SCOTT CHRISTIAN COLLEGE (AUTONOMOUS)

NAGERCOIL

(Estd. 1893)

CURRICULUM AND SYLLABUS

DEPARTMENT OF CHEMISTRY & RESEARCH CENTRE

(Approved by the Standing Committee of the Academic Councils held on 21.10.2023 & 13.01.2024)

UNDERGRADUATE PROGRAMME

CBCS-SEMESTER SYSTEM

(For those who join from 2023 to 2026)

An evolution towards revolution …

Education is crucial for attaining full human potential, developing an unbiased and evenhanded society and promoting national and global development. The education sector in India is witnessing a sweeping wave of change. The very first policy for education, *National Policy on Education* (NPE-1968) was promulgated in 1968, with the National Policy on Education (NPE- 1986) following in 1986. The National Policy on Education (NPE- 1992) and the Programme of Action 1992 (POA-1992) refined and implemented the NPE-1986. The National Education Policy 2020 (NEP 2020) is a landmark document and an evolution towards revolution in the Indian educational sector. It presents the vision for greater access, equity, excellence, inclusion, multiple entry and exit and affordability to help India emerge as the global knowledge superpower.

Providing access to quality education is the key to the curriculum and syllabus of Scott Christian College (Autonomous), in terms of social justice and equality, scientific advancement, cultural preservation and national and global integration. Students should have the freedom and flexibility in choosing their courses, skills, and capacities to become moral, successful, innovative, adaptable, and productive human beings.

Higher education plays an important role in promoting human as well as societal wellbeing and in contributing towards sustainable livelihoods and economic development. The present Outcome-Based Education (OBE) curriculum and syllabus, provides valuable insights and recommendations on aspects of education that include moving towards multidisciplinary and holistic education, mastery and high-order learning and promotion of quality research.

The current curriculum has been designed based on NEP 2020, the National Credit Framework (NCrF), the National Higher Education Qualifications Framework (NHEQF) and Curriculum and Credit Framework for Undergraduate Programmes (CCFUP) which envisage that students must develop into good, thoughtful, well-rounded, creative individuals with a standard of achievement. The themed curriculum aims to support teachers and students in developing their understanding of the curriculum design and delivery process as per the requirement of the world of work.

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DEPARTMENT OF CHEMISTRY & RESEARCH CENTRE

PROFILE

Scott Christian College (Autonomous) established in 1893 is one of the oldest co-educational institutions in South India by the missionaries of the London Missionary Society. The college has its motto, "Truth shall make you free" and serves as a model of academic excellence and social harmony. Scott Christian College offers (Autonomous) diversified undergraduate and post graduate courses. Among the available departments, Department of Chemistry is one of the well-recognized departments, much known for its excellence in teaching and research. It was established in 1952, upgraded as a PG department in 1982 and became a fully fledged research centre in 2005. It celebrated its Diamond Jubilee in 2012-13. It has highly qualified and dedicated team of faculty members. The Department has well equipped, separate laboratories for UG, PG and research students.

The Department is well known for its research in thrust areas like photochemistry, environmental chemistry, polymer nanocomposites, electrochemistry, synthetic organic chemistry and radiation chemistry. It is credited with scores of publications in reputed national and international journals and several ongoing minor and major projects from UGC, ISRO and DRDO. The research laboratory is well equipped with modern instruments and is funded by DST-FIST. Seventy five scholars completed their Ph.D and 32 are currently persuing their research activities. Our former students are working in prestigious institutions like Indian Institute of Technology, National Chemical Laboratory, Pune and Central Universities. Besides these our students have entered into Indian Administrative and Foreign Services also.

Vision

Envisions to be a centre of excellence in chemistry for teaching learning and research

Mission

- To impart current knowledge to the young learners through learner centric methods
- To transform the lives of learners by inculcating values and life skills
- To promote advanced research activities in collaboration with industries
- To encourage the faculty periodically updating themselves through professional development training.

Eligibility

Duration of Course **:** 3 Years (VI Semesters)

Min. Duration **: 3** Years

Medium of Instruction **: English**

FACULTY MEMBERS

MEMBERS OF THE BOARD OF STUDIES

1. **Chairperson**

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2. **Faculty Members**

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3. **Subject Expert 1** : Dr.J. Helen Rathna Monica
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4. **Subject Expert 2** : Dr.A.Siva
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5. **Subject Expert (Nominated by the VC)** : Dr.T.F. Abbs Fen Reji
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6. **Representative** : Mr. M. Praveen Mathew
Industrialist
Director,
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9443360221.

7. **Postgraduate Meritorious Alumnus** : Mr. A. Bebin
Senior Research Fellow
CSIR-CECRI
Mob: 8148018894

The Scott Christian College (Autonomous) defines the focus reinforcing its academic programmes and student life experience on campus through the Graduate Attributes (GA), that describe the knowledge, competencies, values and skills students imbibe for holistic development, multidisciplinary development and contribution to society. These attributes comprise characteristics that are transferable beyond the sphere of study into the national and international realm through curricular, co-curricular and extra-curricular engagements. They equip graduates for life long personal development and employment. Every Graduate of Scott Christian College (Autonomous) – (SCC) is desired to possess the following Graduate Attributes:

GA 1: Intellectual Competencies

Graduates of SCC

- have a comprehensive and incisive understanding of their domain of study as well as the ability for cross-disciplinary learning
- have the ability to apply the knowledge acquired through the curriculum as well as self-directed learning to a broad spectrum ranging from analytical thinking to synthesize new knowledge through research

- are able to have critical, independent and individual outlook regarding academic work and socially relevant issues

GA 2: Problem Solving

Graduates of SCC

- have the capacity to extrapolate from what has been learnt, translate concepts to real-life situations and apply acquired competencies in the required contexts to generate solutions to specific problems
- can view a problem or a situation from multiple perspectives and think 'out of the box' and generate solutions to complex problems in unfamiliar contexts
- are effective problems-solvers, able to apply critical, creative and evidence-based thinking to conceive innovative responses to challenges

GA 3: Communication Skills

Graduates of SCC

- listen carefully, analyse texts and research papers, and present complex information in a clear and concise manner
- express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media
- confidently express herself/himself and construct logical arguments using correct technical language related to a field of learning and area of professional practice

GA 4: Environmental Awareness

Graduates of SCC

- lessen the effect sofenviron mentaldegradation, climate change, and pollution
- learn the nuances for cleanliness, conservation and wise use of resources so that it can be used for generations
- know the nuances of waste management, conservation of biological diversity, management of biological resources and biodiversity, and sustainable development and living

GA 5: Professional Ethics

Graduates of SCC

- develop principled and expert behavior, and this will be showcased in their chosen careers and constructive roles as citizens of the world at large
- imbibe intellectual integrity and ethics in scholarly engagement and develop a spirit of inclusiveness through interactions with diverse people at all levels in life
- acquire new knowledge and skills, including 'learning how to learn' skills, for pursuing learning activities throughout life and adapting to changing demands of the workplace through knowledge, skill development and reskilling, ethically

GA 6: Leadership Qualities

Graduates of SCC

- inculcate leadership qualities and attitudes, and team behaviour along autonomous lines through curricular, co-curricular and extra-curricular activities
- develop managerial and entrepreneurial skills to create new opportunities for diverse careers and gear up to take up competitive examinations
- acttogetherasagrouporateamintheinterestsofacommoncauseandworkefficientlyas a memberofateam

GA 7: Holistic Skill Development

Graduates of SCC

- develop critical thinking, problem-solving capacity, effective communication, and social skills
- are self-aware, flexible, resilient and have the capacity to accept and give constructive feedback and cope up with stress
- develop soft skills, e-skills and life skills to live, learn and work in the technically sound society globally and use appropriate digital methods for analysis of data

GA 8: Cross-Cultural Competencies

Graduates of SCC

- gain cross-cultural competencies through engaging with diverse linguistic, ethnic and religious communities and know how to understand, accept and appreciate individuals at local, national and international levels
- develop a global perspective through contemporary curriculum, culture, language and international exchange programmes
- acquire knowledge of the values and beliefs of multiple cultures and a global perspective to honour diversity, gender sensitivity and adopt gender-neutral approach and show empathy to the less advantaged and the differently-abled

GA 9: Community Engagement

Graduates of SCC

- are sensitive to social concerns and have conviction toward social justice through active social engagement
- are endowed with a strong sense of environmental awareness through the curriculum and a friendly and serene campus eco-system.
- formulate an inspiring vision and build a team that can help achieve the vision, and motivate people to the right destination

GA 10: Value-Based Ethical Competency

Graduates of SCC

- are rooted in the principles of ethical responsibility and integrity permeated with Christian values leading to the building of character and constitutional values
- develop virtues such as truth, love, courage, unity, integrity, brotherhood, industry and uprightness
- practiseresponsible national and global citizen ship required for responding to contemporary challenges, enabling learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, andsustainablesocieties

Learning Outcomes Descriptors for Qualificationat Level 4.5 on the NHEQF

An Undergraduate Certificate is awarded to students who have demonstrated the achievement of theoutcomeslocatedatlevel4.5 on theNHEQF.

ElementoftheDescriptor	NHEQF level descriptors relating to undergraduate certificate
Knowledge and Understanding	The graduates should be able to demonstrate the acquisition of: ● knowledge of facts, concepts, principles, theories, and processes in broad multidisciplinary learning contexts within the chosen fields of learning ● understanding linkages between the learning areas within and across the chosen fields of study, ● procedural knowledge required for performing skilled tasks associated with the fields of learning.
General,Technicaland Professional Skills	The graduates should be able to demonstrate the acquisition of: ● cognitive, rational and technical skills required to identify, analyze and synthesize information and to accomplish tasks relating to the fields of learning. ● Cognitive and technical skills required for selecting and using relevant methods,tools,andmaterials ● apply the acquired technical and theoretical knowledge and use basic methods, tools, materials, and information to generate solutions to specific problems relating in the field of learning.
GenericLearning Outcomes	The graduates should be able to demonstrate the ability to: ● listen carefully, read texts related to the chosen fields of study analytically, and present information in a clear and concise manner ● express thoughts and ideas effectively in writing and orally and present the results/findings of the experiments carried out ● make judgment and take decisions, based on analysis of data and evidence, for formulating responses to issues/problems associated with the chosen fields of learning
Constitutional, Humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness to: ● practice constitutional, humanistic, ethical, and moral values in real-life situations, ● put forward convincing arguments to respond to the ethical and moral issues associated with the chosen field so learning ● use reason and empathy, considering the consequences of human actions and the likely impact on other people and animals
Employability and Entrepreneurship Skills	The graduates should be able to demonstrate the acquisition of: ● knowledge and essential skills, required to perform effectively in a defined job relating to the chosen fields of study, ● ability to exercise responsibility for the completion of assigned tasks and for the outputs of own work, and to take some responsibility for group work and output as a member of the group ● transferable skills and key personal attributes which are highly valued by employers and essential for effective performance in the workplace.
Credit Requirements	● The successful completion of the first year(two semesters)of the under-graduate programme of minimum 40credit hours
Entry Requirements	● Certificate obtained after successful completion of Grade 12 or equivalent state of education.

Learning Outcomes Descriptors for Qualifications at Level 5 on the NHEQF

An Undergraduate Diploma is awarded to students who have demonstrated the achievement of the outcomes located at level 5on the NHEQF.

ElementoftheDescriptor	NHEQF Level Descriptors
Knowledge and Understanding	The graduates should be able to demonstrate the acquisition of: ● Theoretical and technical knowledge in multidisciplinary contexts ● Deeper knowledge and understanding of the learning areas and its underlying principles and theories ● procedural knowledge required for performing skilled tasks
Application of Knowledge and Skills	The graduates should be able to demonstrate the ability to: ● apply the acquired specialized or theoretical knowledge ,and arrange of cognitive and practical skills to gather quantitative and qualitative data, ● select and apply basic methods, tools, materials, and information to formulate solutions to problems related to the chosen field(s)of learning. ● analyze and synthesize ideas and information from a range of sources and act on information to generate solutions to problems
GenericLearning Outcomes	The graduates should be able to demonstrate the ability to: ● listen carefully, read texts and present complex information in a clear and concise manner in writing and orally ● critically evaluate the essential theories, policies, and practices by following a scientific approach to knowledge development. ● make judgement and take decision, based on the analysis and evaluation of information, for determining solutions to a variety of unpredictable problems associated with the chosen fields of learning
Constitutional,Humanistic, Ethical, and Moralvalues	The graduates should demonstrate the willingness and ability to: ● embrace constitutional, humanistic, ethical, and moral values and practice these values in life ● ethically address issues relating to the chosen fields of learning, including environmental and sustainable development issues ● use reason and empathy, considering the consequences of human actions and the likely impact on other people and animals
Employability and Entrepreneurship Skills	The graduates should be able to demonstrate the acquisition of skill sets that are necessary to: ● take up employment relating to the chosen fields of study or professional practice ● exercise self-management within the guidelines of study and work contexts. ● Take responsibility for the evaluation and improvement of work or study activities
Credit Requirements	The successful completion of the first two years(four semesters)of the under-graduate programme involving a minimum of 80 credit hours
Entry Requirements	Continuation of study or lateral entry in the second year of the undergraduate programme will be possible for those who have met the entrance requirements, including specified levels of attainment, specified in the programme regulations.

Learning Outcomes Descriptors for a HigherEducation Qualification at Level 5.5 on the NHEQF

The Bachelor's degree is awarded to students who have demonstrated the achievement of the outcomes located at level5.5 on the NHEQF.

Elementofthe Descriptor	NHEQF Level Descriptors
Knowledge and Understanding	The graduates should be able to demonstrate the acquisition of: • comprehensive, factual, theoretical, and specialized knowledge in broad multidisciplinary contexts with depth in the underlying principles and theories relating to the fields of learning. • knowledge of the current and emerging issues and developments within the chosen field of learning. • Procedural knowledge required for performing and accomplishing professional tasks in the chosen fields of learning.
General,Technical and Professional Skills	The graduates should be able to demonstrate the acquisition of: • Cognitive and technical skills required for performing and accomplishing complex tasks • Cognitive and technical skills required to evaluate and analyze complex ideas and generate solutions • measurable abilities and knowledge that come through learning and can be job or task-specific
Application of Knowledge andSkills	The graduates should be able to demonstrate the ability to: • apply the acquired theoretical knowledge, and cognitive and practical skills to gather and analyze quantitative and /or qualitative data • employ the right approach to generate solutions to problems related to the fields of learning • develop through practice, experience, and the effective utilization of acquired knowledge to perform specific tasks, solve problems, or exhibit competence
Generic Learning Outcomes	The graduates should be able to demonstrate the ability to: • communicate in writing and orally the constructs and methodologies adopted for the studies undertaken relating to the chosen fields of learning, • make coherent arguments to support the findings/results of the study undertaken and pursue self-paced and self-directed learning to upgrade knowledge and skills and pursue higher level of education and training. • make judgement and take decisions based on the analysis and evaluation of information for formulating responses to problems based on empirical evidence
Constitutional, Humanistic, Ethical, and Eoral Values	The graduates should be able to demonstrate the willingness and ability to: • Embrace constitutional, humanistic, ethical, and moral values, and practice these values in life. • Formulate coherent arguments about ethical and moral issues, including environmental and sustainable development issues, • follow ethical practices in all aspects of research and development
Employability and Entrepreneurship Skills	The graduates should be able to demonstrate the acquisition of: • knowledge and essential skills set and competence that are necessary to take up a professional job • entrepreneurship skills required for setting up and pursuing self-employment • the ability to exercise management and supervision in the contexts of work or study activities involving unpredictable work processes and working environments.
CreditRequirements	The successful completion of the first three years(six semesters)of the undergraduate programme involving a minimum of 120 credit hours
EntryRequirements	Continuation of study or lateral entry into the third year of the undergraduate programme will be possible for those who have met the specified levels of attainment, specified in the programme admission regulations .

PLO & GA Mapping

Programme Learning Objective #	Programme Learning Objective (PLO)	Description of PLO
PLO 1	Language proficiency	Exhibit spoken and written skills for effective communication
		Relate reading and listening skills to expedite access to knowledge resources and understanding
		Combine two or more language abilities while interacting
PLO 2	Critical thinking and domain knowledge	Acquire knowledge of basic concepts, theories and processes through study of core courses in respective programmes and have a critical outlook
		Critically relate and consider domain specific knowledge to emerging areas of academia
		Evaluate, familiarize and develop domain specific transferrable skills to new and or unfamiliar contexts
PLO 3	Interdisciplinary knowledge	Identify and determine connection across disciplines
		Empower students to combine frameworks and concepts from multiple disciplines to examine and solve a problem from different perspectives
		Procure and apply interdisciplinary knowledge for universal development
PLO 4	Digital competency	Acquire the ability to leverage digital technologies to communicate, collaborate, and analyze data
		Get acquainted with software resources, computational skills and digital tools
		Ethically apply digital skills to confidently use technology for work, learning and daily life
PLO 5	Analytical skills	Develop the ability to think critically and relate learning to academic, professional and real-life problem solving
		Apply empirical knowledge and skills to identify and collect quantitative and qualitative data to analyze and formulate evidence-based suggestions and solutions
		Analyse problems and come out with facts-based solutions

PLO 6	Academic writing & presentation skills	Formulate and document results, case studies, project works, field works and internships
		Present ideas, analyze research and construct an effective argument
		Keep focused, planned and structured by using effective methodologies and in formal presentations
PLO 7	Innovation and creativity	Validate convertible capabilities and entrepreneurial skills that are needed for employment opportunities
		Develop and generate intellectual property
		Empower entrepreneurs to discover opportunities, solve problems, adapt to change, continuously improve, and drive business growth
PLO 8	Social engagement and responsibility	Exhibit the ability to link classroom learning with social concerns and engagement through service learning and outreach programmes
		Enhance positive leadership qualities for peaceful coexistence, general wellbeing and improved quality of life
		Have ethical responsibility, philanthropic responsibility and economic responsibility
PLO 9	Environmental sensitization	Appreciate environmental consciousness and sustainability
		Make students acquire sensitivity to the environment and its problems and help them to acquire a set of values for environmental protection
		Encourage students to acquire knowledge of pollution and environmental degradation
PLO 10	Autonomy and Responsibility	Demonstrate a sense of community service, be proactive and creative at work, committed to lifelong learning
		Encourage independent thought, problem-solving, creative thinking and productive teamwork
		Reflect the basic human need to have control over our own lives both at work and in life

METHODS OF ASSESSMENT

Remembering (K1)	• The lowest level of questions require students to recallinformation from the course content • Knowledge questions usually require students to identify information in the textbook
Understanding (K2)	• Understanding of acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words • The questions go beyond simple recall and require students to combine the ideas together
Application (K3)	• Students have to solve problems by using/applying aconcept learned in the classroom • Students must use their knowledge to determine exact response
Analyze (K4)	• Analyzing the question by asking students to breakdown something into its component parts • Analyzing requires students to identify reasons, causes or motives and reach conclusions generalizations
Evaluate (K5)	• Evaluation requires an individual to make judgmenton something • Questions to judge the value of an idea, a character, awork of art, or a solution to a problem • Students are engaged in decision-making
Create (K6)	• The questions of this category challenge students toget engaged in creative and original thinking • Developing original ideas and problem solving skills

Cognitive Level (CL)

No.	Code	Cognitive Level
1	R	Remember
2	U	Understanding
3	Ap	Apply
4	An	Analyse
5	E	Evaluate
6	C	Create

Knowledge Category (KC)

No	Code	Knowledge
1	F	Factual
2	C	Conceptual
3	P	Procedural
4	M	Metacognitive

Learning Activities

A. Participative Learning

No	Code	Description
1	GD	Group Discussion
2	SI	Simulation
3	OO	One to One Learning
4	RF	Rapid Fire
5	KWL	Know, Want to Know, Learned
6	Sem	Seminar
7	WSQ	Watch Summarise Question
8	FC	Flipped Class

B. Cooperative Learning

No	Code	Description
1	Lec	Lecture
2	Soc	Socrates Method
3	BS	Brain Storming
4	GT	Group Learning
5	OT	One to One Tutoring

C. Peer Learning

No	Code	Description
1	TPS	Think Pair Share
2	RPT	Reciprocal Peer learning
3	PT	Peer Learning

D. Experiential Learning

No	Code	Description
1	RP	Roleplay
2	FW	Fieldwork
3	MPr	Micro/Mini Project
4	Pr	Project
5	Viv	Viva-Voce
6	Rep	Report Writing
7	Rev	Review Writing
8	CW	Critique Writing

E. Problem Solving Method

No	Code	Description
1	CS	Case Study
2	Ess	Essay
3	AW	Article Writing
4	SP	Solution to Problem
5	PF	Problem Finding

Assessment Task

No	Code	Description
1	CA	Class Assignment
2	HrA	Hour Assignment
3	CT	Class Test
4	ST	Self Test
5	OT	Online Test
6	OBT	Open Book Test
7	Qui	Quiz
8	HoA	Home Assignment
9	MCQ	Multiple Choice Question
10	SA	Short Answer
11	Ess	Essay

METHODS OF EVALUATION

Evaluation	Methods	Marks
Internal	Continuous Internal Assessment Test	**40**
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
External	End Semester Examination	**60**
Total		**100**

UG CURRICULUM TABLE

Year	Semester	Module No.	Courses	Hours						Total Hours	Credits	Credit points	Subject Code
				Lecture	Tutorial	Practical	Internship	Self-Learning	Demonstration				
I	I	1.1	Part I MIL-1 Modern Indian Language –Tamil /Malayalam / Hindi	6						6	3	13.5	23LT11
		1.2	Part II CE-1 Communicative English	5		1				6	3	13.5	23LE11
		1.3	PartIII CC-1- General Chemistry I	6						6	5	22.5	23GC11
		1.4	CC-2 Basic concepts of chemistry Core Lab course - Quantitative inorganic estimation and inorganic preparation	4		2				4 2	4 1	13.5 22.5	23GC12 23GCP1
		1.5	Part-1V MS1-Allied Course I	4						4	4	13.5	23AC01
		1.6	MSP1- Allied Lab Course I			2				2	1	4.5	23ACP1
			Total							**30**	**21**	**90**	
I	II	2.1	Part I MIL-2 Modern Indian Language Tamil/Malayalam / Hindi	6						6	3	13.5	23LT21
		2.2	Part II CE-2 Communicative English	5		1				6	3	13.5	23LE21

		2.3	Part III CC3-General Chemistry-II	6						6	5	22.5	23GC21
		2.4	CC-4 Organic chemistry -I Lab Course II - Organic Qualitative analysis and organic preparation	4		2				4 2	4 1	22.5	23GCP2
		2.5	Part IV MS2- Allied Course II	4						4	4	13.5	23AC02
		2.6	Part IV MSP2- Allied Lab Course II			2				2	1	4.5	23ACP2
		Total								**30**	**21**	**90**	
II	III	3.1	Part I MIL-3 Modern Indian Language	6						6	3	15	23LT31
		3.2	CE-3 Communicative English	5		1				6	3	15	23LE31
		3.3	Part III CC-5 General Chemistry III	4						4	4	25	23GC31
		3.4	CC-6 Inorganic Chemistry I	4						4	4	20	23GC32
			Lab Course - 3 Qualitative Inorganic Analysis (Simple Salt)			2				2	2	5	23GCP3
		3.5	Part IV MS-3 Allied Chemistry	4						4	4	20	23AC03
			MSP-3 Allied Chemistry Practicals			2				2	1	5	23ACP3

		3.6	Part-V SEC-1 Food Chemistry	2						2	1	5	23GCS1
		3.7	Part VI VAC- 1 Health and Fitness through Yogasanas (Common to all)	0						0	1	5	23SE11
			Total							**30**	**23**	**115**	
II	IV	4.1	Part I MIL-4 Modern Indian Language Tamil/Malayalam/Hindi	6						6	3	15	23LT41
		4.2	Part II CE-4 Communicative English	5		1				6	3	15	23LE41
		4.3	Part III CC-7 Organic Chemistry-II	4						4	4	20	23GC41
			CP-4 Qualitative Inorganic Analysis (Mixture)			2				2	1	5	23GCP4
		4.4	Part IV MS-4 Allied Chemistry	4						4	4	20	23AC04
			PMSP-4 Allied Chemistry Practicals			2				2	1	5	23ACP4
		4.6	PartV SEC-2 Cosmetics and Personal Grooming							2	1	5	23GCS2
		4.7	Part VI VAC -2 Digital Empowerment through Artificial Intelligence, Multimedia and Cyber Security (Common to all)	2						2	1	5	23SE21
		4.8	Part VII (NME1) M1-Dairy Chemistry	2						2	2	10	23GCN1

		4.9	Internship				0			0	1	5	23GCD1
			Total							**30**	**21**	**105**	
III	V	5.1	Part III CC-8 Physical Chemistry-I	4						4	4	22	23GC51
			CP-5 Organic Estimation & Preparation of Organic Dyes			2				2	1	5.5	23GCP5
		5.2	CC-9 Project	6						6	5	27.5	23GCD2
		5.3	CCE- 1-Core Course Elective i. Elements of Material Science and Nano Chemistry ii. Pharceutical Chemistry	6						6	4	22	23GCEA 23GCEB
		5.4	CCE-2-Core Course Elective i. Instrumental Method of Analysis ii. Textile Chemistry	6						6	4	22	23GCEC 23GCED
		5.5	Part V SEC-3-Entrepreneurial Skills in chemistry	2						2	1	5.5	23GCS4
		5.6	Part VI VAC- 3 Indian Knowledge System and Human Rights (Common to all)	2						2	1	5.5	23SE31
		5.7	Part VII NME_2 M 2-Chemistry in Everyday Life	2						2	2	11	23GCN2
			Total							**30**	**22**	**121**	

III	VI	6.1	Part III CC-10 Inorganic Chemistry-II	4						4	4	22	23GC61
			CP-6 Gravimetric Analysis and Inorganic Preparation			2				2	1	5.5	23GCP6
		6.2	CC-11 Physical Chemistry-II	4						4	4	22	23GC62
			CP-7 Physical Chemistry Practical			2				2	1	5.5	23GCP7
		6.3	CCE-3 Core Course Elective i. Biological Chemistry ii. Forensic Chemistry	6						6	4	22	23GCEE 23GCEF
		6.4	CCE-4 Core Course Elective i. Polymer Chemistry ii. Ii. Agricultural Chemistry	6						6	4	22	23GCEG 23GCEH
		6.5	Part V SEC -4 Water Management	2						2	1	5.5	23GCS5
		6.6	Part VI VAC-4 Environmental Science (Common to all)	2						2	1	5.5	23SE41
		6.7	Part VII –NME-3 M-3 Rubber Technology	2						2	2	22	23GCN3
			Total							**30**	**22**	**132**	

Credit Allocation Summary

S.No	Components	Courses	Credits	Hours
1	Part –I Modern Indian Language Tamil/Malayalam/Hindi	4	12	24
2	Part II Communicative English	4	12	24
3	Part IIICore Courses/Major (CC)	11	49	54
4	Part III Core Course /Generic Elective	4	16	24
5	Part IV Minor Stream (Allied)	4	20	24
6	Part-V Skill Enhancement Course (SEC)	4	4	8
7	Part VI Value Added Courses(VAC) Common for all	4	4	6
8	PartVII Multidisiciplinary (NME)	3	6	6
9	Internship (II year vacation)	1	1	0
10	Total	**39**	**124**	**170**

Semester - I

Course Title: Part – I **Tamil** 23LT11	Course Type: Theory

Total Hours : 90	Hours / Week – 6	Credits: 3

Pass-out Policy: Minimum	Contact Hours: 54	
Total Score %: 100	Internal: 40	External: 60
Minimum Pass % 40 (No Minimum for Internal)		

Course Creator	Expert 1	Expert 2
Dr. D. Deva Sambath Associate Professor Head of the Department Mobile : 9994964710	Dr. S. Sujana Bai Assistant Professor Mob: 9486758307 sujanabai@gmail.com	Dr. J. Kingsly Assistant Professor Mobile: 7871978855 kingslyphd@gmail.com

CLO No.	Course Learning Outcomes (CLO) upon completion of this course, students will be able to	% of PLO mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO 1	பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப் படுவதால் கவியாக்கத் திறன் பெறுவர்	1(8), 2(8), 6(4)	**1, 2, 3,**	Ap	P
CLO 2	புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்.	1(6), 2(8), 3(6)	**1, 2, 3, 8**	U	F
CLO 3	இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறன் பெறுவர்.	1(8), 7(12)	**2, 3, 7**	An	M
CLO 4	மொழியறிவோடு சிந்தனைத் திறன் அறிவில் மேம்படுவர்.	1(10), 2(10)	**2, 3**	Ev	C
CLO 5	தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்வர்.	1(8), 3(6), 6(6)	**2, 3, 8**	C	P

Module	Course Description	Hours	% of CLOmapping with Module	Learning Activities	Assessment Tasks	Reference
	அலகு I மரபுக்கவிதை					
1.1	தமிழ்த் தெய்வ வணக்கம் - மனோன்மணியம் பெ. சுந்தரனார்	2	1(11)	GT	HrA	1
1.2	சிறுத்தையே வெளியில் வா- பாரதிதாசன்	2	1(12)	Sem	CT	1
1.3	புத்தரும் சிறுவனும்- கவிமணி தேசிக விநாயகம் பிள்ளை	4	1(22)	GD	CT	1
1.4	மொழி உணர்ச்சி -முடியரசன்	2	1(11)	Lec	CA	1
1.5	ஆட்டனத்தி ஆதிமந்தி -ஆதிமந்தி புலம்பல் -கண்ணதாசன்	4	1(22)	Lec	HoA	1

1.6	வினாத்தாள் -சுரதா	2	1(11)	SI	ST	1
1.7	கடல் - தமிழ் ஒளி	2	1(11)	ESS	SA	1
	அலகு II புதுக்கவிதை					
2.1	வீட்டுக்கொரு மரம் வளர்ப்போம் - அப்துல் ரகுமான்	2	2(11)	Sem	HoA	1
2.2	சென்ரியூ கவிதைகள் -ஈரோடு தமிழன்பன் (ஏதேனும் ஐந்து கவிதைகள்)	2	2(11)	Lec	Qui	1
2.3	பிற்சேர்க்கை -வைரமுத்து	3	2(17)	Lec	CA	1
2.4	வாழைமரம் - மு. மேத்தா	2	2(11)	GD	CT	1
2.5	வள்ளுவம்பத்து- அறிவுமதி	2	2(11)	Lec	CT	1
2.6	ஆனந்தயழை மீட்டுகிறாய் - நா. முத்துக்குமார்	3	2(17)	OO	ST	1
2.7	சபிக்கப்பட்ட முத்தம்- சுகிர்தராணி	2	2(11)	Sem	SA	1
2.8	நீ எழுத மறுக்கும் எனது அழகு - இளம்பிறை	2	2(11)	Sem	HoA	1
	அலகு III சிறுகதைகள்					
3.1	வாய்ச்சொற்கள்- ஜெயகாந்தன்	2	3(11)	Lec	HoA	9
3.2	கடிதம் -புதுமைப்பித்தன்	1	3(6)	Lec	CT	10
3.3	கரு- உமா மகேஸ்வரி	2	3(11)	GD	HrA	9
3.4	முள்முடி தி. -ஜானகிராமன்	2	3(11)	Sem	CT	9
3.5	சிதறல்கள்- விழி.பா. இதயவேந்தன்	2	3(11)	Lec	SA	10
3.6	காகித உறவு - சு. சமுத்திரம்	3	3(17)	Lec	ST	10
3.7	வீட்டின் மூலையில் ஒரு சமையலறை- அம்பை	4	3(22)	GD	Ess	9
3.8	நாய்க்காரச் சீமாட்டி -ஆண்டன் செக்காவ்	2	3(11)	Lec	SA	4
	அலகு IV இலக்கிய வரலாறு					
4.1	மரபுக்கவிதை	6	4(33)	Lec	MCQ	3

4.2	புதுக்கவிதை	6	4(33)	Lec	SA	3
4.3	சிறுகதை	6	4(34)	Sem	Ess	3
	அலகு V மொழித்திறன் போட்டித்தேர்வு					
5.1	பொருள் பொதிந்த சொற்றொடர் அமைத்தல்	3	5(16)	RF	Qui	6
5.2	ஒரெழுத்து ஒரு மொழி	3	5(16)	Sem	MCQ	6
5.3	வேற்றுமை உருபுகள்	3	5(17)	Lec	Ess	4
5.4	திணை, பால், எண், இடம்	3	5(17)	Lec	MCQ	5
5.5	கலைச்சொல்லாக்கம்	3	5(17)	RF	CA	6
5.6	மொழிபெயர்ப்பு	3	5(17)	Ess	CA	8

Reference Books
1. பொதுத்தமிழ் -முதற்பருவம், தமிழ்த்துறை வெளியீடு, ஸ்காட் கிறிஸ்தவக் கல்லூரி (தன்னாட்சி), நாகர்கோவில்.
2. தமிழ் இலக்கிய வரலாறு சிற்பி. பாலசுப்பிரமணியன், கவிதா பதிப்பகம், சென்னை
3. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல், மீனாட்சி புத்தக நிலையம், மதுரை.
4. ஆண்டன் செகாவ் கதைகள் எம். கோபாலகிருஷ்ணன், நூல்வனம் பதிப்பகம், சென்னை.
5. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு முனைவர் பாக்யமேரி, நியூசெஞ்சுரி புக்ரவுஸ் (பி) லிட், சென்னை.
6. நன்னூல் - சொல்லதிகாரம், மணிவாசகர் பதிப்பகம், சென்னை
7. தொல்காப்பியம் - சொல்லதிகாரம், சாரதா பதிப்பகம், சென்னை
8. அடிப்படைத் தமிழ் இலக்கணம் -எம்.ஏ.நுஃமான், அடையாளம் பதிப்பகம், புத்தாநத்தம்
9. 100 சிறந்த சிறுகதைகள் பாகம் (1) எஸ். ராமகிருஷ்ணன், தேசாந்திரி பதிப்பகம், சென்னை.
10. 100 சிறந்த சிறுகதைகள் எஸ். ராமகிருஷ்ணன், தேசாந்திரி பதிப்பகம், சென்னை பாகம்(2).

SEMESTER - I

Course Title: **Malayalam** 23LM11 Modern Indian Language-1 (MIL – 1) Prose Composition and Translation	Course Type: Theory

Total Hours:90 Hours/Week: 6 Credits:3

Pass-Out Policy : Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Name : Dr.Jisha.S.K	Name : Dr.Pramod Kumar D.N	Name : Dr.R.Sreejasankar
Designation : Assistant Professor	Designation : Associate Professor	Designation : Assistant Professor
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Email id : jisha@scottchristian.org	Email id : pramodrds@gmail.com	Email id : sreejavijayan77@gmail.com

CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	understand the word level and sentence level translation and obtain the proverb narrative techniques	1(10), 2(10)	1, 8	U	M, C
CLO-2	evaluate the Malayalam Novel of different eras and getting life awareness and obtain the riddle's moral value	1(5), 2(5), 5(10)	1, 2, 3, 6, 8	U, An	M,F
CLO-3	analyse the Malayalam Short story of different eras and getting life awareness and obtain the riddle's moral value	5(10), 9(10)	6, 7	An, E	M,P
CLO-4	evaluate the Malayalam autobiography of different eras and getting life awareness	9(10), 10(10)	1, 3, 7	An, E	M,F, C
CLO-5	evaluate the Malayalam Travelogue. of different eras and getting life awareness and obtain the moral value	5(10), 9(10)	1, 2	U, E	M, C, P

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	References
1	**Vivarthanam**	**18**				
1.1	Malayala Vivarthana Charithram	1	1[10]	Lec	CA	14
1.2	Vivarthanathinte Prayojanam	1	1[15]	Lec	CA	14
1.3	Vivarthakanate Gunangal	1	1[12]	Lec	HrA	14
1.4	Vivarthanathinte Parimithikal	1	1[13]	Lec	CT	14
1.5	Englishil Ninnum Malayalathilekku Vivarthanam Cheyyuka	4	1[12]	Lec	ST	14
1.6	Malayalathil NinnumEnglishilekku Vivarthanam Cheyyuka	4	1[13]	Lec	CT	14
1.7	Sailikalum Pazhancholllukalum	3	1[12]	Lec	ST	14
1.8	Aasayavipulanam	3	1[13]	Lec	CT	14
2	**Malayalanovel**	**18**				
2.1	Malayalanovel Charithram	2	2[10]	Lec	OT	1,4,6, 7,8,1 3
2.2	M.D.yude Novalukal	1	2[10]	Lec	OBT	1,4,6, 7,8,13
2.3	Naalukettu Samagra avalokanam (Visada PadanamAadyathe 5 Adhyayangal)	3	2[20]	Lec	Qui	1,4,6, 7,8,13

2.4	Adyayam 1	3	2[10]	Lec	HoA	1,4,6, 7,8,13
2.5	Adyayam 2	3	2[20]	Lec	MCQ	1,4,6, 7,8,13
2.6	Adyayam 3	3	2[10]	Lec	Qui	1,4,6, 7,8,13
2.7	Adyayam 4	3	2[20]	Lec	HoA	1,4,6, 7,8,13
3	**Malayala Cherukadha**	**18**				
3.1	Malayala Cherukadha Charithram	3	3[20]	GD	SA	1,2,3, 5,10,1 1
3.2	Karoorinte Cherukadhakal	3	3[10]	CS	ESS	1,2,3, 5,10,1 1
3.3	Marappavakal- Kaaroor	3	3[20]	Lec	CA	1,2,3, 5,10,1 1
3.4	Uthuppante Kinar - Kaaroor	3	3[10]	Lec	HrA	1,2,3, 5,10,1 1
3.5	Kalchakaram - Kaaroor	3	3[20]	Lec	CT	1,2,3, 5,10,1 1
3.6	Poovamabhazham - Kaaroor	3	3[20]	Lec	CT	1,2,3, 5,10,1 1
4	**Athmakadha Saahithyam**	**18**				
4.1	Malayala AathmakadhaSaahithyaCharithram	3	4[20]	Sem	ST	1,12
4.2	Joseph Mundasseri	3	4[20]	Sem	OT	1,12
4.3	Kozhinja Elakal Samagra avalokanam (Visada Padanam Aadya Naalu Adhyayangal)	3	4[20]	CS	OBT	1,12
4.4	Adyayam 1	3	4[10]	Lec	Qui	1,12
4.5	Adyayam 2	3	4[20]	Lec	HoA	1,12
4.6	Adyayam 3	3	4[10]	Lec	Qui	1,12

5	**Yaathravivaranam**	**18**				
5.1	Malayala Yaathra vivarana Charithram	3	5[20]	Ess	MCQ	1
5.2	Raajan Kaakkanadan	3	5[10]	GD	SA	1
5.3	Himavante Mukal Thattil - Raajan Kaakkanadan Samagra avalokanam (Visada Padanam Aadya moonnu	3	5[20]	SP	CA	1
5.4	Adyayam 1	3	5[10]	SP	HrA	1
5.5.	Adyayam 2	3	5[20]	GL	CT	1
5.6	Adyayam 3	3	5[20]	GL	CT	1

Reference Books

1. K.M.George, Aadgunika Malayala Sahithya Charithram Prasthanangalilude, Kottayam, D.C.Books, 1998.
2. M.Achuthan, Cherukadha Innale Innu, D.C Books,2007
3. N.Prabhakaran, Kadha Thedunna Kadha,
4. 4.Tharakan K.M. Malayala Novel Saahithya Charithram, Karala Saahithya Accademy Thichur, D.C.Books,1978
5. K.S.Ravikumar, Kadhayum Kalavum,
6. E. V. Ramkrishnan ,Malayala Novalinte Desakaalangal, Mathrbhoomi Books,2017.
7. K.P. Appan, Maranunna Malayala Noval, , D.C Books, 2015
8. P.K.Rajasekharan , Andhanaya Daivam, D.C Books,,1970
9. Dr.K.M. Prabhakara Varir , Shylee shilppam,
10. Kaaroor Neelakanda Pillai,Kaaroor Kadhakal Sampoornam, NBS Kottayam 2004,
11. Karur Kadha patanam- M.M.Basheer,NBS Kottayam, 1980
12. Gopalakrishnan Naduvattom, Aathmakadhasaahithyam Saahithyam, Kerala Bhasha Institute,
13. Thiruvananthapuram, 1990
14. Tharakan K.M., Aadhunika Novel Dersanangal, N.B.S. Kottayam, 1980.
15. Dr. N.E.Viswanadhan, Vivarthana Vicharam, D.C Books, 2004

SEMESTER I

Course Title: **General Hindi** 23LH11 Modern Indian Language-1 (MIL – 1)	Course Type: Theory

Total Hours:90	Hours/Week:6	Credits: 3

Pass-Out Policy :	Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Mrs. Josy Vincent	Dr.Sreedevi S	Dr.Jayasree. K.
Assistant Professor of Hindi	Assistant professor of Hindi,	AssistantProfessor of hindi
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josysam2020@gmail.com	sdtvpm@yahoo.com	Jayasree8262@gmail.com

CLO. No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	• Understand the concepts of Hindi sounds	1(10), 2(10)	1, 8	U	M,F,C
CLO-2	• Understand and analyze Sentence formation in Hindi	2(5), 3(10), 5(5)	1,2, 3, 5	U,An	M,C
CLO-3	Remember Hindi vocabulary	2(5), 9(10), 10(5)	1, 3, 7, 8,	An, E	M,C,P
CLO-4	• Understand and analyze stories and other passages	9(10), 10(10)	3, 7, 9	An, E	M,C,P
CLO-5	Evaluate Language ability	1(10), 5(5), 9(5)	1, 6,	U, E	M,C,P

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	References
1	**Buniyadi Hindi**	**18**				
1.1	Swar	3	1[10]	Lec	CA	2,3,4,5,6,8
1.2	Vyanjan	4	1[15]	Lec	CA	2,3,4,5,6,8
1.3	BarahKhadi	3	1[25]	Lec	HrA	2,3,4,5,6,8
1.4	Shabdh	2	1[25]	Lec	CT	2,3,4,5,6,8
1.5	Vakyarachana	3	1[25]	Lec	ST	1
2	Hindi shabdhavali					
2.1	Risthom ke naam	3	2[50]	Lec	OT	2,3,4,5,6,8
2.2	Gharelu Padharthom ke naam	3	2[50]	Lec	OBT	2,3,4,5,6,8
3	Vyakaran					
3.1	Sadharan vakya our sangya	3	3[25]	GD	SA	2,3,4,5,6,8
3.2	Sarvanaam	3	3[25]	CS	ESS	2,3,4,5,6,8
3.3	Visheshan	3	3[25]	Lec	CA	2,3,4,5,6,8
3.4	Kriya aadi shabdhom ka prayog	3	3[25]	Lec	HrA	2,3,4,5,6,8
4	Chote Gadhyamsh ke patan					
4.1	Bachom ki kahaniyam	3	3[50]	Lec	CT	7
4.2	Pathr pathrkaom mem Prakashith Gadyamsh ka patan	3	4[50]	Sem	OT	2,3,4,5,6,8
5	Nibandh					
5.1	Sant. Thiruvalluvar	3	5[25]	Ess	MCQ	9

5.2	EVR Thandai Periyar	3	5[25]	GD	SA	9
5.3	Naari Saktheekaran	3	5[25]	SP	CA	9
5.4	Paravaran Samrakshan	3	5[25]	SP	HrA	9

Reference Books

1. Hindi ke avyay vakyamsh – Chaturbuj Sahay
2. Subodh Hindi vyakaran – Phoochand Jain
3. Sanshipt Hindi Vyakaran – Vyavaharic Hindi – Nagappa
4. Abhinav Hindi vyakaran – Nagappa
5. Saral Hindi Vyakaran – Syamachandra Kapur
6. Vyakaran Pradeep – Ramdev
7. Lakhu Balkadhayem – Ramashankar
8. Hindi Grammar – Edwin Greeves
9. Hindi Nibandh

SEMESTER - I

Course Title: Part 11 Communicative English (Semester 1) 23LE11	Course Type: Theory

Total Hours: 90 (Including Seminar/ Practical [information Transfer] and formative assessment)
Hours/Week: 6 Credits: 3

Pass-Out Policy: Minimum Contact Hours: 54
Total Score %: 100 Internal:40 External: 60
Minimum Pass %: 40 [No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Dr. V Brinsley	Dr. L. Judith Sophia	Dr. Sheni D. L. Singh
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8903480894	9486459061	9487386706
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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	1 (10) 6 (7) 7 (3)	2, 3	U AP	F P
CLO-2	Examine and present material of the prescribed texts and other texts	2 (8) 5 (12)	1, 2	U, An E	C M
CLO-3	Identify cross cutting issues like, Human values, (Professional, Personal and Domestic) ethics and environmental sustainability and practise them	3 (8) 8 (6) 9 (6)	1, 4, 8, 9	An E, Ap	C P
CLO-4	Present and differentiate various cultures and civilizations of the Globe and distinguish Indian traditional Knowledge	1 (10) 8 (5) 10 (5)	5, 6, 10	U, Ap	P M
CLO-5	Relate the textual content and underlying meaning of the context to the real life situations	5 (6) 8 (8) 10 (6)	1, 2, 5, 7	E, Ap, C	C M

Module	**Course Description**	**Hours**	**% CLO mapping with Module**	**Learning Activities**	**Assessment Tasks**	**References**
1	**PROSE**		**18**			
1.1	**JRD - Harish Bhat**					
1.1.1	Introduction to the Author, essay &	3	2 [4],	L	Ho A	1

	Textual analysis		4 [4]			
1.1.2	Human values to be imbibed from the life of Tata	1	2 [4], 3 [5], 5 [5]	L GD	SA	1
1.1.3	Professional and Personal ethics revealed in "JRD"	2	2 [4], 3 [5], 5 [5]	L GD	Ess	1
1.2	**Us and Them - David Sedaris**					
1.2.1	Introduction to the Author, essay & Textual Analysis	3	2 [4], 4 [8]	L	Ho A	2
1.2.2	Thematic discussion: Self-centred attitude & Social media influence	2	2 [4], 3 [5] 5 [5]	L GD	MCQ HoA	2
1.2.3	Human Values (Empathy) reflected in "Us and Them"	1	2 [4], 3 [4], 5 [5]	L GD	SA Ess	2
1.3	**Uncle Podger Hangs a Picture - Jerome K Jerome**					
1.3.1	Introduction to the Author & essay Textual Analysis	3	2 [4], 4 [6]	L	Ho A	3
1.3.2	Thematic Discussion: Comic attitude of Patriarchal Dominance in the domestic context	2	2 [4], 3 [5],	L GD	Ess HoA	3
1.3.3	Uncle Podger- Character analysis	1	5 [6]	RP	MCQ	3
2	**POETRY**		**18**			

2.1	**A Patch of Land - Subramania Bharati**					
2.1.1	Introduction to the poet and the poem	1	2 [2], 4 [8]	L	Ho A	4
2.1.2	Poetry Analysis- Discussion on themes & Techniques	2	2 [3], 5 [5]	L GD	Hr A	4
2.1.3	Connection between Land and Poetic creation: A Reflection on Indian Knowledge	1	4 [6]	GD	Ess	
2.2	**The Sparrow - Paul Laurence Dunbar**					
2.2.1	Introduction to the poet and the poem	1	2 [3], 4[4]	L	Ho A	5
2.2.2	Poetry Analysis- Discussion on themes and Techniques	3	2 [4], 5 [3]	GD CCC	Hr A	5
2.2.3	Human - Environment Interaction and Sustainability implied in “The Sparrow”	1	2 [4], 3[5], 5 [5]	L GD	Essay	5
2.3	**A Nation’s Strength – Ralph Waldo Emerson**					
2.3.1	Introduction to the poet and the poem	1	2 [4], 4 [4],	L	Ho A	6
2.3.2	Poetry Analysis- Discussion on themes - Nation building & Techniques	3	2 [4], 4 [4]	L GD	Ho A	6
2.3.3	Democratic values and Universalism in “A Nation’s Strength”	1	4 [4] 5 [3]	PT	MCQ	6
2.4	**Love Cycle - Chinua Achebe**					
2.4.1	Introduction to the Poet and the poem	1	2 [4], 4 [4]	L, CCC	Ho A	7

2.4.2	Poetry Analysis- Discussion on themes - Connection between Land/Nature and human life and human values (tolerance)	2	2 [4], 3 [4], 5 [5]	PT GD	Ho A	7
2.4.3	Analysis of Techniques & Poetic devices in "Love Cycle"	1	2 [4]	PT	MCQ	7
3	**SHORT STORIES**		**18**			
3.1	**The Faltering Pendulum- Bhabani**					
3.1.1	Introduction to the author and the short story	1	2 [4], 4 [8]	L	Ho A	8
3.1.2	Plot & Character Analysis	3	2 [4], 5 [3]	TPS GD	Hr A Ho A	8
3.1.3	Nature- Human Interaction and Human rights in "Faltering Pendulum"	2	2 [4], 3[5], 5[5]	L GD	Hr A	8
3.2	**How I Taught my Grandmother to Read- Sudha Murthy**					
3.2.1	Introduction to the author and the short story	1	2 [4], 4[8]	L GD	Ho A	9
3.2.2	Plot & Character Analysis	3	2 [4], 5 [5]	CCC	Hr A CT	9
3.2.3	Thematic discussion: Lifelong learning & Human value of perseverance	2	2 [4], 3 [10], 5 [10]	L, GD	Ho A, CT	9
3.3	**The Gold Frame- R.K. Laxman**					
3.3.1	Introduction to the author and the short story	1	2 [4], 4 [4]	L	Ho A, CT	10
3.3.2	Plot & Character Analysis	3	2 [4], 5 [3]	L, CCC	Ho A, CT	10

3.3.3	Themes & Techniques	2	2 [4], 5[3]	PT, GD	Hr A	10
4	**LANGUAGE COMPETENCY**			**18**		
4.1	**Vocabulary: Synonyms, Antonyms & Word Formation**	5	1[32],	CCC	Hr A	11, 12
4.2	**Appropriate use of Articles**	2	1[24],	CCC	Hr A	11, 12
4.3	**Parts of Speech**	7	1[24],	CCC	Hr A	11, 12
4.4	**Error correction**	4	1[20],	CCC	Hr A	11, 12
5	**ENGLISH FOR WORKPLACE**			**18**		
5.1	**Self - introduction, Greetings**	5	1[28],	GT, GD	Viva	13
5.2	**Introducing others**	4	1[20]	GT, GD	Viva	13
5.3	**Listening for General and Specific Information**	5	1[24],	GD	Viva	13
5.4	**Listening to and Giving Instructions / Directions**	4	1[28],	GD	Viva	13

Text books (Latest Editions)

1. https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories
2. https://legacy.npr.org/programs/morning/features/2004/jun/sedaris/usandthem.html
3. http://rosyhunt.blogspot.com/2013/01/uncle-Podger-hangs-picture.html
4. https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false
5. https://poets.org/poem/sparrow-0
6. https://poets.org/poem/nations-strength
7. https://www.best-poems.net/chinua-achebe/love-cycle.html
8. *Steel Hawk and Other Stories* by Bhattacharya, Bhabani, New Delhi: Sahitya Akademi, 1967
9. *How I Taught my Grandmother to Read and Other Stories*, Murthy, Sudha, Penguin Books, India, 2004

10. https://fybaenglish.blogspot.com/2018/12/the-gold-frame-r-k-laxman.html
11. *English in Use - A Textbook for College Students* (English, Paperback, - T.Vijay Kumar, K
Durga Bhavani, YL Srinivas)

12. *Practical English Usage* - 4th Edition By Michael Swan
13. The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and Grace -Margaret Shepherd, Penny Carter, (Illustrator), Sharon Hogan, 20

PART-3
MAJOR (CORE) COURSE I
23GC11-GENERAL CHEMISTRY-1 (CC1)

Course Title:	**CC1-General Chemistry I**	Course Type: **Theory** Course Code :23GC11
Total Hours: **90**	Hours/Week: **6**	Credits: **5**
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO No.	**Expected Learning Outcomes** Upon completion of this course, students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO -1	Understand various atomic models and atomic structure	2(15),5(5)	1,2,7,10	U	F, C
CLO-2	Explain wave particle duality of matter, the periodic table, periodicity in properties and its application in chemical behavior	2(15),5(5)	1,2,7,10	E	P, M
CLO -3	Describe the behavior of ionic and covalent bonding	2(15),5(5)	1,2,7,10	R	F, M
CLO-4	Describe the nature of coordinate bond, metallic bond and weak chemical forces	2(15),5(5)	1,2,7,10	Ap,R	F, P
CLO-5	Understand the fundamental concepts of organic chemistry	2(15),5(5)	1,2,7,10	U	P

Module	Course Description	Hours	% CLO mapping with Module	Learning Activities	Assessment Tasks	References
I	**ATOMIC STRUCTURE**					
1.1	History of atom (J.J. Thomson, Rutherford)	1	1[5]	Lec	Qui	1,2
1.2	Moseley's Experiment and Atomic number	1	1[5]	Lec	Qui	1,2
1.3	Atomic Spectra	1	1[5]	Lec	Sem	1,2
1.4	Black-body Radiation and Planck's Quantum theory	2	1[5]	TPS	Ass	1,2
1.5	Bohr's model of atom	1	1[10]	Lec	Sem	1,2
1.6	The Franck-Hertz Experiment	1	1[10]	Lec	Ess	1,2
1.7	Interpretation of H-spectrum	1	1[10]	BS	Ass	1,2
1.8	Photoelectric effect, Compton effect	1	1[10]	Lec	Qui	1,2
1.9	Dual nature of matter – de Broglie wavelength	2	1[5]	TPS	Ass	1,2
1.10	Davisson and Germer experiment	1	1[10]	Lec	Sem	1,2
1.11	Heisenberg's Uncertainty principle	1	1[5]	GD	Ass	1,2
1.12	Electronic Configuration of Atoms and ions-Hund's rule, Pauli's exclusion principle and Aufbau principle	2	[15]	Lec	Qui	1,2
II	**INTRODUCTION TO QUANTUM MECHANICS**					
2.1	Classical mechanics, Wave mechanical model of atom	1	2[5]	Lec	Qui	1,8
2.2	Distinction between a Bohr orbit and orbital	1	2[10]	Lec	Qui	1,8
2.3	Postulates of Quantum mechanics, probability interpretation of wave functions	2	2[10]	BS	Sem	2,4
2.4	Formulation of Schrodinger wave equation	1	2[10]	TPS	Ass	2,4

2.5	Probability and electron density-visualizing the orbitals	1	2[5]	Lec	Qui	2,4
2.6	Probability density and significance of ψ and ψ^2,	1	2[10]	Lec	Qui	2,4
	MODERN PERIODIC TABLE					
2.7	Features of the periodic table; classification of elements	2	2[20]	Lec	Sem	1,8
2.8	Periodic trends for atomic size- Atomic radii, Ionic, Crystal and covalent radii	2	2[10]	GD	Ass	1,8
2.9	Ionization energy, electron affinity	2	2[10]	Lec	Qui	1,8
2.10	Electronegativity – electronegativity scales, applications of electronegativity	2	2]10]	Lec	Sem	1,8
III	**STRUCTURE AND BONDING-I**					
	Ionic bond					
3.1	Lewis dot structure of ionic compounds: Basic properties of ionic compounds	2	3[10]	Lec	Qui	1,7,8
3.2	Energy involved in ionic compounds; Born Haber cycle-Lattice energies, Madelung constant; relative effect of lattice energy and salvation energy	2	3[20]	Lec	Qui	1,7,8
3.3	Ion 39polarizing39n- 39 polarizing power and polarisability; Fajan's rules-effects of polarization on properties of compounds	2	3[20]	Lec	Sem	1,7,8
	Covalent bond					
3.4	Shapes of orbitals, overlap of orbitals-σ and Π bonds; directed valency-hybridisation	3	3[10]	Lec	Sem	1,7,8
3.5	VSEPR theory-shapes of molecules of the type AB_2,AB_3,AB_4,AB_5,AB_6 and AB_7	2	3[20]	Lec	Qui	1,7,8
3.6	Partial ionic character of covalent bond-dipole moment , application to molecules of the type A_2, AB,AB_2,AB_3, AB_4	2	3[10]	Lec	Qui	1,7,8
3.7	Percentage of ionic character- numerical problems based on calculation of percentage of ionic character	2	3[10]	Lec	Sem	1,7,8
IV	**STRUCTURE AND BONDING-II**					
4.1	VB-theory-application to hydrogen molecule; concept of resonance-resonance structures of some inorganic species- CO_2,	2	4[20]	Lec	Qui	1,7,8

	NO_2, CO_3^{2-}, NO_3^-; Limitations of VBT					
4.2	MO theory-bonding, antibonding and non bonding orbital's, bond order;	2	4[20]	Lec	Qui	1,7,8
4.3	MO diagrams of H_2,C_2, O_2, O_2^+,O_2^{2-},N_2, HF, CO; Magnetic characteristics	2	4[15]	Lec	Sem	1,7,8
4.4	Comparison of VB and MO theories	1	4[5]	Lec	Qui	1,7,8
4.5	Coordinate bond: Definition, formation of BF_3, NH_3, NH_4^+, H_3O^+ properties	2	4[10]	Lec	Qui	1,7,8
4.6	Metallic bond-electron sea model, VB model; Band theory- mechanism of conduction in solids; Conductor, insulator, semiconductor-types, applications of semiconductor	2	4[10]	Lec	Sem	1,7,8
4.7	Weak chemical forces-Vander waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, instantaneous dipole-induced dipole interactions.	2	4[10]	TPS	Ass	1,7,8
4.8	Hydrogen bonding-Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points	2	4[10]	Lec	Sem	1,7,8
V	**BASIC CONCEPTS IN ORGANIC CHEMISTRY AND ELECTRONIC EFFECTS**					
5.1	Types of bond cleavage- heterolytic and hemolytic; arrow pushing in organic reactions;	2	5[10]	BS	Ass	4
5.2	Reagents and substrates; types of reagents-electrophiles, nucleophiles, free radicals	2	5[10]	Lec	Qui	4
5.3	Reaction intermediates-carbanions, carbocations, carbenes, arynes and nitrynes	2	5[10]	TPS	Ass	4
5.4	Inductive effect-reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electomeric effects	2	5[20]	Lec	Sem	4
5.5	Resonance-resonance energy, conditions for resonance-acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance	3	5[10]	GD	Ass	4

5.6	Hyperconjucation-stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and methane	2	5[20]	Lec	Qui	4
5.7	Types of organic reactions- addition, substitution, elimination and rearrangements	2	5[20]	Lec	Qui	4

References

1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2nded.; S.Chand and Company: New Delhi, 2003.
2. Rao, C.N. R. University General Chemistry, Macmillan Publication: NewDelhi, 2000.
3. Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry,* 38thed.;Vishal Publishing Company: Jalandhar, 2002.
4. Bruce, P. Y. and PrasadK. J. R. *Essential Organic Chemistry*, PearsonEducation: New Delhi, 2008.
5. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016
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7. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS William Heinemann: London,1991.
8. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26thed.; Goel PublishingHouse: Meerut, 2001.
9. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford UniversityPress: New York, 2014.
10. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity,*4th ed .; Addison, Wesley Publishing Company: India,1993.

CC2- 23GC12 - BASIC CONCEPTS OF CHEMISTRY

Course Title:	**CC2- Basic Concepts of Chemistry**	Course Type: **Theory** Course Code :23GC12
Total Hours: **60**	Hours/Week: **4**	Credits: **3**
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO -1	Able to correlate the periodic table with various chemical behaviour	2(10),7(10)	1,2,5,7	R	F, C
CLO-2	Understand the hybridisation and chemical bonding	2(10),7(10)	1,2,5,7	U	C, M
CLO -3	Analyze the nomenclature for organic compounds	2(10),7(10)	1,2,5,7	An	F, M
CLO-4	Understand the different states of matter	2(10),7(10)	1,2,5,7	U	P, M
CLO-5	Attain the basic knowledge of spectroscopy	2(10),7(10)	1,2,5,7	E	P, M

Unit	Section	Course Description	Hours	% CLO mapping with Module	Learning Activities	Assessment Tasks	References
I	**STRUCTURE OF ATOM AND PERIODIC CLASSIFICATION OF ELEMENTS AND PROPERTIES**						
	1.1	Atom structure-Fundamental particles-Atomic mass- Atomic number – Isotopes –Isobars –Isotones	1	1[10]	Lec	Ass	1,6
	1.2	Orbitals-Quantum number and their significance.	1	1[20]	Lec	Quiz	1,6
	1.3	Shapes of s,p and d orbitals- Rules governing electronic configuration in various its atomic orbitals.	1	1[20]	GD	Ass	1,6
	1.4	Periodic table-periodic laws (Mendeleev and Mosley)- Classification of elements into s,p, d and f-blocks .	1	1[20]	Lec	Quiz	1,6
	1.5	Metals-Non metals-Periodic properties-Concept, Variation and factors affecting various periodic properties-Inert pair effect.	2	1[30]	Lec	Ass	1,6
II	**CHEMICAL BONDING**						
	2.1	Introduction qualitative and quantitative analysis. Methods of	2	5[20]	GD	MCQ	9-

		expressing concentration of solutions – molarity, molality, normality, percentage by volume, percentage by weight, ppt, ppm, ppb.					11
	2.2	Problems involving all the above concentration terms.	2	5[10]	Lec	Qui	9-11
	2.3	Principle of dilution of solution of one concentration to another.	1	5[10]	Lec	Qui	9-11
	2.4	Titrimetry – Basic principles.	1	5[10]	GD	Sem	9-11
	2.5	Types of titrations - neutralization, permanganometry, dichrometry, iodometry, iodimetry, complexometry and precipitation.	2	5[10]	Lec	Ass	9-11
	2.6	Standard solutions – primary standard – characteristics.	2	5[10]	Lec	MCQ	9-11
	2.7	Primary standards for the different types of titrations – problems.	3	5[10]	GD	Sem	9-11
	2.8	Secondary standards – characteristics and examples.	2	5[20]	BS	Qui	9-11
III	**NOMENCLATURE AND ISOMERISM IN ORGANIC COMPOUNDS**						
	3.1	Carbon compounds- Uniqueness of carbons- Classification of hydrocarbons - IUPAC Nomenclature of Organic compounds	1	3[20]	Lec	Quiz	2,7,8
	3.2	Isomerism: Structural and Stereoisomerism	1	3[20]	Lec	Sem	2,7,8
	3.3	Structural Isomerism: Chain isomerism, Functional isomerism, Positional isomerism and Meta isomerism.	2	3[20]	GD	Ass	2,7,8
	3.4	Stereoisomerism: Geometrical and Optical isomerism Chiral molecule	1	3[20]	TPS	Sem	2,7,8
	3.5	Enantiomers – Diastereomer s - Mesocompounds - Racemic mixture.	1	3[20]	Lec	Quiz	2,7,8
IV	**STATES OF MATTER**						
	4.1	**Gaseous state**: Kinetic theory of gases- Ideal and Non-ideal gases - Ideal gas equation-	1	4[20]	Lec	Ass	3

	4.2	Deviation of ideal gas from ideal behavior - vander Waal's equation and Liquification of gases.	1	4[20]	Lec	Sem	3
	4.3	**Liquids:** Intermolecular forces, Vapour pressure and Boiling point of liquid - Surface tension – Viscosity - Factors affecting surface tension and viscosity	2	4[30]	BS	Quiz	3
	4.4	**Solids:** Definition - Characteristics of solids- Amorphous and Crystalline solids – Space lattice and unit cells	1	4[20]	GD	Sem	3
	4.5	Close packed structure of solids-Radius ratio rule.	1	4[10]	TPS	Quiz	3
V	**INTRODUCTION TO SPECTROSCOPY**						
	5.1	Electromagnetic radiation- General characteristics of Wave – Wavelength – Frequency –Amplitude – Wave number	1	5[10]	Lec	Quiz	4,5
	5.2	Electromagnetic spectrum- Absorption and Emission spectrum-	2	5[20]	Lec	Quiz	4,5
	5.3	Quantization of Energy level - Selection rule - Intensity of the Spectral lines – Width of Spectral lines.	1	5[30]	TPS	Sem	4,5
	5.4	Types of spectroscopy: Microwave spectroscopy, Infrared spectroscopy, UV-Visible spectroscopy	1	5[20]	GD	Ass	4,5
	5.5	Nuclear Magnetic Resonance spectroscopy, Electron spin resonance spectroscopy.	1	5[20]	Lec	Ass	4,5

REFERENCES:

1. R.D. Madan, Sathya Prakash, Mordern Inorganic chemistry 2nd edition, S.Chand andcompany, New Delhi, 2003.
2. B.S.Bhal, ArunBhal, Advanced Organic chemistry, 3rd edition, S.Chand and company,New Delhi, 2003.
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4. Y.R.Sharma Organic spectroscopy Principles and Chemical applications,S.Chand&Company PVT Ltd ,2002.
5. C.N.Banwell, Fundamentals of spectroscopy Tata McGraw Hill, 1983.
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10. P.L. Soni, M. Katyal, Text Book of Inorganic Chemistry, Sultan Chand and Sons, 2004.
11. Vogel's Text Book of Quantitative Analysis, 4thEdn. ELBS, 2005

CORE LAB COURSE I

23GCP1-QUANTITATIVE INORGANIC ESTIMATION AND INORGANIC PREPARATION (CC2)

Course Title:	**CC2- Quantitative Inorganic Estimation And Inorganic Preparation**	Course Type: **Theory** Course Code :23GCP1
Total Hours: **30**	Hours/Week: **2**	Credits: **1**
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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Title of theCourse	**Quantitative Inorganic Estimation (titrimetry) and InorganicPreparations**						
Paper No.	**Core II**						
Category	**Core**	**Year**	I	**Credits**	1	**Course Code**	23GCP1
		Semester	I				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	-	-	2			2	
Prerequisites	Higher secondary chemistry						
Objectives ofthe course	This course aims at providing knowledge on • laboratory safety • handling glasswares • Quantitative estimation • preparation of inorganic compounds						

Course Outline	**Unit I**
	Chemical Laboratory Safety in Academic Institutions
	Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration

	of operation; chemical waste and safe disposal.
	Common Apparatus Used in Quantitative Estimation (Volumetric)
	Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.
	Principle of Quantitative Estimation (Volumetric)
	Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations**;** indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.
	Unit II **Quantitative Estimation (Volumetric)** Preparation of standard solution, dilution from stock solution
	Acidimetry- Alkalimetry Estimtion of sodium carbonate using standard sodium carbonate **Permanganometry** Estimation of sodium oxalate using standard ferrous ammonium sulphate
	Dichrometry Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator) **Iodometry** Estimation of copper in copper sulphate using standard dichromate **Argentimetry** Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)
	Unit III **Complexometry** Estimation of hardness of water using EDTA **Estimations** Estimation of iron in iron tablets Estimation of ascorbic acid. **Preparation of Inorganic compounds**-Potash alum Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	**Reference Books:** 1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic*

	*Principles ofPractical Chemistry,*2nd ed.; Sultan Chand &Sons: New Delhi, 1997. *2.* Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical* *Chemistry,* 3rd ed.; New Central Book Agency: Kolkata, 2007.
Reference Books	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed.; PearsonEducation Ltd: New Delhi, 2000.
Website ande-learning source	**Web References:** 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric- analysis 2) https://chemdictionary.org/titration-indicator/

PART-4
(ALLIED) COURSE I (MS1)
23AC01-FOR BIOLOGICAL SCIENCES

Course Title:	**MS1-Allied Chemistry**	Course Type: **Theory** Course Code :23AC01
Total Hours: **60**	Hours/Week: **4**	Credits: **4**
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.R.D.Femitha,	Dr.A.Jeena Pearl,	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
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Mobile-9944108412	Mobile-9487352164	Mobile - 9488884898

CO No.	**Expected Learning Outcomes Upon completion of this course, students will be able to**	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Understand the basics of chemical bonding and nuclear chemistry	3(20)	1,2,8	U	F, C
CLO-2	Gain knowledge on fuel gases and fertilizers	3(20)	1,2,8	R	C, M
CLO-3	Understand the fundamental concepts in organic chemistry	3(20)	1,2,8	U	F, M
CLO-4	Get idea about different types of drugs and its applications	3(20)	1,2,8	An	P, M
CLO-5	Understand volumetric analysis, separation and purification techniques	3(20)	1,2,8	U	P, M

Module	Course description	Hours	% CLO mapping with Module	Learning Activities	Assessment Tasks	References
I	**CHEMICAL BONDING AND NUCLEAR CHEMISTRY**					
1.1	Chemical bonding: Molecular Orbital Theory - bonding, antibonding and non - bonding orbitals	3	1[20]	Lec	Ess	1,2
1.2	Molecular orbital diagrams for Hydrogen, Helium, Nitrogen - discussion of bond order and magnetic properties	3	1[20]	TPS	MCQ	1,2
1.3	Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers	2	1[10]	Lec	Qui	1,2
1.4	Differences between chemical reactions and nuclear reactions, Group displacement law	2	1[10]	Lec	MCQ	1,2
1.5	Nuclear binding energy - mass defect - calculations	1	1[10]	PT	Qui	1,2
1.6	Nuclear fission and nuclear fusion - differences, Stellar energy	2	1[10]	Lec	MCQ	1,2
1.7	Applications of radioisotopes - carbon dating, rock dating and medicinal applications	2	1[20]	Lec	Qui	1,2
II	**INDUSTRIAL CHEMISTRY**					
2.1	Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas	3	2[20]	Lec	Qui	7
2.2	Producer gas, CNG, LPG and oil gas (manufacturing details not required)	3	2[20]	Lec	Sem	7
2.3	Silicones: Synthesis, properties and uses	3	2[20]	Lec	Qui	7
2.4	Fertilizers: Urea, ammonium sulphate, potassium nitrate	3	2[20]	BS	MCQ	7
2.5	NPK fertilizer, superphosphate, triple superphosphate	3	2[20]	SI	MCQ	7
III	**FUNDAMENTAL CONCEPTS IN ORGANIC CHEMISTRY**					
3.1	Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4	3	3[10]	Lec	Ass	3,4
3.2	Hybridization and geometry of C_2H_2, C_6H_6	2	3[10]	Lec	Ass	3,4
3.3	Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases	2	3[10]	Lec	MCQ	3,4

3.4	Electromeric effect, Mesomeric effect	1	3[10]	GD	Qui	3,4
3.5	Hyperconjugation and Steric effect	1	3[10]	Lec	Qui	3,4
3.6	Reaction mechanisms: Types of reactions - aromaticity (Huckel's rule)	1	3[10]	BS	MCQ	3,4
3.7	Aromatic electrophilic substitution - Nitration, Halogenation	2	3[10]	Lec	Ass	3,4
3.8	Friedel Craft's alkylation and acylation	1	3[10]	TPS	Sem	3,4
3.9	Heterocyclic compounds: Preparation, properties of pyrrole and pyridine	2	3[20]	SI	Ass	3,4
IV	**DRUGS AND SPECIALITY CHEMICALS**					
4.1	Definition, structure and uses: Antibiotics - Penicillin, Chloramphenicol and Streptomycin	3	4[20]	Lec	Ess	5
4.2	Anaesthetics - Chloroform and ether	3	4[20]	GD	MCQ	5
4.3	Antipyretics - Aspirin, Paracetamol, Ibuprofen	3	4[20]	GD	MCQ	5
4.4	Artificial Sweeteners - Saccharin, Aspartame and Cyclamate	3	4[20]	Lec	Ass	5
4.5	Organic halogen compounds - Freon, Teflon	3	4[20]	Lec	Ass	5
V	**ANALYTICAL CHEMISTRY**					
5.1	Introduction to qualitative and quantitative analysis	3	5[10]	Lec	Ess	6
5.2	Principles of volumetric analysis	2	5[10]	PT	MCQ	6
5.3	Separation and purification techniques - extraction, distillation and crystallization	3	5[20]	Lec	Qui	6
5.4	Chromatography: Principles and applications of - column chromatography	3	5[20]	Lec	Qui	6
5.5	Paper chromatography	2	5[20]	BS	MCQ	6
5.6	Thin layer chromatography	2	5[20]	TPS	Sem	6

REFERENCES

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Textbook of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, TextBook of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
5. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry; Sultan Chand and Company, NewDelhi, twentieth edition, 2007.
6. B.R.Puri, L.R.Sharma, M.S.Pathania, Textbook Physical Chemistry; Vishal Publishing Co., New Delhi,fortyfortyseventhedition,2018.
7. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

ALLIED LAB COURSE I (MS2)

CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES

(for Mathematics and Physics – II Year/III Semester-23ACP3;for Botany and Zoology I Year/ I Semester-23ACP1)

Course Title:	**MS2-Allied Practicals**	Course Type: Practical Course Code :23ACP1
Total Hours: **30**	Hours/Week:**2**	Credits: **1**
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.R.D.Femitha,	Dr.A.Jeena Pearl,	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
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Title of the Course	**CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES (for Mathematics and Physics – II Year/III Semester;for Botany and Zoology I Year/ I Semester)**						
Paper No.	**Generic Elective V**						
Category	**Generic Elective**	**Year**	I/ II	**Credits**	4	**Course Code**	
		Semester	I/III				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**		**Total**		
	-	-	6		2		
Prerequisites							
Objectives of the course	This course aims to provide knowledge on the • basics of preparation of solutions. • principles and practical experience of volumetric analysis						

Course Outline	**VOLUMETRIC ANALYSIS** 1. Estimation of sodium hydroxide using standard sodiumcarbonate. 2. Estimation of hydrochloric acid using standard oxalic acid. 3. Estimation of ferrous sulphate using standard Mohr's salt. 4. Estimation of oxalic acid using standard ferrous sulphate. 5. Estimation of potassium permanganate using standardsodium hydroxide. 6. Estimation of magnesium using EDTA. 7. Estimation of ferrous ion using diphenyl amine as indicator.
Reference Books	V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, Basic Principlesof Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

ALLIED MATHEMATICS FOR CHEMISTRY STUDENTS
ALLIED MATHEMATICS-I

Course Title: Allied Mathematics-I(Minor stream-I)	Course Type: Theory Course code: 23AC01
Total Hours: 90 Hours/Week: 6 Credits: 5	
Pass-Out Policy : Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]	

Course Creator	Expert 1	Expert 2
Dr. Y. S. Irine Sheela	Dr.T. Binu Selin	Dr. R. Ajitha
Associate Professor, Head of the Department	Assistant Professor	Assistant Professor
94423902567	8870100931	9486771686
irinesheela@gmail.com	binuselin@gmail.com	sujalin88@gmail.com

CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	analyze the nature of equations and its roots	5(20)	An	M
CLO-2	solve second order ordinary differential equations.	2(8), 5(12)	Ap	P
CLO-3	apply matrix methods to solve simultaneous equations	2(15), 5(5)	Ap	P
CLO-4	solve first order partial differential equations	2(13), 5(7)	Ap	P
CLO-5	make use of Laplace transform to solve problems based on derivatives	7(20)	Ap	M

Module	**Course Description**	**Hours**	**% CLO mapping with Module**	**Learning Activities**	**Assessment Tasks**	**References**
1	**Theory of Equations**					
1.1	Formation of Equations	2	1[15]	Lec	SA	1
1.2	Relation between roots and coefficients	2	1[13]	Lec	SA	1
1.3	Problems on relation between roots and coefficients	2	1[12]	Lec	SA	1
1.4	Problems on Reciprocal Equations (Theorems without proof)	3	1[20]	Lec	SA	1
1.5	Solving a Standard Reciprocal equation	2	1[15]	SP	CT	1
1.6	Solving a Reciprocal equations of I type	2	1[15]	Lec	CT	1
1.7	Solving a Reciprocal equations of II type	3	1[15]	Lec	CT	1
2	**Ordinary Differential Equations**					
2.1	Linear equation with constant coefficients	2	2[20]	Lec	CT	2

2.2	Methods of finding complementary functions	2	2[15]	Lec	SA	2
2.3	Particular integral of the functions of the form $e^{ax}, x^m, cosaxorsinax\ , e^{ax}f(x)and$ $x^m sinaxorx^m cosax$	6	2[25]	SP	CT	2
2.4	Solving Homogeneous linear equations	2	2[20]	Lec	Ess	2
2.5	Problems on Homogeneous linear equations	2	2[20]	SP	CT	2
3	**Matrices**					
3.1	Rank of the matrix	3	3[10]	Lec	Ess	1
3.2	Solving simultaneous linear equations	2	3[20]	Lec	Ess	1
3.3	Cayley Hamilton theorem (without proof)and problems using Cayley Hamilton theorem	3	3[20]	Lec	Ess	1
3.4	Inverse of the matrix using Cayley Hamilton theorem	3	3[20]	SP	CT	1
3.5	Properties of Eigen values and Eigen Vectors(Without Proof)	2	3[12]	SP	SA	1
3.6	Eigen values and Eigen vectors	3	3[18]	Lec	Ess	1
4	**Partial Differential Equations**					
4.1	Formation of Partial Differential Equations-Elimination of arbitrary Constants	3	4[20]	Lec	Ess	2
4.2	Formation of Partial Differential Equations-Elimination of arbitrary Functions	2	4[20]	Ess	Ess	2
4.3	Solutions of First order Partial Differential Equations	2	425]	Ess	Ess	2
4.4	Lagrange's method of solving First order Partial Differential Equations	4	4[25]	SP	CT	2
4.5	Four Standard forms	4	4[10]	SP	SA	2
5	**Laplace Transform**					
5.1	Laplace Transform	2	5[15]	Lec	SA	2
5.2	Properties of Laplace Transform	3	5[20]	Lec	Ess	2
5.3	Problems related to Laplace Transform	3	5[20]	SP	SA	2

5.4	Inverse Laplace Transform	3	5[20]	Lec	Ess	2
5.5	Properties of Inverse Laplace Transform	3	5[25]	Lec	Ess	2

Reference Books

1. Allied Mathematics, Paper I, Arumugam and Isaac, 2006,New Gamma Publishing House.
2. Allied Mathematics, Paper II, Arumugam and Isaac,Nov 2011, New Gamma Publishing
House .

ALLIED ZOOLOGY FOR CHEMISTRY STUDENTS

23AZ01- INVERTEBRATA AND CHORDATA

Course Title: Minor Stream (Allied) Course 1 **Invertebrata and Chordata**	Sub. Code: 23AZ01/ 23AZ03	Course Type: Theory

Total Hours: 60 Credits: 3	Hours/Week: 4

Pass-Out Policy: Minimum Contact Hours: 36

Total Score %:100 Internal: 40 External: 60

Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Dr. E. Grace Marin	Dr. J. Georgina	Dr.Jebitta M Shirlin
Assistant Professor	Assistant Professor	Assistant Professor
Department of Zoology	Department of Zoology	Department of Zoology
Scott Christian College (Autonomous)	Scott Christian College (Autonomous)	Scott Christian College (Autonomous)

CLO-No.	Course Learning Outcomes *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapped with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida	2(3), 3(3), 5(4), 6(3), 7(4), 9(3)	GA1, GA2, GA7, GA8, GA10	R, U	F
CLO-2	To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata	2(3), 3(3), 5(4), 6(3), 7(4), 9(3)	GA1, GA2, GA7, GA8, GA10	R, U	F
CLO-3	To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia	2(4), 3(4), 5(4), 7(4), 9(4)	GA1, GA2, GA3, GA8, GA10	U, Ap	C
CLO-4	To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia	2(4), 3(4), 5(4), 7(4), 9(4)	GA1, GA2, GA3, GA8, GA10	U, Ap	C
CLO-5	To acquire detailed knowledge of select invertebrate and chordate forms	2(5), 3(5), 5(5),8(2), 9(3)	GA1, GA2, GA3, GA4, GA8, GA7, GA9	R, U	F

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
1.1	Principles of taxonomy	2	1[20]	OO	CA	1
1.2	Criteria for classification	2	1[20]	Lec	CT	1
1.3	Symmetry and Coelom	2	1[10]	Lec	CA	1
1.4	Binomial nomenclature	3	1[10]	Lec	CT	1

1.5	Classification of Protozoa upto classes with two examples.	3	1[10]	Lec Sem	Qui	1
1.6	Classification of Coelenterata up to classes with two examples	3	1[10]	Lec Sem	Qui	1
1.7	Classification of Helminthes upto classes with two examples	3	1[10]	Lec Sem	Ess	2
1.8	Classification of Annelida upto classes with two examples	3	1[10]	Lec Sem	Ess	2
2.1	Classification of Arthropoda upto classes with two examples	3	2[40]	Lec Sem	Ess	2
2.2	Classification of Mollusca upto classes with two examples	3	2[40]	Lec Sem	CT	2
2.3	Classification of Echinodermata upto classes with two examples	3	2[20]	Lec Sem	CT	2
3.1	Classification of Prochordata	3	3[40]	KWL	MCQ	2
3.2	Classification of Pisces upto orders with two examples	3	3[40]	Lec Sem	HoA	3
3.3	Classification of Amphibia upto orders with two examples	3	3[10]	Lec Sem	HoA	3
4.1	Classification of Reptilia upto orders with two examples	3	4[40]	Lec Sem	HoA	5
4.2	Classification of Aves upto orders with two examples	3	4[40]	Lec Sem	HoA	3
4.3	Classification of Mammalia upto orders with two examples	3	4[10]	Lec Sem	HoA	5
5.1	Structure and organization of earthworm	4	5[60]	Lec Pr	CT	4
5.2	Structure and organization of rabbit/rat	4	5[20]	Lec Pr	CT	4
5.3	Structure and organization of prawn/fish	4	5[20]	Lec Pr	CT	5

Reference Books:

1. Ekambaranatha Iyer,-Outlines of Zoology. Viswanathan Publication
2. Ekambaranatha Iyer and T.N.Ananthakrishnian - A Manual of Zoology Invertebrata–Vol I: Viswanathan Publishers.
3. EkambaranathaIyar and T.N.Ananthakrishnan,-A Manual of Zoology- Invertebrata–VolII:Viswanathan Publishers.
4. Ekambaranatha Iyar and T.N.Ananthakrishnan, A Manual of Zoology:Chordata Viswanathan Publishers.
5. Jordan E.L.and P.S. Verma-Invertebrate Zoology, S.Chand& Co.

23AZP1-ALLIED LAB COURSE (MS2)- LAB ON INVERTEBRATA AND CHORDATA

Course Title: **Lab on Invertebrata and Chordata**	Sub. Code: 23AZP1/ 23AZP3	Course Type: Theory+ Practical

Total Hours: 60 Hours/Week: 2 Credits: 2

Pass-Out Policy: Minimum Contact Hours: 36 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Dr. E. Grace Marin	Dr. J. Georgina	Dr.Jebitta M Shirlin
Assistant Professor	Assistant Professor	Assistant Professor
Department of Zoology	Department of Zoology	Department of Zoology
Scott Christian College (Autonomous)	Scott Christian College (Autonomous)	Scott Christian College (Autonomous)

CLO-No.	Course Learning Outcomes *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapped with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Compare and distinguish the dissected internal organs of Lower and higher animals.	2(6), 3(6), 5(8),	GA2, GA7,GA8	U, Ap	C
CLO-2	Prepare and develop the mounting procedure of important invertebrate and chordate anatomical parts and to appreciate the structure, function and mode of life.	2(10), 3(10)	GA1, GA2, GA7	U, Ap	F, C
CLO-3	Identify and label the external features of different Groups of invertebrate animals	2(7), 3(6), 5(7),	GA1, GA2, GA3,	U, Ap	C, M
CLO-4	Identify and label the external features of different groups of chordate animals	2(5), 3(6), 9(9)	GA2, GA3, GA8, GA10	U, Ap	C, M
CLO-5	Understand and apply the theoretical knowledge. To plant the area of research and to identify different groups of invertebrate and chordate animals.	2(5), 3(5), 5(5),8(2), 9(3)	GA1, GA2, GA3, GA4, GA8, GA7, GA9	U, Ap	C, F

Module	Course Description
1.1	**DISSECTION:** Cockroach-digestive system
1.2	Cockroach-nervous system
1.3	Fish-digestivesystem
2.1	**MOUNTING:** Mouthparts-Cockroach
2.2	Mouthparts–Mosquito
2.3	Scales-Placoid,Cycloid and Ctenoid
2.4	Prawnappendages

3.1	**SPOTTERS-** *Paramecium,Plasmodium*,Scypha,*Leucosolenia*, Corals.
3.2	*Taeniasolium*–entire,*Ascaris*male and female.Earthworm,Prawn.
3.3	Scorpion, Pila,Starfish.
4.1	Amphioxus,Shark, Frog,Calotes.
4.2	Pigeon feather, Rabbit
5.1	**Field visit** – Study of fauna in the campus

TextBooks:	
1.	Ekambaranatha Iyyar and T.N.Ananthakrishnan,1995 A manual of Zoology,Vol.I(Part1,2)S.Viswanathan,Chennai
2.	Ganguly,Sinha and Adhikari,2011.Biology of Animals:VolumeI,New,Central Book Agency;3rd Revised edition.1008 pp.
3.	Sinha,Chatterjee and Chattopadhyay,2014. Advanced Practical Zoology,Books & Allied Ltd;3rd Revised edition,1070pp.
4.	Lal,S.S, 2016.Practical Zoology Invertebrate,Rastogi Publications.
5.	Verma,P.S.2010. A Manual of Practical Zoology:Invertebates,S.Chand,497pp.
6.	Lal S S, 2009.Practical Zoology Vertebrate, Rajpal and Sons Publishing,484pp.
References Books:	
1.	Barnes,R. S. K. , Calow,P.,Olive,P.J.W.,Golding,D.W.andSpicer,J.I.(2002). *The Invertebrates: A NewSynthesis*, III Edition, Blackwell Science.
2.	Barnes,R.D.(1982).*Invertebrate Zoology*,VEdition.Holt Saunders International Edition.
3.	Barrington,E.J.W.(1979).*Invertebrate Structure and Functions*. IIEdition, E.L.B.S.and Nelson
4.	Boradale,L.A.andPotts,E.A.(1961).*Invertebrates:AManual for the use of Students*.AsiaPublishing Home.
5.	Lal,S.S.2005.A text Book of Practical Zoology: Invertebrate,Rastogi,Meerut
WebResources:	
1.	https://nbb.gov.in/
2.	http://www.agshoney.com/training.htm
3.	https://icar.org.in/
4.	http://www.csrtimys.res.in/
5.	http://csb.gov.in/
	https://iinrg.icar.gov.in/
	https://www.national geographic.com/animals/invertebrates/

SEMESTER II
Part I
23LT21-MIL-2 MODERN INDIAN LANGUAGE

CourseTitle:Part–I **Tamil**	Course Type:Theory Course Code: 23LT21
TotalHours : 90 Hours/Week– 6 Credits:6	
Pass-outPolicy:Minimum Total Score %: 100 ContactHours: 54 Internal:40 External: 60 MinimumPass% 40(No MinimumforInternal)	

Course Creator	Expert1	Expert2
Dr. D. Deva Sambath Associate Professor HeadoftheDepartment Mobile : 9994964710 devasambath013@gmail.com	Dr. S. Sujana Bai AssistantProfessorMob: 9486758307 sujanabai@gmail.com	Dr. J. Kingsly Assistant Professor Mobile:7871978855 kingslyphd@gmail.com

CLO No.	CourseLearningOutcomes(CLO) upon completion of this course, students will be able to	%ofPLO mapping withCLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO 1	பாரதியார்காலந்தொட்டுதற்காலப்புதுக்கவிதைகள்வரைகவிதைஇலக்கியம்அறிமுகப்படுத்தப்படுவதால்கவியாக்கத்திறன்பெறுவர்	1(8), 2(8), 6(4)	**1, 2, 3,**	Ap	P
CLO 2	புதுக்கவிதைவரலாற்றினைஅறிந்துகொள்வர்.	1(6), 2(8), 3(6)	**1, 2, 3, 8**	U	F
CLO 3	இக்காலஇலக்கியவகையினைக்கற்பதன்மூலம்படைப்பாக்கத்திறன்பெறுவர்.	1(8), 7(12)	**2, 3, 7**	An	M
CLO 4	மொழியறிவோடுசிந்தனைத்திறன்அறிவில்மேம்படுவர்.	1(10), 2(10)	**2, 3**	Ev	C
CLO 5	தமிழ்மொழியைப்பிழையின்றிஎழுதவும், புதியகலைச்சொற்களைஉருவாக்கவும்அறிந்துகொள்வர்.	1(8), 3(6), 6(6)	**2, 3, 8**	C	P

Module	CourseDescription	Hours	Mapping %CLO withModule	Learning Activities	Assessment Tasks	Reference
	Unit I செய்யுள் -பக்திஇலக்கியம், சிற்றிலக்கியம்					
1.1	பக்திஇலக்கியம், சிற்றிலக்கியம்விளக்கம்மற்றும்வகைகள்	2	1(11)	Lec	Qui	1
1.2	தேவாரம்திருநாவுக்கரசர் (மறுமாற்றத்திருத்தாண்டகம்)	2	1(11)	Lec	SA	1
1.3	திருப்பாவைஆண்டாள் (முதல் 10 பாகம்)	2	1(11)	Lec	Qui	1
1.4	அருள்விளக்கமாலைவள்ளலார் (முதல் 10 பாடல்கள்)	2	1(11)	Lec	Qui	1
1.5	இரட்சணியமனோகரம்எச்.எ. கிருட்டினப்பிள்ளை (பால்யபிரார்த்தனை)	2	1(11)	Lec	Sem	1
1.6	பராபரக்கண்ணிகுணங்குடிமஸ்தான்சாகிபு (முதல் 10 கண்ணிகள்)	2	1(11)	Lec	SA	1
1.7	தமிழ்விடுதூது (முதல் 20 கண்ணிகள்)	2	1(11)	Lec	Qui	1
1.8	திருக்குற்றாலக்குறவஞ்சி (நாட்டுவளம்கூறுதல்)	2	1(11)	Lec	Qui	1
1.9	முக்கூடற்பள்ளு (குமுறல்கொடுமை)	2	1(12)	Lec	Qui	1
	Unit II உரைநடை					
2.1	உரைநடைபொதுவானவிளக்கம்	1	2(6)	Lec	Qui	2
2.2	சேமித்துப்பழகுவோம்அகிலன்;	3	2(17)	Lec	Qui	2
2.3	பெண்மக்கள்கடமைமறைமலைஅடிகள்	1	2(6)	Sem	Sem	2
2.4	மூன்றாம்உலகப்போர்முனைவர்தே. ஞானசேகரன்	1	2(6)	Lec	SA	2
2.5	நடுநிலைமைமு. வரதராசன்	2	2(11)	Sem	CT	2
2.6	வாழ்வியல்நீதி - புலவர்செந்துறைமுத்து	2	2(11)	Lec	Sem	2
2.7	கல்வியும்சமுதாயநலனும் - முனைவர்க. நஞ்சையன்	2	2(11)	Lec	SA	2

2.8	தென்றல்வீசுகிறதுகி.வா. ஜகந்நாதன்	2	2(11)	Lec	Qui	2
2.9	தமிழின்தொன்மையும்சிறப்பும்	2	2(11)	Lec	OT	2
2.10	இலைமுதல்இமெயில்வரைஇஸ்டான்லி	2	2(12)	Lec	Qui	2
	Unit III -நாடகம்					
3.1	நாடகம்பற்றியஅறிமுகம்	1	3(6)	Lec	Qui	3
3.2	ஆசிரியர்அறிமுகமும்படைப்புகளும்	1	3(6)	Lec	SA	3
3.3	இராவணன்மாளிகை	2	3(11)	Sem	Qui	3
3.4	நீதிதேவன்மாளிகை	2	3(11)	Lec	Qui	3
3.5	தவச்சாலை	2	3(11)	Lec	SA	3
3.6	தேவலோகம்- **அறமன்றம்**	2	3(11)	Lec	GD	3
3.7	**இராவணன்நீதிதேவன்வருகை**	2	3(11)	Sem	Qui	3
3.8	**கோபமாகக்கம்பர்வருகை**	2	3(11)	Sem	Qui	3
3.9	**அறநெறிகூறுவோர்அறுவர்**	2	3(11)	Lec	QA	3
3.10	**நீதிகூறல்**	2	3(11)	Lec	GD	3
	Unit IV -இலக்கணம்					
4.1	**தொடர்வகைகள்**	3	4(17)	Lec	Qui	4
4.2	**மரபுத்தொடர்**	2	4(11)	Lec	SA	5
4.3	**பழமொழிகள்**	2	4(11)	Lec	CT	5
4.4	**பிறமொழிசொற்களைக்களைதல்**	2	4(11)	Lec	Qui	5
4.5	**வழுச்சொற்கள்நீக்குதல்**	2	4(11)	Lec	GD	5
4.6	**இலக்கண குறிப்பு அறிதல்**	2	4(11)	Lec	GD	4
4.7	**தொடர்வகைகளை உருவாக்கி எழுத மாணவர்களிடம் கூறல்**	2	4(11)	Lec	CT	4
4.8	**மரபுத்தொடர் பற்றி வகுப்பறையில் விவாதித்தல்**	1	4(6)	Lec	Qui	5
4.9	**இலக்கணக்குறிப்புகளைக்குறித்தபயிற்சிகொடுத்தல்**	1	4(6)	Lec	Qui	5
4.10	**பழமொழிகள் இடத்திற்கு இடம் மாறும் முறையினைக் கலந்து பேசுதல்**	1	4(6)	Lec	GD	5

	Unit V - இலக்கியவரலாறு					
	I. பக்திஇலக்கியம்					
5.1.1	**பக்திஇலக்கியம்அறிமுகம்**	1	5(6)	Lec	Qui	6
5.1.2	**சைவமும்தமிழும்**	2	5(11)	Lec	SA	6
5.1.3	**வைணவமும்தமிழும்**	2	5(11)	Lec	CT	6
5.1.4	**சமணமும்தமிழும்**	2	5(11)	Lec	Qui	6
5.1.5	**இஸ்லாமும்தமிழும்**	2	5(11)	Lec	GD	6
5.1.6	**கிறிஸ்தவமும்தமிழும்**	2	5(11)	Lec	Qui	6
	II. சிற்றிலக்கியம்					
5.2.1	**சிற்றிலக்கியம்தோற்றமும்வளர்ச்சியும்**	1	5(6)	Lec	SA	6
5.2.2	**பரணி, பிள்ளைத்தமிழ்**	2	5(11)	Lec	Qui	6
5.2.3	**கலம்பகம், குறவஞ்சி, உலா**	2	5(11)	Lec	Qui	6
5.2.4	**பள்ளு, தூது**	2	5(11)	Lec	Qui	6

ReferenceBooks

- **தமிழ்இலக்கிய,வரலாறுசிற்பி. பாலசுப்பிரமணியன், சாகித்யஅகாதெமி, சென்னை** 2013
- **பொதுத்தமிழ், தமிழ்த்துறை, ஸ்காட்கிறிஸ்தவக்கல்லூரி, நாகர்கோவில்**
- **நீதிதேவன்மயக்கம், பேரறிஞர்அண்ணா, பூம்புகார்பதிப்பகம், சென்னை**
- **நன்னூல், கழகவெளியீடு, சைவசித்தாந்தநூற்பதிப்புக்கழகம், சென்னை**
- **தமிழ்நாடுபாடநூல், பொதுத்தமிழ்** (6 **முதல்** 10 **வரை**)
- **வகைமைநோக்கில்தமிழ்இலக்கியவரலாறு, முனைவர்பாக்யமேரி, நியூசெஞ்சுரிபுக்ஹவுஸ் (பி)லிட், அம்பத்தூர், சென்னை 2008.**

Course Title: Malayala Kavitha Modern Indian LanguageII(MIL II)	Course Type: Theory Course Code: 23LM21

Total Hours:90 Hours/Week: 6 Credits:3

Pass-Out Policy :	Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

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CLO-No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be ableto:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand and reviewMalayalam Poems in different periods.	1(10), 5(10)	1, 6, 8	1,2,3	U
CLO-2	Understand the impact of various theories.	1(10), 2(5), 3(5)	1, 2, 3, 5	1,3	U, An
CLO-3	Evaluate the characteristics of Poetriesand obtain the poetry narrative techniques	5(10), 10(10)	1, 3, 7	1,2,5	An, E
CLO-4	Understand the word level and sentence level Poetry writing styles	9(10), 10(10)	3, 7	1, 9, 10	An, E
CLO-5	Evaluate the different texts and obtain moral values.	5(10), 9(10)	6, 7	1,2,5	U, E

Module	Course Description	Hours	%of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
I	**Pracheenakhattam**	**18**				
1.1	Paattu	1	1[15]	Lec	CA	8,9,10,11,12
1.2	NaadanPaattu	1	1[20]	Lec	HrA	8,9,10,11,12
1.3	nalacharitham (NaadanPaattu)	1	1[15]	Lec	CA	8,9,10,11,12
1.4	Gaadha	1	1[15]	Lec	CA	1
1.5	BhakthiPrasthaanam	4	1[20]	Lec	HrA	2,3, 11,12
1.6	Poonthanamjnanappana	10	1[15]	Lec	CA	8,9,10,11,12
2	**Navodhanavum Navodhanaanandara Pravanathakalum**	**18**				
2.1	Kalpanikaprasthanam	2	2[20]	GD	ST	8,9,10,11,12
2.2	Kumaranasan	2	2[20]	GD	ST	4,5,8,9
2.3	Duravastha – kumaranasaan	7	2[20]	GD	ST	8,9,10,11,12
2.4	Edasseri	2	2[20]	,kLec	OT	8,9,10,11,12
2.5	Karuththachettichikal – Edasseri	5	2[20]	Sem	OBT	8,9,10,11,12
3	Aadhunikakhattam	18				
3.1	Aatdhunikakavithayudesaviseshathaka l	3	2[20]	Qui	MCQ	8,9,10,11,12

3.2	Kakkadintekavyalokam	3	2[20]	Qui	MCQ	8,9,10,11,12
3.3	Kakkadu – safalameeyaathra	4	4[20]	Qui	MCQ	8,9,10,11,12
3.4	AyyappanikkarudejeevithavumKavithayum	4	3[20]	Lec	HoA	8,9,10,11,12
3.5	Ayyappappanikkar – KaadevideMakkale	4	3[20]	GL	MCQ	8,9,10,11,12
4	**AadhunikaAnantharakhattam**	**18**				
4.1	Post Modernism	2	4[10]	CS	Ess	6,7
4.2	Dalithvaadam,	2	4[15]	Lec	MCQ	6,7
4.3	Paristhithivaadam	2	4[15]	GD	SA	6,7
4.4	Sthreevaadam	3	4[20]	CS	Ess	6,7
4.5	Bhaagavatham – Vijayalekshmi	3	4[10]	Lec	MCQ	6,7
4.6	Malayalakavithaykkuorukaththu	3	4[20]	CS	Ess	6,7
4.7	UththamapurushanKadhaparayumpol	3	4[10]	Lec	MCQ	6,7
5	**Cyber Kavitha**	**18**				
5.1	Digital Saangethikathayude Saadhyathakal Parimithikal	2	5[15]	Lec	HrA	7.,11,12
5.2	Printing Meedia	2	5[15]	GS	CA	7.,11,12
5.3	Kavithaapooranam	2	5[10]	GS	MCQ	7.,11,12
5.4	Chithrarechana	2	5[10]	Lec	HrA	7.,11,12
5.5.	Inter Active Poetry	2	5[10]	GS	CA	7.,11,12
5.6	hyper Text	4	5[10]	Lec	MCQ	7.,11,12
5.7	Game – Viswaprasaad	2	5[15]	Lec	HrA	7.,11,12
5.8	Blog – ottamazha 2010	2	5[15]	Lec	MCQ	7.,11,12

Reference Books

1. Mukudhan N, Gadha, keralabhasha Institute: Thiruvananthapuram, 2013.
2. Ezhuthachan, RamayanamKilipattu, N.B.S: Kottayam, 2012
3. Mukundhan N, Kilippattu, Keralabhasha Institute, Thiruvananthapuram, 2013
4. Kumaranashan ,veenapovu, D.C.Books: Kottayam, 1988
5. Susheelan K. P, Kumaranashaneorkkumbol, Keralabhasha Institute, Thiruvananthapuram, 2013
6. P.P.K Pothuvaal, Paristhithikavithaykkoraamukham, D.C Books, Kottayam 1995.
7. Balachandran Vadakkedath, AadhunikathaykkumUtharaadhunikaykkumedayil, PranathaBooks , Cochin
8. Leelavathy.M, Kavithasahithyacharithram, Keralanbhasha Institute: Thiruvananthapuram, 2013
9. George K.M, AadhunikaMalayalasahithyaCharithramprasthanagaliloode, Kottayam :DC books.
10. George.K.M, SahithyaCharithramprasthanagaliloode, Kottayam , SahithyaPravarthakasahakaranaSangam, 1958.
11. Krishna Pilla N, Kairaliyudekadha, D.C. Books, Kottayam, 1958.
12. Venugopan Nair. S. V., MalayalaBhashaCharitram, Maluben publications, Thiruvananthapuram. 2000.

Course Title: General Hindi Modern Indian LanguageII(MIL II)	Course Type: Theory Course Code: 23LH21

Total Hours:75	Hours/Week:5	Credits: 5

Pass-Out Policy : Minimum Contact Hours: 45 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

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CLO. No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be able to*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand Hindi Fiction	1(10),2(5),5 (5)	1, 2, 5, 6, 8, 10	U	M,F, C
CLO-2	Evaluate social values through stories	2(10),3(10)	1, 2, 3,	U, An	M,C
CLO-3	Remember cultural values through reading passages	2(5), 5(10),10(5)	1, 2, 3, 6, 7	An, E	M,P
CLO-4	Apply practical grammar	9(10), 10(10)	8, 3, 7	An, E	M,C
CLO-5	Evaluate modules related to fiction based on competitive examinations	1(10), 5(5), 9(5)	1, 7, 8	U,E	M,C,P

Module	**Course Description**	**Hours**	**%of CLO Mapping with Module**	**Learning Activities**	**Assessment Task**	**Reference**
1	**Hindi Katha sahithyaParichay**	**18**				
1.1	Kahanikethathva	6	1[20]	Lec	CA	1,2,3
1.2	Hindi kePramukhakahaanikaromkaparichay	4	1[30]	Lec	CA	1,2
1.3	EkankikeThathva	5	1[25]	Lec	HrA	1,2
1.4	Hindi kePramukhaekankikaromkaparichay	3	1[25]	Lec	CA	1,2
2	Hindi Kahaniyaam					1,2
2.1	Bade gharkibetti – Premchand	6	1[30]	Lec	CA	1,2
2.2	Vo theraghar Yah Meraghar – Malathi Joshi	6	1[30]	Lec	HrA	1,2
2.3	Pita – Gyanarenjan	6	1[40]	Lec	CA	1,2
3	Hindi Ekanki	18				1,2

3.1	LekshmikaSwagath – Upendranathashk	6	1[30]	Lec	CA	1,2
3.2	Vibhajan – vushnuprabhakar	6	1[40]	Lec	HrA	1,2
3.3	MaaBaap – Srivishnu	6	1[30]	Lec	CA	1,2
4	vyakaran	18				1,2
4.1	Kriyavisheshan	6	1[25]	Lec	CA	1,2
4.2	SambathaBodhak	4	1[25]	Lec	CA	1,2
4.3	SamuchayBodhak	5	1[25]	Lec	HrA	1,2
4.4	VismayaBodhak	3	1[25]	Lec	CA	1,2
5	Thakaneekishabdh our anuvaad	18				1,2
5.1	ThakaneekiShabdh	9	1[50]	Lec	HrA	1,2
5.2	ChotteChotteanuvaad	9	1[50]	Lec	CA	1,2

Reference Books

1. AathEkankinatak – Ed. Dr.Ramkumar Varma
2. Das Ekanki

Course Title: Part 11 Communicative English (Semester 11)	Course Type: Theory Course Code: 23LE21

Total Hours: 90 (Including Seminar/ Practical [information Transfer] and formative assessment)

Hours/Week: 6 Credits: 3

Pass-Out Policy : Minimum Contact Hours: 54

Total Score %: Internal: 40 External: 60

Minimum Pass %: 40 [No Minimum for Internal]

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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	1 (10) 6 (7) 7 (3)	2, 3	U AP	F P
CLO-2	Examine and present material of the prescribed texts and other texts	2 (8) 5 (12)	1, 2	U, An E	C M
CLO-3	Identify cross cutting issues like, Human values, (Professional, Personal and Domestic) ethics and environmental sustainability and practise them	3 (8) 8 (6) 9 (6)	1, 4, 8, 9	An E, Ap	C P
CLO-4	Present and differentiate various cultures and civilizations of the Globe and distinguish Indian traditional Knowledge	1 (10) 8 (5) 10 (5)	5, 6, 10	U, Ap	P M
CLO-5	Relate the textual content and underlying meaning of the context to the real life situations	5 (6) 8 (8) 10 (6)	1, 2, 5, 7	E, Ap, C	C M

Module	Course Description	Hours	%of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	**PROSE**	**18**				
1.1	**When You Dread Failure (1952)- A. J. Cronin**					
1.1.1	Introduction to the author & the Essay	1	2 [4], 4 [10]	L	Ho A	1
1.1.2	Textual Analysis	2	2 [4]	L GD	SA	1
1.1.3	Thematic analysis: Developing positive mindset Discussion on Human values, Personal and Professional ethics	3	2 [4], 3[10], 5[12]	L GD	Essay	1
1.2	**I Have a Dream (1963) - Martin Luther King**					
1.2.1	Introduction to the author & the Essay	1	2 [4], 4 [10]	L	Ho A	1
1.2.2	Textual Analysis	2	2 [4]	L GD	MCQ	1
1.2.3	Themes: Sensitising towards equality and liberty & Discussion on racial discrimination- reflection of Human values	3	2 [4], 3[10], 5[12]	L GD	Ess	1
1.3	**I Plead that You Read- Shashi Tharoor** (2023)					
1.3.1	Introducing the author & Essay	1	2 [4], 4 [10]	L	Ho A	1
1.3.2	Textual analysis	2	2 [4]	L, GD	S A	1
1.3.3	Thematic analysis: The need for critical reading	3	2 [4], 3[10], 5[10]	L GD	Ess	1
2	**POETRY**	**18**				
2.1	**Solitary Reaper - Wordsworth**					

2.1.1	Introducing the poet & the poem	1	2 [4] 4[10]	L	Ho A	1
2.1.2	Analysis of the poem	2	2[4]	L, GD	S A	1
2.1.3	Theme: Work is worship- work ethics & Soothing effect of Music, Art & communication	2	2 [4], 4[10]	GD ,TP S	Ess	1
2.2	**Telephone Conversation - Wole Soyinka**					
2.2.1	Introducing the poet & the poem	1	2[4] 4[10]	L	Ho A	1
2.2.2	Analysis of the poem	2	2[4]	L, GD	MCQ	1
2.2.3	Themes of the poem- Injustice; racial discrimination and Human values	2	2 [4], 3[12], 5[12]	GD , TP S	Ass	1
2.3	**On Killing a Tree- Gieve Patel**					
2.3.1	Introducing the poet & the poem	1	2 [4] 4[10]	L	Ho A	1
2.3.2	Analysis of the poem	2	2[4]	L GD	S A	1
2.3.3	Themes: Creating awareness to protect trees; Environmental issues	1	2 [4], 3[12], 5[12]	L GD	Ess	1
2.4	**Still I Rise - Maya Angelou**					
2.4.1	Introducing the poet & the poem	1	2 [4] 4[10]	L	Ho A	1
2.4.2	Analysis of the poem	1	2[4]	L GD	S A	1
2.4.3	Human Values & gender issues in “Still I Rise”	2	2 [4], 3[12], 5[12]	L GD	Ess	1
3	**FICTION 18**					
3	***The Lion, the Witch and the Wardrobe***- C. S. Lewis					

3.1	Plot & Character analysis	7	2 [4] 5[10]	L GD	MCQ	2
3.2	Compare and contrast the characters	3	2 [4]	GD	S A	2
3.3	Thematic analysis: Conflict between Good and Evil	4	2 [4] 4[20]	L GD	Ess	2
3.4	Human Values reflected in *The Lion, the Witch and the Wardrobe*	2	2 [4], 3[12], 5[10]	GD CC C	Ass	2
3.5	Ethical issues presented in *The Lion, the Witch and the Wardrobe*	2	2 [4], 3[12], 5[10]	GD CC C	S A	2
4	**LANGUAGE STUDY 18**					
4.1	**Grammar Units 26-53** (Essential English Grammar by Raymond Murphy)	18	1[50]	CC C	Hr A	3
5	**LANGUAGE IN PRACTICE 18**					
5.1	**Vocabulary: One Word Substitutes** **One Word substitutes for Person**: 1.Anthropologist, 2. Anchor, 3. Celebrity 4. Extrovert, 5. Humanitarian, 6. Hypocrite, 7. Optimist, 8. Philanthropist, 9. Philatelist, 10. Teetotaller. **One Word substitutes for Generic terms**: 1. Almanac, 2. Axiom, 3. Biopsy, 4. Chronology, 5. Extempore, 6. Integrity, 7. Panacea, 8. Plagiarism, 9. Souvenir, 10. Utopia. **One Word Substitutes for Venue/ Spot**: 1. Archives, 2. Aviary, 3. Aquarium, 4. Arena, 5. Burrow, 6. Cemetery, 7. Gymnasium, 8. Kennel, 9. Orchard, 10. Wardrobe.	5	1[16]	CC C	CT	4
5.2	Taking and Making Notes	3	1[8]	AB L	CT	4
5.3	Writing Paragraphs	3	1[8]	AB L	CT	4

5.4	Reading for General and Specific Information (Only for- Viva/Practical purpose) [Interpreting Charts, Tables, Schedules, Graphs, Maps etc.]	3	1[8]	ABL PL	Practical	4
5.5	Spoken English (Practical) Situational Conversations: ● At the Booking counter in a Bus Stand and Railway Station ● At the reception counter to book a room ● At restaurant ordering food ● At the bank to open an account	4	1[10]	PL	Practical	4

PART-3
MAJOR (CORE) COURSE II
23GC21- GENERAL CHEMISTRY-II (CC3)

Course Title: General Chemistry (Core paper 3)

Course type: Theory

Total hours: 90 Hours/week: 6 **Credits: 5**

Pass-out Policy: Min. **Contact Hours: 54**
Total Score %:100 **: Int.: 40 Ext.: 60**
Minimum Pass % **:40 [No min. for Int.]**

Course Creator	Expert 1	Expert 2
Dr. G.R. Bella	Dr.A.Yardily	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
grbella321@gmail.com	ayardily @gmail.com	NMCC. Marthandam

CLO No.	Course Learning Outcomes (CLO) Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO -1	Understand the chemistry of acids, bases and determine the pH, ionic products, solubility products, relative strength of acids and bases.	2(15),5(5)	1,2,7,10	U	M
CLO-2	Explain the properties of s and p-block elements	2(15),5(5)	1,2,7,10	R	P
CLO -3	Describe the behavior p-block elements	2(15),5(5)	1,2,7,10	An	P
CLO-4	Understand the fundamental concepts of organic hydro carbon chemistry	2(15),5(5)	1,2,7,10	E,U	P
CLO-5	Understand the fundamental concepts of Colloids and surface chemistry	2(15),5(5)	1,2,7,10	U	M

Module	Course Description	Hours	%of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
I	**ACIDS, BASES AND IONIC EQUILIBRIA**					
1.1	Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept;	2	1[10]	Lec	Qui	5,7
1.2	Relative strengths of acids, bases and dissociation constant;	1	1[10]	Lec	Qui	5,7
1.3	Dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions;	2	1[10]	GD	ASS	5,7
1.4	Degree of dissociation, common ion effect, factors affecting degree of dissociation;	2	1[20]	Lec	Sem	5,7

1.5	Acid base indicators, theory of acid base indicators-action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;	2	1[10]	Lec	Qui	5,7
1.6	Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation;	2	1[20]	TPS	Ass	5,7
1.7	Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis;	2	1[10]	Lec	Sem	5,7
1.8	Solubility product - determination and applications; Numerical problems involving the core concepts**.**	2	1[10]	Lec	Ess	5,7
II	**CHEMISTRY OF s - BLOCK ELEMENTS**					
2.1	Hydrogen: Position of hydrogen in the periodic table.	1	2[5]	Lec	Qui	1,2,8
2.2	Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates.	2	2[10]	Lec	Qui	1,2,8
2.3	Diagonal relationship of Li with Mg.	1	2[10]	BS	Sem	1,2,8
2.4	Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals.	2	2[10]	TPS	Ass	1,2,8
2.5	Anomalous behaviour of Be.	1	2[10]	Lec	Qui	1,2,8
	CHEMISTRY OF p-BLOCK ELEMENTS (Group 13 & 14)					
2.6	Preparation and structure of diborane and borazine.	1	2[10]	Lec	Qui	2,8
2.7	Chemistry of borax.	1	2[10]	Lec	Qui	2,8
2.8	Extraction of Al and its uses. Alloys of Al.	2	2[10]	Lec	Qui	2,8
2.9	Comparison of carbon with silicon.	1	2[5]	Lec	Sem	2,8
2.10	Carbon-di-sulphide – Preparation, properties, structure and uses.	1	2[10]	GD	Ass	2,8

2.11	Percarbonates, per monocarbonates and per dicarbonates.	2	2[10]	Lec	Qui	2,8
III	**CHEMISTRY OF p- BLOCK ELEMENTS (Group 15-18)**					
3.1	General characteristics of elements of Group 15; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3.	2	3[10]	Lec	Qui	2,10
3.2	Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4).	2	3[10]	Lec	Qui	2,10
3.3	General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone.	1	3[10]	Lec	Sem	2,10
3.4	Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).	2	3[10]	GD	Ass	2,10
3.5	Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power	2	3[20]	Lec	Qui	2,10
3.6	Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$).	2	3[10]	Lec	Sem	2,10
3.7	Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.	2	3[10]	GD	Ass	2,10
3.8	Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.	2	3[20]	Lec	Sem	2,10
IV	**HYDROCARBON CHEMISTRY-I**					
4.1	**Petro products:** Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses	2	4[10]	Lec	Qui	3,4
4.2	**Alkenes**-Nomenclature, general methods of preparation – Mechanism of □- elimination reactions – E1 and E2 mechanism	2	4[10]	Lec	Qui	3,4

	- factors influencing – stereochemistry –orientation					
4.3	Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions– hydroxylation,oxidative degradation, epoxidation,ozonolysis; polymerization.	2	4[20]	GD	Qui	3,4
4.4	**Alkadienes** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions;	2	4[10]	Lec	Sem	3,4
4.5	Free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.	2	4[10]	GD	Qui	3,4
4.6	**Alkynes** Nomenclature; general methods of preparation, properties and reactions;	1	4[10]	Lec	Qui	3,4
4.7	Acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.	1	4[10]	GD	Sem	3,4
4.8	**Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations.	1	4[20]	Lec	Qui	3,4
4.9	Conformational analysis of cyclohexane, mono and di substituted cyclohexanes.	1	4[10]	Lec	Sem	3,4
4.10	Geometrical isomerism in cyclohexanes.	1	4[10]	Lec	Ass	3,4
V	**COLLOIDS AND SURFACE CHEMISTRY**					
5.1	**Colloids:** Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols),	2	5[10]	BS	Ass	5,6
5.2	Preparation of Sols- Dispersion methods, aggregation methods,	2	5[20]	GD	Sem	5,6

5.3	Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis,	3	5[20]	Lec	Qui	5,6
5.4	Coagulation or precipitation, Stability of sols, associated colloids, Emulsions,	3	5[20]	TPS	Ass	5,6
5.5	Gels-preparation of Gels, Applications of colloids	2	5[10]	Lec	Qui	5,6
5.6	Macromolecules: Molecular weight of Macromolecules-Number average molecular weight-average molecular weight, Determination of Molecular weight of molecules	3	5[20]	Lec	Sem	5,6

Seminars and class test-10 hours

References

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed, S.Chand and Company, New Delhi.
2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.
3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.
6. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork.
7. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi.
8. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London.
9. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India.
10. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut.
11. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, 8thed., Goel Publishing House,Meerut.

Course Title:	**CC4-Organic Chemistry- I**	Course Type: **Theory** Course Code :23GC22
Total Hours: **60**	Hours/Week: **4**	Credits: **4**
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.C.Anuba	Dr.R.S.JebaJeevitha	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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CLO-No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	To assign RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.	2(15),5(5)	1,2,7,10	U	M
CLO-2	To explain preparation and properties of aromatic and aliphatic nitro compounds and amines	2(15),5(5)	1,2,7,10	R	P
CLO-3	To explain colour and constitution of dyes and food additives	2(15),5(5)	1,2,7,10	An	P
CLO-4	To discuss preparation and properties of five membered heterocyclic like pyrrole, furan and thiophene	2(15),5(5)	1,2,7,10	E,U	P
CLO-5	To discuss preparation and properties of six membered heterocycles like pyridine,quinoline and isoquinoline	2(15),5(5)	1,2,7,10	U	M

Module	Course description	Hours	%of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
I	**STEREOCHEMISTRY**					
1.1	Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions;	2	1[10]	Lec	Qui	1,2, 6-8
1.2	Geometrical isomerism: cis–trans, syn-anti isomerism, E/Znotations.	2	1[20]	Lec	Sem	1,2, 6-8
1.3	Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures	2	1[20]	TP S	MC Q	1,2, 6-8
1.4	Racemisation-methods of racemisation	1	1[10]	Lec	Ass	1,2, 6,7, 8
1.5	Resolution-methods of resolution. C.I.P rules. R and S notations for one and two chirality(stereogenic)centres.	2	1[20]	TP S	MC Q	1,2, 6-8
1.6	Molecules with no asymmetric carbon atoms–allenes and biphenyls.	1	1[10]	GD	Qui	1,2, 6-8
1.7	Conformational analysis of ethane and butane.	1	1[10]	TP S	MC Q	1,2, 6-8
II	**CHEMISTRY OF NITROGEN COMPOUNDS–I**					
2.1	**Nitro alkanes** Nomenclature, isomerism, preparation from alkylhalides, haloacids,alkanes; Nitro-acinitro tautomerism.	2	2[10]	Lec	MC Q	3,4
2.2	Physical properties Reactions–reduction, halogenations, Grignard reagent, Pseudo acid character.	1	2[10]	Lec	Ass	3,4
2.3	Aromatic nitro compounds Nomenclature, preparation –nitration, from diazonium salts	2	2[20]	GD	Qui	3,4
2.4	Physical properties Reactions-reduction of nitrobenzene in different medium	1	2[10]	Lec	MC Q	3,4
2.5	Electrophilic substitution reactions, TNT.	1	2[10]	BS	Pro	3,4
2.6	**Amines:** Aliphatic amines Nomenclature, isomerism	1	2[10]	Lec	Qui	3,4
2.7	Preparation – Hofmanns' degradation reaction, Gabriel's phthalimide synthesis, Curtius Schmidt rearrangement.	2	2[20]	Lec	Sem	3,4
2.8	Physical properties, reactions – alkylation, acylation, carbylamine reaction, Mannich reaction,	2	2[10]	GD	MC Q	3,4

	oxidation, basicity of amines.					
III	**CHEMISTRY OF NITROGEN COMPOUNDS –II**					
3.1	**Aromatic amines** – Nomenclature, preparation – from nitro compounds, Hofmann's method; Schmidt reaction, properties - basic nature, ortho effect	2	3[20]	Lec	MCQ	5-7
3.2	Reactions – alkylation, acylation, carbylamine reaction, reaction with nitrous acid, aldehydes, oxidation,	2	3[10]	Lec	Qui	5-7
3.3	Electrophilic substitution reactions, diazotization and coupling reactions; sulphanilic acid - zwitter ion formation.	2	3[10]	TPS	MCQ	5-7
3.4	Distinction between primary, secondary and tertiary amines	1	3[10]	Lec	Ass	5-7
3.5	Aliphatic and aromatic Diazonium compounds	1	3[10]	Lec	MCQ	5-7
3.6	Diazo methane, Benzene diazonium chloride-preparations and synthetic applications.	1	3[10]	Lec	Qui	5-7
3.7	**Dyes** Theory of colour and constitution; classification based on structure and application	1	3[10]	TPS	MCQ	5-7
3.8	Preparation –Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green. Industry oriented content	1	3[10]	Lec	Qui	5-7
3.9	Dyes Industry, Food colour and additives	1	3[10]	TPS	Sem	5-7
IV	**HETEROCYCLIC COMPOUNDS- I**					
4.1	Nomenclature and classification. General characteristics - aromatic character and reactivity.	2	4[10]	Lec	Ass	7-10
4.2	Five-membered heterocyclic compounds	2	4[10]	Lec	Sem	7-10
4.3	**Pyrrole** – preparation - from succinimide, Paal Knorr synthesis; reactions– reduction, basic character, acidic character, electrophilic substitution reactions, ring opening.	3	4[30]	Lec	MCQ	7-10
4.4	**Furan** – preparation from mucic acid and pentosan; Reactions – hydrogenation, reaction with oxygen, Diels Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction.	3	4[30]	Lec	Qui	7-10
4.5	Thiophene synthesis - from acetylene; reactions –reduction; oxidation; Electrophilic substitution reactions	2	4[20]	TPS	Ass	7-10
V	**HETEROCYCLIC COMPOUNDS - II**					
5.1	Pyridine – synthesis - from acetylene,	2	5[20]	Lec	MCQ	5-10
5.2	Physical properties; reactions - basic	3	5[20]	Lec	Ass	5-

	character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution- uses					10
5.3	Condensed ring systems	1	5[20]	GD	Sem	5-10
5.4	Quinoline – preparation - Skraup synthesis and Friedlander's synthesis; reactions – basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions – Chichibabin reaction	3	5[20]	Lec	MCQ	5-10
5.5	Isoquinoline – preparation by the Bischler – Napieralski reaction, reduction, oxidation; electrophilic substitution.	3	5[20]	BS	Sem	5-10

REFERENCES

1. M.K. Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2009.
2. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 2009.
3. ArunBahl and B.S. Bahl, Advanced organic chemistry, New Delhi, S.Chand& Company Pvt. Ltd., Multicolour edition, 2012.
4. P. L.Soni and H. M. Chawla, Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, twenty ninth edition, 2007.
5. C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.
6. R. T. Morrison and R. N. Boyd, Organic Chemistry, Pearson Education, Asia, sixth edition, 2012.
7. T.W.GrahamSolomons, Organic Chemistry, John Wiley & Sons, eleventh edition, 2012.
8. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, seventh edition,2009.
9. I. L. Finar, Organic Chemistry, Vol. (1& 2), England, Wesley Longman Ltd, sixth edition, 2006.
10. J. A. Joule, and G. F. Smith, Heterocyclic Chemistry, Wiley, Fifth Edition, 2010.

Website

1. www.epgpathshala.nic.in
2. www.nptel.ac.in
3. http://swayam.gov.in
4. Virtual Textbook of Organic Chemistry

Course Title:	**CP2- Organic Qualitative Analysis And Organic Preparation**	Course Type:**Practical** Course Code :23GCP2
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. G.R. Bella	Dr. S.Begila David	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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II.APPLIED EXPERIMENT

Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	-	-	2	2
Prerequisites	General Chemistry II			
Objectives ofthe course	This course aims at providing knowledge on laboratory safety handling glass wares analysis of organic compounds preparation of organic compounds			
	QUALITATIVE ORGANIC ANALYSIS Identification of functional groups in organic compounds- by systematic analysis and preparation of solid derivatives. Report should be made under the following heads. a) Elements present other than C, H and O b) Aliphatic or aromatic c) Saturated or unsaturated d) Functional group e)Solid derivative prepared			
	Preparation of Organic Compounds Nitration - picric acid from Phenol Halogenation - p-bromo acetanilide from acetanilide Oxidation - benzoic acid from Benzaldehyde Microwave assisted reactions in water: Methyl benzoate to Benzoic acid Salicylic acid from Methyl Salicylate Rearrangement - Benzil to Benzilic Acid Hydrolysis of benzamide to Benzoic Acid			

Preparation of washing powder,talcum powder and shampoo

REFERENCE

1. Vogel'sText Book of Practical Organic Chemistry, Person Education, Delhi, 5th Edn. 2004.
2. Venkateswaran, R. Veeraswamy, A.R.Kulandaivelu., Basic principles of practical chemistry 2nd edition, New Delhi, Sultan Chand and Sons. 2006
3. Vogel's Text Book of Quantitative Chemical Analysis, 5thEdn. ELBS, 2004.

Course Title: Allied Chemistry

Course Type: Theory + Practical
Course Code: 23AC02

Total Hours:60 Hours/week: 4 Credit: [Th:4+Pr:1]

Pass-out policy : Min.Contact Hours: 27
Total Score% : 100 Int :40 Ext:60
Min.Pass% : 40 [No min. for Int.]

Creator	Expert 1	Expert 2
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CO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand the water quality parameters and manufacture of ozone	1[10], 3[5],2[5]	1,2,3	U	M
CLO-2	Explain the preparation and properties of carbohydrates	1[10], 3[5],2[5]	1,2,3	R	P
CLO-3	Understand aminoacids and essential elements of biosystem	1[10], 3[5],2[5]	1,2,3	An	P
CLO-4	Explain about polymers, plastics and rubber	1[10], 3[5],2[5]	1,2,3	E,U	P
CLO-5	Outline the various types of photochemical process	1[10], 3[5],2[5]	1,2,3	U	M

Module	Course description	Hours	%of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	**WATER AND OZONE**					
1.1	Water – Introduction, Hydrogen bonding-types - Intermolecular and intramolecular	2	1[20]	Lec	Ess	1,2,3
1.2	Definition - hydrates, efflorescence, deliquescence and hygroscopic	2	1[10]	TPS	MCQ	1,2,3
1.3	Water quality parameters – pH, DO, BOD, COD, alkalinity, chlorinity, salinity and conductivity	3	1[10]	Lec	Qui	1,2,3
1.4	Hardness of water – Temporary and Permanent hardness, determination of hardness of water by EDTA titration	3	1[20]	PT	Qui	1,2,3
1.5	Water purification by ion exchange process	2	1[20]	Lec	Qui	1,2,3
1.6	Ozone: Manufacture and uses Mechanism of ozone depletion	3	1[20]	Lec	Sem	1,2,3
2	**CARBOHYDRATES**					
2.1	Classification, preparation and properties of glucose	3	2[20]	Lec	Qui	4,5
2.2	Classification, preparation and properties of fructose	3	2[20]	Lec	Sem	4,5
2.3	Glucose - fructose interconversion	3	2[10]	BS	MCQ	4,5
2.4	Preparation and properties of sucrose	2	2[10]	SI	MCQ	4,5
2.5	Preparation and properties of starch	2	2[20]	Lec	Ass	4,5
2.6	Preparation and properties of cellulose	2	2[20]	PT	Qui	4,5
3	**AMINO ACIDS AND ESSENTIAL ELEMENTS OF BIOSYSTEM**					
3.1	Classsification - preparation and properties of alanine	3	3[10]	Lec	Ess	5,6
3.2	Preparation of dipeptides using Bergmann method	2	3[20]	Lec	Pro	5,6
3.3	Proteins - classification - structure	2	3[20]	Lec	pro	5,6
3.4	Colour reactions - biological functions	2	3[10]	GD	Qui	5,6
3.5	RNA and DNA - structure	3	3[20]	BS	MCQ	5,6
3.6	Essentials of trace metals in biological system - Na, Cu, K, Zn, Fe, Mg	3	3[20]	Lec	Ass	5,6

1V	**POLYMER CHEMISTRY**					
4.1	Introduction - Polymer, polymerization General characteristics of polymers	2	1[10]	Lec	Qui	7
4.2	Fibres - classification - uses of terylene, nylon and orlon	2	1[10]	TPS	Sem	7
4.3	Plastics - classification - thermoplastics and thermosetting plastics, advantages of plastics	3	1[20]	Lec	Qui	7
4.4	Uses of polythene, PVC, polystyrene, Teflon and thermocole	2	1[20]	GD	MCQ	7
4.5	Rubber - types - natural rubber, synthetic rubber	2	1[10]	Lec	Ess	7
4.6	Defects of natural rubber, Vulcanization of rubber	2	1[20]	Lec	MCQ	7
4.7	Uses of neoprene, thiocol, butyl rubber, silicone rubber and foam rubber	2	1[10]	Lec	Sem	7
V	**PHOTOCHEMISTRY**					
5.1	Grothus - Drapper's law	3	5[20]	Lec	Sem	7
5.2	Stark - Einstein's law of photochemical equivalence	3	5[20]	Lec	MCQ	7
5.3	Quantum yield - hydrogen chloride reaction	3	5[20]	GD	Ess	7
5.4	Phosphorescence, fluorescence, chemiluminescence	3	5[20]	Lec	Qui	7
5.5	Photosensitization and photosynthesis (definition with examples)	3	5[20]	TPS	Sem	7

REFERENCES

1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Textbook of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, Milestone publishers and Distributors, 2008.

4. J.L. Jain, Sunjay Join and Nitin Jain, Fundamentals of Biochemistry, S. Chand and Company Ltd., New Delhi, 2005.
5. Arun Bahl, B.S. Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012.
6. P.L. Soni, Text book of Organic Chemistry, S. Chand and Company Ltd, New Delhi 2008.
7. R.Puri, L.R. Sharma, M.S. Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.

Course Title: ORGANIC QUALITATIVE ANALYSIS AND ORGANIC PREPARATION

Course Type: Practical
Course Code: 23ACP2

Total Hours:60 Hours/week: 4 Credit: [Th:4+Pr:1]

Pass-out policy: Min.Contact Hours: 27
Total Score% :100 Int :40 Ext:60
Min.Pass% : 40 [No min. for Int.]

Credit :1 **Hours: 2**

CLO.No.	Expected Learning Outcomes On successful completion of this course, student should be able to:	PSO Mapped with[%]	Cognitive Level
CLO-1	Understand the principle of systematic organic qualitative analysis	4[100]	U
CLO-2	Apply the principles of chemistry in the day today life activities.	4[100]	D

1. QUALITATIVE ORGANIC ANALYSIS

The analysis must be carried out as follows:

(a) Functional group tests – Acid, phenol, aldehyde, carbohydrate, aromatic primary amine, amides (mono &di)
(b) Detection of elements – Nitrogen
(c) To distinguish between aliphatic and aromatic compounds
(d) To distinguish saturated and unsaturated compounds

REFERENCE

4. Vogel'sText Book of Practical Organic Chemistry, Person Education, Delhi, 5th Edn. 2004.

5. VVenkateswaran, R. Veeraswamy, A.R.Kulandaivelu., Basic principles of practical chemistry 2nd edition, New Delhi, Sultan Chand and Sons. 2006

6. Vogel's Text Book of Quantitative Chemical Analysis, 5thEdn. ELBS, 2004.

7. V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles ofPractical Chemistry; Sultan Chand & sons, Second edition, 1997.

ALLIED MATHEMATICS FOR CHEMISTRY STUDENTS
ALLIED MATHEMATICS-II

Course Title: Allied Mathematics II(Minor Stream 2)	Course Type: Theory Course code:23AC02

Total Hours: 90 Hours/Week: 6 Credits: 5

Pass-Out Policy : Minimum Contact Hours: 75 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Dr. Y. S. Irine Sheela	Dr. K. Lal Gipson	Dr. J. Ajitha Fancy
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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be ableto:*	**% of PLO mapping with CLO**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Compute partial derivatives, derivatives of vector valued functions, gradient function.	1(2),2(8), 3(5),4(4)	C	C
CLO-2	Evaluate integral of functions or vector valued quantities over curves, surfaces and domains in two or three dimensional space.	1(4),2(7),3(7),4(3)	E	P
CLO-3	Apply fundamental theorem of line integrals, Green's theorem, Stoke's theorem	2(8),3(6), 4(7),5(3)	Ap	M
CLO-4	Understand the concept of fourier series.	2(2),3(8), 4(4),5(2)	U	P
CLO-5	Solve the problem related to gamma and beta	1(3),2(3), 3(6),4(6),5(2)	S	F

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	References
I	**Vector Differentiation**					
1.1	Gradient	4	1[10]	Lec	HoA	1
1.2	Divergence of a vector	4	1[30]	SP	HrA	1
1.3	Solenoidal vector	4	1[20]	Sem	CT	1
1.4	Curl of a vector	3	1[20]	Lec	CA	1
1.5	Irrotational vector	3	1[20]	Lec	ST	1
II	**Vector Integration**					
2.1	Line integral	5	2[20]	Lec	CT	1
2.2	Workdone by a force	4	2[30]	Sem	HoA	1
2.3	Surface integral	5	2[30]	SP	ST	1
2.4	Volume integral	4	2[20]	Sem	HrA	1
III	**Application of a vector differentiation and Integration**					
3.1	Green's Theorem(statement only) and problems using Green's theorem	6	3[30]	Lec	CT	1
3.2	Stokes Theorem(statement only) and problems using Stokes theorem	6	3[40]	Sem	HrA	1
3.3	Gauss divergence Theorem(statement only) and problems using Gauss divergence theorem	6	3[30]	Sem	HrA	1

IV	**Fourier Series**					
4.1	Fourier series	3	4[20]	Lec	CT	1
4.2	Half range Fourier series	4	4[20]	SP	ST	1
4.3	Fourier sine series	5	4[20]	Sem	HoR	1
4.4	Fourier cosine series	6	4[20]	Lec	HrA	1
V	**Beta and Gamma Functions**					
5.1	Properties of Beta functions	4	5[20]	Sem	CT	1
5.2	Problems related to Beta functions	4	5[30]	Lec	HoA	1
5.3	Properties of Gamma functions	5	5[30]	Sem	ST	1
5.4	Problems related to Gamma functions	5	5[20]	Lec	HrA	1

Text Book :

1. *Allied Mathematics*, Paper III, Arumugam and Issac, June 2007, New Gamma Publishing House- Palayamkottai.

Course Title: Allied Zoology (Minor Stream 2)	Course Type: Theory Course Code: 23AZ02
Total Hours: 90 Hours/Week: 6 Credits: 5	
Pass-Out Policy : Minimum Contact Hours:54 Total Score %:100 Internal:40 External: 60 Minimum Pass %: 40[No Minimum for Internal]	

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
1.1	Respiratory pigments and transport of gases.	3	1[20]	Lec	CA	1
1.2	Mechanism of blood clotting	2	1[20]	Lec	CA	1
1.3	Types of excretory products	2	1[20]	Lec	CA	1
1.4	Ornithine cycle	2	1[10]	Lec	CT	1
1.5	Structure of neuron	3	1[10]	Lec	CT	1
1.6	Conduction of nerve impulse	3	1[10]	Lec	CT	1
1.7	Mechanism of vision and hearing.	3	1[10]	Lec	ST	1
2.1	Fertilization	2	2[30]	Lec	SA	2
2.2	Cleavage	2	2[30]	Lec	SA	2
2.3	Gastrulation and Organogenesis of Frog	2	2[20]	Lec	SA	2
2.4	Placentation in mammals	2	2[20]	Lec Sem	Ess	2
3.1	Innate and Acquired immunity	2	3[20]	Lec Sem	MCQ	3
3.2	Active and Passive immunity	2	3[20]	Lec Sem	Qui	3
3.3	Antigens and Antibodies	2	3[20]	Lec Sem	CT	3
3.4	Immunological organs	2	3[20]	Lec Sem	CT	3
3.5	Vaccination schedule	2	3[20]	Lec Pr	HoA	3

4.1	Human Chromosomes	2	4[20]	Lec Rep	CA	4
4.2	Sex Determination in Humans	2	4[10]	KWL	SA	4
4.3	Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive	2	4[10]	FC	ST	4
4.4	X-linked	1	4[10]	GD	CT	4
4.5	Y-linked	1	4[10]	GD	CT	4
4.6	Multiple Alleles	2	4[20]	TPS	MCQ	4
4.7	Polygenic inheritance	2	4[10]	Lec	MCQ	4
4.8	Genetic Counseling	2	4[20]	Lec	Ess	4
5.1	Foraging	2	5[20]	Pr	HoA	5
5.2	Courtship Behaviour	2	5[20]	BS	CA	5
5.3	Shelter and Nest Construction	2	5[20]	GT	SA	5
5.4	Parental Care	2	5[20]	TPS	ST	5
5.5	Learning Behaviour	2	5[20]	Lec	CT	5

Reference Books:

1. E. N. Benjamin, Human Anatomy and Physiology, 3/e Cammings Publishing Company,1995.
2. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand &Co.
3. Owen, J. A., Punt, J. & Stranford, S. A. - Kuby Immunology. New York: W.H.Freeman& Company
4. Klug, W. S.Cummings, M.R.& Spencer, C-Concepts of Genetics.(12thed.). New Jersey: Pearson Education
5. Mathur, R.-Animal Behaviour. Meerut:Rastogi.

Course Title: Allied Zoology (Minor Stream 2)	Course Type: Practical Course Code: 23AZP2

Total Hours: 60 Hours/Week: 2
Credits: 5

Pass-Out Policy : Minimum Contact Hours:36
Total Score %: 100 Internal:40 External: 60
Minimum Pass %: 40[No Minimum for Internal]

Module	Course Description
1.1	Examination and analysis of Ammonia.Urea and Uric acid
1.2	Estimation of haemoglobin using haemometer
2.1	**Observation of models,charts anddiagrams** Human heart, haemoglobin, neuron,eye.
2.2	Snellan chart for vision test and ear
3.1	**SPOTTERS-Slides and Specimen** Frog:egg, blastula,gastrula-yolk plug stage.
3.2	Anytwoplacenta
4.1	**CHARTS**-Human karyotype,Haemophilia, Colour Blindness, Hypertrichosis.
4.2	Down's syndrome, Turner's syndrome, Klinefelters' syndrome.
4.3	Examination of blood group-Demonstration.
5.1	Immunization schedule by WHO

Text Books:	
1.	Verma P.S.& Agarwal –Developmental Biology,Chordata embryology S.Chand & Co.
2.	Widmaier, E.P., Raff, H.and Strang, K.T.2008. Vander'sHuman Physiology, XI Edition., McGrawHill.,770PP
3.	AbhijitDutta,2009.Experimental biology:A Laboratory Science,Narosa, NewDelhi.

4.	Roitt,M,PeterJ.Delves,Seamus J.Martin and Dennis R.Burton, 2017. Essential Immunology, 13th edition, Wiley-Blackwell Publishing, USA,576pp.
5.	Owen,J.A.,Punt,J.&Stranford,S.A.-Kuby Immunology.NewYork: W.H.Freeman &Company
6.	Klug,W.S.,Cummings,M.R.& Spencer,C-Concepts of Genetics.(12th ed.). NewJersey: Pearson Education
7.	Mathur,R.-Animal Behaviour.Meerut:Rastogi.
8.	VermaP.S.&Agarwal-Developmental Biology,Chordata embryology S.Chand & Co.

Semester – III

Course Title : Part – I : Tamil Modern Indian Language III (MIL – III)	Course Type: Theory Course Code: 23LT31

Total Hours : 90 Hours / Week – 6 Credits: 3

Pass-out Policy: Minimum Contact Hours: 54
Total Score % : 100 Internal: 40 External: 60 Minimum Pass % 40 (No Minimum for Internal)

Course Creator	**Expert I**	**Expert II**
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Expert III	**Expert IV**
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CLO No.	Course Learning Outcomes (CLO) upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO 1	காப்பியங்கள்	2(8), 3(12)	**1, 2, 8**	U	P
CLO 2	அறிமுகப்படுத்தப்படுவ தால் தமிழ்	4(12), 6(8)	1, 2, 7	U	C
CLO 3	மொழியின் உயர்வையும்	2(12), 3(8)	**1, 2, 8**	C	C
CLO 4	சிறப்பையும் உணர்தல்	5(12), 6(8)	**1, 2, 3, 10**	E	F
CLO 5	தமிழ் புதினங்களின் வழி சமகாலப் படைப்புகளின் வாழ்வியல் சிந்தனையைப் பெறுவர்	7(12), 8(8)	2, 6, 7, 10	E	C

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Tasks	Reference
	Unit I செய்யுள்					
1.1	சிலப்பதிகாரம் -வழக்குரைகாதை	2	1(12)	Lec	MCQ	1
1.2	மணிமேகலை- ஆதிரை பிச்சையிட்ட காதை	2	1(12)	Lec	CA	1
1.3	கம்பராமாயணம் -மந்தரை சூழ்ச்சிப் படலம்	2	1(13)	Sem	SA	1
1.4	சீறாப்புராணம் - புலி	2	1(14)	GD	HOA	1
1.5	வசனித்த படலம்	2	1(12)	Sem	OBT	1
1.6	இரட்சணிய யாத்திரிகம் ஆரணிய பருவம்- விடாத கண்டப்படலம்	2	1(13)	GL	Ess	1
1.7	பெரியபுராணம்- பூசலார்	3	1(14)	GD	CT	1

	நாயனார் புராணம்					
1.8	அரிச்சந்திர புராணம்- நகரச் சிறப்பு	3	1(14)	Sem	HRA	1
	Unit II நாவல்					
2.1	வெ. இறையன்பு- சாகாவரம்	18	2(100)	Lec	MCQ	1
	Unit III உரைநடை- றெக்கையில்லா தேவதைகள்					
3.1	றெக்கையில்லா தேவதைகள்- அரவாணிகள்;	2	3(10)	Lec	SA	2
3.2	இயற்கையின் அதிசயம்	2	3(10)	GD	HrA	2
3.3	கனவுலகம்	2	3(10)	Sem	OBT	2
3.4	அஜ்னபி நாவலும் புலம்பெயர் மக்கள் வாழ்க்கையும்;	2	3(10)	Lec	CT	2
3.5	நெஞ்சையள்ளும் சிலம்பு	2	3(10)	GD	ESS	2
3.6	செம்மொழித் தமிழ்	2	3(10)	GL	MCQ	2
3.7	புதுக்கவிதைகளில் வாழ்வியல் பதிவுகள்;	2	3(10)	Lec	HOA	2
3.8	நாட்டுப்புற பண்பாட்டில் சடங்குகள்	2	3(10)	Sem	MC	2
3.9	செவி வாயாக நெஞ்சு களனாக	2	3(20)	GD	SA	2
	Unit IV இலக்கணம்					
4.1	யாப்பு (யாப்பின் உறுப்புக்கள் ஆறு)	3	4(17)	Lec	Qui	1
4.2	அணியிலக்கணம் (i)உவமையணி (ii) சிலேடை அணி	2	4(11)	Lec	CA	1
	(iii) தற்குறிப்பேற்றவணி	2	4(11)	GD	HrA	1
	(iv) உருவக அணி	1	4(6)	Sem	OBT	1

	(v) வேற்றுப்பொருள் வைப்பணி	2	4(11)	Lec	CT	1
	(vi) பின்வருநிலையணி	2	4(11)	GD	Qui	1
	(vii) தீவக அணி	2	4(11)	Sem	MCQ	1
4.3	மொழிப் பயிற்சி	2	4(11)	Lec	Qui	1
4.4	மொழிபெயர்ப்பு	2	4(11)	Sem	SA	1
	Unit V இலக்கிய வரலாறு					
5.1	ஐம்பெருங் காப்பியங்கள்	4	5(20)	Lec	Qui	3,4, 5
5.2	ஐஞ்சிறுகாப்பியங்கள்	4	5(20)	GD	HrA	3,4, 5
5.3	பெரியபுராண சிறப்புகள்;	4	5(20)	GD	CA	3,4, 5
5.4	அரிச்சந்திர புராணம்	4	5(20)	Lec	CT	3,4, 5
5.5	நளவெண்பா	2	5(20)	Lec	CT	3,4, 5

Text Books	
1.	பொதுத்தமிழ், ஸ்காட் கிறிஸ்தவக் கல்லூரி, தமிழ்த்துறை வெளியீடு
2.	றெக்கையில்லா தேவதைகள், ஜி. ஐசக் அருள்தாஸ், நியூ செஞ்சுரி புக் ஹவுஸ், திருநெல்வேலி.

Reference Books	
1.	*தமிழ் இலக்கிய வரலாறு, சிற்பி. பாலசுப்பிரமணியன்*
2.	*புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழண்ணல்*
3.	*வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, முனைவர். பாக்யமேரி*
4.	*அமிர்த சாகர் இயற்றிய யாப்பருங்கலக் காரிகை, வேங்கடசாமி நாட்டார். கழகப் பதிப்பு, சென்னை* 1997
5.	*தண்டியலங்காரம்* கெ. *சென்னை.* *இராமலிங்கதம்பி ரான், கழக வெளியீடு*

SEMESTER - III

Course Title: Drisyakalasaahithyam Modern Indian Language III (MIL – III)	Course Type: Theory Course Code: 23LM31

Total Hours:90 Hours/Week: 6	Credits:3

Pass-Out Policy : Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2

Name : Dr.Jisha.S.K	Name : Suja S.	Name : Dr.R.Sreejasankar
Designation : Assistant Professor	Designation : Associate Professor	Designation : Assistant Professor
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Email id : jisha@scottchristian.org	Email id : sujasdr@gmail.com	Email id : sreejavijayan77@gmail.com

CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understanding the visual arts and literature of Kerala and acquiring the ability to act by understanding the difference between characters, dialogues and context	1(5), 2(10),5(5)	1, 2, 3, 8	1,2,3	M, F, C
CLO-2	increased ability to understand and entertained by visual Art	2(10), 3(10)	1, 2, 3, 5	1,2,3	M, C
CLO-3	understand the Linguistic Characteristics of the visual arts of Attakkadha and Tullal	2(5), 5(5), 10(15)	1, 2, 3. 6, 7	1,2	M,P
CLO-4	understands the tradition of drama in details and obtains play writing ability.	9(10), 10(10)	3, 7	1, 9, 10	M, C
CLO-5	Realizing the uniqueness of the screenplay and acquiring writing skills.	1(5), 5(10), 9(5)	1, 2, 3, 8	1,2,3	M, C, P

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activity	Assessment Task	Reference
1	**Aattakkadha**	18				
1.1	Kadhakaliyude aarambhavum valarchayum	3	1[20]	CS	CT	1
1.2	Pradhaana Attakkadhakriththukal	3	1[20]	GL	CA	1
1.3	Slokam, Padam, Dandakam	4	1[20]	GD	HrA	1
1.4	Kadhakali chadangukal	4	1[20]	CS	CT	1
1.5	Nalacharitham Aattakkadha randaam Divasam	4	1[20]	GD	HrA	1
2	**Thullal**	18				
2.1	Thullalinte Aarambham Valarcha	4	2[25]	GD	HrA	14,15
2.2	Kunchannampyarude Saahithyasambhaavanakal	4	2[25]	CS	CT	14,15
2.3	Saamoohika Vimarsanam Haasyam	5	3[25]	Lec	CA	14,15
2.4	Kalyana Saugandhikam (Enkilo pandu yudhishttiran ……muthal dharikka nee Mahaabhaage..)	5	3[25]	Lec	CA	14,15
3	**Naadakam**	18				
3.1	Malayaala Naadakaththinte Aarambham Valarcha	6	3[35]	Lec	CA	2,3,4,5
3.2	Paaschaththya Naadaka swadheenam	6	3[35]	Lec	CA	2,3,4,5
3.3	Kudukka – P.M.Taaj	6	4[30]	GL	CA	2,3,4,5
4	Thirakkadha	18				
4.1	Thirakkadha yude pothu Khadakangal	6	4[30]	GL	CA	6,7,8,9 ,10
4.2	Pradhaana Malayaala Thirakkadhaakriththukkal	6	4[35]	GL	CA	6,7,8,9 ,10

4.3	Oridaththoru Fayalvaan	6	4[35]	GD	HrA	6,7,8,9 ,10
5	Cinimayile Puthuvazhikal	18				
5.1	Documentary, Short filims	2	4[10]	GD	HrA	11,12, 13
5.2	Webseries	2	4[20]	GD	HrA	11,12, 13
5.3	Editing Aappukal	2	5[10]	CS	CT	11,12, 13
5.4	Chilavukuranja Cinemanirmaanam	2	4[20]	GD	HrA	11,12, 13
5.5	YouTube videos	2	4[10]	GD	HrA	11,12, 13
5.6	Mobile phone kaalathe Cinema	2	4[10]	GD	HrA	11,12, 13
5.7	Nalacharitham Anchaam Divasam - Vinod	3	4[10]	GD	HrA	11,12, 13
5.8	Web Series - Karikku	3	5[10]	Lec	ST	11,12, 13

Reference Books

1. Krishna Kaimal Imanam, Aattakadha Sahithyam, Keralabhasha institute, Thiruvananthapuram. 2002
2. Shankarapilla G, Nadakadharshanam, D.C.Books: Kottayam,1990
3. Dr. Vayalavasudevan Pilla (AD), Nadaka Sahityam, Sambhoorna Malayala Sahitya Charitram, current books, Kottayam, 2007.
4. Rajan Thiruvothu, Nadakacharithrathinte kanni Keralabhasha Institute: Thiruvananthapuram,2007.
5. Grama Prakash N. R., Nadakam padavum prayogavum, Keralabhasha institute Thiruvananthapuram 2009
6. Shankarapilla G, Nadakasahithyacharithram, Sathiyapravarthaga Sahakaranasangam: Kottayam,1968

1. Vijaya Krishnan, Chalachitrathinte Porul, Kerala Bhasha institute, Thiruvananthapuram , 2011.

2. Divakaran .R.V.M, Kathayum thirakkathayum DC books, Kottayam .2010
3. Vijaya Krishnan, Chalachitra Sameeksha, Kerala Bhasha institute, Thiruvananthapuram .2011
4. Tony Mathew, M.T . Yude Sarga Prabancham, Keralabhasha institute, Thiruvananthapuram .2013
5. V.K.Joseph, Cinemayum prathayashasthravum, keralasamsarika prasithikaranavagup.
6. Binu Kumar .P.M, Thirakkathayude reethi Sastram,(Compiled and Study) , Kerala Bhasha institute, Thiruvananthapuram , 2011.
7. Raveenthran, Cinema samuham prathayashasthram mathrubhumi books
8. Dr. Jose K. Manuval, kathayam thirakkathaiyum, kairali books, Kannur.
9. George K.M, Aadhunika Malayala sahithya Charithram prasthanagaliloode, Kottayam :DC books.
16. George.K.M, Sahithya Charithram prasthanagaliloode , Sahithya Pravarthaka Sahakarana Sangam,1958

SEMESTER III

Course Title: Pracheen, Samakaaleen, Aadhunik Kavithayem, Letter writing Modern Indian Language III (MIL – III)	Course Type: Theory Course Code: 23LH31

Total Hours:90	Hours/Week:6	Credits: 3

Pass-Out Policy :	Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Mrs. Josy Vincent	Dr. Sreedevi S	Dr.Jayasree K.
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CLO. No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Apply nuances of letter writing in Hindi	1(10), 5(10)	1, 3, 7	1,2,3	M,F,C
CLO-2	Analyse the rules of official correspondence	1(5), 2(5), 3(10)	1, 2, 3, 5	1,3	F,C
CLO-3	Understand Hindi poetry	5(10), 10(10)	3, 6, 7	1,2,5	M,C
CLO-4	Evaluate the drafting of job application letter	9(10), 10(10)	1, 3, 7	1, 9, 10	M,F,C
CLO-5	Understand official Hindi	9(10), 5(10)	3, 7, 8	1,2,5	C

Module	**Course Description**	**Hours**	**% of CLO Mapping with Module**	**Learning Activities**	**Assessment Task**	**Reference**
1	Niji Pathra lekhan	18				
1.1	Niji PthraLekhan Arth our Bhed	6	1[50]	Lec	CA	1
1.2	Mithr our Bhai ke naam pathr	12	1[50]	GD	ST	1
2	Noukari ke aavedhan Pathr	18				
2.1	Saamajik Pathr arth our bhedh	9	1[50]	Lec	HoA	1,2
2.2	Avedhan Pathr noukari chutti aadi	9	1[50]	GL	MCQ	1
3	Pracheen Kavithayem					
3.1	Kabeerdas	6	1[35]	GL	CA	2,3
3.2	Rahim	6	1[35]	GL	CA	2,3
3.3	Thulasi das	6	1[30]	GL	CA	2,3
4	Samakaleena Kavithayem	18				
4.1	Dhoomil ki kavitha	6	1[35]	GL	CA	2,3

4.2	Kedhaar Nath sing ki kavitha	6	1[35]	GL	CA	2,3
4.3	Sarveshwar Thayaal Saksena ki kavitha	6	1[30]	GL	CA	2,3
5	Aadhika Kavithaayem	18				
5.1	Maidhili saran Gupth ka Nirchar	9	1[50]	GL	CA	2,3
5.2	Mahadevi Varma Ka Kah de maam ab Kya dhekhoom	9	1[50]	GL	CA	2,3

Reference Books

1. Alekhan our Tipan – Prof Viraj.
2. Aalekhan – Kichlu
3. Kaabya Tharang – Dr. Niranjan

SEMESTER - I11

Course Title: Part 11 Communicative English (Semester 111)	Course Type: Theory Course Code: 23LE31

Total Hours: 90 (Including Seminar/ Practical [information Transfer] and formative assessment)

Hours/Week: 6 Credits: 3

Pass-Out Policy : Minimum Contact Hours: 54

Total Score %: 100 Internal: 40 External: 60

Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Dr. A. Belinda Asir	Dr. T Sherin	Dr. L. Judith Sophia
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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	1 (10) 6 (7) 7 (3)	2, 3	U AP	F P
CLO-2	Examine and present material of the prescribed texts and other texts	2 (8) 5 (12)	1, 2	U, An E	C M
CLO-3	Identify cross cutting issues like, Human values, (Professional, Personal and Domestic) ethics and environmental sustainability and practise them	3 (8) 8 (6) 9 (6)	1, 4, 8, 9	An E, Ap	C P
CLO-4	Present and differentiate various cultures and civilizations of the Globe and distinguish Indian traditional Knowledge	1 (10) 8 (5) 10 (5)	5, 6, 10	U, Ap	P M
CLO-5	Relate the textual content and underlying meaning of the context to the real life situations	5 (6) 8 (8) 10 (6)	1, 2, 5, 7	E, Ap, C	C M

Module	**Course Description**	**Hours**	**% of CLO Mapping with Module**	**Learning Activities**	**Assessment Task**	**Reference**
1	**PROSE**		**18**			
1.1	**My London Days (1929) - M. K. Gandhi**					
1.1.1	Introduction to the author & the Essay	1	2 [4] 4 [10]	L	Ho A	**1**
1.1.2	Textual Analysis	2	2 [4]	L GD	SA	**1**

1.1.3	Thematic analysis: Developing responsibility & Human values	3	2 [4], 3[8], 5[10]	L GD	Ass	**1**
1.2	**Shooting an Elephant (1936)- George Orwell**					
1.2.1	Introduction to the author & the Essay	1	2 [4] 4 [10]	L	Ho A	**1**
1.2.2	Textual Analysis	2	2 [4]	L GD	Quiz	**1**
1.2.3	Human values and Human rights	3	2 [4], 3[5], 5[6]	L GD	Ass	**1**
1.3	**Yes We Can (2008) - Barack Obama**					
1.3.1	Introduction to the author & the Essay	1	2 [4] 4 [5]	L	Ho A	**1**
1.3.2	Textual Analysis	2	2 [4]	L GD	SA	**1**
1.3.3	Human Values	3	2 [4], 3[5], 5[5]	L GD	Ass	**1**
2	**POETRY**		**18**			
2.1	**A Poison Tree - William Blake**					
2.1.1	Introduction to the poet & the poem	**1**	2 [4] 4[5]	L	Ho A	
2.1.2	Poetry Analysis	**2**	2[4]	L GD	Quiz	
2.1.3	Human Values	**2**	2 [4], 3[6], 5[6]	L GD	Ass	
2.2	**Tear and Smile - Khalil Gibran**					

2.2.1	Introduction to the poet & the poem	1	2 [4] 4[7]	L	Ho A	**1**
2.2.2	Poetry Analysis	2	2[4]	L GD	SA	**1**
2.2.3	Human Values	2	2 [4], 3[3], 5[3]	L GD	Ass	**1**
2.3	**A Song of Hope- Oodgeroo Noonuccal**					
2.3.1	Introduction to the poet & the poem	**1**	2 [4] 4[5]	L	Ho A	**1**
2.3.2	Poetry Analysis	**2**	2[4]	L GD	Essay	**1**
2.3.3	Human Values	**1**	2 [4], 3[3], 5[3]	L GD	Ass	**1**
2.4	**Night of the Scorpion- Nissim Ezekiel**					
2.4.1	Introduction to the poet & the poem	**1**	2 [4] 4[5]	L	Ho A	1
2.4.2	Poetry Analysis	**2**	2[4]	L GD	Essay	1
2.4.3	Human Values and Indian Ethos -Domestic Values	**1**	2 [4], 4[3], 5[3]	L GD	Ass	1
3	**SCENES FROM SHAKESPEARE**			**18**		
3.1	***The Merchant of venice* Act IV Scene i**					
3.1.1	Introduction to Shakespeare and the play	1	2 [4] 4[5]	L GD	Ho A	1
3.1.2	Character analysis	2	2[4]	L RP	Essay	1

3.1.3	Reflection of Human values (mercy)	3	2[4] 3[10]	TPS	Ass	1
3.2	***Othello* Act IV Scene ii**					
3.2.1	Introduction to the play	1	2 [4]. 4 [5]	L	Ho A	1
3.2.2	Character Analysis Plot and Character analysis	3	2[6]	L RP	Essay	1
3.2.3	Human Values	2	2[6] 3[10]	L GD	Ass	1
3.3	***Julius Caesar* Act III Scene ii**					
3.3.1	Introduction to the play	1	2[4] 4 [8]	L	Ho A	1
3.3.2	Analysis of the scene	3	2 [4]	L RP	Essay	1
3.3.3	Human Values	2	3[14] 5[12]	L GD	Ass	1
4	**LANGUAGE STUDY**		**18**			
4.1	Grammar: Units 53- 83	18	1[10 0]	AB L	Ho A	2
5	**LANGUAGE IN PRACTICE**			**18**		
5.1	**Vocabulary: Phrases** apart from, approve of, bear with, break down, call upon, calm down, carry on, come across, deal with, endowed with, give away, go through, hand over, hold on, look into, look up to, look after, keep on, passed away, put an end to, in vain, inferior to, step down, take over, root out, see through, shut up, side with, try for, wipe out	5	1 [20]	CC C	CT MCQ	3

5.2	Writing Emails		1[10]	P L	Ass	3
5.3	Learning netiquette, email etiquette	3	1[10]	PL	Ass	3
5.4	Messaging in Social Media Platform [blogs, twitter, instagram, facebook] (Experiential Learning- Practical)	4	1[20]	PL	Practical	3
5.5	Data Interpretation and Presentation (Practical)	4	1[20]	PL	Ass	3
5.6	**Spoken English (Viva alone)** 1. Dialogue between a Teacher and Student 2. Dialogue between a Doctor and Patient 3. Dialogue between Shop owner and Consumer	2	1[20]	RP	Viva	3

References:

1. *Semester 111 Prose, Poetry and Drama.* Edited by the Department of English.

2. *Essential English Grammar* by Raymond Murphy. Cambridge University Press

3. Language in Use: Workbook 111. Edited by the Department of English

Course Title:	**CC 5-General Chemistry III**	Course Type: **Theory** Course Code :23GC31
Total Hours: **90** Hours/Week: **6** Credits: **5**		
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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Assistant Professor	Assistant Professor	Associate Professor
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CLO No.	Course Learning Outcomes (CLO) Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO -1	Understand the physical properties of gases and explain the kinetic properties of gases by using mathematical concepts.	2(15),5(5)	1,2,7,10	U	M,F,C
CLO-2	Describe the physical properties of liquids	2(15),5(5)	1,2,7,10	R	F,C
CLO -3	Investigate the radioactivity, nuclear energy and its production, also the nuclear wastemanagement.	2(15),5(5)	1,2,7,10	Ap	M,C
CLO-4	Write the nomenclature, physical & chemical properties and basic mechanisms of halo organic compounds and alcohols.	2(15),5(5)	1,2,7,10	An	M,C
CLO-5	Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.	2(15),5(5)	1,2,7,10	E	C

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
I	**GASEOUS STATE**					
1.1	Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation;	1	1[10]	Lec	Qui	1
1.2	The Maxwell –Boltzmann distribution of speed of molecules- average, root mean square and most probable velocity and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities.	2	1[20]	Lec	Qui	1
1.3	Collision frequency; collision diameter; mean free path and viscosity of gases.	2	1[10]	GD	ASS	1
1.4	Real gases: Deviations from ideal gas behaviour, (Andrew's and Amagat's plots);	2	1[10]	Lec	Sem	1
1.5	Compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-	2	1[10]	Lec	Qui	1

	Van der Waal's equation;					
1.6	Virial equation; Boyle temperature;	2	1[10]	TPS	Ass	1
1.7	Numerical problems based on equations of states for real gases, isotherms of real gases – critical phenomena – isotherms of CO_2 - continuity of state–Van der waal's equation and the critical state;	2	1[20]	Lec	Sem	1
1.8	Law of corresponding states-liquefaction of gases;	2	1[10]	Lec	Ess	1
II	**LIQUID AND SOLID STATE**					
2.1	Properties of Liquids- Surface tension, viscosity and their applications.	2	2[10]	Lec	Qui	1
2.2	Crystalline and amorphous – differences - geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.	2	2[10]	Lec	Sem	1
2.3	Crystals –size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices;	2	2[10]	GD	Ass	1
2.4	Classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation	2	2[10]	Lec	Qui	1
2.5	Packing in atomic solids – simple cubic, body centered cubic, face centeredand hexagonal close packing;	2	2[20]	BS	Sem	1
2.6	Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO_2;	2	2[10]	GD	Ass	1
2.7	Comparison of structure and properties of diamond and graphite;	1	2[10]	Lec	Qui	1
2.8	Defects in solids - stoichiometric and non stoichiometric defects.	1	2[10]	Lec	Sem	1
2.9	Liquid crystals – classification and applications.	1	2[10]	TPS	Ass	1
III	**NUCLEAR CHEMISTRY**					
3.1	Natural radioactivity - α, β and γ rays; half-life period; binding energy; packing fraction;	3	3[10]	Lec	Qui	1
3.2	Mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series.	2	3[20]	Lec	Qui	1
3.3	Isotopes – uses – tracers –	1	3[10]	Lec	Qui	1

	determination of age of rocks by radiocarbon dating. (Problems to be worked out)					
3.4	Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures..	2	3[10]	Lec	Qui	1
3.5	Fajan–Soddy group displacement law;	1	3[10]	Lec	Sem	1
3.6	Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism;	2	3[10]	GD	Ass	1
3.7	Radioactive decay series; magic numbers; units – Curie, Rutherford, Roentgen;	2	3[20]	Lec	Qui	1
3.8	Nuclear stability - neutron- proton ratio;	2	3[10]	Lec	Sem	1
IV	**HALOGEN DERIVATIVES**					
4.1	**Aliphatic halogen derivatives** Nomenclature and classes of alkyl halides – isomerism, physical properties, Chemical reactions.	2	4[10]	Lec	Qui	4
4.2	Nucleophilic substitution reactions – SN_1, SN_2 and SNi mechanisms with stereochemical aspects and effect of solvent.	2	4[20]	Lec	Qui	4
4.3	**Di, Tri & Tetra Halogen derivatives:** Nomenclature, classification, preparation, properties and applications.	2	4[20]	Lec	Qui	4
4.4	**Aromatic halogen compounds** Nomenclature, preparation, properties and uses. Mechanism of nucleophilic aromatic substitution – benzyne intermediate.	2	4[20]	Lec	Sem	4
4.5	**Aryl alkyl halides** Nomenclature, benzyl chloride – preparation – preparation properties and uses	2	4[10]	Lec	Qui	4
4.6	**Alcohols:** Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetraacetate.	3	4[20]	Lec	Qui	4
V	**PHENOLS AND AROMATIC ALCOHOLS**					
5.1	**Phenols** Nomenclature; classification, Preparation from diazonium salts, cumene, Dow's process, Raching	3	5[20]	BS	Ass	5,6

	process; properties – acidic character and effect of substitution on acidity.					
5.2	Reactions – Fries, claisen rearrangement, Electrophilic substitution reactions, Reimer - Teimen, Kolbe, Schmidt, Gatermann synthesis, Libermann, nitro reaction, phthalein reaction.	3	5[20]	Lec	Qui	5,6
5.3	Resorcinol, quinol, picric acid – preparation, properties and uses.	2	5[20]	TPS	Ass	5,6
5.4	**Aromatic alcohols** Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction, Grignard synthesis, physical properties, reactions – reaction with sodium, phosphorus penta chloride, thionyl chloride, acetic anhydride, hydrogen iodide, oxidation – substitution on the benzene nucleus, uses.	3	5[20]	Lec	Sem	5,6
5.5	Thiols: Nomenclature, structure, preparation and properties	2	5[20]	GD	Ass	5,6

References

1. B.R. Puri, L.R. Sharma, M.S. Pathania; Principles of Physical Chemistry, 46th edition, Vishal Publishing, 2020.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009.
3. 4. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, twentieth edition, 2006.
4. M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2003.
5. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 1994.
6. T. W. Graham Solomons, Organic Chemistry, John Wiley & Sons, fifth edition, 1992.
7. A. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt., Ltd.,New Delhi, seventh edition, 2009.
8. I. L. Finar, Organic Chemistry, Wesley Longman Ltd, England, sixth edition, 1996.

Course Title:	**CC 6-Inorganic Chemistry I**	Course Type: **Theory** Course Code :23GC32
Total Hours: **90** Hours/Week: **6** Credits: **5**		
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. R. S. JebaJeevitha	Dr. J. PremaKumari	Dr.T.F.Abbs Fen Reji
Assistant Professor	Associate Professor	Associate Professor
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CLO-No.	CourseLearning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand the compounds of hydrogen and oxygen	2(15),5(5)	1,2,7,10	U	M,F,C
CLO-2	Explain the halogen compounds and its properties	2(15),5(5)	1,2,7,10	R	F,C
CLO-3	Describe the fundamental concepts of carbon group elements	2(15),5(5)	1,2,7,10	Ap	M,C
CLO-4	Analyze the behavior of d-block elements	2(15),5(5)	1,2,7,10	An	M,C
CLO-5	Understand the characteristics of f-block elements	2(15),5(5)	1,2,7,10	E	C

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	**HYDROGEN AND OXYGEN COMPOUNDS**					
1.1	Hydrogen – Isotopes of hydrogen	1	1[10]	GD	MCQ	1
1.2	Hydrides- types of hydrides	1	1[10]	GD	MCQ	1
1.3	Water purification by ion - exchange method	1	1[10]	Lec	Ass	1
1.4	Conversion of sea water into potable water (Desalination - Reverse osmosis)	1	1[10]	Lec	Ass	1
1.5	Estimation of hardness by EDTA method	1	1[30]	BS	Qui	1
1.6	Estimation of dissolved oxygen in water	1	1[10]	TPS	Qui	1
1.7	Heavy water- isolation, properties and uses	1	1[10]	Lec	Ess	1

1.8	Hydrogen peroxide - Preparation, properties, estimation, structure and uses of hydrogen peroxide	3	1[10]	Lec	Sem	1
1.9	Ozone- Preparation, properties and uses	1	1[10]	Lec	Sem	1
1.10	Determination of molecular formula and structure of ozone- Estimation of ozone, Chemistry of depletion of ozone layer	1	1[10]	TPS	Qui	1
II	**HALOGEN COMPOUNDS**					
2.1	Halogens - Preparation and structure of OF_2, O_2F_2, ClO_2, Cl_2O, Cl_2O_7, I_2O_5, I_2O_7	1	2[20]	GD	Qui	2, 4
2.2	Oxyacids of halogens - oxidation states of halogens in oxyacids and their relative strengths	1	2[10]	Lec	Qui	2, 4
2.3	Preparation and structure of hypochlorous acid, chlorous acid. perchloric acid and periodic acid	2	2[10]	BS	Ass	2, 4
2.4	Interhalogen compounds - Types, preparation and structure	1	2[10]	Lec	MCQ	2, 4
2.5	Basic iodine – Reasons and evidence for basic properties of iodine, Preparation of compounds containing I^+ and I^{3+}	2	2[10]	Lec	MCQ	2, 4
2.6	Pseudo Halogens – Similarities and dissimilarities between halogens and pseudohalogens	1	2[10]	Lec	Sem	2, 4
2.7	Polyhalides – classification, preparation, properties and structure	1	2[20]	BS	Qui	2, 4
2.8	Fluorocarbons - General methods of preparation, properties, stability and applications	2	2[10]	Lec	Sem	2, 4
III	**CARBON GROUP ELEMENTS**					
3.1	Carbides –classification, preparation, properties and uses of beryllium carbide	1	3[10]	Lec	Qui	1, 6
3.2	Allotropes of carbon – fullerenes – preparation and properties- Ultra pure silicon preparation	1	3[20]	Lec	Sem	1, 6
3.3	Difference between fullerenes, diamond and graphite.	1	3[10]	TPS	Sem	1, 6
3.4	Silicon carbide-preparation, properties, structure and uses.	2	3[10]	TPS	Ass	1, 6
3.5	Calcium carbide-preparation, properties, structure and uses	1	3[10]	BS	Sem	1, 6
3.6	Industrial importance of clay.	1	3[10]	TPS	Ass	1, 6
3.7	Comparison between tin and lead.	1	3[10]	Lec	Qui	1, 6
3.8	Extraction of tin and lead	2	3[10]	Lec	Mcq	1, 6
3.9	Lead pigments – preparation and uses of litharge, red lead, white lead and chrome yellow	2	3[10]	Lec	Qui	1, 6
IV	**d-BLOCK ELEMENTS**					
4.1	Extraction, properties and uses of Titanium	1	4[10]	Lec	MCQ	4
4.2	Extraction, properties and uses of Cobalt	1	4[10]	Lec	Ass	4
4.3	Extraction, properties and uses of Platinum	1	4[10]	Lec	Qui	4

4.4	Extraction, properties and uses of Tunsten	1	4[10]	BS	MCQ	4
4.5	Preparation, uses of TiO_2 and $TiCl_4$ and Sodium cobaltinitrite	1	4[10]	Lec	Qui	4
4.6	Preparation and uses of Platinised asbestos, Spongy platinum, Platinum black	1	4[10]	Lec	Qui	4
4.7	Preparation and uses of Colloidal platinum and Potassium chloroplatinate	2	4[10]	GD	Qui	4
4.8	Group study of Fe, Co, Ni	2	4[20]	GD	Qui	4
4.9	Group study of Cu, Ag, Au	1	4[10]	Lec	MCQ	4
V	**f-BLOCK ELEMENTS**					
5.1	f - Block elements: General characteristics	1	5[10]	Lec	Ess	5, 3
5.2	Sources of lanthanides	1	5[10]	Lec	Qui	5, 3
5.3	Separation of lanthanides – ion exchange method and solvent extraction method	2	5[10]	TPS	Qui	5, 3
5.4	Lanthanide contraction and its consequences	2	5[10]	Lec	MCQ	5, 3
5.5	General characteristics of actinides	1	5[10]	BS	Ess	5, 3
5.6	Comparison between lanthanides and actinides	1	5[10]	GD	Sem	5, 3
5.7	Extraction and uses of Thorium	1	5[10]	Lec	Ass	5, 3
5.8	Extraction and uses of Uranium	1	5[10]	Lec	Ass	5, 3
5.9	Preparation and uses of Thorium nitrate, Uranium hexafluoride	1	5[10]	PT	Qui	5, 3
5.10	Preparation and uses of Uranyl acetate, Zinc uranyl acetate	1	5[10]	PT	Qui	5, 3

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1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi, 2004.
2. Gurdeep Raj, Advanced Inorganic Chemistry, Goel Publishing house, Meerut, 2002.
3. P.L. Soni, Text book of Inorganic Chemistry, Sultan Chand and Sons, 2004.
4. J.D. Lee, Concise Inorganic Chemistry, Blackwell Science, 5thEdn. 2012..
5. SatyaPrakash, S. Modern, Inorganic Chemistry, S. Chand and Company, Ltd., 2003.

QUALITATIVE INORGANIC ANALYSIS

Course Title:	**CP 3** **- Inorganic Qualitative Analysis**	Course Type: **Practical** Course Code :23GCP4
Total Hours: **30** Hours/Week: **2** Credits: **1**		
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.R.D.Femitha,	Dr.A.Jeena Pearl,	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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CLO-No.	CourseLearning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Learn the basic principles involved in inorganic qualitative analysis	6(15),10(5)	1,2,3,5,6,7,10	U	M,F,C
CLO-2	Develop the analytical skills required for identifying the ions in a mixture.	6(15),10(5)	1,2,3,5,6,7,10	R	F,C
CLO-3	Analyse a mixture containing two cations and two anions of which one will be an interfering on.	6(15),10(5)	1,2,3,5,6,7,10	An	M,C

1.INORGANIC QUALITATIVE ANALYSIS

Qualitative analysis of Inorganic single salt containing one acidic and one basic radicals

Acid radicals

Carbonate, nitrate, sulphate, chloride, Fluoride, borate, oxalate, phosphate and chromate.

Basic radicals

Group I	:	Lead
Group II	:	Copper,Cadmium, Bismuth
Group III	:	Aluminium, Iron
Group IV	:	Cobalt, Nickel, Manganese,Zinc
Group V	:	Barium, Calcium, Strontium
Group VI	:	Magnesium. Ammonium

Applied Experiment

Analysis of soil for the presence of minerals like potassium, sodium, nitrate, chloride, phosphate.

REFERENCES

1. Vogel's Qualitative Inorganic Analysis revised by G. Svehla, 6th Ed., Orient Longman, 2004.
2. V. Venkateswaran , R. Veeraswamy , A. R. Kulandaivelu., Basic principles of practical chemistry 2nd Edn., New Delhi, Sultan

PART-4

(ALLIED) COURSE III (MS 3)

(FOR PHYSICS STUDENTS)

Course Title:	**MS3-Allied Chemistry**	Course Type: **Theory** Course Code :23AC03
Total Hours:**60** Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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anubacj@gmail.com	sumithaezhil77@gmail.com	abbsfen@gmail.com

CLO-No.	Course Learning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Determine the nature of light using different theories.	3(20)	1,2,8	E	F, C
CLO-2	Determine the atomic structure and the properties of atoms, molecules and matter during physical and chemical interactions.	3(20)	1,2,8	An	C, M
CLO-3	Explain the factors, structures, shapes, properties and bonding behavior using the periodic table as a reference.	3(20)	1,2,8	Ap	F, M
CLO-4	Determine the water quality parameters and chemistry of ozone depletion.	3(20)	1,2,8	U	P, M
CLO-5	Understand about analytical chemistry	3(20)	1,2,8	U	P, M

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**ATOMIC STRUCTURE-I**					
1.1	Duality of light – wave and particle nature of light.	1	1[10]	Lec	Qui	1-4
1.2	Plancks quantum theory.	1	1[10]	Lec	MCQ	1-4
1.3	Photoelectric effect.	1	1[10]	GD	MCQ	1-4
1.4	'Einsteins' explanation. H – Atom spectrum.	1	1[10]	BS	Sem	1-4
1.5	Bohr Theory – postulates, derivation of expression for Bohr radius and energy of an electron in the nth orbit.	1	1[10]	TPS	Ass	1-4
1.6	Bohr's interpretation of H – atom spectrum. Limitations of Bohr theory.	1	1[10]	Lec	Qui	1-4
1.7	Davisson and Germer experiment.	1	1[10]	Lec	Qui	1-4
1.8	Heisenberg's Uncertainity principle.	1	1[10]	Lec	Qui	1-4
1.9	Schrodinger wave equation (No argument in favour required) physical significance of ψ- function.	2	1[20]	Lec	MCQ	1-4
II	**ATOMIC STRUCTURE – II**					

2.1	Quantum number and their significance	1	2[10]	Lec	Qui	1-4
2.2	Concept of atomic orbitals. Shapes of atomic orbitals.	1	2[10]	Lec	MCQ	1-4
2.3	Nodal planes and nodal points in atomic orbitals.	1	2[10]	Lec	MCQ	1-4
2.4	g and u character of atomic orbitals.	1	2[10]	GD	MCQ	1-4
2.5	Pauli's Exclusion Principle, Aufbau principle and Hund's rule. Electronic configuration of elements	2	2[20]	TPS	Qui	1-4
2.6	Periodic table: Modern periodic table. Classification of elements – s,p,d and f - blocks elements.	2	2[20]	BS	Qui	1-4
2.7	Periodic properties – atomic and ionic radii, ionization energy, electron affinity and electronegativity and their periodic variations.	2	2[20]	Lec	Sem	1-4
III	**CHEMICAL BONDING**					
3.1	Ionic bond – Factors affecting the formation of ionic bond, properties of ionic compounds, covalent bond-characteristics.	2	3[10]	Lec	MCQ	1-4
3.2	Covalent character in ionic bonds, polarity of bonds and polar molecules	1	3[10]	GD	MCQ	1-4
3.3	Lewis structures of simple molecules like H_2, F_2, O_2, N_2, H_2O, NH_3, CH_4, $CH_3 – CH_2 = CH_2$, $CH \equiv CH$.	2	3[10]	Lec	MCQ	1-4
3.4	Shapes of molecules – VSEPR theory. Valence Bond (VB) theory and hybridization sp^3, sp^2, sp.	2	3[20]	GD	Qui	1-4
3.5	Molecular orbital (MO) theory and MO diagrams of H_2, He_2, N_2, O_2, and, F_2, and their ions, bond order and magnetic properties.	2	3[20]	BS	Ass	1-4
3.6	Hydrogen bonding – types, effects of H bonding. H - Bonding in water and ice, Vander waals forces.	2	3[20]	TPS	Sem	1-4
3.7	Lattice energy – Born – Haber cycle**.**	1	3[10]	GD	Sem	1-4
IV	**WATER, HYDROGEN PEROXIDE AND OZONE**					
4.1	Water: Dielectric constant and polarity of water molecule.	1	4[10]	Lec	Ass	1-4
4.2	Solubility of compounds in water – mechanism of solvation – ion – dipole interaction (ionic compounds), Hydrogen bonding (non polar compounds).	1	4[10]	GD	Qui	1-4
4.3	Hydrates – examples ($CuSO_4.5H_2O$, $BaCl_2.2H_2O$, $Na_2SO_4.\ 10H_2O.\ 7H_2O$, $CaSO_4.2H_2O$).	1	4[10]	PT	Qui	1-4
4.4	Efflorescence and deliquescence – hygroscopy, silica gel	1	4[10]	Lec	Ass	1-4
4.5	Water quality parameters – pH, alkalinity,	1	4[10]	Lec	Se	1-4

	DO, BOD, COD, chlorinity, salinity, conductivity.				m	
4.6	Water purification – ion exchange process.	1	4[10]	Lec	MCQ	1-4
4.7	Hardness of water - estimation of hardness of water by EDTA method.	1	4[10]	Lec	MCQ	1-4
4.8	Hydrogen peroxide: Manufacture, concentration, properties and uses.	1	4[10]	BS	Qui	1-4
4.9	Methods of expressing concentration of H_2O_2. Estimation of H_2O_2 by permanganometry.	2	4[10]	GD	Qui	1-4
4.10	Ozone: Manufacture, properties and uses.	1	4[5]	Lec	MCQ	1-4
4.11	Chemistry of depletion of ozone layer.	1	4[5]	Lec	Qui	1-4
V	**ANALYTICAL CHEMISTRY**					
5.1	Introduction qualitative and quantitative analysis. Methods of expressing concentration of solutions – molarity, molality, normality, percentage by volume, percentage by weight, ppt, ppm, ppb.	2	5[20]	GD	MCQ	1-4
5.2	Problems involving all the above concentration terms.	2	5[10]	Lec	Qui	1-4
5.3	Principle of dilution of solution of one concentration to another.	1	5[10]	Lec	Qui	1-4
5.4	Titrimetry – Basic principles.	1	5[10]	GD	Sem	1-4
5.5	Types of titrations - neutralization, permanganometry, dichrometry, iodometry, iodimetry, complexometry and precipitation.	2	5[10]	Lec	Ass	1-4
5.6	Standard solutions – primary standard – characteristics.	2	5[10]	Lec	MCQ	1-4
5.7	Primary standards for the different types of titrations – problems.	3	5[10]	GD	Sem	1-4
5.8	Secondary standards – characteristics and examples.	2	5[20]	BS	Qui	1-4

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1. B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal publishing House,2004.
2. Satya Prakash, G.D. Tuli, Basu and R.L. Madan, Advanced Inorganic Chemistry, S. Chand and Company Ltd, New Delhi, 2003.
3. P.L. Soni, M. Katyal, Text Book of Inorganic Chemistry, Sultan Chand and Sons, 2004.
4. Vogel's Text Book of Quantitative Analysis, 4thEdn. ELBS, 2005

23AP01-ALLIED PHYSICS FOR CHEMISTRY STUDENTS

Minor Stream – 3

Course Title:	ALLIED PHYSICS – I	Course Type: Theory Cource Code: 23AP01
Total Hours: 60	Hours/Week: 4	Credits: 2
Pass-Out Policy : Minimum Contact Hours:36 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]		

Course Creator:	Expert 1:	Expert 2:
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Course Objectives

The main objectives of this course are to understand the behaviour of matter in everyday life, acquire .skill of solving related problems and get clear idea about properties ofmatter, electricity and magnetism.

CLO-No.	Course Learning Outcome *Upon completion of this course, studentswill be able to:*	PLO % MAPPED WITH CLO	CLO & PLO MAPPED WITH GA	Cognitive Level CL	Knowled Catog o KC
CLO- 1	Explain types of motion and extend their knowledge in the study of various dynamic motions by analyzing and demonstrating mathematically.	3[0.2] 5[0.3]	1,2,7, 8,10	R, Ap	F, C
CLO- 2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life.	3[0.2] 5[0.3]	1,2,7, 8,10	U, An	C, M
CLO- 3	Comprehend basic concepts of thermodynamics, concept of entropy and associated theorems.	3[0.2] 5[0.3]	1,2,7, 8,10	An	F, M
CLO- 4	Articulate the knowledge about electric current, resistance, capacitance in terms of potential electric field and correlate the connection between electric field and magnetic field and analyze them mathematically.	3[0.2] 5[0.3]	1,2,7, 8,10	A, E	P, M
CLO- 5	Interpret the real-life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. Infer operations using Boolean algebra and acquire elementary idea.	3[0.2] 5[0.3]	1,2,7, 8,10	U, C	P, M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**WAVES, OSCILLATIONS AND ULTRASONICS**					
1.1	Simple harmonic motion (SHM)	1	1[15]	Lec	SA	1, 2
1.2	Composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses	2	1[10]	BS	Ess	1, 2
1.3	Laws of transverse vibrations of strings	1	1[10]	Lec	Ess	1, 2
1.4	Determination of AC frequency using sonometer (steel and brass wires)	1	1[10]	EL	Ess	1, 2
1.5	Ultrasound – Production – Piezoelectric method	1	1[15]	Lec	Ess	1, 3
1.6	Application of ultrasonics:Medical field - Lithotripsy	2	1[10]	GD	Ess	1, 3
1.7	- Ultrasonography, Ultrasonoimaging	1	1[10]	GD	Ess	1, 3
1.8	- Ultrasonics in Dentistry, Ultrasonicsin Physiotheraphy	2	1[10]	GD	Ess	1, 3
1.9	Ultrasonics in green Chemistry	1	1[10]	TPS	Sem	1, 3
II	**PROPERTIES OF MATTER**					
2.1	Elasticity: Elastic constants	1	2[10]	Lec	MCQ	1, 4
2.2	Bending of beam	1	2[10]	Lec	Ess	1, 4
2.3	Determination of Young's modulus by non-uniform bending	1	2[10]	EL	Ess	1, 4
2.4	Energy stored in a stretched wire	1	2[5]	BS	SA	1, 4
2.5	Torsion of a wire – Determination of rigidity modulus by torsional pendulum	1	2[10]	EL	Ess	1, 4
2.6	Viscosity: Streamline and turbulent motion – Critical velocity	1	2[5]	Lec	Ess	1, 4
2.7	Coefficient of viscosity – Poiseuille's formula	1	2[10]	Lec	Ess	1, 4
2.8	Comparison of viscosities – Burette method,	1	2[10]	EL	Ess	1, 4
2.9	Surface tension: Definition – Molecular theory	1	2[10]	Lec	SA	1, 4
2.10	Droplet's formation – COVID transmission through droplets, saliva	2	2[10]	Lec	Ess	1, 4
2.11	Drop weight method – Interfacial surface tension.	1	2[10]	EL	Ass	1, 4
III	**HEAT AND THERMODYNAMICS**					

3.1	Joule-Kelvin effect – Joule-Thomson porous plug experiment	2	3[15]	Lec	Ess	1, 5
3.2	Theory of Joule-Thomson porous plug experiment – Temperature of inversion	2	3[10]	Lec	Ess	1, 5
3.3	Liquefaction of oxygen	1	3[10]	Lec	SA	1, 5
3.4	Linde's process of liquefaction of air	1	3[10]	Lec	Ess	1, 5
3.5	Liquid oxygen for medical purpose	1	3[10]	GD	Ess	1, 5
3.6	Laws of thermodynamics	1	3[15]	Lec	Ess	1, 5
3.7	Heat engine – Carnot's cycle – Efficiency	2	3[10]	Lec	Ess	1, 5
3.8	Entropy	1	3[10]	Lec	SA	1, 5
3.9	Change of entropy in reversible and irreversible process	1	3[10]	BS	Ass	1, 5
IV	**ELECTRICITY AND MAGNETISM**					
4.1	Potentiometer – Principle	1	4[10]	Lec	Ess	1, 6
4.2	Measurement of thermo emf using potentiometer	1	4[10]	EL	Ess	1, 6
4.3	Magnetic field due to a current carrying conductor – Biot-Savart's law	2	4[10]	Lec	Ess	1, 6
4.4	Field along the axis of the coil carrying current	2	4[10]	Lec	Ess	1, 6
4.5	Peak, average and RMS values of AC	1	4[15]	BS	Ess	1, 6
4.6	Power factor and current values in an AC circuit	1	4[10]	BS	Ess	1, 6
4.7	Types of switches in household and factories– Smart wifi switches	2	4[15]	Lec	Ess	1, 6
4.8	Fuses in houses	1	4[10]	RP	Ass	1, 6
4.9	Circuit breakers in houses	1	4[10]	RP	Sem	1, 6
V	**DIGITAL ELECTRONICS AND DIGITAL INDIA**					
5.1	Logic gates - OR, AND	1	5[10]	Lec	Ess	1, 7
5.2	Logic gates – NOT, NAND	1	5[10]	Lec	Ess	1, 7
5.3	Logic gates – NOR, EXOR	1	5[10]	Lec	Ess	1, 7
5.4	Universal building blocks	1	5[10]	BS	Ess	1, 7

5.5	Boolean algebra	1	5[10]	BS	Pro	1, 7
5.6	De Morgan's theorem – verification	1	5[10]	Lec	Ess	1, 7
5.7	Overview of Government initiatives: Software technological parks under MeitY, NIELIT	2	5[15]	GD	Ass	1, 8
5.8	Semiconductor Laboratories under Department of Space	2	5[10]	GD	Ess	1, 8
5.9	An introduction to Digital India	2	5[15]	GD	Sem	1, 8

BOOKS FOR REFERENCE:

R. Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi.

Brijlal and N. Subramanyam (1994), Waves and Oscillations, VikasPublishing House, New Delhi.

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N.S. Khare and S.S. Srivastava (1983), Electricity and Magnetism10thEdn., Atma Ram and Sons, New Delhi.

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V.R. Khanna and R.S. Bedi (1998), Text book of Sound 1st Edn.Kedharnaath Publish and Co, Meerut.

D.R. Khanna and H.R. Gulati (1979), Optics, S. Chand and Co. Ltd., NewDelhi.

R. Murugesan (2005), Optics and Spectroscopy, S. Chand and Co, NewDelhi.

23APP1- ALLIED PHYSICS PRACTICAL – I

Course Title:	ALLIED PHYSICS – I	Course Type: Practical Cource Code: 23APP1
Total Hours: 30	Hours/Week: 2	Credits: 1
Pass-Out Policy : Minimum Contact Hours:18 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]		

Course Creator:	Expert 1 :	Expert 2 :
Prof. A. Charles Hepzy Roy	Dr. J.V. Bynaja	Dr.T.R. Beena
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Course Objectives:

Apply various physics concepts to understand Properties of Matter and electricity;

gain Knowledge in designing digital circuits; develop an understanding about the handling of various instruments; able to do error analysis and correlate results.

CLO-No.	Course Learning Outcome *Upon completion of this course, students will be able to:*	PLO % MAPPED WITH CLO	CLO & PLO MAPPED WITH GA	Cognitive Level CL	Knowledge Catogory KC
CLO-1	Apply the equation of motion to one or two dimensions of the system in order to understand kinematics of the body under the various conditions of applied force.	3[0.1] 6[0.1]	1, 2, 3,8	An, E	M
CLO-2	Apply the knowledge in construction of beams, bridges etc.	3[0.1] 6[0.1]	1, 2, 3,8	An, E	M
CLO-3	Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid	3[0.1] 6[0.1]	1, 2, 3,8	An, E	M
CLO-4	Study the elastic behaviour of materials Analyse the relationship between various types of experiments	3[0.1] 6[0.1]	1, 2, 3,8	An, E	M
CLO-5	Perform the procedure as per standard values	3[0.1] 6[0.1]	1, 2, 3,8	An, E	M

No	Course Description
1	Young's modulus by non-uniform bending using pin and microscope
2	Young's modulus by non-uniform bending using optic lever, scale and telescope
3	Rigidity modulus by static torsion method
4	Rigidity modulus by torsional oscillations without mass
5	Surface tension and interfacial Surface tension – drop weight method
6	Comparison of viscosities of two liquids – burette method
7	Specific heat capacity of a liquid – Newton's law of cooling
8	Calibration of low range voltmeter using potentiometer
9	Determination of thermo emf using potentiometer
10	Verification of truth tables of basic logic gates using ICs
11	Verification of De Morgan's theorems using logic gate ICs.

Note: Use of digital balance permitted

Course Title:	**SEC 1- FOOD CHEMISTRY**	Course Type: **Theory** Course Code :23GCS1
Total Hours: **30** Hours/Week: **2** Credits: **1**		
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.G.S.Prabha Littis Malar	Dr.R.S.Jeba Jeevitha	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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Mobile-9965134136	Mobile-9688985468	Mobile - 9488884898

CLO	Upon completion of this course, the students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
1	Determine the types of food and Food adulteration	7(15),10(5)	1,2,5,6,7,10	U An	F
2	Understand the effects of Food Poisonining	7(15),10(5)	1,2,5,6,7,10	U	F
3	Identify foods that do not contain additives and understand the reasons for preserving food	7(15),10(5)	1,2,5,6,7,10	U	F
4	Identify and describe the types of bevarages	7(15),10(5)	1,2,5,6,7,10	U Ap	C,P
5	Understand the role of fat as a nutrient	7(15),10(5)	1,2,5,6,7,10	U	F

Unit	**Section**	**Course Description**	**Hours**	**% of CLO mapping with Module**	**Learning Activities**	**Assessment Tasks**	**Reference**
I		**FOOD ADULTERATION**					
	1.1	Sources of food- types	1	1[10]	Lec	Ass	7,8,9
	1.2	Advantages and Disadvantages	1	1[20]	Lec	Quiz	7,8,9
	1.3	Food adulteration - contamination of wheat, rice, milk, butter etc.	1	1[20]	GD	Ass	7,8,9

		with clay stones, water and toxic chemicals					
	1.4	Common adulterants, Ghee adulterants and their detection	1	1[20]	Lec	Quiz	2,7,8,9
	1.5	Detection of adulterated foods by simple analytical techniques	1	1[30]	Lec	Ass	2,7,8,9
II	**FOOD POISON**						
	2.1	Food poisons - natural poisons (alkaloids - nephrotoxin) pesticides, (DDT, BHC, Malathion)	1	2[20]	Lec	Ass	1,4,6,7
	2.2	Pesticides- DDT BHC	1	2[20]	Lec	Sem	1,4,6,7
	2.3	Pesticides -Malathion	1	2[20]	TPS	Quiz	1,4,6,7
	2.4	Chemical poisons	1	2[20]	Lec	Ass	1,4,6,7
	2.5	First aid for poison consumed victims	1	2[20]	Lec	Qui	1,4,6,7
III	**FOOD ADDITIVES**						
	3.1	Food additives	2	3[10]	Lec	Quiz	2,3
	3.2	Artificial sweeteners –Saccharin - Cyclomate a n d Aspartate	2	3[20]	Lec	Sem	2,3
	3.3	Food flavours -esters, aldehydes and heterocyclic compounds	3	3[20]	GD	Ass	2,3
	3.4	Food colours – Emulsifying agents	3	3[20]	TPS	Sem	2,3
	3.5	Food Colours-preservatives - leavening agents	2	3[20]	Lec	Quiz	2,3,10
	3.6	Baking powder – yeast – tastemakers – MSG - vinegar		3(10)	Lec	Sem	2,3,10
IV	**BEVERAGES**						
	4.1	Beverages-softdrinks-soda-fruitjuices-examples	3	4[20]	Lec	Ass	7,9,1

							0
	4.2	alcoholicbeverages-examples	3	4[20]	Lec	Sem	7,9,10
	4.3	Carbonation-addiction to alcohol	3	4[30]	BS	Quiz	7,9,10
	4.4	Diseases of liver and social problems	3	4[30]	GD	Sem	7,9,10
V		**EDIBLE OILS**					
	5.1	Fats and oils	1	5[10]	Lec	Quiz	1,2,5,7
	5.2	Sources of oils - production of refined vegetable oils - preservation.	2	5[20]	Lec	Quiz	1,2,5,7
	5.3	Saturated and unsaturated fats - iodine value	2	5[10]	TPS	Sem	1,2,5,7
	5.4	Role of MUFA and PUFA in preventing heartdiseases	1	5[20]	GD	Ass	1,2,5,7
	5.5	Determination of iodine value, RM Value and their significance	2	5[20]	Lec	Ass	1,2,5,7
	5.6	Saponification values and their significance	1	5[20]	Lec	Quiz	1,2,5,7

REFERENCES:

H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science &Business Media, 4th Edition, 2009.

M.Swaminathan, Food Science and Experimental Foods, Ganesh andCompany,1979.

Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and theirapplications Springer New York 2nd ed. 2008.

Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourthrevised and extended edition, 2009.

Principles of food chemistry, John M. deMan, John W. Finley, W. JeffereyHurst, Chang Yong Lee, Springer, Fourth edition, 2018.

Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house,2010.

Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand& Co.Publishers, second edition, 2006.

Food Chemistry, H. K. Chopra, P. S. Panesar, Narosa publishning house,2010.

Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022.

Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Pdmini S Ghugre, New age international publishers, second edition, 2021.

Course Title: Value Added Course I **Health and Fitness through Yogasanas**	Course Type: Theory
Total Notional Hours: 30 Hours/Week: 2 Credit: 1	Course Code: 23SE11

Pass-Out Policy: Minimum Contact Hours: 18
Total Score %:100 Internal: 40 External: 60
Minimum Pass %: 40 [No Minimum for Internal]

Course Creator	Expert 1	Expert II
Dr. C. Samson	Dr .N. Aseer Rufuss	Dr. B. Benitto Anand
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CLO-No.	Course Learning Outcomes *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapped with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	analyse their body physically and mentally for the integration of physical, mental and spiritual fitness	2(8), 3(12)	1, 8	U	M
CLO-2	evaluate mental health	2(4), 3(7), 4(5), 6(4)	1, 2, 7	An, Ap	C, P
CLO-3	apply sports activities in co-ordination with asanas	2(2), 3(8), 4(7), 6(3)	1, 2, 7, 8, 10	C	P
CLO-4	understand oneself with basic knowledge about one's personality	2(2), 3(8), 4(7), 6(3)	1, 2, 7, 8, 10	Ap, C	C, P
CLO-5	evaluate themselves and become healthier, saner and more integrated members of the society and of the nation	2(3), 3(9), 4(6), 6(2)	1, 2, 7, 8, 10	An,E	C, F, M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
1.1	Asanas, guidelines for practising asanas	2	1[33]	Lec	HrA	1
1.2	Asanas in long sitting position	1	1[17]	BS	Qui	1
1.3	Padmasana, Chin Mudra	1	1[17]	OT	CA	1
1.4	Sugasana, Vajrasana	2	1[33]	Sem	SA	1
2.1	Prone position Asanas	2	2[33]	SI	HoA	2
2.2	Makrasana	1	2[17]	WSQ	CT	2
2.3	Dhanurasana	1	2[17]	FC	CA	2
2.4	Bujankasana	2	2[33]	OO	SA	2
3.1	Supine position Asanas - Sava asana	2	3[33]	TPS	Ess	2
3.2	Sarvaangasana	1	3[17]	KWL	HA	2
3.3	Vibareethakarani	1	3[17]	OO	MCQ	2
3.4	Halasana	2	3[33]	Soc	CA	2
4.1	Standing position Asanas - Thirikonasana	2	4[33]	Sem	HA	3
4.2	Thadasana	1	4[17]	GT	MCQ	3
4.3	Veerapathrasana	1	4[17]	Lec	HrA	3
4.4	Bathahasthasana	2	4[33]	BS	Qui	3
5.1	Kneeling position Asanas	2	5[33]	OT	CA	3

5.2	Mayoorasana	1	5[17]	Sem	SA	3
5.3	Artha sirasana	1	5[17]	SI	HoA	3
5.4	Sirasana	2	5[33]	WSQ	CT	3

Reference Books

1. K. Chandrasekaran, *Sound Health through Yoga*. Prem Kalian Publication, Sedapatti, 1999.
2. Yogeshwar, *Textbook of Yoga*, Madras Yoga Centre, 2004.
3. Kumaresan P. *Yogasanam*, Abinaya Publications, 2002.

Semester – IV

Course Title : Part – I Tamil Modern Indian Language – IV (MIL – IV)	Course Type: Theory Cource Code: 23LT41

Total Hours : 90	Hours / Week – 6	Credits: 3

Pass-out Policy: Minimum Contact Hours: 54		
Total Score100 %	Internal: 40	External: 60
Minimum Pass % 40 (No Minimum for Internal)		

Course Creator
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Expert 1
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CLO No.	Course Learning Outcomes (CLO) upon completion of this Course, Students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO 1	தொன்மையான தமிழ் இலக்கியங்களின் சிறப்பினை அறிவர்	1(11), 2(9)	1, 2, 3	R	F
CLO 2	கட்டுரைகளின் வழி தமிழறிஞர்களின் சிந்தனைகளைக் கற்றறிவர்	3(8), 4(12)	1, 2, 7, 8	U	C
CLO 3	இலக்கியங்களைத் தமிழர்கள் உருவாக்குவதற்கு வகுத்துள்ள வரை முறைகளை இலக்கணங்கள் வழி அறிந்து கொள்வர்	3(13), 4(7)	1, 2, 7, 8, 10	An	C
CLO 4	தமிழறிஞர்களின் வாழ்வியல், இலக்கிய பணி பற்றி அறிந்த கொள்வர்	5(8), 7(12)	1, 2, 5, 10	U	C
CLO 5	தமிழ் இலக்கியங்களின் வரலாற்றுப் பின்புலத்தை அறிந்து கொள்வர்	8(9), 9(11)	4, 6, 9, 10	Ap	F

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Refer ence
	அலகு I செய்யுள்					
1.1	நற்றிணை (10, 14, 16 பாடல்கள்	2	1(11)	Lec	CA	1
1.2	குறுந்தொகை (16, 17, 19, 20, 25, 29, 38, 44 பாடல்கள்)	3	1(17)	GD	HrA	1
1.3	கலித்தொகை (38, 51 பாடல்கள்)	1	1(6)	Sem	OBT	1
1.4	அகநானூறு (15, 33, 55 பாடல்கள்)	2	1(11)	Lec	CT	1

1.5	புறநானூறு (37, 86, 112 பாடல்கள்)	2	1(11)	GD	Quiz	1
1.6	பரிபாடல் 55 பாடல்	1	1(6)	Sem	MCQ	1
1.7	நெடுநல்வாடை முழுவதும்	7	1(38)	GL	SA	2
	அலகு II உரைநடை					
2.1	கல்வி அழகே அழகு –மயில்வாகனன்	2	2(11)	Lec	CA	4
2.2	பரிமேலழகர் த. இயேசு தாஸ்	2	2(11)	GD	HrA	4
2.3	பரிசில் வாழ்க்கை-மு. வரதராசன்	2	2(11)	Sem	OBT	4
2.4	குறள் விளக்கம்- வ.சு.ப. மாணிக்கம்	2	2(11)	GL	CT	4
2.5	தலைமைப் பொறுப்பு -அகிலன்;	2	2(11)	GD	Quiz	4
2.6	நகைச்சுவைப் பாடல்கள் - ஜே. ரோஸ்லெட் டானிபாய்	2	2(11)	Lect	HOA	3
2.7	சுற்றுப்புறச் சூழல்- தே. தேவசம்பத்	2	2(11)	GD	SA	3
2.8	சமய நல்லிணக்கம் கு.வெ. பாலசுப்பிரமணியன்	2	2(11)	Sem	MCQ	4
2.9	விருந்தோம்பல் கி. இராசா	2	2(12)	GL	Ess	4
	அலகு III வாழ்க்கை வரலாறு					
3.1	கல்வித் தந்தை காமராஜர் முனைவர் - ப. பாலசுப்பிரமணியன்	18	3(100)	GD	CT	6
	அலகு IV இலக்கணம்					
4.1	அகப்பொருள் இலக்கணம்	4	4(22)	Lec	CA	1
4.2	அகப்பொருள் துறைகள் 1. அறத்தொடு நிற்றல் (48) 2. வரைவு கடாதல் (165) 3. உடன்போக்கு (180) 4. பிரிவு (62) 5. பாங்கியிற் கூட்டம் வகை மடற் கூற்றும் மடல்விலக்கும் (145)	4	4(22)	GD	HOA	1

4.3	புறப்பொருள் இலக்கணம்	4	4(22)	Sem	OBT	1
4.4	புறப்பொருள் துறைகள் வெட்சிப்படலம் 1. விரிச்சி 2. செலவு 3. பாதீடு 4. உண்டாட்டு 5. வெறியாட்டு	3	4(17)	Lec	CT	1
4.5	6. போர் மலைதல் 7. புண்ணொடு வருதல் 8. பிள்ளைத் தெளிவு 9. பிள்ளையாட்டு 10. நெடுமொழி கூறல்	3	4(17)	Sem	Quiz	4
	அலகு V இலக்கிய வரலாறு					
5.1	சங்க வரலாறு	4	5(22)	Lec	MCQ	1
5.2	சங்கம் இருந்தமைக்கான சான்றுகள்	4	5(22)	Sem	SA	1
5.3	எட்டுத்தொகை நூல்கள்	5	5(27)	GD	Ess	1
5.4	பத்துப்பாட்டு நூல்கள்	5	5(29)	GL	CT	1

1. *சங்க இலக்கியம், எட்டுத்தொகை, முனைவர் வி. நாகராசன் (உ.ஆ), நியூ செஞ்சுரி புக் ஹவுஸ் சென்னை* 600 098..

2. *சங்க இலக்கியம், பத்துப்பாட்டு, முனைவர் வி. நாகராசன் (உ.ஆ), நியூ செஞ்சுரி புக் ஹவுஸ் சென்னை* 600 098

3. *மணிச்சிகை, ஜே.ஜி. என் டாசன் (தொ. ஆ), தமிழாய்வு மையம்,*
ஸ்காட் சிறிஸ்தவக் கல்லூரி, நாகர்கோவில் -3

4. *பொதுத்தமிழ் (நான்காம் பருவம்), தமிழ்த்தை வெளியீடு, ஸ்காட் சிறிஸ்தவக் கல்லூரி, நாகர்கோவில்* 2024

5. *வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, முனைவர் பாக்ய மேரி, நியூ செஞ்சுரி புக் ஹவுஸ் சென்னை* - 600 098.

6. *கல்வித் தந்தை காமராஜர், முனைவர் ப. பாலசுப்பிரமணியன், நியூ செஞ்சுரி புக் ஹவுஸ் (பி) லிட்., சென்னை* -600 050.

Reference Books	
1.	தமிழ் இலக்கிய வரலாறு சிற்பி. பாலசுப்பிரமணியன்.
2.	இராஜகோபாலாச்சாரியார், கே., அணியியல், கண்ணப்பன் பதிப்பகம், தி.நகர், சென்னை.

SEMESTER - IV

Course Title: Journalism and Composition Modern Indian Language – IV (MIL – IV)	Course Type: Theory Course Code: 23LM41

Total Hours:90 Hours/Week: 6	Credits:3

Pass-Out Policy : Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2
Name : Dr.Jisha.S.K	Name : Suja S.	Name : Pramod Kumar D.N
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CLO- No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand the history and necessity of Printing	1(10), 2(10)	1, 2, 3, 8	1,2,3	M, F, C
CLO-2	Understand the linguistic features of Media	2(5), 3(5),5(10)	1, 2, 3, 5	1,2,3	M, C
CLO-3	Understand different idioms and features of sentences	2(5), 9(10), 10(5)	1, 3, 7	1,2	M, C, P
CLO-4	Understand the compositional features of official writing and acquire	9(10), 10(10)	3, 7, 8	1, 9, 10	M, C, P
CLO-5	Analyse social responsibility by learning essay writing based on social	1(5), 5(10), 9(5)	1, 2, 8	1,2,3	M, C, P

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	Achadi	18				
1.1	Achadiyude Valarcha, Parinaamam	2	1[15]	GL	Qui	8
1.2	Pressukal	3	1[15]	GT	HrA	8
1.3	Pathramaasikakal	2	1[15]	Lec	CT	8
1.4	Vidyavinidini	3	1[15]	Lec	ST	8
1.5	Rasikarenjini	3	1[15]	GL	Qui	8
1.6	Jnananikhepam	3	1[15]	GT	HrA	8
1.7	Kavanakaumudi	2	1[10]	Lec	CT	8
2	Maadhyamabhaasha	18				
2.1	Kambyutting	4	2[30]	GL	OBT	6
2.2	Word document	4	2[30]	GD	HrA	6
2.3	Malayalam DTP cheyyunnavidham	10	2[40]	Lec	CT	6
3	Bhaashayum Prayogavum	18				
3.1	Padasudhi	4	3[25]	Lec	OBT	7
3.2	Samgrahanam	4	3[25]	GL	CA	7
3.3	Aasayavipulanam	5	3[25]	GD	HrA	7
3.4	Vaakyarachana	5	3[25]	CS	Qui	7
4	Vividhatharam Ezhuththukal	18				
4.1	Jolikkuvendiyulla Apekhakal	3	4[15]	Lec	CA	1,2
4.2	Suparsakkaththukal	3	4[15]	GL	OBT	1,2

4.3	Abhiprayamchodikkal	3	4[10]	Ess	HrA	1,2
4.4	Sarkkular	3	5[10]	Sp	CT	1,2
4.5	Vaanijyakkaththukal	2	5[10]	Lec	Ess	1,2
4.6	Memorandum	2	5[20]	Lec	HoA	1,2
4.7	Nivedanam	2	5[20]	Lec	CA	1,2
5	Upanyasa Rechana	18				
5.1	Upanyasa Rechana Reethi	2	5[20]	Sp	CT	4
5.2	Paristhithi vidyabhyaasam	4	5[20]	Lec	Ess	4
5.3	Keraleeya Kalakal	4	5[20]	Lec	HoA	4
5.4	Pusthaka Paaraayanam	4	4[20]	Ess	HrA	4
5.5	Bharanabhaasha Malayalam	4	5[20]	Sp	CT	4

Reference Books

1. George K.M, Aadhunika Malayala sahithya Charithram prasthanagaliloode, Kottayam :DC books, 1998.
2. George.K.M, Sahithya Charithram Prasthanagaliloode , Sahithya Pravarthaka Sahakarana Sangam Kottayam,1958
3. Krishna Pilla .N, Kairaliyude Katha, DC Books, Kottayam ,1958.
4. Rajendran , Upanyasanrachna, Sahitya Pravarthaga Sahakarana Sangam, Kottayam ,1997.
5. //ml.wikibooks.org/wiki/Malayalam_Computing
6. Gadyasilpam, C.V.Vasudeva Bhattathir,i Keralabkasha Institute, 1998 Malayalappacha ,Research Journal, vol – 7, no. 7, 2018

SEMESTER IV

Course Title: Aadhunika Kavitha, Khandakaavya, Chand , Alankaar Modern Indian Language – IV (MIL – IV)	Course Type: Theory Course Code: 23LM41

Total Hours:90 Credits: 3	Hours/Week:6

Pass-Out Policy : External: 60 for Internal]	Minimum Contact Hours: 54 Total Score %:100 Internal: 40 Minimum Pass %: 40[No Minimum

Course Creator	Expert 1	Expert 2

Mrs. Josy Vincent	Dr.Sreedevi S	Dr.Jayasree. K.
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CLO. No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand the history of modern Kavitha	1(10), 2(10)	1,2, 3, 6, 8	1,2,3	M, C
CLO-2	Understand the value and Beauty of Modern Poetry	1(5), 2(10), 5(5)	1, 2, 3, 6	1,3	M,F
CLO-3	Evaluate history of short Epic	5(10), 9(10)	6, 7	1,2,5	M,P
CLO-4	Understand the usage of Chand our Alankaar in Poetry.	9(10), 10(10)	1, 3,7	1, 9, 10	M,F, C
CLO-5	Evaluate and gain knowledge about Translation	9(10), 5(10)	1, 7	1,2,5	M, C, P

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	Aadhunika Kavitha	18				
1.1	Aadhunik kavitha ke bare mem, kaviyom ke bare mem	9	1[50]	Lec	CA	1,2,3
1.2	Gajanan Madhav Mukthi Bodh Kaa O Megh	9	1[50]	Lec	CA	1,2,3
2	Khanda Kavya	18				
2.1	SreeNaresh Mehtha nakak kavi ka Parichay	2	2[20]	GD	ST	5
2.2	Sabari ki Kahani	2	2[10]	Lec	OT	5
2.3	Thretha - adhyayan	2	2[10]	Sem	OBT	5
2.4	Pampasar - Adhyayan	3	3[20]	Lec	Qui	5
2.5	Thapasya - adhyayan	3	3[20]	Lec	HoA	5
2.6	Pareeksha - Adhyayan	3	3[10]	GL	MCQ	5
2.7	Dharshan – Adhyayan	3	4[10]	GD	SA	5
3	Chand	18				
3.1	Chand Parichay	2	2[20]	Sem	OBT	4
3.2	Dhoha Chand Vishadeekaran	4	3[20]	Lec	Qui	4
3.3	Sorata chand Vishadeekaran	4	3[20]	Lec	HoA	4
3.4	Indhravajra - Vishadeekaran	4	3[20]	GL	MCQ	4

3.5	Maalini - Vishadeekaran	4	4[20]	GD	SA	4
4	Alankaar	18				
4.1	Ardhaalankaar, shabdhalankaar, Ubhayalankar	2	2[20]	Sem	OBT	4
4.2	Anupras Alankaar	4	3[20]	Lec	Qui	4
4.3	Yamak Alankaar	4	3[20]	Lec	HoA	4
4.4	Upama Alankaar	4	3[20]	GL	MCQ	4
4.5	Roopak Alankaar	4	4[20]	GD	SA	4
5	Anuvad	18				
5.1	Anuvad Ka Swaroop	2	2 (20)	Sem	OBT	4
5.2	Anuvad Vinjan Ya Kala	4	3 (20)	Lec	Qui	4
5.3	Anuvad Ki Prakriya	4	3 (20)	Lec	HoA	4
5.4	Anuvad Prayogikatha	4	3 (20)	GL	MCQ	4
5.5	Anuvad Abhyas	4	4 (20)	GD	SA	4

Reference Books

1. Kaavya Tarang – Dr. Niranjan
2. Aadhunik Hindi Kaavya our Kavi – Dr. Ramchandra thivaari
3. Aadhunik Hindi Kavitha – Vivid Aayam
4. Hindi vyakaran : ras, Chand, alankaar Sahith – 2019, Umesh Chandra Shulk, Hindi Sansthan, Nayidilli
5. Sabari – Sri Naresh Mehtha

Course Title: Part 11 Communicative English- Semester IV	Course Type: Theory Course Code: 23LE41

Total Hours: 90 (Including Seminar/ Practical [information Transfer] and formative assessment) Hours/Week: 6 Credits: 3

Pass-Out Policy : Minimum Contact Hours: 54 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40[No Minimum for Internal]

Course Creator	Expert 1	Expert 2

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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be able to:*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	1 (10) 6 (7) 7 (3)	2, 3	U AP	F P
CLO-2	Examine and present material of the prescribed texts and other	2 (8)	1, 2	U, An	C

	texts	5 (12)		E	M
CLO-3	Identify cross cutting issues like, Human values, (Professional, Personal and Domestic) ethics and environmental sustainability and practise them	3 (8) 8 (6) 9 (6)	1, 4, 8, 9	An E, Ap	C P
CLO-4	Present and differentiate various cultures and civilizations of the Globe and distinguish Indian traditional Knowledge	1 (10) 8 (5) 10 (5)	5, 6, 10	U, Ap	P M
CLO-5	Relate the textual content and underlying meaning of the context to the real life situations	5 (6) 8 (8) 10 (6)	1, 2, 5, 7	E, Ap, C	C M

Module	Course Description	Hours	% of CLO Mapping with Module	Learning Activities	Assessment Task	Reference
1	PROSE 18					
1.1	Mother Teresa - John Frazer					
1.1.1	Introduction to the Author and the essay	1	2 [4], 4 [10]	L	Ho A	1
1.1.2	Textual Analysis	2	2 [4]	L GD	SA	1
1.1.3	Human Values in “Mother Teresa”	3	2 [4], 3[10], 5[7]	L GD	Ass	1

1.2	Anancy- Andrew Salkey					
1.2.1	Introduction to the Author and the essay	1	2 [4], 4 [10]	L	Ho A	1
1.2.2	Textual Analysis	2	2 [4]	L GD	Quiz	1
1.2.3	Reflection of Human Values in "Anancy"	3	2 [4], 3[5], 5[7]	L GD	Ass	1
1.3	Dangers of Drug Abuse- Hardin B. Jones					
1.3.1	Introduction to the Author and the essay	1	2 [4], 4 [5]	L	Ho A	1
1.3.2	Textual Analysis	2	2 [4]	L GD	SA	1
1.3.3	Human Values in "Dangers of Drug Abuse"	3	2 [4], 3[5], 5[5]	L GD	Ass	1
2	POETRY 18					
2.1	Ode to the West Wind- P. B. Shelley					
2.1.1	Introduction to the poet & the poem	1	2 [4] 4[3]	L	Ho A	1
2.1.2	Poetry Analysis	2	2[4]	L GD	Ess	1
2.1.3	Human Values reflected in "Ode to the West Wind"	1	2 [4], 3[3], 5[5]	L GD	Ass	1
2.2	The Lotus- Toru Dutt					
2.2.1	Introduction to the poet & the poem	1	2 [4] 4[5]	L	Ho A	1
2.2.2	Poetry Analysis	2	2[4]	L GD	Ess	1
2.2.3	Expressions of Indian Ethos in "The lotus" and cultural exchange between East and West	1	2 [4], 4[5], 5[4]	L GD	Ass	1
2.3	Once Upon a Time -Gabriel Okara					
2.3.1	Introduction to the poet & the poem	1	2 [4] 4[5]	L	Ho A	1
2.3.2	Poetry Analysis	2	2[4]	L GD	Ess	1

2.3.3	Human Values in “Once Upon a Time”	1	2 [4], 3[3], 5[3]	L GD	Ass	1
2.4	Be the Best of Whatever You are- Douglas Malloach					
2.4.1	Introduction to the poet & the poem	1	2 [4] 4[5]	L	Ho A	1
2.4.2	Poetry Analysis	2	2[4]	L GD	Ess	1
	Human Values reflected in “Be the Best of Whatever You are”	1	2 [4], 3[6], 5[5]	L GD	Ass	1
3	ONE ACT PLAYS 18					
3.1	A Marriage Proposal - Anton Chekov					
3.1.1	Introducing the author and the play	1	2 [4]. 4 [5]	L	Ho A	1
3.1.2	Character and plot analysis	3	2[4]	L RP	Ess	1
3.1.3	Wealth, Love and Marriage in “A Marriage Proposal”	2	2[4] 5[10]	L GD	Ass	1
3.2	A Bishop’s Candlesticks - Norman McKinnel					
3.2.1	Introducing the author and the play	1	2 [4]. 4 [5]	L	Ho A	1
3.2.2	Character and plot analysis	3	2[9]	L RP	Ess	1
3.2.3	Human Values in “A Bishop’s Candlesticks”	2	2[8] 3[10]	L GD	Ass	1
3.3	Chitra - Rabindranath Tagore					
3.3.1	Introduction to Tagore and the play	1	2 [8]. 4 [5]	L	Ho A	1
3.3.2	Textual analysis and character analysis	3	2[4]	L RP	Ess	1
3.3.3	Human Values reflected in “Chitra”	2	2[10] 3[10]	L GD	Ass	1
4	LANGUAGE STUDY 18					
4.1	Grammar: Units 84-114	18	1[100]	ABL	CT	2
5	LANGUAGE IN PRACTICE 18					

5.1	Vocabulary: Idioms 1. To smell a cat 2. To kill two birds with one stone 3. To cut a sorry figure 4. Gift of the gab 5. In the family way 6. To fish in troubled waters 7. Spick and span 8. Maiden speech 9. Through thick and thin 10. Beat around the bush 11. Elephant in room 12. Out of the blue 13. By hook or crook 14. A wolf in sheep's clothing 15. Between the devil and the deep sea 16. Better late than never 17. Blessing in disguise 18. Add fuel to the fire 19. Go the extra mile 20. Don't cry over spilled milk 21. Read between the lines 22. Turn a deaf ear 23. Look before you leap 24. Pour one's heart out 25. Pull one's leg 26. Break the ice 27. To bell the cat 28. Face the Music 29. Come out with flying colours 30. At face value	4	1[10]	ABL	CT	3
5.2	Job Applications, Covering Letters, CV & Resume	4	1[20]	ABL	Ass	3
5.3	Circular, Notice, Agenda and Minutes	4	1[10]	ABL	Ass	3
5.4	Interview Etiquettes (Practical skills in Interviews -body language)- face to face - telephone and video conferencing)	2	1[20]	ABL	Viva	3
5.5	Power Point preparation (Practical)	2	1[10]	ABL	Ass	3
5.6	Creating a Digital Profile- Linkedin (Practical)	1	1[10]	ABL	Ass	3
5.7	Spoken English (Practical) Making suggestions & Responding to suggestions, Asking for and giving Advice or Help	1	1[20]	RP	Viva	3

Reference

1. *Semester 1V: Prose, Poetry and One Act Plays.* Edited by the Department of English.

2. *Essential English Grammar* by Raymond Murphy. Cambridge University Press

3. Language in Use: Workbook 1V. Edited by the Department of English.

CC 7- Course Title: **ORGANIC CHEMISTRY II**	Course Type: Theory Course Code :23GC11

Total Hours: **90** Hours/Week: **6** Credits: **5**		
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	To explain the isolation and properties of alkaloids and terpenes	2(10),5(10)	1,2,7,10	E	F
CLO-2	To explain the preparation and reactions of mono and disaccharides	2(10),5(10)	1,2,7,10	U	C
CLO-3	To classify the biomolecules and natural products based on their structure, properties, reactions and uses	2(10),5(10)	1,2,7,10	An	C
CLO-4	To discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.	2(10),5(10)	1,2,7,10	Ap	C
CLO-5	To discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acids and hydroxyl acids.	2(10),5(10)	1,2,7,10	E	F

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**ALKALOIDS AND TERPENES**					
1.1	Alkaloids: Classification, isolation, general properties	2	1[10]	BS	Qui	1,2,6-8
1.2	Hofmann Exhaustive Methylation	2	1[10]	Lec	Sem	1,2,6-8
1.3	Structure elucidation – Coniine and piperine	2	1[10]	TPS	MCQ	1,2,6-8
1.4	Structure elucidation nicotine	1	1[10]	TPS	MCQ	1,2,6-8
1.5	**Terpenes:** Classification, Isoprene rule, isolation	2	1[20]	GD	Qui	1,2,6-8
1.6	Structural elucidation of Citral and alpha terpineol	2	1[20]	TPS	MCQ	1,2,6-8
1.7	Structural elucidation of Menthol	3	1[20]	TPS	MCQ	1,2,6-8
II	**CARBOHYDRATES**					
2.1	**Carbohydrates** Definition and Classification of Carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof).	1	2[10]	Lec	MCQ	1,2,6-8
2.2	Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.	1	2[10]	TPS	Pro	1,2,6-8
2.3	**Monosaccharides**– configuration – D and L hexoses – aldohexoses and ketohexoses.	1	2[10]	Lec	Ass	1,2,6-8
2.4	Glucose, Fructose–Occurrence, preparation,properties,reactions, structural elucidation, uses.	3	2[20]	GD	Qui	1,2,6-8
2.5	Interconversions of sugar series–	2	2[10]	Lec	MC	1,2,

	ascending, descending, aldose to ketose and ketose to aldose.				Q	6-8
2.6	**Disaccharides**–sucrose, lactose, maltose-preparation, properties and uses (no structural elucidation).	1	2[10]	BS	Pro	1,2, 6-8
2.7	**Polysaccharides**–Source, constituents and biological importance of Homo polysaccharides-starch and cellulose	2	2[20]	Lec	Qui	1,2, 6-8
2.8	Source, constituents and biological importance of hetero polysaccharides– hyaluronic acid, heparin	1	2[10]	Lec	MC Q	1,2, 6-8
III	**MOLECULAR REARRANGEMENTS**					
3.1	Molecular Rearrangement: Type of rearrangements	2	3[20]	Lec	Qui	1,2, 6-8
3.2	Mechanism for Benzidine rearrangement	1	3[10]	GD	MC Q	1,2, 6-8
3.3	Mechanism for Favorskii rearrangement	2	3[20]	TPS	Qui	1,2, 6-8
3.4	Mechanism for Clasien rearrangement	1	3[10]	Lec	MC Q	1,2, 6-8
3.5	Mechanism for Fries rearrangement	1	3[10]	Lec	MC Q	1,2, 6-8
3.6	Mechanism for Hofmann and Curtius rearrangement	1	3[10]	Lec	Qui	1,2, 6-8
3.7	Mechanism for Schmidt and Beckmann rearrangement	2	3[10]	Lec	Sem	1,2, 6-8
3.8	Mechanism for Pinacol- pinacolone rearrangement	2	3[10]	Lec	Sem	1,2, 6-8
IV	**ETHERS, THIOETHERS AND EPOXIDES**					
4.1	Ethers-Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel' s method of estimation of methoxy group.	1	4[10]	GD	MCQ	3,4,5 ,9,10
4.2	Reactions of epoxides with alcohols, ammonia derivatives and $LiAH_4$.	1	4[10]	Lec	Qui	3,4,5 ,9,10
4.3	Thioethers-nomenclature, structure, preparation, properties and uses.	1	4[10]	Lec	Sem	3,4,5 ,9,10
4.4	Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones	1	4[10]	Lec	MCQ	3,4,5 ,9,10
4.5	General methods of preparation and physical properties	1	4[10]	Lec	Qui	3,4,5 ,9,10
4.6	Nucleophilic addition reactions, base catalysed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin	4	4[10]	Lec	Qui	3,4,5 ,9,10

	reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction					
4.7	Oxidation of aldehydes. Baeyer - Villiger oxidation of ketones	1	4[10]			3,4,5,9,10
4.8	Reduction: Clemmensen reduction, Wolf - Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with LiAlH4and $NaBH_4$.	3	4[20]	Lec	MCQ	3,4,5,9,10
4.9	Addition reactions of unsaturated carbonyl compounds: Michael addition	2	4[10]	Lec	Sem	3,4,5,9,10
V	**CARBOXYLIC ACIDS**					
5.1	**Carboxylic Acids**: Nomenclature, structure, preparation and reactions of aliphatic and aromatic monocarboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength.	2	5[10]	Lec	MCQ	3,4,5,9,10
5.2	HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation, Hunsdiecker reaction. Formic acid-reducing property.Reactions of dicarboxylic acids ,hydroxyl acids and unsaturated acids	2	5[10]	GD	Sem	3,4,5,9,10
5.3	**Carboxylic acid Derivatives:** Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides	2	5[10]	TPS	Ass	3,4,5,9,10
5.4	Nucleophilic substitution reaction at the acyl carbon of acyl halide, anhydride, ester, amide. Schottan-Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement.	1	5[20]	Lec	MCQ	3,4,5,9,10
5.5	**Active Methylene compounds:** Keto–enol tautomerism. Preparationand synthetic applications of diethyl malonate and ethyl acetoacetate	2	5[10]	BS	Sem	3,4,5,9,10
5.6	**Halogen substituted acids**–nomenclature; preparation by direct halogenation, iodination from unsaturated acids,alkyl malonic acids	2	5[20]	Lec	Qui	3,4,5,9,10
5.7	**Hydroxyacids**–nomenclature; preparation from halo,amino,aldehydicand ketonic acids, ethylene glycol, aldol acetaldehyde; reactions – action of heat on α,β,γ hydroxy acids.	2	5[20]	GD	Pro	3,4,5,9,10

REFERENCES

1. J. March and M. Smith, Advanced Organic Chemistry, 5 th edition, John-Wiley and Sons.2001.
2. E. S. Gould, Mechanism and Structure in Organic Chemistry, Holt, Rinehart and Winston Inc., 1959.
3. P.S. Kalsi, Stereochemistry of carbon compounds, 8 th edition, New Age International Publishers, 2015.
4. P. Y. Bruice, Organic Chemistry, 7th edn, Prentice Hall, 2013.
5. J. Clayden, N. Greeves, S. Warren, Organic Compounds, 2 ndedition, Oxford University Press, 2014.
6. F.A. Carey and R.J. Sundberg, Advanced Organic Chemistry Part-A and B, 5th edition, Kluwer Academic / Plenum Publishers, 2007.
7. D. G. Morris, Stereochemistry, RSC Tutorial Chemistry Text 1, 2001.
8. N.S. Isaacs, Physical Organic Chemistry, ELBS, Longman, UK, 1987.
9. E. L. Eliel, Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000.
10. I. L. Finar, Organic chemistry, Vol-1 & 2, 6th edition, Pearson Education Asia, 2004.

CP 4- Course Title:	**Qualitative Inorganic Analysis (Mixture) SEMI MICRO ANALYSIS**	Course Type: **Practical** Course Code :23GCP4
Total Hours: **30**	Hours/Week: 2	Credits: **1**
Pass-Out Policy: Minimum Contact Hours:18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Learn the basic principles involved in inorganic qualitative analysis	6(15),10(5)	1,2,3,5,6,7,10	U	M,F,C
CLO-2	Develop the analytical skills required for identifying the ions in a mixture.	6(15),10(5)	1,2,3,5,6,7,10	R	F,C
CLO-3	Analyse a mixture containing two cations and two anions of which one will be an interfering on.	6(15),10(5)	1,2,3,5,6,7,10	An	M,C

Non interfering anions

Carbonate, sulphide, chloride, bromide, iodide, nitrate and sulphate.

Interfering anions

Fluoride, borate, oxalate, phosphate and chromate

Cations

Pb^{2+}
Bi^{2+}, Cu^{2+}, Cd^{2+},
Fe^{2+}, Fe^{3+},
Mn^{2+}, Co^{2+}, Ni^{2+}, Zn^{2+}
Ba^{2+}, Ca^{2+}, Sr^{2+}
Mg^{2+}, NH_4^+

Applied Experiment

Analysis of soil for the presence of minerals like potassium, sodium, nitrate, chloride, phosphate.

REFERENCES

1. Vogel's Qualitative Inorganic Analysis revised by G. Svehla, 6th Ed., Orient Longman, 2004.

2. V. Venkateswaran , R. Veeraswamy , A. R. Kulandaivelu., Basic principles of practical chemistry 2ndEdn., New Delhi, Sultan Chand and Son, New Delhi, 2006

MS 4- Course Title:	**ALLIED CHEMISTRY FOR PHYSICAL SCIENCE**	Course Type: **Theory** Course Code :23AC04
Total Hours: **60** Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**
Course Creator:	**Expert 1:**	**Expert 2:**
Dr.C.Anuba	Dr.T.Sumitha Celin	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
anubacj@gmail.com	sumithaezhil77@gmail.com	abbsfen@gmail.com
Mobile-8098957618	Mobile No.9486540793	Mobile - 9488884898

CLO.No.	Expected Learning Outcomes On successful completion of this course, student should be able to:	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Acquire the basic knowledge about electrochemistry and thermodynamics.	3(10),6(10)	1,2,3,8	C	A
CLO-2	Discuss the chemical kinetics of certain chemical compounds.	3(10),6(10)	1,2,3,8	F	D
CLO-3	Understand about dilute solutions and colloids.	3(10),6(10)	1,2,3,8	F	U
CLO-4	Explain the thermal, photochemical and nuclear reactions.	3(10),6(10)	1,2,3,8	C	E
CLO-5	Understand the advanced synthesis of polymers	3(10),6(10)	1,2,3,8	F	U

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**ELECTROCHEMISTRY**					
1.1	Resistance, conductance, specific conductance, equivalent conductance, and molar conductance.	1	1[10]	Lec	Qui	1-2
1.2	Measurement of conductance, variation of equivalent conductance with dilution.	1	1[10]	Lec	MCQ	1-2
1.3	Classification of electrolytes – strong and weak electrolytes. Bronsted – Lowry and Lewis concept of acids and bases.	1	1[10]	GD	MCQ	1-2
1.4	Dissociation constants of acids and bases.	1	1[10]	BS	Sem	1-2
1.5	Acidity and alkalinity of aqueous solutions	1	1[10]	TP	Ass	1-2

	– pH – definition, pH scale, determination of pH using glass electrode.			S		
1.6	Buffers – Definition of a buffer solution and types	1	1[10]	Lec	Qui	1-2
1.7	Henderson equation.	1	1[10]	Lec	Qui	1-2
1.8	EMF – Electrochemical cells. Cell representation and convention – single electrode potential, reference electrodes (Standard hydrogen electrode and calomel electrode).	1	1[10]	Lec	MCQ	1-2
1.9	Electro chemical series and its applications.	1	1[5]	GD	MCQ	1-2
1.10	Thermodynamics of EMF – calculation of ΔG, ΔH, ΔS and equilibrium constant of cell reactions. (No derivation of relation required).	1	1[5]	Lec	Qui	1-2
II	**CHEMICAL KINETICS**					
2.1	Rate of a reaction, rate equation, rate constant. Order and molecularity of a reaction.	1	2[10]	Lec	MCQ	1-2
2.2	Differential and integral forms of rate expressions for first, second and zero order reactions (Derivation required).	2	2[10]	GD	MCQ	1-2
2.3	Time for half change for first and second order reactions.	2	2[20]	TPS	Qui	1-2
2.4	Experimental methods of determining order of a reaction.	2	2[20]	BS	Qui	1-2
2.5	Pseudo unimolecular reaction.	1	2[20]	Lec	Sem	1-2
2.6	Effect of temperature on reaction rates – Arrhenius equation – Activation energy and its significance.	2	2[20]	TPS	Ass	1-2
III	**DILUTE SOLUTIONS AND COLLOIDS**					
3.1	Colligative properties – osmosis, laws of osmotic pressure, measurement of osmotic pressure, isotonic solutions.	2	3[20]	Lec	MCQ	1-2
3.2	Reverse osmosis – desalination and dialysis.	1	3[10]	Lec	MCQ	1-2
3.3	Colloids: True solutions, suspensions and colloids.	1	3[10]	GD	Qui	1-2
3.4	Types of colloids – Lyophilic and lyophobic colloids.	1	3[10]	BS	Ass	1-2
3.5	Properties of colloids: Optical properties – Tyndall effect; Kinetic properties – Brownian movement.	2	3[10]	TPS	Sem	1-2

3.6	Electrical properties - origin of charge on colloidal particles, concept of electrical double layer, electrophoresis and electroosmosis.	1	3[10]	GD	Sem	1-2
3.7	Coagulation of colloids – Hardy – Schutz Law, protective colloids and gold number.	1	3[10]	Lec	MCQ	1-2
3.8	Gels: Preparation and properties (imbibitions, syneresis and thixotropy).	1	3[10]	Lec	MCQ	1-2
3.9	Emulsions. Type of emulsions, emulsifiers and surfactants.	1	3[10]	GD	Qui	1-2
IV	**PHOTOCHEMISTRY AND NUCLEAR CHEMISTRY**					
4.1	Comparison between thermal and photochemical reactions.	1	4[10]	Lec	Ass	1-2
4.2	Laws of photochemistry. Quantum yield.	1	4[10]	Lec	Sem	1-2
4.3	Chain reactions.	1	4[10]	Lec	MCQ	1-2
4.4	Fluorescence, phosphorescence, photo sensitization, chemiluminescence, bioluminescence.	1	4[10]	Lec	MCQ	1-2
4.5	Photochemical cells.	1	4[10]	BS	Qui	1-2
4.6	Nuclear chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers Radio activity – detection and measurement – Geiger Muller counter, radioactive decay.	2	4[20]	GD	Qui	1-2
4.7	Soddy's group displacement law, radioactive series.	1	4[10]	Lec	Qui	1-2
4.8	Nuclear fission and fusion – application. Application of radioactivity.	3	4[20]	Lec	Qui	1-2
V	**POLYMERS**					
5.1	General characteristics of polymers in comparison with common organic compounds.	2	5[20]	GD	MCQ	1-2
5.2	Plastics, elastomers and fibres.	3	5[10]	Lec	Qui	1-2
5.3	Thermoplastics and thermosetting plastics.	2	5[20]	Lec	Qui	1-2
5.4	Methods of polymerization. (Bulk, suspension and solution polymerization).	3	5[10]	GD	Sem	1-2
5.5	Block and graft synthesis and uses of polyurethanes, epoxy resins, polycarbonates and teflon.	2	5[20]	Lec	Ass	1-2
5.6	Biomedical application of polymers.	2	5[20]	Lec	Qui	1-2

REFERENCES

1. B.R, Puri, L.R. Sharma and M. S. Pathania, Elements of Physical chemistry, Vishal Publishing Co., Jalandhar, 2008
2. K.K. Sharma and L.R .Sharma , A Text Book of Physical Chemistry, 4th ED., Vikas Publishing House., New Delhi, 2002.

PMSP 4- Course Title:	**ALLIED CHEMISTRY FOR PHYSICAL SCIENCE**	Course Type: **Practical** Course Code :23GCP4
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.C.Anuba	Dr.T.Sumitha Celin	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
anubacj@gmail.com	sumithaezhil77@gmail.com	abbsfen@gmail.com
Mobile-8098957618	Mobile No.9486540793	Mobile - 9488884898

CLO-No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Learn the basic principles involved in organic qualitative analysis	6(10),10(10)	1,2,3,5,6,7,10	U	M,F,C
CLO-2	Develop the analytical skills required for identifying the substance.	6(2),10(10)	1,2,3,5,6,7,10	R	F,C
CLO-3	Analyse the functional groups	6(2),10(10)	1,2,3,5,6,7,10	An	M,C
CLO-4	Prepare the organic substance	6(2),10(10)	1,2,3,5,6,7,10	R	C

1.QUALITATIVE ORGANIC ANALYSIS

Identification of functional groups in organic compounds by systematic analysis. Report should be made under the following heads.

a) Elements present other than C, H and O
b) Aliphatic or aromatic
c) Saturated or unsaturated
d) Functional group

II Preparation of Organic Compounds

1. Preparation of osazone from glucose
2. Preparation of p-Bromo acetanilide
3. Preparation of aspirin
4. Preparation of salicylic acid

II.APPLIED EXPERIMENT

Preparation of washing powder, talcum powder and shampoo

REFERENCE

1. Vogel'sText Book of Practical Organic Chemistry, Person Education, Delhi, 5th Edn. 2004.

2. Venkateswaran, R. Veeraswamy, A.R.Kulandaivelu., Basic principles of practical chemistry 2nd edition, New Delhi, Sultan Chand and Sons. 2006

3. Vogel's Text Book of Quantitative Chemical Analysis, 5thEdn. ELBS, 2004.

ALLIED PHYSICS FOR CHEMISTRY STUDENTS

Course Title:	ALLIED PHYSICS – II	Course Type: Theory Course Code: 23AP02
Total Hours: 60	Hours/Week: 4	Credits:4
Pass-Out Policy : Minimum Contact Hours:36 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]		

Course Creator:	Expert 1:	Expert 2:
Prof. A. Charles HepzyRoy	Dr. T.R. Beena	Dr. D. Hudson Oliver
Asso. Prof., Faculty Head	Assi. Prof. of Physics	Assi. Prof. of Physics
+919944261881	+919487386199	+919952654515
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Course Objectives:

Apply various physics concepts to understand the concepts like interference, differaction, polarisation based on wave patterns; study the outlines of different atom models, atomic structure, fussion and fission; gain Knowledge in semiconductor devices.

CLO-No.	Course Learning Outcome *Upon completion of this course, students will be able to:*	PLO % MAPPED WITH CLO	CLO & PLO MAPPED WITH GA	Cognitive Level CL	Knowledge Catogory KC
CLO-1	Explain the concepts of interference diffraction using principles of superposition and rephrase the concept of polarization based on wave patterns	3[0.2] 5[0.3]	1,2,7,8,10	R, Ap	F, C
CLO-2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts.	3[0.2] 5[0.3]	1,2,7,8,10	U, An	C, M
CLO-3	Summarize the properties of nuclei, nuclear forces, structure of atomic nucleus and nuclear models. Interpret nuclear processes like fission and fusion.	3[0.2] 5[0.3]	1,2,7,8,10	An	F, M
CLO-4	Describe the basic concepts of relativity inertial frames and transformation equations.	3[0.2] 5[0.3]	1,2,7,8,10	A, E	P, M
CLO-5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices	3[0.2] 5[0.3]	1,2,7,8,10	U, C	P, M

Module	**Course Description**	**Hours**	**% of CLO mapping with Module**	**Learning Activities**	**Assessment Tasks**	**Reference**
I	**OPTICS**					
1.1	Interference	1	1[10]	Lec	SA	1, 2
1.2	Interference in thin films – colors ofthin films	1	1[10]	Lec	Ess	1, 2
1.3	Air wedge – Determination of diameterof a thin wire by air wedge	1	1[10]	EL	Sem	1, 2
1.4	Diffraction – Fresnel and Fraunhoferdiffraction	2	1[10]	GD	SA	1, 2

1.5	Normal incidence – experimental determination of wavelength using diffraction grating (no theory)	2	1[10]	EL	Ess	1, 2
1.6	Polarization	1	1[10]	Lec	SA	1, 2
1.7	Brewster's law	1	1[10]	Lec	Ess	1, 2
1.8	Polarization by double refraction	1	1[10]	Lec	Ess	1, 2
1.9	Optical activity	1	1[10]	Lec	Ess	1, 2
1.10	-Application in sugar industries	1	1[10]	GD	Ass	1, 2
II	**ATOMIC PHYSICS**					
2.1	Atom models – Bohr atom model	1	2[10]	Lec	Ess	1, 2
2.2	Vector atom model - Various quantum numbers	2	2[10]	Lec	Ess	1, 2
2.3	Pauli's exclusion principle	1	2[10]	Lec	SA	1, 2
2.4	Periodic classification of elements	1	2[10]	BS	Sem	1, 2
2.5	Bohr magneton	1	2[10]	Lec	SA	1, 2
2.6	Stark effect	1	2[10]	Lec	Ess	1, 2
2.7	Zeeman effect (elementary ideas only)	1	2[10]	Lec	Ess	1, 2
2.8	Photo electric effect	1	2[10]	Lec	SA	1, 2
2.9	Einstein's photoelectric equation	1	2[10]	BS	Ess	1, 2
2.10	Applications of photoelectric effect - Solar cells - Solar panels	2	2[10]	GD	Ass	1, 2
III	**NUCLEAR PHYSICS**					
3.1	Nuclear Models – liquid drop model	1	3[10]	Lec	Ess	1, 2
3.2	Magic numbers – shell model	1	3[10]	Lec	Ess	1, 2
3.3	Mass defect – binding energy	1	3[10]	Lec	Ess	1, 2
3.4	Radioactivity – uses – half life – mean life	1	3[10]	TPS	MCQ	1, 2
3.5	Nuclear fission – energy released in fission – chain reaction	1	3[10]	Lec	Ess	1, 2
3.6	Atom bomb	1	3[10]	GD	Sem	1, 2
3.7	Nuclear reactor	1	3[10]	Lec	Ess	1, 2
3.8	Introduction to Department of Atomic Energy (DAE), International Atomic Energy Agency (IAEA)	2	3[10]	GD	Ass	1, 2
3.9	Nuclear fusion – thermonuclear reactions	2	3[10]	Lec	Ess	1, 2
3.10	Differences between fission and fusion	1	3[10]	TPS	SA	1, 2
IV	**INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES**					
4.1	Frame of reference	1	4[10]	Lec	SA	1, 2
4.2	Postulates of special theory of relativity	1	4[10]	Lec	Sem	1, 2
4.3	Galilean transformation equations	1	4[10]	BS	Ess	1, 2
4.4	Lorentz transformation equations	2	4[10]	BS	Ess	1, 2

	–derivation					
4.5	Length contraction	1	4[10]	BS	Ess	1, 2
4.6	Time dilation	1	4[10]	BS	Ess	1, 2
4.7	Twin paradox	1	4[10]	BS	Ess	1, 2
4.8	Mass-energy equivalence	1	4[10]	Lec	SA	1, 2
4.9	Introduction on gravitational waves,	1	4[10]	Lec	SA	1, 2
4.10	Laser Interferometer Gravitational-Wave Observatory (LIGO) - Opportunities at International Centre for Theoretical Sciences (ICTS)	2	4[10]	GD	Ass	1, 2
V	**SEMICONDUCTOR PHYSICS**					
5.1	p-n junction diode	1	5[15]	Lec	Qui	1, 2
5.2	Forward biasing, Reverse biasing	2	5[10]	Lec	Ess	1, 2
5.3	Characteristic of diode	1	5[10]	Lec	Ess	1, 2
5.4	Zener diode	1	5[10]	Lec	Ess	1, 2
5.5	Characteristic of zener diode	1	5[10]	Lec	Ess	1, 2
5.6	Voltage regulator	1	5[10]	Lec	Sem	1, 2
5.7	Full wave bridge rectifier - construction and working – advantages (no mathematical treatment)	2	5[15]	Lec	Ess	1, 2
5.8	USB cell phone charger	1	5[10]	GD	Ess	1, 2
5.9	Introduction to e-vehicles	2	5[10]	GD	Ass	1, 2

BOOKS FOR REFERENCE:

1. R. Murugesan (2001), Allied Physics, S. Chand and Co, New Delhi.
2. R. Murugesan (2005), Modern Physics, S. Chand & Co, New Delhi.
3. K. Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai.
4. Brijlal and N. Subramanyam (2002), Text book of Optics, S. Chand & Co, New Delhi.
5. A. Subramaniyam, Applied Electronics, 2nd Edn., National Publishing Co., Chennai.
6. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
7. D.R. Khanna and H.R. Gulati (1979). Optics, S. Chand & Co. Ltd., New Delhi.
8. A. Beiser (1997), Concepts of Modern Physics, Tata Mc Graw Hill Publication, New Delhi.
9. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi.
10. V.K. Metha (2004), Principles of Electronics, 6th Edn., S. Chand and Company, New Delhi.

Course Title:	ALLIED PHYSICS – II	Course Type: Practical II Course Code: 23PP2
Total Hours: 30	Hours/Week: 2	Credits: 1
Pass-Out Policy : Minimum Contact Hours:18 Total Score %: 100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]		

Course Creator:	Expert 1:	Expert 2:
Prof. A. Charles Hepzy Roy	Dr. Y. Sheeba Sherlin	Dr. T.R. Beena
Asso. Prof., Faculty Head	Asso. Prof. of Physics	Assi. Prof. of Physics
+919944261881	+919442304397	+919487386199
achroy66@gmail.com	ysheebamohan @gmail.com	trbeena@gmail.com

Course Objectives:

Apply various Physics concepts to understand concepts of Light; gain knowledge on working principles of electronic circuits; develop and understanding about the handling of various instruments; able to do error analysis and correlate results,

CLO-No.	Course Learning Outcome *Upon completion of this course, students will be able to:*	PLO % MAPPED WITH CLO	CLO & PLO MAPPED WITH GA	Cognitive Level CL	Knowledge Catogory KC
CLO-1	Apply the equation of motion to one or two dimensions of the system in order to understand kinematics of the body under the various conditions of applied force.	6[0.1]	1, 2, 3, 8	An, E	M
CLO-2	Apply the knowledge in construction of beams, bridges etc.	6[0.1]	1, 2, 3, 8	An, E	P
CLO-3	Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid	6[0.1]	1, 2, 3, 8	An, E	M
CLO-4	Study the elastic behaviour of materials Analyse the relationship between various types of experiments	6[0.1]	1, 2, 3, 8	An, E	P
CLO-5	Perform the procedure as per standard values	6[0.1]	1, 2, 3, 8	An, E	M

No.	Course Description
1	Radius of curvature of lens by forming Newton's rings
2	Thickness of a wire using air wedge
3	Spectrometer – Grating N, λ – Normal incidence
4	Spectrometer – Refractive Index and dispersive power
5	Determination of AC frequency using sonometer
6	Characteristics of PN diode
7	Characterization of Zener diode
8	Zener diode as regulator
9	Construction of AND, OR, NOT gates using diodes and transistor
10	NOR gate as a universal building block
11	NAND gate as a universal building block

SEC- 2 Course Title:	**SEC-2 Cosmetics And Personal Grooming**	Course Type: **Theory** Course Code :23GCS2
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
Dr. G.R. Bella	Dr. S.Begila David	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
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Course Outline	**Unit-I Skin Care** Nutrition of the skin, skin care and cleansing of the skin; face powder–ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sun screen (formulation only); Gels–formulation and advantages; astringent and skin tonics–key ingredients, skin lightness, depilatories.
	Unit-II Hair Care Shampoos–types–powder, cream, liquid, gel–ingredients; conditioner–types–ingredients **Dental care** Toothpastes–ingredients–mouthwash
	Unit-III Makeup Base–foundation–types- ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge
	Unit-IV Perfumes Classification-Natural–plant origin–parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic–classification emphasizing characteristics– esters– alcohols–aldehydes– ketones
	Unit-V Beauty Treatments Facials-types–advantages–disadvantages; facemasks–types; bleach-types–advantages–disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing; permanent waving–hair straightening; wax – types–waxing; pedicure, manicure-advantages–disadvantages
Recommended Text	1.Thankamma Jacob,(1997)Foods, drugs and cometics–A consumer guide, Macmillan publication, London.
Reference Books	1. Wilkinson JBE and Moore RJ, (1997) Harry's cosmeticology,7thed., Chemical Publishers, London. 2. George Howard,(1987)Principles and practice of perfumes and cosmetics,
	Stanley Therones, Chettenham
Website and e-learning source	1. http://www.khake.com/page75.html 2. Net.foxsm/list/284

SEMESTER - IV

Course Title: Value Added Course II **Digital Empowerment through Artificial Intelligence, Multimedia and Cyber Security**	Course Type: Theory
Total Hours: 30 Hours/Week: 2 Credit: 1	Course Code: 23SE21
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %:100 Internal: 40 External: 60 Minimum Pass %: 40 [No Minimum for Internal]	

Course Creator	Expert 1	Expert II
Dr.B.Shamina Ross	Mrs. P. Ezhil Roja	Dr. C. Thinkal Dayana
Associate Professor	Assistant Professor	Assistant Professor
Mobile: 9443137232	Mobile: 9944479273	Mobile: 9715919193
shaminas@hotmail.com	roja_z@yahoo.com	thinkaldayana@gmail.com

CLO-No.	**Course Learning Outcomes** *Upon completion of this course, students will be able to:*	**% of PLO Mapping with CLO**	**CLO & PLO Mapped with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	understand the evolution of computers, computing concepts and the various applications of computers	1(10), 6(10)	1, 8, 5	R, U	F, C
CLO-2	understand Internet Application, World Wide Web, Web Browsers and e-mail service	5(6), 6(7), 8(7)	1, 5, 6, 7	U	F, C, M
CLO-3	analyze features and types of E-commerce model and applications and Multimedia Technology concepts	6(7), 9(6), 10(7)	1, 5, 7	An	F, C
CLO-4	understand the basics of Artificial Intelligence, Robotics and Computer Vision	7(7), 9(7), 10(6)	5, 8, 10	E	F, C, M
CLO-5	understand the basic concepts of Cyber Security, types of security threats and safety measures	6(11), 10(9)	1, 5	U	F, C, M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
Evolution of Digital System						
1.1	Introduction and Evolution of Computers	2	1[33]	Lec	CA	1
1.2	Generations of Computers	1	1[17]	FC	HrA	1
1.3	Computing Concepts, The Computer System	2	1[33]	OO	OT	1
1.4	Applications of Computers	1	1[17]	RF	SA	1
Communication and Collaboration in Digital World						
2.1	Introduction, Applications of Internet	2	2[33]	Lec	HoA	1
2.2	Understanding the World Wide Web	1	2[17]	Sem	ST	1
2.3	Web Browsers	2	2[33]	SI	CA	1
2.4	E-mail Service	1	2[17]	GT	OT	1
E-Commerce and Multimedia						
3.1	**E-Commerce:** Introduction, Features of E-Commerce	1	3[17]	Lec	ST	2

3.2	Types of E-commerce Model, Business Application of E-commerce	1	3[17]	Sem	CT	2
3.3	Uses of E-commerce, Traditional Commerce Vs E-Commerce, Advantages of E-Commerce, Disadvantages of E-Commerce	2	3[33]	GT	CA	2
3.4	**Multimedia:** Introduction, Elements of Multimedia, Applications of Multimedia, Advantages of Multimedia and Disadvantages of Multimedia.	2	3[33]	SI	HoA	3
Artificial Intelligence						
4.1	Introduction, Goals of AI, History of AI, Applications of AI, Intelligence	2	4[33]	GT	CT	4
4.2	Robotics: Robot Locomotion, Application of Robotics.	2	4[33]	Sem	HrA	4
4.3	Computer Vision: Task of computer Vision	1	4[17]	BS	CA	4
4.4	Application Domains of Computer Vision	1	4[17]	SI	Qui	4
Cyber Security						
5.1	Introduction, Types of Cyber Security	2	5[33]	Lec	SA	5
5.2	Importance of Cyber Security	1	5[17]	GD	HrA	5
5.3	Types of Cyber Security Threats	1	5[17]	FC	MCQ	5
5.4	Benefits of Cyber Security, Cyber Security Measures	2	5[33]	GT	CT	5

Reference Books

1. E. Balagurusamy, *Fundamentals of Computers*, Tata McGraw Hill Education, Private Limited, 2009. New Delhi.
2. David Whiteley, *e-commerce-Strategy, Technology and Applications*, Tata McGraw-Hill Publishing Company Limited, First Edition, Reprint 2007
3. Ralf Steinmetz, Klara Nahrstedt, *Multimedia: Computing Communications & Applications.* Pearson Education, January, 2002.
4. Eugene Charniak, Drew McDermott, *Introduction to Artificial Intelligence*. Pearson Education, January, 2002.
5. Anad Shinde, *Introduction to Cyber Security*, Guide to the World of Cyber Security Paperback-5, February 2021.

Course Title:	**NME1- Dairy Chemistry**	Course Type: **Theory** Course Code :23GCN1
Total Hours: **30** Credits: **2**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**
Course Creator:	**Expert 1:**	**Expert 2:**
Dr.A.Yardily	Dr.R.Ragel Mabel Saroja	Dr.T.F.Abbs Fen Reji
Assistant Professor	Associate Professor	Associate Professor
Scott Christian College (Autonomous) Nagercoil-629003	Scott Christian College (Autonomous) Nagercoil-629003	Nesamony Memorial Christian College, Marthandam - 629165
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CLO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Understand the various methods, Function and Properties of milk.	3(12),10(8)	1,2,5,6, 7,8	U	FC
CLO-2	Determine the various aspects of Milk Processing	3(12),10(8)	1,2,5,6, 7,8	A	F,C
CLO-3	Define the various methods of milk products	3(12),10(8)	1,2,5,6, 7,8	R	M,C
CLO-4	Understand the various aspects of milk products	3(12),10(8)	1,2,5,6, 7,8	An	C
CLO-5	Understand the various methods and properties of Milk lipids	3(12),10(8)	1,2,5,6, 7,8	U	C

Module	Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**PROPERTIES OF MILK**					
1.1	Milk – definition – general properties of milk – Differences between Cow milk and Buffalo milk	1	1[10]	Lec	Qui	1
1.2	Chemical composition – Factors affecting the composition of milk	1	1[20]	Lec	Sem	1
1.3	General properties of the constituents of milk – SNF – milk fat	1	1[20]	PT	Ass	1
1.4	Acid number, saponification number, Iodine number and Reichert – Meissi number	1	1[20]	PT	Qui	1
1.5	Milk protein – physical properties like electrical properties	1	1[20]	Lec	Qui	1
1.6	Milk vitamins – classification and functions	1	1[10]	Lec	Ass	1
II	**PROCESSING OF MILK**					
2.1	Estimation of fat in milk	1	2[30]	Lec	MCQ	1

2.2	Determination of specific gravity and total solids of milk	2	2[20]	Lec	Qui	1
2.3	Neutralizers – milk processing	1	2[20]	Lec	Sem	1
III	**MILK PRODUCTS I**					
3.1	Special milk – sterilized milk – advantage and disadvantage – flow diagram of manufacture of special milk	1	3[10]	Lec	Mcq	3
3.2	Homogenized milk – Definition – Merits and Demerits, Factors inflenzing homogemization -homogenizer	1	3[20]	Lec	Sem	3
3.3	Soft – curd milk – Definition, method of preparation – flavored milk – flow diagram of manufacture of soft milk	1	3[20]	Lec	Ass	3
3.4	Vitaminized/Irradiated milk – Definition – necessity frozen concentrated milk - fermented milk	1	3[20]	Lec	Qui	3
3.5	Cultered butter milk - flow diagram of manufacture – Acidophilus milk - Yoghurt	1	3[10]	Lec	Sem	3
3.6	Khoa and channa definition – preparation of khoa and channa sweets – Gulabjamu and Rassogilla, Ice cream – definition – percentage composition – ingredients – manufacture of ice cream	1	3[20]	GD	Qui	3
IV	**MILK PRODUCTS II**					
4.1	Standardised milk – Recons – tituted / Rehydrated milk – recombined milk – Definition, merits, Toned milk – Double toned milk – Definition – merits – flow diagram of manufacture	1	4[20]	Lec	Sem	**2**
4.2	Filled milk – Imitation milk – Vegetable toned milk – Soya milk – Definition and manufacture,	1	4[20]	GD	Ass	**2**
4.3	Cream – definition – classification – physic – chemical properties, Seperation of cream – gravity method and centrifugal method, Manufacture of different types of cream – Estimation of fat in cream	1	4[20]	Lec	Qui	**2**

4.4	Buffer – Definition, composition, classification and Manufacture of Butter	1	4[10]	P T	Qui	**2**
4.5	Estimation of acidity and moisture content of butter	1	4[20]	P T	Qui	**2**
4.6	Ghee – definition, composition, Adulteration and Detection	1	4[10]	L e c	Ass	**2**
V	**MILK LIPIDS / ENZYMES**					
5.1	Milk lipids – definition, classification	1	5[10]	Lec	Qui	4,5
5.2	Phospholipids – Lecithins, composition and struture	1	5[10]	Lec	Mcq	4,5
5.3	Chuming operation – preparation, Filling, addition of color, chuming difficulties	1	5[20]	PT	Qui	5
5.4	Refractive index and antioxidants	1	5[10]	Lec	Ass	5
5.5	Milk sugar- Lactose – physical and chemical properties, application, structure and estimation of lactose, Milk enzymes – condensed milk - classification	1	5[10]	Lec	Qui	5
5.6	Stassanization and uperization – Nutritive value of milk, Visit to a pasteurization factory/milk product company and submission of a report	1	5[10]	Lec	Qui	5

REFERENCES:

1.Robert Jenness and S.Patom., Wiley,Principles of Dairy Chemistry, New York, 1998.

2. K.S. Rangappa and K.T Acharya. Indian Diary Products. Asia Publishing House, 1974.

3. F.P.Wond., Fundamentals of Dairy Chemistry, Springer, 1998.

4. Sukumar De, Outline of Dairy, Oxford University Press, 2001.

5. Webb Johnson and Alfred, Fundanentals of Dairy Chemistry, CBS Publishers and Distributors, 2005.

23GCD1- INTERNSHIP

The students go to some industries and do some project works related to their subjects.The training may be given to the students in the concerned companies.After completion of the training ,the report of the training must be submitted to the company as well as the college.

The Internship Programme offers students and recent graduates from diverse academic backgrounds the opportunity to gain hands-on experience through global internship opportunities.Interns at get experiential learning opportunities in the humanitarian sector and a meaningful internship experience that will support their academic, professional and personal development.

CC 8- Course Title:	**PHYSICAL CHEMISTRY I**	Course Type: **Theory** Course Code :23GC51
Total Hours: **90** Credits: **5**	Hours/Week: **6**	
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
Dr. T. Sumitha Celin	Dr. I. Starlet Thanjam	Dr.J. Helen Rathna Monica
Assistant Professor	Associate Professor	Associate Professor
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CLO	Upon completion of this course, the students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO1	Have fundamental knowledge on various thermodynamic laws and understand the thermodynamic processes	2(14),5(6)	1,2,7,10	U	M,F,C
CLO2	Know the second law of thermodynamics, concept of entropy and free energy	2(14),5(6)	1,2,7,10	R	F,C
CLO3	Interpret relation between elevation of boiling point and molarity , thermodynamics of open system and third law of thermodynamics	2(14),5(6)	1,2,7,10	Ap	M,C
CLO4	Understand the Phase rule and partially miscible liquid system	2(14),5(6)	1,2,7,10	An	C
CLO5	Apply Nernst distribution law in solvent extraction and double salt formation	2(14),5(6)	1,2,7,10	Ap	M,C

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**THERMODYNAMICS -I**					
1.1	Scope and limitations of thermodynamics. Thermodynamic terms - systems and surroundings, state of a system, thermodynamic variables, extensive and intensive properties, thermodynamic equilibrium.	2	1[10]	Lec	Qui	1
1.2	Zeroth law and concept of temperature. State and path functions - exact and inexact differentials.	2	1[10]	Lec	Pro	2
1.3	Internal energy - first law of thermodynamics in various forms. Cyclic processes, reversible and irreversible processes.	1	1[20]	BS	MCQ	1
1.4	Derivation of expression for maximum work of expansion. Thermodynamic derivation of relation between C_p and C_v. Energy content	2	1[30]	GD	Ass	3

	of an ideal gas.					
1.5	Various thermodynamic processes - isothermal, adiabatic, isobaric and isochoric process.	2	1[20]	Lec	Qui	3
1.6	Adiabatic expansion - relation between T-V, P-V and P-T during adiabatic changes.	2	1[30]	Lec	Sem	2
1.7	Expression for q, E and H for 'n' moles of an ideal gas and Vander Waal's gas during reversible and irreversible isothermal and adiabatic processes.	2	1[30]	PT	Ess	4
1.8	Comparison of work of expansion of an ideal gas and a Vander Waal's gas.	1	1[20]	Lec	Ass	2
1.9	Application of first law of thermodynamics-standard state- standard enthalpy of formation,					
1.10	Thermochemistry-Enthalpy of a reaction, thermo chemical equations, Variation of enthalpy of reaction with temperature, Different kinds of enthalpy of reactions, Hess's law of constant summation and its application.	2	2[30]	Lec	Ass	3
II	**THERMODYNAMICS - II**					
2.1	Need for second law of thermodynamics - statement of the law in different forms.	1	2[20]	BS	Ass	4
2.2	Carnot's cycle: Carnot's theorem, Carnot's engine, efficiency of Carnot's engine.	2	2[30]	GD	Qui	4
2.3	Distinction between heat engine and refrigerator. Thermodynamic scale of temperature.	2	2[10]	Lec	Sem	4
2.4	Entropy: Definition, entropy as a thermodynamic property – significance.	2	2[20]	Lec	MCQ	3
2.5	Entropy changes in isolated system for reversible and spontaneous processes.	1	2[20]	Lec	Qui	3
2.6	Entropy changes of an ideal gas during isothermal and adiabatic processes. Entropy changes in phase transitions -	2	2[20]	PT	ass	3
2.7	Entropy of mixing of ideal gases. Entropy and probability.	2	2[10]	Lec	sem	3
2.8	Entropy change as a criterion for spontaneity.	1	3[20]	Lec	Qui	3
2.9	Free energy: Definition - Helmholtz and Gibb's free energy – free energy changes as criterion for spontaneity and equilibrium.	1	3[20]	Lec	Qui	3
2.10	Gibb's Helmholtz equation - Derivation and applications.	2	3[30]	BS	MCQ	3
III	**THERMODYNAMICS - III**					

3.1	Derivation of Clapeyron equation in general form – application.	2	3[30]	GP	Sem	4
3.2	Derivation of Clausius - Clapeyron equation.	1	3[10]	PT	ass	4
3.3	Thermodynamic derivation of relation between elevation of boiling point and molality, and depression of freezing point and molality of a dilute solution.	1	3[10]	PT	ass	4
3.4	Law of mass action - thermodynamic derivation of the law of mass action. Effect of external factors on chemical equilibria.	2	3[20]	Lec	MCQ	4
3.5	Le Chatelier principle. Effect of temperature on chemical equilibria Van't Hoff equation or Van't Hoff reaction isochore and Van't Hoff reaction isotherm	2	3[30]	GD	Quiz	4
3.6	Thermodynamics of Open systems: Partial molar properties - partial molar free energy (chemical potential) - Derivation of Gibb's Duhem equation.	1	3[10]	Lec	MCQ	4
3.7	Thermodynamic properties of real gases*:* Concepts of fugacity and activity (basic ideas).	1	3[20]	GD	Quiz	4
3.8	Third law of thermodynamics*:* Nernst heat theorem. Statements of third law of thermodynamics.	1	3[10]	PT	ass	4
3.9	Determination of absolute entropy of a solid and a gas.	2	3[20]	Lec	MCQ	4
3.10	Exception to third law of thermodynamics	2	3[10]	PT	ass	4
IV	**PHASE RULE - I**					
4.1	Mathematical statement. Definition of terms used. Thermodynamic derivation of phase rule.	1	4[10]	Lec	Quiz	3,6
4.2	Application of phase rule to one component systems – (i) Water system (ii)Sulphur system	1	4[30]	Lec	ass	3,6
4.3	Condensed systems: Reduced phase rule - simple eutectic systems - Ag - Pb system - desilverization of lead.	1	4[20]	GD	Quiz	3,6
4.4	Principle of freezing mixtures. – KI-Water system	1	4[10]	GD	sem	3,6
4.5	Systems forming compounds with congruent melting points, Zn - Mg system.	1	4[20]	Lec	MCQ	3,6
4.6	Binary liquid mixture: Completely miscible liquid systems.	1	4[20]	PT	sem	3,6
4.7	Ideal and non - ideal solutions - Raoult's law, Konowaloff's rule and Henry's law.	1	4[30]	Lec	Quiz	3,6

4.8	Vapour pressure - composition and boiling point - composition curves of completely miscible systems.	1	4[20]	GD	sem	3,6
4.9	Theory of fractional distillation - Benzene - Toluene system.	1	4[10]	Lec	MCQ	3,6
4.10	Azeotropic mixtures - ethanol - water, HCl - H_2O systems. Lever rule	1	4[20]	PT	sem	3,6
4.11	Partially miscible liquid systems - Phenol - H_2O, triethylamine - water, Nicotine - water systems.	2	4[10]	GD	MCQ	3,6
4.12	Completely immiscible system – theory and application of steam distillation.	1	4[20]	GD	sem	3,6
4.13	Solid - vapour equilibrium - $CuSO_4$ - H_2O system. Explanation of deliquescence and efflorescence on the basis of vapour pressure.	1	4[10]	Lec	MCQ	3,6
V	**PHASE RULE II**					
5.1	Three component systems: Partially miscible three liquid systems.	1	5[10]	Lec	sem	3,6
52	One partially miscible pair, two partially miscible pair, three partially miscible pair	1	5[20]	PT	Quiz	3,6
5.3	Application of ternary liquid diagram	1	5[10]	GD	sem	3,6
5.4	System of two solids and a liquid crystallization of pure component	1	5[20]	Lec	Quiz	3,6
5.5	The Schreinemakers wet residue method - Formation of binary compound.	2	5	GD	ass	3,6
5.6	Double salt formation - Formation of ternary compound - Formation of solid solution – partial miscibility of solid phases.	1	30]	Lec	MCQ	3,6
5.7	Distribution law: Statement of Nernst distribution law thermodynamic derivation - conditions of validity.	1	5[20]	PT	sem	3,6
5.8	Distribution law based on molecular association (benzoic acid in benzene - water system) and dissociation (acetic acid in benzene - water system).	1	5[30]	Lec	MCQ	3,6
5.9	Application of distribution law in the determination of formula of a complex (KI + $I_2 \rightarrow KI_3$). Solvent extraction - principle.	1	5[30]	Lec	ass	3,6

* Seminar & Class Tests - 15 hours

REFERENCES

1. D.N Bajpai,*Advanced Physical Chemistry*, S. Chand & Company Ltd., 1996.
2. J. Rajaram and J.C. Kuriacose*, Thermodynamics for Students of Chemistry*. Shoban Lal Nagin Chand and Co, Jalandhar, 1996.

3. B.R Puri, L.R Sharma and M.S Pathania, *Principles of Physical Chemistry* Vikas Publishing House. 2004.
4. Samuel H. Maron and F. Prutton, *Principles of Physical Chemistry,* Oxford IBH Publishing Co. Pvt. Ltd. 1965.
5. R.P. Rastogi R.R. Misra, *An Introduction to Chemical Thermodynamics*, Vikas publishing house Pvt. Ltd. 1992.
6. Rakshit, *Physical Chemistry*, Science Book Agency. 1969.
7. P.W. Atkins, *Physical Chemistry,* Third Ed. ELBS., 1987.
8. Walter J Moore *Physical Chemistry*, 5th edn., Prentice-Hall, 1999
9. Bahl B.S, Arun Bahl and Tuli G.D. ,*Essentials of Physical Chemistry,* New Delhi: Sultan Chand and sons 2012.
10. Samuel Glasstone*Thermodynamics for Chemists (* 3rd printing). East-West Edn,1974.
11. Klotz and R.M. Rosenberg*, Chemical Thermodynamics*, 4th edition, Benjamin, 1986.
12. Thomas Engel & Philip Reid, *Thermodynamics, Statistical Thermodynamics and Kinetics* by Pearson Education inc. (2007)
13. A Text Book of *PhysicalChemistry* P.K. Sharma and L.K. Sharma, Vikas Publication 2016.

23GCD2- CC-9 PROJECT

Course Objective

This course is designed to reinforce the theoretical concepts with analytical techniques. It will provide a platform for students to have a hands on experience with instruments and present a report on a research topic.

Course outcome

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

1. Design and conduct experiments to analyze and interpret results and scientifically report.
2. Develop interdisciplinary solutions to a variety of chemical problems.
3. Communicate effectively in a variety of forms
4. Extend knowledge and understanding of a variety of chemical concepts in a range of contexts.

Students will select a project work on a tittle approved by the respective project supervisor.
Students will maintain daily records and present oral reports while doing the project.All the above processes will be duly assessed by the project supervisor. They will submit the thesis at the end of the semester.

CP 5- Course Title:	**CC8- Organic Estimation & Preparation Of Organic Dyes**	Course Type: **Practical** Course Code :23GCP5
Total Hours: **30**	Hours/Week: **2**	Credits: **1**
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. T. Sumitha Celin	Dr.G.Allen Gnana Raj	Dr.T.F.Abbs Fen Reji
Assistant Professor	Associate Professor	Associate Professor
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CLO-No.	CourseLearning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Learn the basic principles involved in organic Estimation	6(12),10(8)	1,2,3,5,6,7,10	U	M,F,C
CLO-2	Develop the analytical skills required forEstimation.	6(12),10(8)	1,2,3,5,6,7,10	R	F,C
CLO-3	Prepare the organic substance	6(12),10(8)	1,2,3,5,6,7,10	R	C

I ORGANIC QUANTITATIVE ANALYSIS

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of Glucose (Using ferric alum)

II PREPARATION OF DYES

1. Methyl orange from Sulphanilic Acid
2. Methyl Red
3. Orange II
4. p-nitro phenylazo-β-naphthol
5. Congo Red
6. Malachite Green
7. Crystal Violet

III APPLIED EXPERIMENT

1.Analysis of UV-visible spectrum of any two dyes and interpretation of the spectra (demonstration only)

REFERENCES

1.. Vogel's Text Book of Practical Organic Chemistry, Person Education, Delhi 5th Ed., Reprint, 2004.

2. V. Venkateswaran, R. Veeraswamy, A.R Kulandaivelu., Basic principles of practical chemistry 2nd edition, New Delhi, Sultan Chand and Sons., 2006.

Course Title:	**CCE1- Elements Of Material Science And Nano Chemistry**	Course Type: **Theory** Course Code :23GCEA
Total Hours: **60** Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. G.R. Bella	Dr. S.Begila David	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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CLO No.	**Expected Learning Outcomes** Upon completion of this course, students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO -1	Understand the types of ionic crystals, ionic conductors and crystal defects in solids.	2(10),5(10)	1,2,7,10	U	M,F,C
CLO-2	Explain the types of magnetic materials, insulating materials and ferro electric materials.	2(10),5(10)	1,2,7,10	R	F,C
CLO	Illustrate the metallic glasses, shape memory alloys, metal alloy	2(10),5(10)	1,2,7,10	An	M,C

-3	biomaterials, ceramic biomaterials and polymer biomaterials.				
CLO-4	Discuss the types of nano materials, types of nanostructures and significance of nano scale. Know Feynman's prophecy, top-down and bottom-up methods of manufacturing.	2(10),5(10)	1,2,7,10	K	C
CLO-5	Understand the importance of Nano safety, health and environmental issues of nanotechnology. Explain some methods of synthesis of nano materials and applications of nanotechnology.	2(10),5(10)	1,2,7,10	U	M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**IONIC CONDUCTIVITY AND SOLID ELECTROLYTES**					
1.1	Ionic crystals – Types, properties.	1	1[5]	Lec	Qui	1
1.2	Alkali halide – sodium chloride, caesium chloride.	1	1[5]	Lec	Qui	1
1.3	Alkali earth fluoride – calcium fluoride.	1	1[5]	Lec	Sem	1
1.4	Simple stoichiometric oxides – sodium oxide, magnetite.	1	1[5]	TPS	Ass	1
1.5	Ionic conductors – Factors affecting ionic conductivity.	1	1[10]	Lec	Sem	1
1.6	Types of ionic conductors - halide ion conductors- Oxide ion conductors – zirconium dioxide, perovskite.	1	1[10]	Lec	Ess	1
1.7	Solid electrolytes – general characteristics of solid electrolytes and applications	1	1[10]	BS	Ass	1
1.8	Electrochemical cell – Principle, batteries, sensors and fuel cells.	1	1[10]	Lec	Qui	1
1.9	Crystal defects in solids – line and plane defects.	1	1[10]	TPS	Ass	1
1.10	Electronic properties and band theory: Metals, insulators, Semiconductors.	1	1[10]	Lec	Sem	1

1.11	Colour of inorganic solids.	1	1[10]	GD	Ass	1
1.12	Optical properties - luminescence, lasers.	1	1[10]	Lec	Qui	1
II	**MAGNETIC MATERIALS**					
2.1	Types of magnetic materials – Introduction, properties and examples of Diamagnetic, Paramagnetic and Ferromagnetic materials	1	2[20]	Lec	Qui	2
2.2	Preparation of Ferrites for microwave applications.	2	2[20]	Lec	Qui	2
2.3	Magnetic bubble memory and applications.	1	2[20]	BS	Sem	2
2.4	Insulating materials – Introduction, classification and properties.	1	2[10]	TPS	Ass	2
2.5	Examples and uses of Polymer insulating materials, Ceramic insulating materials and Ferro electric materials	3	2[20]	Lec	Qui	2
2.6	Applications of ferroelectric materials.	1	2[10]	Lec	Qui	2
III	**MODERN ENGINEERING MATERIALS**					
3.1	Metallic glasses – Introduction, Composition – binary alloy and ternary alloy glasses	2	3[10]	Lec	Sem	2
3.2	Structural, mechanical, electrical, Magnetic and chemical properties of metallic glasses	2	3[20]	GD	Ass	2
3.3	Applications and types of metallic glasses.	1	3[10]	Lec	Qui	2
3.4	Shape memory alloys – Introduction, Phases of shape memory alloys and applications	2	3]10]	Lec	Sem	2
3.5	Advantages and disadvantages of shape memory alloys.	1	3[10]	BS	Qui	2
3.6	Biomaterials – Introduction, Metals and alloys in biomaterials - examples and applications	2	3[10]	GD	Sem	2
3.7	Examples and applications of Ceramic biomaterials and Composite biomaterials	1	3[10]	Lec	Qui	2
3.8	Biopolymers - examples and applications.	1	3[20]	Lec	Qui	2
IV	**NANOCHEMISTRY-I**					
4.1	Nanoscale, Nanomaterials – definition, Significance of the nanoscale.	1	4[10]	Lec	Qui	3

4.2	Definition of nanotechnology, nanoscience and nanochemistry.	1	4[10]	Lec	Sem	3
4.3	Types of nanomaterials – quantum wells, Quantum wires, quantum dots.	1	4[20]	Lec	Qui	3
4.4	Different types of nano structures – nanoclusters, nanocrystals, Nanowires and nanotubes.	2	4[10]	Lec	Qui	3
4.5	Factors responsible for the special properties of nanomaterials.	1	4[10]	Lec	Sem	3
4.6	Feynman's prophecy. Top down and bottom up approaches in manufacturing.	2	4[10]	BS	Ass	3
4.7	Nanotechnology and health issues.	1	4[10]	GD	Qui	3
4.8	Nanotechnology and environmental issues.	1	4[10]	Lec	Sem	3
V	**NANOCHEMISTRY-II**					
5.1	Methods of synthesis of nanomaterials – Laser Ablation, Sonication, Phase – transfer methods, Sol –gel method	3	5[20]	Lec	Qui	3
5.2	Application of nanotechnology – medicine diagnostics, Drug delivery, Food, drinks, Cosmetics, Textiles, Sports / outdoor, Filtration chemical industry, Catalysis reactions, Electronics and displays	5	5[20]	Lec	Ass	3
5.3	Risks from nanoparticles and nanosafety	2	5[30]	GD	Sem	3

REFERENCES

1. Anthony R. West, Solid state chemistry and its applications, John Wiley & Sons 1989.
2. V.R Raghavan., Materials Science and Engineering, Printice Hall (India) Ltd., 2001.
3. Kenneth J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publications.
4. V.K. Ahluwalia, M. Kidwar, New Trends in Green Chemistry, II nd Edition, Anamaya Publisher, New Delhi , 2012.
5. V.K. Ahluwalia, Green Chemistry, Narosa Publishing House, 2013.

3. PHARMACEUTICAL CHEMISTRY(23GCEB)

CCE-1 Course Title:	**Pharmaceutical Chemistry**	Course Type: **Theory** Course Code :23GCEB
Total Hours: **30** Hours/Week: **2** Credits: **1**		
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.A.Yardily	Dr.R.Ragel Mabel Saroja	Dr. A. Siva,
Assistant Professor	Associate Professor	Associate Professor
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CLO.No.	**Expected Learning Outcomes** On successful completion of this course, student should be able to:	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Understand the Nomenclature, Mechanism and metabolism of Drugs	5(8),10(12)	1,2,5,6,7,10	U	F,C
CLO-2	Understand the prevention and treatment of various diseases	5(8),10(12)	1,2,5,6,7,10	U	M,C
CLO -3	Define various drugs	5(8),10(12)	1,2,5,6,7,10	R	C
CLO-4	Understand the important rules of first aid for accidents	5(8),10(12)	1,2,5,6,7,10	U	M,C
CLO-5	Determine the importance of Medicinal plants and trees	5(8),10(12)	1,2,5,6,7,10	R	F,C

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**PHARMACEUTICAL CHEMISTRY -I**					
1.1	Introduction	1	1[20]	Lec	Qui	1
1.2	Classification and Nomenclature of drugs	1	1[20]	Lec	Sem	1
1.3	Mechanism of drug action	1	1[30]	PT	Ass	1
1.4	Metabolism of drugs	1	1[30]	PT	Qui	1
1.5	Absorption of drugs-Routes of administration	1	1[30]	Lec	Qui	1
1.6	Assay of drugs	1	1[30]	Lec	Ass	1
II	**PHARMACEUTICAL CHEMISTRY -II**					
2.1	Common diseases – Introduction	2	2[10]	Lec	Mcq	1
2.2	Prevention and treatment of insect borne diseases (Malaria,Plague,Filariasis)	1	2[20]	Lec	Qui	1
2.3	Prevention and treatment of air borne diseases (Common cold,Diphtheria, Whooping Cough, Influenza,Measles,T.B)	1	2[20]	Lec	Sem	1
2.4	Prevention and treatment of water borne – diseases (Cholera,Typhoid, Dysentry)	2	2[20]	Lec	Ass	1
2.5	Definition and examples of analgesics, antipyretics, antimalarials and antibiotics	1	2[20]	PT	Ass	1
III	**FIRST AID FOR ACCIDENTS**					
3.1	Important rules for First Aid	1	3[30]	PT	Mcq	1
3.2	Cuts, abrasion and Bruises	1	3[20]	Lec	Sem	1
3.3	Bleeding, Fracture and burns	1	3[20]	Lec	Ass	1
3.4	Fainting and Poisonous bites	1	3[20]	Lec	Qui	1
3.5	A First Aid Box	1	3[30]	Lec	Sem	1
3.6	Detection of Hallucinogens and poisons – Antidotes for poisoning	2	3[30]	GD	Qui	1
3.7	Some common poisons and their antidotes	1	3[30]	PT	Sem	1
IV	**INDIAN MEDICINAL PLANTS AND TREES**					
4.1	Ocimum sanctum (Tulsi)	1	4[20]	Lec	Sem	2
4.2	Azadirachta indica (neem tree)	1	4[20]	GD	Ass	2
4.3	Mangifera indica (mango tree)	1	4[20]	Lec	Qui	2
4.4	Kizhanelli	1	4[20]	PT	Qui	2
4.5	Greens	1	4[20]	Lec	Mcq	2
4.6	Grasses		5[20]	PT	Qui	2

		1				
4.7	Adathodavasica	1	5[20]	Lec	Ass	2
4.8	Hibiscus rosasinensis	1	5[20]	Lec	Qui	2

REFERENCS:

1.Jayashree Ghosh, Pharmaceutical Chemistry, S. Chand and Company Ltd. New Delhi, 2012.

Course Title:	**CCE2- Instrumental Method Of Analysis**	Course Type: **Theory** Course Code :23GCEC
Total Hours: **60** Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. G.R. Bella	Dr. S.Begila David	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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CO No.	**Expected Learning Outcomes** Upon completion of this course, students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO -1	Analyze different substances using different chromatographic methods	5(5), 10(15)	1,2,5,6,7,10	U	F,C
CLO-2	Understand the qualitative and quantitative analysis using thermo analytical and electroanalytical methods such as TGA, DTA, coulometry, polarography and amperometric methods	5(5), 10(15)	1,2,5,6,7,10	U	M,C
CLO -3	Explain colorimetric, spectrophotometry, fluorimetry, nephelometry, turbidimetry methods	5(5), 10(15)	1,2,5,6,7,10	R	C
CLO-4	Analyze different compounds using UV, IR, Raman spectroscopy	5(5), 10(15)	1,2,5,6,7,10	U	M,C
CLO-5	Understand the principal, instrumentation and applications of NMR spectroscopy and AAS	5(5), 10(15)	1,2,5,6,7,10	R	F,C

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**CHROMATOGRAPHY**					
1.1	Chromatography – Introduction and classification. Principles of adsorption and partition chromatography	1	1[10]	Lec	Qui	1,2
1.2	Column chromatography - Preparation of column, elution, recovery of substance and applications	1	1[20]	Lec	Qui	1,2
1.3	Paper chromatography – Principle, experimental methods and applications	1	1[20]	Lec	Sem	1,2
1.4	Types of paper chromatography – ascending, descending Radial chromatography, R_f value, Factors affecting R_f values	1	1[10]	TPS	Ass	1,2
1.5	Thin layer chromatography – Principle, experimental methods and applications	1	1[20]	Lec	Sem	1,2
1.6	Ion exchange chromatography – principle, experimental techniques, types of resins, action of resins Application - Separation of zinc and magnesium, chloride and bromide.	1	1[20]	Lec	Ess	1,2
II	**THERMOANALYTICAL AND ELECTROANALYTICAL METHODS**					
2.1	Thermogravimetric analysis (TGA) – Principle, instrumentation - Derivative Thermogravimetric Analysis, Factors affecting TGA, applications	1	2[20]	Lec	Qui	1,2
2.2	Differential Thermal Analysis – Principle and applications - Simultaneous DTA, TGA curves	1	2[20]	Lec	Qui	1,2
2.3	Thermometric titrations - Principle and applications Electrogravimetric analysis - theory, instrumentation, applications	1	2[10]	BS	Sem	1,2
2.4	Coulometric analysis, Coulometric titrations – applications, Potentiostatic	1	2[20]	Lec	Qui	1,2

	coulometry – applications					
2.5	Polarograpy – principle, experimental assembly Dropping mercury electrode – advantages, evaluation of Polarographic curves, applications to qualitative and quantitative analysis, Concept of Pulse polarography.	1	2[20]	Lec	Ass	1,2
2.6	Amperometric titrations - principle and applications.	1	2[10]	Lec	Sem	1,2
III	**COLORIMETRIC AND SPECTROPHOTOMETRIC ANALYSIS**					
3.1	Colorimetry – Principle, types and instrumentation of Visible colorimetry	1	3[20]	Lec	Qui	3,4
3.2	Photocolorimetry – instrumentation, Types – Single beam photocolorimetry and Double beam photocolorimetry.	1	3[10]	Lec	Sem	3,4
3.3	Spectrophotometry - instrumentation.	1	3[20]	BS	Ass	3,4
3.4	Fluorimetry – principle, instrumentation, applications	1	3[20]	Lec	Qui	3,4
3.5	Flame photometry – principle, instrumention, applications	1	3[20]	Lec	Sem	3,4
3.6	Nephelometry and Turbidimetry - theory, instrumentation and applications	1	3[10]	Lec	Qui	3,4
IV	**SPECTROSCOPY - I**					
4.1	U.V Spectroscopy – theory, Absorption laws – Lambert's law and Beer's law, Types of electronic transitions, Chromophores, auxochromes, solvent effect.	1	4[20]	Lec	Qui	1,2
4.2	Instrumentation and Applications of U.V spectroscopy	1	4[20]	Lec	Sem	1,2
4.3	Woodward - Fieser rule for calculating λ_{max} for dienes	1	4[10]	Lec	Sem	1,2
4.4	IR Spectroscopy - principle and instrumentation, Sampling Techniques, vibrational frequencies, Factors affecting IR spectra - Fingerprint region.	1	4[20]	TP S	Ass	1,2
4.5	Raman spectroscopy - Rayleigh and Raman scattering - stokes and anti-stokes lines, instrumentation	1	4[20]	TP S	Ass	1,2
4.6	Raman spectra of CO_2 and H_2O - Advantages and limitations of Raman spectroscopy.	1	4[10]	BS	Sem	1,2

V	**SPECTROSCOPY II**					
5.1	NMR spectroscopy – Principle and instrumentation Relaxation effect, Chemical shift, Factors influencing chemical shift	2	5[20]	Lec	Sem	1,2
5.2	Spin-spin coupling and coupling constant. NMR spectra of simple organic molecules (1-propanol, 1,1,2- tribromoethane, ethyl acetate, benzaldehyde)	1	5[20]	Lec	Qui	1,2
5.3	Applications of NMR spectroscopy.	1	5[20]	BS	Qui	1,2
5.4	Atomic absorption spectroscopy – Principle and instrumentation, Spectral and chemical interferences	1	5[20]	Lec	Sem	1,2
5.5	Applications (Cr in steel, Ca in blood serum).	1	5[20]	TP S	Ass	1,2

REFERENCES

1. Douglas A. Skoog, F. James Holler, Timothy A. Nieman., Principle of Instrumental Analysis, 5thEdn., 2004.
2. H.H. Willard, L.L. Merrit , J.A. Dean and F.A. Settle, Instrumental Methods of Analysis, CBS Publishers, 1986.
3. D.A. Skoog, D.M. West, F.J. Holler, Fundamental of Analytical Chemistry, Harcourt Asia, 2001.
4. G.D. Christian, Analytical Chemistry WSE, Wiley, 2003.

CCE- 2 Course Title:	**TEXTILE CHEMISTRY**	Course Type: **Theory** Course Code :23GCED
Total Hours:**60** Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO -1	Understand the classification, structure, properties of various textile fibres	5(13),10(7)	1,2,5,6,7,10	U	F,C
CLO-2	Know dyes which are used in textile industries	5(13),10(7)	1,2,5,6,7,10	R	M,C
CLO -3	Gain knowledge to understand the interaction between dye and textile fibres	5(13),10(7)	1,2,5,6,7,10	Ap	F,C
CLO-4	Learn about types of fibres and dyeing processes and after treatment techniques	5(13),10(7)	1,2,5,6,7,10	U	M,C
CLO-5	Learn various treatment techniques of dyes	5(13),10(7)	1,2,5,6,7,10	Ap	M

Mod	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**STRUCTURE OF FIBRES**					
1.1	Introduction- General properties of textile fibres	1	1[10]	Lec	Qui	1
1.2	Classification of fibres(natural, synthetic, semi synthetic fibres)	1	1[20]	Lec	MCQ	1
1.3	Difference between cellulose and synthetic fibres	1	1[20]	TP S	Sem	1
1.4	Structure of synthetic fibres: cotton, wool, silk, nylon, polyester, polyacrylamide	1	1[20]	Lec	Ess	1

1.5	Hydrophilic and hydrophobic fibres	1	1[10]	BS	MCQ	1
1.6	Properties and uses of cellulose fibre(cotton), protein fibre(silk)and synthetic fibres(nylon and polyester)	1	1[20]	GD	Ass	1
II	**MANUFACTURE AND PROCESSING OF FIBRES**					
2.1	Semi synthetic fibres: Rayon- manufacture of viscose rayon,	1	2[20]	Lec	Qui	1
2.2	Manufacture of cuprammonium rayon and acetate poly acryl amide	1	2[20]	Lec	Qui	1
2.3	Synthetic fibres: Preparation, properties and uses of Nylon 6, Nylon 66, Poly ester and poly acryl amide	2	2[20]	TP S	Sem	1
2.4	Preparation, properties and uses of, Poly ester and poly acryl amide	1	2[20]	Lec	Qui	1
2.5	Mercerization- Manufacture of mercerized cotton and their applications	1	2[20]	Lec	MCQ	1
III	**DYES**					
3.1	Dyes: Requisite of a Dye-Theories of colour-Witt and Modern theory	2	3[20]	Lec	Sem	2
3.2	Classification of dyes with examples-according to application and structure	1	3[30]	BS	Qui	2
3.3	Dye- Fibre interactions: Ionic, Covalent, Vander waals, H- bonding interactions	2	3[30]	GD	MCQ	2
3.4	Dye assisting agents: NaOH, Na_2CO_3, aluminium sulphate, chromic sulphate	1	3[20]	Lec	Ass	2
IV	**PRINCIPLES OF DYEING PROCESSES**					
4.1	General concepts of dyeing processes: Affinity of a dye, conditions for dyeing	2	4[20]	Lec	MCQ	2
4.2	Selection of dye stuff	1	4[20]	Lec	Qui	2
4.3	Dyeing methods – Direct dyeing, Top	2	4[30]	TP	Ass	2

	dyeing,			S		
4.4	Stock dyeing, Piece dyeing, garment dyeing and silk dyeing	1	4[30]	Lec	Sem	2
V	**TREATMENT PROCESSES**					
5.1	After treatment processes: Stripping of dyes, low temperature dyeing	1	5[20]	Lec	Qui	3
5.2	Sizing: sizing agents and applications	1	5[20]	GD	Ass	3
5.3	Bleaching: Types of bleaching, Reductive bleaching	2	5[20]	TP S	Sem	3
5.4	Oxidative bleaching agents	1	5[20]	Lec	Qui	3
5.5	Brightening: Optical brightening agents- Types and uses	1	5[20]	Lec	MCQ	3

SEC- 3 Course Title:	**Entrepreneurship Skills in Chemistry**	Course Type: **Theory** Course Code :23GCS4
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.R.D.Femitha,	Dr.A.Jeena Pearl,	Dr.T.F.Abbs Fen Reji
Assistant Professor	Assistant Professor	Associate Professor
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CLO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	To understand food adulteration	5(10),6(10)	1,3,2,7	An	M,F,C
CLO-2	Detection of adulterants in food items	5(10),6(10)	1,3,2,7	U	F,C

Course Outline	**UNIT-I** **Food Chemistry** Food adulteration-contamination of food items with claystones,water and toxic chemicals-Common adulterants. Food additives, Natural and synthetic anti-oxidants, glazing agents (hazardous effect), food colourants, Preservatives, leavening agents,Baking powder and baking soda, yeast, MSG, vinegar. **Dyes** Classification–Natural, synthetic dyes and their characteristics–basic methods and principles of dyeing
	UNIT-II **Hands on Experience (Students can choose any four)** Detection of adulterants in food items like coffee, tea, pepper, chilli powder, turmeric powder, butter, ghee, milk, honey etc., by simple techniques. Preparation of Jam, squash and Jelly, Gulkand, cottage cheese. Preparation of products like candles, soap, detergents, cleaning powder, shampoos, pain balm, toothpaste/powder and disinfectants in small scale. Extraction of oils from spices and flowers. Testing of water samples using testing kit. Dyeing–cotton fabrics with natural and synthetic dyes Printing–tie and dye, batik.
Skills acquired From this course	Entrepreneurial skills.

Recommended Text	1. George S & Muralidharan V,(2007)Fibre to Finished Fabric–A Simple Approach, Publication Division, University of Madras, Chennai. 2. Appaswamy GP, A Handbook on Printing and Dyeing of Textiles.
Reference Books	ShyamJha, Rapid detection of food adulterants and contaminants (Theory and Practice), Elsevier,eBook ISBN9087128004289, 1st Edition,2015
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Course Title: Value Added Course III **Indian Knowledge System and Human Rights**	Course Type: Theory
Total Hours: 30 Hours/Week: 2 Credit: 1	Course Code: 23SE31

Pass-Out Policy: Minimum Contact Hours: 18
Total Score %:100 Internal: 40 External: 60
Minimum Pass %: 40[No Minimum for Internal]

Course Creator	**Expert 1**	**Expert II**
Dr. G. Anish S. Georshia	Dr. Sidney Shirly	Dr. Santhosha Kumari
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CLO- No.	**Course Learning Outcomes** *Upon completion of this course, students will be able to:*	**% of PLO Mapping with CLO**	**CLO & PLO Mapped with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	understand the diverse cultural heritage of India.	3(10), 8(10)	1, 5, 8, 9	U	F
CLO-2	analyze the historical evolution of Indian society and the conservation of traditional knowledge in modern India.	6(8), 8(12)	2, 5, 9	An	P
CLO-3	understand basic concepts and principles in Indian astrology and astronomy.	3(13), 8(7)	1, 5, 8, 9	C	C

CLO-4	apply principles of Ayurveda, Siddha and Unani to achieve a balanced lifestyle.	3(5), 7(4), 8(4), 9(7)	1, 2, 4, 5, 8, 9	Ap	P
CLO-5	analyze the duties and constitutional responsibilities of Indian citizens and human rights in India.	3(5), 8(5), 10(10)	1, 2, 5, 9, 10	E	M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**Introduction**					
1.1	Overview of India's diversity, languages, religions, and regional variations	2	1[33]	AW	CA	2
1.2	Historical background and evolution of Indian society	2	1[33]	Ess	ST	2
1.3	Conservation and Revival of Traditional Knowledge in Modern India	2	1[34]	Rev	OT	2
II	**Indian Culture**					
2.1	Traditional Arts and Crafts of India	2	2[33]	TPS	OBT	2
2.2	Festivals and Celebrations in Indian Culture	1	2[17]	PT	HoA	2
2.3	Classical Dance and Music Forms of India	1	2[17]	GT	OBT	1
2.4	Culinary Traditions and Indian fashion	2	2[33]	CW	HoA	1
III	**Indian Astrology and Astronomy**					

3.1	Basic Concepts and Principles in Indian Astrology	2	3[33]	GD	SA	1
3.2	Zodiac Signs, Influence of Planetary Positions, Birth Charts and Horoscopes	1	3[17]	KWL	Qui	1
3.3	Applications and Relevance of Indian Astronomy	1	3[17]	Soc	ST	2
3.4	Ancient Indian Mathematics and Development of number systems	2	3[33]	BS	CT	2
IV	**Indian Ayurveda, Siddha and Unani**					
4.1	Introduction to Ayurveda: Principles and Doshas	2	4[33]	Rev	OBT	2
4.2	Key Concepts of Ayurvedic Medicine	2	4[33]	CW	MCQ	2
4.3	Importance of Siddha and Unani	2	4[34]	Rep	Qui	2
V	**Human Rights in India**					
5.1	Human Rights: Definition and Evolution	1	5[17]	Lec	Ess	2
5.2	Fundamental Human Rights and Constitutional Values in the Indian Constitution	1	5[17]	KWL	HoA	2
5.3	Protection of Civil Liberties and Freedoms – Safeguarding Social and Economic Rights	2	5[33]	Sem	OT	2
5.4	Women's and Children's Rights and Rights of Minorities	2	5[33]	GT	HrA	2

Reference Books:

1. Bhatia, Tej K. *Indian Culture and Heritage*. New Delhi, Prabhat Prakashan, 2018.

2. Thapar, Romila. *The Penguin History of Early India: From the Origins to AD 1300*. Penguin Books, 2003.

3. Choudhry, G.K. *How to Judge a Horoscope: Volume II*. New Delhi, Sagar Publications, 2002.

4. Sarma, P.S. *Astronomy in India: A Historical Perspective*. Springer, 2014.

5. Pingree, David. *Jyotihśāstra: Astral and Mathematical Literature*. Otto Harrassowitz Verlag, 1981.

6. Raghavan, Sriram. *Music and Dance in Indian Art*. New Delhi, National Book Trust, 2009.

7.. Frawley, David, and Vasant Lad. *The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine*. Lotus Press, 2001.

8. Gupta, L. C. *Fundamentals of Ayurvedic Medicine*. Chaukhamba Sanskrit Pratishthan, 2002.

9. Sahni, Julie. *Classic Indian Cooking*. William Morrow Cookbooks, 1980.

10. Harle, J.C. *The Art and Architecture of the Indian Subcontinent*. Yale University Press, 1994.

11. Craven, Roy C. *Indian Art: A Concise History*. Thames & Hudson, 2010.

12. Anand, Meenakshi, and A. G. Noorani. *Human Rights in India: Historical, Social, and Political Perspectives*. Oxford University Press, 2017.

13. Kapur, Ratna. *Gender, Alterity and Human Rights: Freedom in a Fishbowl*. Routledge, 2017.

NME- 2 Course Title:	**Chemistry in Everyday Life**	Course Type: **Theory** Course Code :23GCN2
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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CLO No.	Expected Learning Outcomes Upon completion of this course, students will be able to	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Survey of chemicals used in everyday life	5(10),6(10)	1,3,2,7	An	M,F,C
CLO-2	Identify the role played by plastics, building materials in everyday life.	5(10),6(10)	1,3,2,7	U	F,C
CLO-3	Design the formulation of cosmetics and perfumes in everyday life.	5(10),6(10)	1,3,2,7	R	M,C
CLO-4	Know about fertilizers and fuels	5(10),6(10)	1,3,2,7	R	M,C
CLO-5	Understand the importance of pharmaceutical drugs, pigments and dyes	5(10),6(10)	1,3,2,7	R	M,C

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**AIR &WATER**					
1.1	General Survey of chemicals used in everyday life.	1	1[20]	Lec	Qui	2
1.2	Air-components and their importance: photosynthetic reaction, air pollution, green house effect and their impact on our life style.	1	1[30]	Lec	Sem	2
1.3	Water- sources of water, qualities of potable water, soft and hard water.	1	1[30]	PT	Ass	2
1.4	Methods of removal of hardness.	1	1[30]	Lec	Qui	2
1.5	Water pollution.	1	1[30]	Lec	Qui	2
11	**BUILDNG MATERIALS & PLASTICS**					
2.1	Building materials-cement, ceramics, glass and refractories- definition, composition and applications only.	3	2[30]	Lec	Mcq	1
2.2	Plastics-polythene, PVC, Bakelite, polyesters – preparation, structure and uses only.	2	2[30]	Lec	Qui	1
111	**FOOD &COSMETICS**					
3.1	Food and Nutrition-Carbohydrates, Proteins, Fats-definition and their importance as food constituents-balanced diet-calorie-minerals and vitamins (sources and their physiological importance).	5	3[30]	PT	Mcq	1

3.2	Cosmetics- Tooth pastes, face powder, soaps and detergents, shampoos, nail polish.	2	3[20]	Lec	Sem	1
3.3	Perfumes-general formulation and preparations.	2	3[20]	Lec	Ass	1
3.4	Possible hazards of cosmetic use.	1	3[20]	Lec	Qui	1
IV	**EXPLOSIVES AND FUELS**					
4.1	Chemicals in food production-fertilizers-need, natural sources: Urea, NPK fertilizers and super phosphate.	2	4[30]	Lec	Sem	3
4.2	Fuel- classification-solid, liquid and gaseous.	2	4[30]	GD	Ass	3
4.3	Nuclear fuel-examples and uses.	1	4[30]	Lec	Qui	3
V	**PHARMACEUTICAL DRUGS & EXPLOSIVES**					
5.1	Pharmaceutical drugs-analgesics.	1	5[20]	Lec	Sem	4
5.2	Antipyretics- paracetamol and aspirin.	1	5[20]	Lec	Ass	4
5.3	Colour chemicals- pigments and dyes-examples and applications.	1	5[30]	Lec	Qui	4
5.4	Explosives- classification and examples.	2	5[30]	GD	Ass	4

REFERENCES:

1. W.A. Poucher Perfumes, Cosmetics and Soaps (Vol.3), 2011.
2. James Girard, Principles of Environmental Chemistry, Jones and Bartlett Publishers, 2011
3. Jayashree Ghosh, Fundamental concepts of Applied chemistry, S. Chand & Co. Publishers, 2012.
4. Thankamma Jacob, Text Books of applied chemistry for Home Science and allied Sciences, Macmillan.

SEMESTER-VI

Course Title:	**CC10 -Inorganic Chemistry II**	Course Type: **Theory** Course Code :23GC61
Total Hours: **90** Credits: **5**	Hours/Week: **6**	
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**

Course Creator:	**Expert 1:**	**Expert 2:**
Dr. S. Begila David	Dr.A.Yardily	Dr.T.F.Abbs Fen Reji
Associate Professor	Assistant Professor	Associate Professor
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begilarobin@gmail.com	ayardily@gmail.com	abbsfen@gmail.com
Mobile -9487785342	Mobile: 9487113332	Mobile - 9488884898

CLO-No.	CourseLearning Outcomes (CLO) *Upon completion of this course, students will be able to*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Explain the nomenclature and properties of coordination compounds	2(10),7(10)	1,2,5,7	R	F
CLO-2	Discuss the modern theories of coordination compounds	2(10),7(10)	1,2,5,7	U	C
CLO-3	Understand the stability and geometry of coordination compounds	2(10),7(10)	1,2,5,7	Ap	F
CLO-4	Demonstrate the nature of bonding in metal carbonyls and metal complexes as therapeutic agents	2(10),7(10)	1,2,5,7	An	C
CLO-5	Understand the inorganic chemistry of biological systems.	2(10),7(10)	1,2,5,7	E	C

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**UNIT I - COORDINATION COMPOUNDS - I**					
1.1	Double salts and coordination compounds. Definition and terminology.	2	1[10]	Lec	Ass	1,4, 9
1.2	Nomenclature of coordination compounds.	1	2[20]	Lec	Qui	1,4, 9
1.3	Effective atomic number.	1	1[20]	Lec	Ass	1,4, 9
1.4	Sidwick theory	2	1[10]	TP S	Ass	1,4, 9
1.5	Werner's coordination theory.	2	1[20]	Lec	Qui	4,9
1.6	Recent methods of studying complexation. (Conductivity measurement, dipole moment measurement, electronic spectra and X-ray diffraction).	2	1[20]	BS	Sem	4,9
II	**UNIT-II: COORDINATION COMPOUNDS - 1I**					
2.1	Modern theories of coordination compounds – Valence Bond Theory (VBT). Limitations of	2	2[20]	Lec	Ass	2,4

	VB Theory.					
2.2	Crystal field Theory – shapes of d orbitals, crystal field splitting of d- orbitals – crystal field splitting in octahedral complexes.	2	2[20]	Lec	Sem	2,4
2.3	Crystal field stabilization energy, crystal field splitting in square planer complexes.	2	2[10]	GD	Ass	2,4
2.4	John Teller effect.	1	2[I0]	GD	Ass	2,4
2.5	Ligand field theory.	2	2[20]	BS	Sem	2,4
2.6	Explanation for magnetic properties, geometry and color of the coordination compounds on the basis of above theories.	2	2[20]	Lec	Ass	1,4
III	**UNIT-III: COORDINATION COMPOUNDS - III**					
3.1	Isomerism in coordination compounds.	2	3[20]	Lec	Ass	2,4
3.2	Structural isomerism, Stereo isomerism.	2	3[20]	Lec	Sem	2,4
3.3	Geometrical and optical isomerism in 4 and 6 coordination compounds.	2	3[20]	GD	Ass	2,4
3.4	Stability of complexes- thermodynamic stability -factors influencing the stability - Chelate effect.	3	3[10]	Lec	Ass	2-6
3.5	Kinetic stability - inert and labile complexes. Substitution reactions in complexes.	2	3[10]	BS	Ass	2,4
3.6	Stabilization of unusual valence states by complexation.	2	3[20]	Lec	Sem	2-6
IV	**UNIT-IV: COORDINATION COMPOUNDS - IV**					
4.1	Metal carbonyls - mono, binuclear.	2	4[10]	Lec	Qui	2,4
4.2	Polynuclear carbonyls of Ni, Cr, Fe, Co and Mn and their structure.	2	4[20]	Lec	Ass	2,4
4.3	Nature of M-L bond in metal carbonyls.	1	4[20]	BS	Ass	2,4
4.4	Applications of complexes in analytical chemistry (qualitative, volumetric and gravimetric analysis).	2	4[20]	Lec	Sem	2,4
4.5	Trans effect – Synthetic application.	2	4[20]	Lec	Ass	9,10
4.6	Metal complexes of Cu and Pt as therapeutic agents.	2	4[10]	Lec	Ass	9,10
V	**UNIT-V: INORGANIC CHEMISTRY OF BIOLOGICAL SYSTEMS**					
5.1	Function and toxicity of the following elements in biological systems	2	5[10]	Lec	Sem	2,5
5.2	Transition metals – Fe Cu, Mo, W, V and Cr.	1	5[10]	Lec	Sem	2,5
5.3	Nonmetals - boron, silicon, bromine, fluorine, iodine and selenium. Metallo – porphyrins.	1	5[10]	Lec	Sem	7,9
5.4	Bio-inorganic Chemistry of Iron – haemoglobin, myoglobin.	2	5[20]	Lec	Sem	7,9
5.5	Chlorophyll and Photosynthesis.	2	5[20]	Lec	Ass	7,9
5.6	Vitamin B12, – Na+/K+ pump.	2	5[20]	Lec	Ass	7,9
5.7	Metalloproteins and metalloenzymes	1	5[10]	Lec	Sem	7,9

REFERENCES

1. F.A. Cotton C.A. Murillo M. Bochmann and G. Wilkinson, Advanced Inorganic Chemistry, 6thEdn., John Wiley and Sons Inc. 1988.

2. F. Basalo and R. Johnson, Coordination Chemistry, Benjamin Ink. 1964.

3. A.I. Vogel, Text Book of Quantitative Inorganic Analysis, Orient Longmann 2004.

4. B.R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Vallabh Publications, 2004

5. Bertni, H.B. Gray, S.J. Lippard, J.S. Valentine, Bioinorganic Chemistry, Viva Books Private Ltd., 1998.

6. R. Gopalan, V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House, Pvt. Ltd, 2007.

7. R.D. Madan, Modern Inorganic Chemistry, S. Chand & Company Pvt. Ltd, 2003.

8. Wahid-U-Malik, G.D. Tuli, R.D. Madan, Selected Topics in Inorganic Chemistry, S. Chand and Company Pvt. Ltd, 2001

9. K. F. Purcell and J. C. Kotz, Inorganic Chemistry; W.B. Saunders company: Philadelphia, 1977.

10. James E. Huheey, Ellen A. Keiter and Rich and L. Keiter, Inorganic Chemistry: Principles of structure and Reactivity, 4th Ed., Harper Collins college publishers, 1993.

CC 11 Course Title:	PHYSICAL CHEMISTRY-II	Course Type: **Theory** Course Code :23GC62
Total Hours: **90** Credits: **5**	Hours/Week: **6**	
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	Course Learning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Derive the rate laws and rate constants and understand the theories of unimolecular and bimolecular reaction.	2(8),5(7),7(5)	1,2,5,7,10	R	M,C
CLO-2	Know the laws of photochemistry and photo physical processes	2(8),5(7),7(5)	1,2,5,7,10	Ap	C
CLO-3	Apply the concept of group theory to study the symmetry of molecules and point groups.	2(8),5(7),7(5)	1,2,5,7,10	Ap	M,C
CLO-4	Understand the application of conductance and emf measurements, Kohlrausch's law and its application.	2(8),5(7),7(5)	1,2,5,7,10	U	C
CLO-5	Have knowledge about electrochemical cells, thermodynamics and EMF	2(8),5(7),7(5)	1,2,5,7,10	U	C

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**CHEMICAL KINETICS**					
1.1	Expression for rate of reaction, rate constant.	1	1[10]	lec	Pro	1,2,3
1.2	Order and molecularity of a reaction.	1	1[10]	lec	MCQ	1,2,3
1.3	Differential and integral forms of rate expressions for first, second and zero order reactions (derivation required), examples.	1	1[20]	GD	Ass	1,2,3
1.4	Time for half change of first and second order reactions.	1	1[20]	lec	Qui	1,2,3
1.5	Experimental methods of determining order of reactions.	1	1[30]	PT	Sem	1,2,3
1.6	Pseudo unimolecular reactions- examples.	1	1[10]	GD	Ess	1,2,3
1.7	Experimental determination of rate constants - inversion of cane sugar and alkaline hydrolysis of esters.	1	1[20]	lec	Ass	1,2,3
1.8	Effect of temperature on reaction rate -	1	1[10]	PT	Qu	1,2,

	Arrhenius equation.				iz	3
1.9	Activation energy and its significance.	1	1[20]	GD	sem	1,2,3
1.10	Collision theory and derivation of rate constants of a bimolecular reaction, limitations of collision theory.	2	1[30]	lec	MCQ	1,2,3
1.11	Unimolecular reactions and Lindemann's theory, Absolute reaction rate theory (ARRT) - elementary treatment.	2	1[30]	lec	ass	1,2,3
1.12	Significance of entropy and free energy of activation of collision and ARRT.	1	1[20]	lec	Qui	1,2,3
II	**PHOTOCHEMISTRY**					
2.1	Comparison between photochemical and thermal reactions.	2	2[10]	lec	Ess	1,3,4
2.2	Beer - Lambert's law, Stark-Einstein's law.	1	2[20]	GD	Ass	1,3,4
2.3	Primary and secondary processes.	2	2[10]	PT	sem	1,3,4
2.4	Quantum yield - high and low quantum yields, experimental determination of quantum yield.	2	2[20]	GD	Qui	1,3,4
2.5	Flash photolysis	1	2[10]	BS	Sem	1,3,4
2.6	Chemical actinometer.	1	2[20]	lec	Ess	1,3,4
2.7	Kinetics of decomposition of HI, combination of $H_2$and Cl_2 (quantitative treatment).	2	2[30]	GD	Ass	1,3,4
2.8	Photochemical equilibrium - Jablonsky diagrams, fluorescence, phosphorescence, thermoluminescence, chemiluminescence and bio luminescence.	3	2[30]	lec	Pro	1,3,4
2.9	Photosensitization – elementary ideas.	1	2[10]	PT	MCQ	1,3,4
III	**MOLECULAR SYMMETRY AND GROUP THEORY**					
3.1	Symmetry elements and symmetry operations.	1	3[10]	lec	Qui	5
3.2	Identity (E) – definition and operation generated by E.	1	3[20]	GD	Sem	5
3.3	Proper rotation axis (Cn) – definition and examples of molecules containing C_2, C_3, C_4, C_5 and C_6 axis, operations generated by Cn and their number.	2	3[30]	PT	Ess	1,5
3.4	Mirror plane (σ) – definition, classification as vertical (σv), horizontal (σh) and dihedral (σd), operations generated by σ's.	2	3[30]	lec	Ass	1,5
3.5	Inversion centre (i) – definition, examples of	1	3[20]	BS	As	1,5

	molecules containing inversion centre.				s	
3.6	Improper axis of rotation (Sn)- definition, examples of molecules containing S_2, and S_3.	1	3[20]	PT	MCQ	1,5
3.7	The symmetry operations possible in H_2O molecule.	1	3[10]	GD	ass	1,5
3.8	Group postulates and types of groups- Abelian, non- Abelian and cyclic groups.	2	3[20]	lec	Qui	1,5
3.9	Illustration of the group postulates using the symmetry operations of H_2O molecule.	2	3[30]	BS	Sem	1,5
3.10	Multiplication table- construction of table - H_2O and ammonia molecules. Similarity transformations and class of a group. Calculation of number of classes in H_2O and ammonia molecule	2	3[20]	PT	Ess	1,5
IV	**ELECTROCHEMISTRY I**					
4.1	Ohm's law, conductance, specific conductance, equivalent conductance,	1	4[10]	lec	Quiz	6-9
4.2	Relation between specific conductance and equivalent conductance, molar conductance.	1	4[10]	GD	Ass	6-9
4.3	Conductivity cell, cell constant. Determination of electrical conductance.	1	4[20]	GD	Qui	6-9
4.4	Variation of equivalent conductance with dilution.	1	4[20]	lec	Sem	6-9
4.5	Strong and weak electrolytes. Ionic mobility and its determination. Migration of ions.	1	4[10]	BS	Ess	6-9
4.6	An elementary treatment of Debye-Huckel theory of strong electrolytes. Debye – Huckel Onsagar equation (derivation not required).	1	4[30]	lec	Ass	6-9
4.7	Transport number, determination of transport number by Hittorf' s and moving boundary methods, abnormal transport numbers.	2	4[30]	PT	Quiz	6-9
4.8	Kohlrausch' s law and its applications.	1	4[20]	lec	ass	6-9
4.9	Application of conductance measurements.	1	4[20]	BS	sem	6-9
4.10	Determination of degree of dissociation of weak electrolytes,	1	4[10]	lec	ass	6-9
4.11	Determination of solubility and solubility products of sparingly soluble salts and conductometric titrations.	1	4[20]	BS	MCQ	6-9
4.12	Ostwald's dilution law- determination of dissociation constant; ionic product of water, pH value.	1	4[20]	lec	sem	6-9
4.13	Relation between solubility and solubility product. Application of solubility product principle and common ion effect in	1	4[30]	GD	ass	6-9

	analytical and industrial processes.					
4.14	Buffer solution – Henderson Hasselbalch Equation.	1	4[30]	BS	Quiz	6-9
V	**ELECTROCHEMISTRY II**					
5.1	Electrochemical cells. The Galvanic cells, reversible and irreversible cells.	1	5[10]	lec	ass	6-9
5.2	Electromotive force and its measurement.	1	5[20]	PT	Quiz	6-9
5.3	Standard Cells-Weston standard cell. Cell reaction and EMF. Cell representation and conventions.	1	5[10]	BS	sem	6-9
5.4	Single electrode potential. Reference electrodes - standard hydrogen gas electrode (SHE) and calomel electrode.	1	5[20]	PT	ass	6-9
5.5	Determination of single electrode potential.	1	5[20]	GD	Quiz	6-9
5.6	Thermodynamics and EMF: calculation of ΔG, ΔH, ΔS and equilibrium constant of cell reaction.	1	5[30]	lec	sem	6-9
5.7	Nernst equation. Some common types of reversible electrodes (metal – metal ion, amalgam, gas, metal – insoluble salt and oxidation – reduction electrodes – representation, electrode reaction and expression for electrode potential in each case)	2	5[30]	lec	ass	6-9
5.8	Electrochemical cells - chemical cells and concentration cells.	1	5[30]	GD	sem	6-9
5.9	Chemical cells with and without transference.	1	5[20]	BS	Quiz	6-9
5.10	Cell reaction and expression for EMF.	1	5[10]	GD	sem	6-9
5.11	Liquid junction potential. Expression for liquid junction potential.	1	5[20]	lec	ass	6-9
5.12	Principle of salt bridge. Concentration cells with and without transference. - Cell reaction and expression for EMF.	1	5[30]	PT	MCQ	6-9
5.13	Application of EMF measurements - solubility and solubility product of a sparingly soluble salt.	1	5[20]	lec	sem	6-9
5.14	Determination of pH using hydrogen, glass, quinhydrone electrodes, potentiometric titrations.	1	5[30]	BS	ass	6-9

REFERENCES

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2. K.J. Laidler, Chemical Kinetics, Tata McGraw Hill, 1983.
3. D.N. Bajpai, Advanced physical chemistry, S. Chand & company Ltd, 1998.
4. K.K. Rohatgi Mukherjee, Fundamentals of Photochemistry, New Age International Publisher 1997.
5. K.V. Raman, Group theory and its application to Chemistry, Tata Mc Graw – Hill Publishing Company., 2007
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7. D.R. Crow, Principles and Applications of Electrochemistry, Chapman Hall,London, 1979
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11. M.S. Gopinathan and V. Ramakrishnan, Group Theory in Chemistry, Vishal publication, Jalandhar, 1998.
12. R.S. Thakur, Role of symmetry, Groups and Matrices in chemistry, Atlantic publisher and Distributors (p) Ltd. 2007.

Course Title:	**CP6- Gravimetric Analysis & Inorganic Preparations**	Course Type: **Practical** Course Code :23GCP6
Total Hours: **30**	Hours/Week: **2**	Credits: **1**
Pass-Out Policy: Minimum Contact Hours-18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
Dr.A.Malar Retna	Dr. S.Begila David	Dr.T.F.Abbs Fen Reji
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CLO-No.	CourseLearning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Learn the basic principles involved in Gravimetric analysis	6(15),10(5)	1,2,3,5,6,7,10	U	M,F,C
CLO-2	Develop the analytical skills required forestimation.	6(15),10(5)	1,2,3,5,6,7,10	R	F,C
CLO-3	Prepare the inorganic substance	6(15),10(5)	1,2,3,5,6,7,10	An	M,C

I. GRAVIMETRIC ANALYSIS

1. Estimation of Lead as Lead chromate.
2. Estimation of Barium as Barium chromate.
3. Estimation of Calcium as Calcium oxalate monohydrate.
4. Estimation of Copper as Cuprous thiocyanate.
5. Estimation of Zinc as Zinc oxinate.
6. Estimation of Nickel as Nickel dimethyl glyoxime.

II INORGANIC PREPARATION

1. Preparation of Prussian blue
2. Preparation of tetraaminecopper(II)Sulphate tetrahydrate
3. Preparation of tris-(thiourea)-copper(II) sulphate dihydrate
4. Preparation of potassium trioxalatoferrate(III)
5. Preparation of sodium ferrioxalate chromate(III) tetrahydrate
6. Preparation of Trans-Potassium dioxalatodiaqua dichromate(III)
7. Preparation of sodium thiosulphato cuprate(I).

III APPLIED EXPERIMENT

1.Analysis of UV-visible spectrum of any two complexes and interpretation of the spectra (demonstration only)

REFERENCES

1. Vogel's Text Book of Quantitative Chemical Analysis, 5th Ed. ELBS, 2004.

2. V. Venkateswaran, R. Veeraswamy , A.R. Kulandaivelu, Basic principles of practical chemistry 2nd edition, , Sultan Chand and Sons., New Delhi, 2006

Course Title:	**CP7- Physical Chemistry Practicals**	Course Type: **Practical** Course Code :23GCP7
Total Hours: **30**	Hours/Week: **2**	Credits: **1**
Pass-Out Policy: Minimum Contact Hours-18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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1. EXPERIMENTS

1. Determination of molecular weight by Rast macro method.
2. Determination of transition temperature of a salt hydrate-sodium acetate and sodium thiosulphate
3. Construction of the phase diagram of a simple eutectic system - Naphthalene-Biphenyl
4. Determination of CST of Phenol - water system.
5. Effect of impurity on CST (2% NaCl or 2% Succinic acid).
6. Determination of heat of solution by solubility method.
7. Kinetics of acids hydrolysis of an ester (Methyl acetate or Ethyl acetate).
8. Determination of cell constant and limiting molar conductance of a strong electrolyte (KCl)
9. Conductometric titration of Strong acid *Vs* Strong Base
10. Precipitation titration (Conductometric)
    $MgSO_4$ *vs* $BaCl_2$

Course Title:	**CCE3-Biological Chemistry**	Course Type: **Theory** Course Code :23GCEE
Total Hours: **60**	Hours/Week: **6**	Credits: **4**
Pass-Out Policy: Minimum Contact Hours-36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	**CourseLearning Outcomes (CLO)** *Upon completion of this course, students will be able to*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Understand the classification of carbohydrates and its metabolism	2(8),7(12)	1,2,5,6,7,10	U	C
CLO-2	Make the students understand the aspects of lipids, chemistry of phospholipids and cholesterol	2(8),7(12)	1,2,5,6,7,10	Ap	C
CLO-3	Know the structure, composition and function of proteins	2(8),7(12)	1,2,5,6,7,10	R	F

CLO-4	Understand the types and composition of nucleic acid	2(8),7(12)	1,2,5,6,7,10	U	M
CLO-5	Have a knowledge about the enzymatic actions in biological systems	2(8),7(12)	1,2,5,6,7,10	R	M,C

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**CARBOHYDRATES**					
1.1	Definition and classification of carbohydrates	1	1[10]	Lec	Ass	3
1.2	Monosaccharides: Structure and reactions of monosaccharides (pyranose structure) glucose, fructose,	2	1[20]	Lec	Sem	3
1.3	Disaccharides: - Structure and reactions of disaccharides – maltose, cellobiose, lactose, sucrose, isomaltose (structural elucidation not required).	2	1[10]	Lec	Ess	2
1.4	Glycosides – their physiological significance	2	1[10]	Lec	Ass	1
1.5	Aminosugars – their importance.	2	1[10]	GD	Quiz	1
1.6	Polysaccharides - Homopolysaccharides: starch, glycogen, cellulose, insulin, chemicellulose, chitin, pectin and lignin.	2	1[10]	Lec	Ass	5
1.7	Heteropolysaccharides: Glycos amino glycans, hyaluranic acid, chondroitin sulphate. Keratan sulphate, heparin, dermatan sulphate, bloodgroup substances.	2	1[10]	Lec	Sem	5
1.8	Carbohydrate metabolism: Embden Meyerhoff pathway, citric acid cycle.	2	1[10]	BS	Ess	5
II	**LIPIDS**					
2.1	Definition and classification of lipids.	1	2[10]	Lec	Sem	2
2.2	Types of fatty acids: – saturated unsaturated, unusual and essential fatty acids.	2	2[10]	Lec	Ass	2
2.3	Triacyl glycerols: – their chemistry and characterization	2	2[10]	Lec	Ess	2
2.4	Saponification number, Iodine number, Acid number, RM value and Acetyl value	3	2[20]	GD	Quiz	2
2.5	Chemistry of phospholipids: - Lecithin,	2	2[10]	Lec	Ass	4

	Cephalin and Serine, Plasmalogens and phosphatidyl inositols					
2.6	Structure and Function of Sphingolipids: - Sphingomycin, Cerebroside and Ganglioside	3	2[20]	Lec	Ess	4
2.7	Cholesterol – tests, structure. (structural elucidation not required) and physiological significance of cholesterol	2	2[20]	BS	Sem	4
III	**AMINO ACIDS AND PROTEINS**					
3.1	Amino acids: - Nomenclature and abbreviated names	1	3[10]	Lec	Ass	2
3.2	Classification and methods of preparation of α amino acids.	1	3[10]	Lec	Sem	2
3.3	Properties and test of amino acids.	1	3[10]	GD	Ess	2
3.4	Structure and functions of simple peptides: - Glutathione, Carnosine, Anserine, Vasopressin and Oxytocin.	1	3[10]	Lec	Ass	1
3.5	Structure and functions of peptide antibiotics: Gramicidin, Bacitracin and Actinomycin	1	3[10]	Lec	Quiz	1
3.6	Proteins – classification, composition, tests and Biochemical importance of proteins.,	2	3[10]	Lec	Ess	1
3.7	Primary structure of proteins (one method each to identify C – terminal and N-terminal amino acids),	2	3[10]	BS	Ass	1
3.8	Secondary structure of proteins	2	3[10]	Lec	Quiz	1
3.9	Tertiary and Quartenary structures with heamoglobin as an example	2	3[10]	Lec	Ass	1
3.10	Amino acid metabolism– General pathway, Removal of amino group, Fate of amino group and Fate of carbon skeleton	2	3[10]	Lec	Ess	1
IV	**NUCLEIC ACIDS**					
4.1	Introduction-Chemical composition of nucleic acid	3	4[10]	Lec	Ass	3
4.2	Components of nucleic acid nucleosides – nucleotides, cyclic nucleotides.	3	4[20]	Lec	Ess	3
4.3	Structure and functions of DNA	3	4[30]	Lec	Ass	3
4.4	Different types of RNAs (m- RNA, t- RNA, and r- RNA).	3	4[20]	GD	Sem	3
4.5	Nucleases – D Nase, R Nase – nucleoproteins.	3	4[20]	Lec	Ass	3
V	**ENZYMES**					
5.1	Classification of enzymes.	1	5[10]	Lec	Ass	5
5.2	Enzyme specificity.	1	5[10]	Lec	Sem	5
5.3	Factors affecting enzyme reaction.	1	5[10]	GD	Quiz	5
5.4	Michaelis Menton theory (derivation).	1	5[10]	Lec	Ess	5
5.5	Line-Weaver plot	1	5[10]	Lec	Ass	5
5.6	Inhibition of enzymes- Competitive, Noncompetitive and Uncompetitive inhibition	3	5[20]	Lec	Ass	5

5.7	Mechanism and action of coenzymes	2	5[10]	BS	Sem	5
5.8	Immobilizations of enzymes, Lock and Key Mechanism of enzymes	2	5[20]	Lec	Ess	5
5.9	Industrial and medical applications of enzymes.	3	5[10]	Lec	Sem	5

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1. LubertStryer, Biochemistry, 4thEdn. 1994.
2. A.N. Lehningher, Principles of Biochemistry, CBS Publisher 1984.
3. Herper's, Review of Biochemistry, Appleton & Lange; 24th Edn, 1996.
4. Todd, Manson and Van Bruggen, Text Book of Biochemistry, 4thEdn. West, 2006.
5. R.L.P. Adams, J.T. Knowler D.P. Leader, the Biochemistry of the Nucleic Acid

Course Title:	**CCE 3-Forensic Chemistry**	Course Type: **Theory** Course Code :23GCEF
Total Hours:60 Credits: **4**	Hours/Week: **4**	
Pass-Out Policy: Minimum Contact Hours: 36 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CO No.	**Expected Learning Outcomes** Upon completion of this course, students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO -1	Understand the types of poisons and heavy metal contamination	2(8),7(12)	1,2,5,6,7,10	U	C
CLO-2	Know methods of crime detection	2(8),7(12)	1,2,5,6,7,10	Ap	C

CLO -3	Gain knowledge to detect forgery	2(8),7(12)	1,2,5,6,7,10	R	F
CLO-4	Identify tracks and traces	2(8),7(12)	1,2,5,6,7,10	U	M
CLO-5	To know the causes and prevention of AIDS, burns and plastic surgery	2(8),7(12)	1,2,5,6,7,10	R	M,C

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**CRIME DETECTION**					
1.1	Accidental explosion during manufacture of matches and fire works	1	1[20]	Lec	Qui	1
1.2	Human bombs-possible explosives(gelatin sticks and RDX)	1	1[20]	TPS	Sem	1
1.3	Metal detector devices and other security measures for VVIP	1	1[20]	Lec	MCQ	1
1.4	Composition of bullets and detecting power borne	1	1[10]	GD	Ass	1
1.5	Analysis of incendiary and timed bombs	1	1[10]	Lec	MCQ	1
1.6	Spill of toxic and corrosive chemicals from tankers	1	1[20]	BS	Qui	1
II	**POISONS**					
2.1	Poisons -types and classification	1	2[10]	Lec	Qui	1
2.2	Diagnosis of poisons in the living and the dead	1	2[20]	Lec	MCQ	1
2.3	Clinical symptoms-postmortem appearance	1	2[20]	TPS	Sem	1
2.4	Heavy metal contamination(Hg, Pb, Cd) of sea foods	1	2[20]	Lec	Qui	1

2.5	Use of neutron activation analysis in detecting Arsenic in hair	1	2[20]	GD	Ass	1
2.6	Use of antidotes for common poisons	1	2[10]	BS	MCQ	1
III	**FORGERY AND COUNTERFEITING**					
3.1	Documents-different types of forged signatures, Stimulated and traced forergies	1	3[20]	Lec	Sem	2
3.2	Inherent signs of forgery methods- writing delibertly modified	1	3[10]	GD	MCQ	2
3.3	Uses of ultraviolet rays-comparision of type written letters	1	3[10]	Lec	Ass	2
3.4	Checking silver line water in currency notes	1	3[20]	TPS	Sem	2
3.5	Alloy analysis using AAS to detect counterfeit coins	1	3[20]	Lec	MCQ	2
3.6	Detection of gold purity gold plated jewels and authenticity of diamond	1	3[20]	Lec	Qui	2
IV	**TRACKS AND TRACES**					
4.1	Tracks and traces-small tracks and police dogs	1	4[20]	Lec	MCQ	2
4.2	Foot prints-costing of foot prints, residual print, walking pattern or tyre marks	1	4[20]	TPS	Qui	2
4.3	Miscellaneous traces and tracks- glass tracture, tool marks, paints, fibres	1	4[10]	Lec	Sem	2
4.4	Analysis of biological substances-blood,semen, saliva, urine and hair, Cranial analysis (head and teeth) DWA	1	4[20]	GD	Ass	2
4.5	Finger printing for tissue identification in dismembered bodies	1	4[20]	BS	Ass	2
4.6	Detecting steroid consumption in athletes and race horses	1	4[10]	Lec	MCQ	2
V	**MEDICAL ASPECTS**					
5.1	AIDS- causes and prevention	1	5[20]	Lec	Qui	2
5.2	Misuse of scheduled drugs, Burns and their plastic surgery	1	5[20]	GD	Ass	2
5.3	Metabolite analysis using mass spectrum, gas chromatography	1	5[20]	Lec	MCQ	2
5.4	Arson-natural fires and arson, burning characteristic and chemistry of	1	5[20]	TPS	MCQ	2

	combustible materials					
5.5	Ballistic-classification-internal and terminal	1	5[10]	BS	Ass	2
5.6	Barrel washing and powder detection by chemical tests	1	5[10]	Lec	Qui	2

References:

1. T.H. James, Forensic Sciences, Stanley Thomas Ltd., 2001

2. Richard, Criminalistics- An Introduction to Forensic Science 8th edition, Sofestein Prince Hall., 20

Course Title:	**CCE4-Polymer Chemistry I**	Course Type: **Theory** Course Code :23GCEG
Total Hours:**90** Hours/Week: **6**		Credits: **4**
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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CLO No.	**Expected Learning Outcomes** Upon completion of this course, students will be able to	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO -1	Understand the functionality of polymers, types and mechanism of polymerization	5(12), 10(8)	1,2,3,5,6,7,10	U	M,F,C
CLO -2	Know the methods of polymerization	5(12), 10(8)	1,2,3,5,6,7,10	R	F,C
CLO -3	Understand the methods of synthetic polymers and natural polymers	5(12),10(8	1,2,3,5,6,7,10	U	M,C

		)			
CLO -4	Learn the synthesis of monomers, molecular weight determination and kinetics of polymerization	5(12),10(8)	1,2,3,5,6,7,1 0	Ap	C
CLO -5	Crystallinity of polymers and degradation of polymers	5(12),10(8)	1,2,3,5,6,7,1 0	An	C

Modules	Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**POLYMER AND ITS TYPES**					
1.1	General characteristics of polymers, Distinction among plastics, elastomers and fibres.	1	1[20]	Lec	Qui	1
1.2	Nomenclature of polymers. Homo and hetero polymers, Copolymers, block and graft co–polymers, Tacticity : isotactic, atactic, syndiotactic polymers	2	1[30]	BS	Sem	1
1.3	Plastics: thermosetting and thermoplastics. Functionality - linear, branched and cross linked polymers, Initiators and Inhibitors	1	1[30]	Lec	Qui	1
1.4	Mechanism of addition polymerization-initiation, propagation and termination process, Free radical, cationic, anionic and co - ordination addition polymerization.	2	1[20]	Lec	Qui	1
II	**TECHNIQUES OF POLYMERIZATION, SYNTHESIS AND CHARACTERISATION OF SOME IMPORTANT POLYMERS**					
2.1	Techniques of polymerization - bulk, suspension, emulsion and solution polymerization.	1	2[20]	Lec	Qui	2,3
2.2	Synthesis, properties and application of the following polymers. Phenol - formaldehyde resin, Melamine - formaldehyde resin, Polyurethanes,	2	2[20]	BS	Sem	2,3

	silicone polymers, Polycarbonates.					
2.3	Natural rubber – vulcanization.	1	2[10]	TPS	Ass	2,3
2.4	Synthetic rubber - styrene rubber, nitrile rubber, butyl rubber, polysulphide rubber and neoprene.	1	2[20]	Lec	Ass	2,3
2.5	Appearance, feel and hardness, density, effect of heat, solubility, combustion, tensile strength, shear, stress, impact strength, mechanical.	1	2[30]	GD	Sem	2,3
III	**SYNTHETIC POLYMERS AND NATURAL POLYMERS**					
3.1	Study of some engineering polymers.	1	3[30]	Lec	Sem	4
3.2	Synthetic polymers - polyolefins - polyethylene - HDPE, LDPE, LLDPE, Polypropylene, Polyvinyl chloride - grades of PVC, Teflon, Polymethyl - methacrylate (plexiglass), Polystyrene.	2	3[30]	BS	Ass	4
3.3	Homopolymers and copolymers (SBR, ABS, SAN). Polyesters, Polyamide - Nylon66.	2	3[20]	TPS	Ess	4
3.4	Natural polymers- cellulose, starch, silk, wool, cellulose acetate, cellulose nitrate.	1	3[20]	Lec	Sem	4
IV	**PHYSICAL STATE AND BIOMEDICAL APPLICATION OF POLYMERS**					
4.1	Synthesis of monomers - terephthalic acid, DMT, caprolactam, hexamethylene diamine, ethylene glycol, adipic acid, and acrylonitrile.	1	4[20]	Lec	Quiz	4
4.2	Molecular mass - number average, weight average, viscosity average.	1	4[20]	BS	Sem	4
4.3	Significance of molecular mass distribution - size of polymers.	1	4[20]	TPS	Ess	4
4.4	Methods of determination of molecular weight of polymers – light scattering method, sedimentation velocity method, viscosity method.	1	4[20]	Lec	Quiz	4
4.5	Kinetics of addition polymerisation and Carather's equation.	1	4(10)	BS	Sem	5
4.6	Polymers in medicine and surgery - biomedical applications of polymers.	1	4[10]	Lec	Sem	5
V	**PROPERTIES AND PROCESSING OF POLYMERS**					
5.1	Glassy state. Glass transition temperature and factors affecting it.	1	5[10]	Lec	Quiz	5
5.2	Determination of glass transition temperature – Dilactometric method,	1	5[10]	BS	Sem	5

	thermo mechanic method.					
5.3	Crystallinity in polymers.	1	5[10]	TPS	Quiz	5
5.4	Viscosity, solubility, optical, electrical, thermal and mechanical properties of polymers.	1	5[20]	BS	Sem	5
5.5	Degradation of polymers by thermal, oxidative, mechanical and chemical methods.	1	5[20]	Lec	Ass	5
5.6	Polymer processing - compression moulding, injection moulding, transfer moulding, extrusion moulding, casting, extrusion of fibres and spinning.	1	5[30]	TPS	Sem	5
5.6	Polymer processing - compression moulding, injection moulding, transfer moulding, extrusion moulding, casting, extrusion of fibres and spinning.	1	5[30]	TPS	Sem	5

REFERENCES

1. F.W. Billmeyer, Textbook of Polymer Science, John Wiley and Sons, 1984
2. M.P. Stevens, Polymer Chemistry, Oxford University Press 1990.

3.V.R. Gowarikar, N.V. Viswanathan and J. Sreedhar, Polymer Science, New Age International Pvt. Ltd. 2002.

4. Raymond B. Seymour, C.E. Carraher, Polymer Chemistry, Marcel Dekker Inc. 1992.

5. M.S. Bhatnagar, A text book of polymers, Vol. I, S. Chand and company Ltd, 2004.

Course Title:	**CCE4-Agricultural Chemistry I**	Course Type: **Theory** Course Code :23GCEH
Total Hours:**90** Hours/Week: **6**		Credits: **4**
Pass-Out Policy: Minimum Contact Hours: 54 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		
Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	Course Learning Outcomes (CLO) *Upon completion of this course, students will be*	% of PLO Mapping with CLO	CLO & PLO Mapping with GA#	Cognitive Level (CL)	Knowledge Category (KC)
CLO-1	Know about orgin and components of soil	5(10),10(10)	1,2,3,5,6,7,10	R	M,F,C
CLO-2	Know the physical properties of soil, soil structure and reactions of soil	5(10),10(10)	1,2,3,5,6,7,10	U	F,C
CLO-3	**U**nderstand the chemical aspects of soil	5(10),10(10)	1,2,3,5,6,7,10	R	M,C
CLO-4	Learn the various plant nutrients and have an insight of fertilizers	5(10),10(10)	1,2,3,5,6,7,10	E	C
CLO-5	Undersand the pesticide, fungicides and herbicides	5(10),10(10)	1,2,3,5,6,7,10	Ap	C

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**ORIGIN OF SOIL**					
1.1	Definition of soil	1	1[20]	Lec	Sem	1
1.2	Origin -weathering of rocks- igneous, metamorphic and sedimentary rocks	2	1[20]	TPS	MCQ	1,2
1.3	Main components of soil- organic, inorganic, liquid and gaseous phase	1	1[10]	Lec	Ass	1,2
1.4	Soil formation- factors responsible for soil formation, soil formation processes	2	1[20]	TPS	MCQ	1,2
1.5	Soil survey-standard soil survey, methods of soil survey-remote sensing and soil mapping	1	1[10]	GD	Qui	1,2
1.6	Soil resource management- use of satellite data	1	1[20]	TPS	MCQ	1,2
II	**PHYSICAL PROPERTIES OF SOIL**					
2.1	Physical properties of soil-soil textures and classification-pore space-bulk density, particle density	2	2[20]	Lec	MCQ	1,2
2.2	Soil structures and soil colour- surface area	1	2[10]	Lec	Ass	1,2
2.3	Soil colloids- plasticity, shrinkage-flocculation and deflocculation	2	2[20]	GD	Qui	1,2
2.4	Soil air, soil temperature, their importance in	1	2[10]	Lec	MCQ	1,2

	plant growth					
2.5	Soil reaction- ion exchange reaction	1	2[10]	BS	Pro	1,2
2.6	Buffering capacity-hydrogen concentration, determination of pH values, factors affecting soil pH	1	2[10]	Lec	Qui	1,2
2.7	Soil degradation-causes	2	2[20]	Lec	Sem	1,2
III	**CHEMICAL ASPECTS OF SOIL**					
3.1	Origin of problem soils, their properties-acid, alkali and saline soil	2	3[20]	Lec	MCQ	1,2
3.2	Remediation of acid and salt effected soils	2	3[10]	Lec	Qui	1,2
3.3	Methods of reclamation and after care	2	3[10]	TPS	MCQ	1,2
3.4	Soil testing- concept, objectives and basis	1	3[10]	Lec	Ass	1,2
3.5	Soil sampling- took, collection dispatch of soil and water samples	1	3[10]	Lec	MCQ	1,2
3.6	Soil organic matter- source of organic matter, maintenance and distribution	1	3[20]	Lec	Qui	1,2
3.7	Soil organism- their role, nitrification-denitrification, nitrogen fixation in soils	1	3[20]	TPS	MCQ	1,2
IV	**PLANT NUTRIENTS**					
4.1	Macro and micro nutrients, their role in plant growth	2	4[10]	Lec	Ass	1,2
4.2	Nutrient absorption-factor affecting nutrient absorption	2	4[10]	Lec	Sem	1,2
4.3	Deficiency of nutrients- symptoms, corrective measures	3	4[20]	Lec	MCQ	1,2
4.4	Nutrient requirement of crops, their availability	3	4[20]	Lec	Qui	1,2
4.5	Fertilizers-classification, sources, properties, use and relative efficiency	2	4[20]	TPS	Ass	1,2
4.6	Principle of fertilizers use, the efficient use of various fertilizers	1	4[20]	GD	SEM	1,2
5.1	**PESTICIDES, FUNGICIDES AND HERBICIDES**					
5.2	Pesticides-definition, classification, mechanism of action	3	5[10]	Lec	Ass	1,2
5.3	Impact of pesticides on soil, plants and environment	1	5[20]	GD	Sem	1,2
5.4	Fungicides- definition, classification, mechanism of action,-sulfur, copper, mercury compounds, dithanes and dithiocarbamates	3	5[20]	Lec	MCQ	1,2
5.5	Herbicides- definition, classification, mechanism of action	2	5[20]	Lec	MCQ	1,2
5.6	Arsenic and boron compounds	3	5[10]	BS	Sem	1,2
5.7	Acaricides, Rodenticides, Attractants	2	5[10]	Lec	SEM	1,2
5.8	Repellants, Fumiganus , defoliants	2	5[10]	Lec	SEM	1,2

REFERENCES

1. T.D. Biswas and S.K. Mukerjee., Text Book of Soil Science, 1987
2. A.J. Daji., A Text Book of Soil Science, Asia Publishing House, Chennai, 1970

Course Title:	**SEC4- Water Management**	Course Type: **Theory** Course Code :23GCS5
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Minimum Pass %: **40** [No Minimum for Internal]	Internal: **40**	External: **60**

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO.No.	**Expected Learning Outcomes** On successful completion of this course, student should be able to:	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Understand the different types of water pollution	8(4),9(2),10(2)	1,2,3,5,6,7,10	U	M,C
CLO-2	Explain the different water quality parameters	8(4),9(2),10(2)	1,2,3,5,6,7,10	E	C
CLO -3	Understand the various methods of purification of	8(4),9(2),10(2)	1,2,3,5,6,7,10	U	M,C

	water				
CLO-4	Apply various methods of waste water treatment	8(4),9(2),10(2)	1,2,3,5,6,7,10	Ap	C
CLO-5	Evaluate different method of restoration and management of water	8(4),9(2),10(2)	1,2,3,5,6,7,10	R	F

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
1	**WATER POLLUTION**					
1.1	Definition - sources of water pollution-	1	1[10]	Lec	Ass	1
1.2	Types of water pollutants -Sewage and domestic wastes	1	1[10]	BS	Sem	1
1.3	Industrial effluents,agricultural discharges, and detergents	1	1[20]	TPS	Quiz	1
1.4	Diease causing agents and radioactive materials	1	1[10]	Lec	Ass	1
1.5	Eutrophication and its effects	1	1[10]	BS	Sem	1
11	**WATER QUALITY PARAMETERS**					
2.1	Water and water quality parameter, Desirable limits, Permissible limit,	1	2[10]	Lec	Sem	2
2.2	Drinking Water Specifications: Physical parameters (Color, taste-odor, Turbidity, suspended solids, Temperature)	1	2[10]	Lec	Ass	2
2.3	Chemical parameters:TDS, pH, DO, BOD, COD Alkalinity, Hardness, salts, acids and alkalis, chlorides, fluorides, proteins, carbohydrates, organics, fats oil & grease,	2	2[20]	BS	Quiz	2
2.4	Trace metals,	1	2[10]	BS	Sem	2
2.5	Heavy metals, tests on quality parameters	1	2[10]	TPS	Ass	2
111	**WATER PURIFICATION**					
3.1	Purification of water for drinking purposes	1	3[10]	Lec	Ass	3
3.2	Sedimentation,filtration and disinfection	1	3[10]	Lec	Ass	3
3.3	Desalination-Reverse osmosis-	1	3[10]	BS	Sem	3
3.4	Purification of water for industrial purpose	1	3[10]	BS	Sem	3
3.5	Water Softening-Permutit process and ion -exchange process	1	3[10]	TPS	Quiz	3
3.6	Removal of Fe, Mn, silica, fluorine and other metals from water	1	3[10]	TPS	Quiz	3
3.7	Removal of gas, smack and odour from water.	1	3[10]	Lec	Ass	3

3.8	Purification of water from radio-active substances	1	3[10]	Lec	Ass	3
1V	**WASTE WATER TREATMENT**					
4.1	Elimentary ideas of waste water treatment	1	4[10]	Lec	Sem	4
4.2	Pre-treatment-Primary and secondary treatment	1	4[10]	Lec	Quiz	4
4.3	Aerobic and anaerobic processes.	1	4[10]	BS	Ass	4
4.4	Tertiary treatment.	1	4[10]	BS	Sem	4
4.5	Evaporation,adsorption and chemical precipitation	1	4[10]	TPS	Quiz	4
4.6	Magnetic treatment of water.	1	4[10]	TPS	Ass	4
V	**RESTORATION AND MANAGEMENT**					
5.1	Importance of lakes and rivers	1	5[10]	Lec	Sem	5
5.2	Stresses on the Indian rivers and their effects	1	5[10]	Lec	Quiz	5
5.3	Case study	1	5[10]	TPS	Ass	5
5.4	Ganga Action Plan Objectives implementation and drawbacks	1	5[10]	BS	Sem	5
5.5	Rain water harvesting	1	5[10]	Lec	Quiz	5
5.6	Water recycling The water Prevention and control of Pollution Act1974	1	5[10]	BS	Ass	5

'References

1. Chemistry of Water & Microbiology (Mir Publication)-N.F. Voznaya.
2. Lenka, 1999. Irrigation and Drainage. Kalyani Publishers, New Delhi
3. S.S. Parihar and B.S. Sandhu, 1978. Irrigation of field crops
4. Jayashree Ghosh, Fundamental concepts of applied chemistry, S. Chand & Co. Publishers, 2012.
5. WHO 1992, International standards for drinking water, World Health Organisation, Geneva
6. B.K. Sharma Environmental Chemistry, Geol Publishing House, Meerut

CourseTitle: Value Added Course IV **Environmental Science**	CourseType:Theory
TotalHours:30 Hours/Week:2 Credit:1	CourseCode:23SE41
Pass-Out Policy: Minimum Contact Hours:18 Total Score %:100 Internal: 40 External: 60	

Course Creator	**Expert 1**	**Expert II**
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DepartmentofZoology	DepartmentofZoology	DepartmentofZoology
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CLO-No.	**CourseLearningOutcomes** *Uponcompletionofthiscourse,studentswill beableto:*	**% of PLO Mapping with CLO**	**CLO & PLO Mapped with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	understandthevariousenvironmentalattributes	2(4), 3(4) 4(4), 5(3),7(3), 8(2)	GA4	U	F
CLO-2	evaluatetheimpactsofover-exploitationanddegradationof naturalresources	7(8), 8(3), 4(5) 2(4)	GA4	An	C
CLO-3	remembervariousglobal environmental issues	1(5), 2(5),3(5), 10(5)	GA8	E	P
CLO-4	create emphasis on energyconservationandneedforsustainabledevelopment	7(6), 2(6), 3(8)	GA9	Ap	M
CLO-5	createsubstantialgoalsforsustainabledevelopment	4(10), 5(5), 10(5)	GA10	C	M

Module	Course Description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
1.1	Definition, scope and importance	1	1[25]	SI	ST	1
1.2	Multidisciplinary nature of environmental studies	1	1[25]	KW L	ST	1
1.3	Need for public awareness	1	2[25]	Sem	ST	1
1.4	Concept of sustainable development	1	5[25]	GD	ST	1
2.1	Renewable and non-renewable resources	1	1[25]	Lec	CT	1
2.2	Land resources, forest resources, water resources	1	1[25]	Lec	HoA	1
2.3	Mineral resources, energy resources, food resources	1	1[25]	Lec	HoA	1
2.4	Conservation of resources	1	1[25]	RP	HoA	1
3.1	Ecosystem: Concept, structure and function	2	1[25]	BS	MCQ	2
3.2	Food chains, food webs and energy flow in an ecosystem	2	1[25]	Lec	MCQ	2
3.3	Biodiversity: Definition, values, levels of biological diversity and mega-diversity centers	2	1[13]	BS	OBT	2
3.4	Endangered and endemic species of India. Threats and conservation of biodiversity	2	2[25]	Sem	OBT	2

4.1	Environmental pollution: Air, water, soil and noise pollution-causes, effects and controls	2	1[12] 2[13]	Sem	SA	3
4.2	Solid waste management, control measures of urban and industrial waste	2	4[25]	CS	Qui	3
4.3	Disaster management: Floods, earthquake, cyclone and landslides	2	4[25]	CS	Qui	3
4.4	Environmental policies and practices	1	5[25]	Rep	HoA	3
5.1	Clean energy technologies	2	2[25]	GT	MCQ	3
5.2	Bio-energy and conversion systems	2	3[25]	FW	OT	3
5.3	Green building with eco-friendly materials	2	4[25]	MPr	OBT	3
5.4	Zero waste management	1	4[12] 5[13]	SP	HoA	3

Reference Books

1. Sharma, P. D.2009. *Ecology and Environment*, Rastogi Publication, India.
2. Barthwl ,R. R. 2002. *Environmental Impact Assessment*, New Age International Publishers, New Delhi, India.
3. United Nations Environment Programme (UNEP).1995.*Global Biodiversity Assessment*, Cambridge University Press.

Course Title:	**NME3-Rubber Technology**	Course Type: **Theory** Course Code :23GCN3
Total Hours: **30** Credits: **1**	Hours/Week: **2**	
Pass-Out Policy: Minimum Contact Hours: 18 Total Score %: **100** Internal: **40** External: **60** Minimum Pass %: **40** [No Minimum for Internal]		

Course Creator:	**Expert 1:**	**Expert 2:**
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CLO-No.	**Course Learning Outcomes (CLO)** *Upon completion of this course, students will be*	**% of PLO Mapping with CLO**	**CLO & PLO Mapping with GA#**	**Cognitive Level (CL)**	**Knowledge Category (KC)**
CLO-1	Understand the uses and types of rubber products	7(2),9(4), 10(2)	1,2,4,5,7,10	U	M,F,C
CLO-2	Know the various methods of rubber processing	7(2),9(4), 10(2)	1,2,4,5,7,10	R	F,C
CLO-3	Understand the methods, properties and uses of Rubber taping and rubber Latex	7(2),9(4), 10(2)	1,2,4,5,7,10	U	M,C
CLO-4	Understand various techniques of Rubber Additives	7(2),9(4), 10(2)	1,2,4,5,7,10	U	C
CLO-5	Understand various applications of Rubber products	7(2),9(4), 10(2)	1,2,4,5,7,10	U	F

Module	Course description	Hours	% of CLO mapping with Module	Learning Activities	Assessment Tasks	Reference
I	**INTRODUCTION OF NATURAL AND SYNTHETIC RUBBER**					
1.1	Natural Rubber- definition, Types of rubber, preparation of rubber	1	1[20]	Lec	Ass	3
1.2	Vulcanisation of rubber, Comparison between natural rubber and vulcanized rubber	2	1[20]	Lec	Ass	3
1.3	Preparation of synthetic rubber- Neoprene, Buna-S	1	1[30]	TPS	Sem	3
1.4	Uses of natural rubber and Synthetic rubber	1	1[20]	GD	Qui	3
II	**METHODS OF RUBBER PROCESSING**					
2.1	Extrusion, Latex dipping, Molding and Calendering	1	2[20]	GD	Sem	2
2.2	Rubber industries- Production of natural rubber. Recovering the rubber	1	2[20]	Lec	Ass	2
2.3	Grades of Natural Rubber Processing of thermoplastic elastomers, Synthetic Rubber	2	2[30]	GD	Qui	2
2.4	Manufacture of Tires and other rubber products- Footwear, Seals, Foamed rubber products, Sports equipment	2	2[30]	Lec	Qui	2
III	**RUBBER LATEX**					
3.1	Rubber tapping:Collection of latex, Composition of latex, Latex concentration- centrifuging, creaming-preservation of Latex	2	3[30]	Lec	Sem	2
3.2	Test for latex: Total solids, Dry rubber content, Total alkalinity, Viscosity, Coagulum content, Sludge content, p^H , VFA number, Surface tension	2	3[30]	TPS	Ass	2
3.3	Treatment of Latex:Pre- Vulcanisation – methods, properties and uses of pre-vulkanised latex	1	3[30]	GD	Qui	2
3.4	Advantages of Pre- Vulcanisation	1	3[10]	Lec	Ass	2
IV	**RUBBER ADDITIVES**					
4.1	Compounding, Mixing, Carbon black in rubber	1	4[20]	Lec	Sem	2, 4
4.2	Additives to increase viscosity, Filler	1	4[20]	TP	Ass	2,

	Treatments			S		4
4.3	Plasticizers and process oils Vulcanizing agents – accelerators, antioxidants, Reinforcing Fillers	2	4[30]	BS	Qui	2, 4
4.4	Fillers and pigments, surface active agents, emulsifiers, foam promoters, viscosity Modifiers	2	4[30]	Lec	Ass	2, 4
V	**APPLICATION OF RUBBER PRODUCTS**					
5.1	Applications of Styrene butadiene rubber	1	5[20]	Lec	Ass	1, 2
5.2	Reclaimed Rubber	1	5[20]	TPS	Qui	1, 2
5.3	Nitrile rubber	1	5[20]	BS	Ass	1, 2
5.4	Polyacrylic rubber	2	5[20]	Lec	Sem	1, 2
5.5	Applications of natural rubber	1	5[20]	GD	Ass	1, 2

REFERENCES

1. Shinzo Kohjiya and Yuko Ikeda,Chemistry, Manufacture and Application of Rubber
2. Peter.S.Johnson, Rubber Processing ; An Introduction, 2018.
3. P.K. Tripathi, The Rubber Processing and Compounding Technology, pp 632
4. Michael Ash and Irene Ash, Plastic and Rubber additives, Journal of chemical information, 1995.