

Kalinga University

Science

Master Of Science (Chemistry)

PO

S. No.	Program Outcome (PO) Description
1	Introduce the basic concepts, fundamental principles, and the theories related to various scientific phenomena and their relevancies in the day-to-day life.
2	Realize how developments in the interdisciplinary fields help in the development of other science subjects and vice-versa and provides better solutions for the sustainable development.
3	Acquire the skills in handling scientific instruments, planning and performing experiments and drawing logical inferences from the scientific experiments.
4	Develop flair by participating in various social and cultural scientific activities voluntarily, in order to spread knowledge, creating awareness about the recent innovations in science and technology etc.
5	Develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing scientific ideas and views clearly and effectively.
6	Realize that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.
7	Acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.
8	Develop the ability to communicate scientific information and research results in written and oral formats.

9	Prepare students for pursuing research or careers in industry in concerned subject and allied fields. Capability to use appropriate software to solve various problems and to apply programming concepts of C++ and Mathematica/ Matlab to various scientific investigations , problem solving and interpretation
10	Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning throughout life, through self- paced and self- directed learning aimed at personal development, and adapting to changing academic demands of work place through knowledge/ skill development/ reskilling .
11	Learn the laboratory skills needed to design safely and interpret chemical research.
12	Understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics, biology and other disciplines to a wide variety of chemical problems.

PSO

S. No.	Program Specific Outcome (PSO) Description
1	Provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.
2	Achieve the skills required to succeed in the chemical industry and professional school. Get exposures of a breadth of experimental techniques using modern instrumentation.
3	Understand the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.
4	Understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics, biology and other disciplines to a wide variety of chemical problems.
5	Learn the laboratory skills needed to design safely and interpret chemical research.

CO

S.No.	Course Code	Course Name	Course Outcome (CO's) - Description
1	MCHM101	Inorganic Chemistry-I	CO1: To understand an elementary idea of the nature of bonding in Main Group elements.
			CO2: To attain an idea about the transition metal complexes and their behavior.
			CO3: To appreciate the mechanism behind the inorganic reactions.
			CO4: To learn the application based information on metal ligand bonding.
			CO5: To develop an understanding about the various concepts under HSAB.
2	MCHM102	Organic Chemistry-I	CO1: To impart knowledge of mechanisms of substitution, addition, elimination and some named reactions in organic chemistry
			CO2: Gain basic knowledge of stereochemistry of organic molecules.
			CO3: Learn chemistry of alkenes, alkynes, alkadienes, cycloalkanes, alkyl halides, Grignard's Reagent, Alcohols, ethers, carbonyl compounds, carboxylic acids and amines.
			CO4: Study about stereochemistry, principle and mechanism of same reaction
			CO5: To study IUPAC nomenclature of organic molecules
3	MCHM103	Physical Chemistry-I	CO1: Knowledge of Fundamentals of quantum mechanics , Exact Quantum Mechanical Results and differential calculus.
			CO2: Basic knowledge about the Applications of Quantum Mechanics, Electron density, Directed Valences and Ionic Bonding and MO theory.
			CO3: Generating knowledge about the Importance of Huckel theory of conjugated systems bond and charge density calculations. Applications of angular momentum.
			CO4: Comprehension of the basic knowledge of Concept of Brief resume of concepts of laws of thermodynamics and classical thermodynamics.
			CO5: Advance knowledge of Stastical Thermodynamics like Fermi-Dirac Statistics, distribution law and applications to metal. Bose-Einstein statistics distribution Law.
4	MCHM104	SPECTROSCOPY- I	CO1: Describe the interaction between electromagnetic radiations and atoms/molecules. Recognize spectroscopy in microwave, Rotational spectra of rigid diatomic molecules, selection rules, interaction of spectral lines.
			CO2: Understand Infrared spectroscopy and its applications to structural problems Study of Vibrating diatomic molecule, energy levels of a diatomic molecule, simple harmonic and anharmonic oscillator.
			CO3: Learn Electronic spectra of diatomic molecules. : Study and solve Photoelectron problems of spectroscopy of organic.

			CO4: Study of Scattering of light and Raman Spectrum. rotational and vibrational Raman Spectra. CO5: Basic principles, Significance of various terms and Techniques for surface analysis by X-ray diffraction. Understand Instrumentation, experimental techniques of Electron and Neutron diffraction.
5	MCHM105A	Research Methodology	CO1: Students will understand a general definition of research design. CO2: Understand some basic concepts of research and its methodologies CO3: Students will know why educational research is undertaken, and the audiences that profit from research studies. CO4: Students will be able to identify the overall process of designing a research study from its inception to its report. CO5: Students will be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research
6	MCHM105B	Science Journalism	CO1: They will appreciate the digital landscape within which science journalism exists today by learning: blogging in science journalism (honing your craft, developing a voice); how to get work (pitching and staying relevant); the value of social networks for science journalism (sharing stories, finding stories, joining discussions and finding sources); digital strategies employed by major news organizations (data visualization, multimedia, community building). CO2: Students will analyze and learn about the structure of several types of data including numbers, texts and documents. Students will learn the skills to examine, evaluate, and critique those data, extract patterns, summarize features, create visualizations, and provide insights, while learning to be sensitive to ethical concerns associated. CO3: Science communication at the end of the Enlightenment and the importance of notions of the public in the origin of modern science CO4: Students will practice academic, and professional audiences and contexts using writing strategies, conventions, genres, technologies, and formats to communicate effectively CO5: Students will learn the mechanics of science writing, including research, sourcing, and generating story.
7	MCHM201	INORGANIC CHEMISTRY- II	CO1: To understand all the basic concepts of inorganic chemistry students will learn the applications of periodicity in properties CO2: prepare the exact solutions for quantitative analysis CO3: Apply the knowledge of quantitative analysis for the determination of metals from ores/alloys.

			CO4: Address the environmental issues from a chemical perspective and able to explain the function of various elements in biological systems. CO5: Discuss classification of clusters and different structural patterns of metal clusters.
8	MCHM202	ORGANIC CHEMISTRY-II	CO1: Study the fundamentals of Pericyclic Reactions. CO2: Get the fundamentals of reduction reaction of organic molecules by reducing agent. CO3: The use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure CO4: The fundamental electronic structure and bonding in carbonyl compounds CO5: The use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure elucidation
9	MCHM203	PHYSICAL CHEMISTRY-II	CO1: They will understand pH and thermodynamics factors of solutions CO2: chemical equilibrium and its relationship with thermodynamic quantities CO3: concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other CO4: Students were imparted knowledge on phase rule, its applications and introduced with the Current technological applications, as well as the most recent advances in the field. CO5: chemical kinetics; how reaction rates are measured and represented in rate laws, and applications of chemical kinetics in studying enzyme mechanisms
10	MCHM204	SPECTROSCOPY-II	CO1: Explain the principle of NMR spectroscopy, instrumentation, chemical shifts, factors affecting them, signal integration, Spin-spin coupling, Coupling constants and factors affecting them and applications of NMR spectroscopy. CO2: Explain the principles of Rotational spectroscopy and calculate bond lengths and atomic mass from rotational spectra of diatomic molecules, Isotope effect on rotational spectra CO3: Discuss the Classical and Quantum theories of Raman Effect. CO4: Explain the principles of Ultraviolet/Visible Spectroscopy, Woodward-Fieser rules and their applications CO5: Students will study Nuclear Magnetic Resonance Spectroscopy and Nuclear Quadruple Resonance Spectroscopy.
11	MCHM205A	Entrepreneurship	CO1: Clarity about the business idea. Market potential for the product or service. Skills in preparing business plan. CO2: Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation

11	MCHM205A	Entrepreneurship	CO3: Student manager will be able to list the objective and role of given institutions which supports the entrepreneurs CO4: Student manager will be able to outline the role of entrepreneurship in economic development. CO5: Entrepreneurship and Innovation minors will be able to find problems worth solving.
12	MCHM205B	Intellectual Property Right	CO1: The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works during their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. CO2: This course provide further way for developing their idea or innovations. CO3: To Pave the way for the students to catch up Intellectual Property(IP) as an career option a. R&D IP Counsel b. Government Jobs – Patent Examiner c. Private Jobs d. Patent agent and Trademark agent e. Entrepreneur. CO4: Distinguish and explain various forms of IPRs. CO5: Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, and Industrial Designate.
13	MCHM301	NATURAL PRODUCT	CO1: Sort the natural goods into categories based on their structures. CO2: Understand the many types of amino acids, their structures, and their importance. CO3: Alkaloids' biofunctions and structures should be understood. CO4: Recognize the biochemical actions and structures of terepenoids. CO5: Understand the bio-functions and structures of steroids.
14	MCHM302	Organo-transition and Bioinorganic	CO1: Molecular recognition and nature of bindings involved in biological systems CO2: Structure of supramolecules of various types in solution and solid state CO3: Applications of supramolecules in miniaturization of molecular devices CO4: Kinetics and mechanism of enzyme catalysis. CO5: Know and understand the different properties and structures for organometallic compounds from different parts of the periodic table and their trends
15	MCHM303A	POLYMER CHEMISTRY	CO1: Different mechanisms of polymerization. CO2: Number, weight and viscosity average molecular weights with various techniques CO3: Processing of thermoplastic and thermosetting polymers. CO4: concept of conducting polymers and their applications CO5: Explain polymers production processes.
			CO1: Sort biochemistry into groups based on biochemical reactions and bioenergetics.

16	MCHM303B	BIOCHEMISTRY	CO2: Learn about the different types of amino acids and how important they are. CO3: Bio-functions of biological cells, metal ions, and metalloenzymes should all be understood. CO4: Be able to undertake investigations and perform analyses that provide information about biochemical questions and help to solve biochemical problems. CO5: Learn the molecular structures of 20 amino acids, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions.
17	MCHM304A	Medicinal Chemistry	CO1: Understand medicinal chemistry's history and principles. CO2: Determine the drug's classification and the link between structure and activity. CO3: Understand the bio-mechanics of antibiotics as well as the routes by which they are synthesized. CO4: To know the structural activity relationship of different class of drugs CO5: Knowledge about the mechanism pathways of different class of medicinal compounds.
18	MCHM304B	Analytical Chemistry	CO1: Get knowledge about various topics of analytical chemistry such as Errors and Evaluation of measurements, Volumetric analysis, Gravimetric analysis and Separation techniques CO2: Study Radiochemical methods like Isotope Method, Inverse Isotopic Dilution, and Neutron activation technique. CO3: Study Electroanalytical Techniques like Conductometry, Potentiometry Voltammetry and Polarography. CO4: Study Thermoanalytical Methods like TGA, DTA and DSC CO5: Understand Spectral Methods like Nephelometry, Turbidimetry, Flame Photometry
19	MCHM401	Environmental Chemistry	CO1: Learn the fundamentals of environmental chemistry and its many dimensions. CO2: Learn about the major sources of pollution. CO3: I'll figure out how to control the analysis data. CO4: Recognize the health risks that you face on a daily basis. CO5: Identify and evaluate the relative importance of various reactions, physical processes and transport mechanisms affecting different chemicals in the environment.
			CO1: Students will learn a variety of green chemical strategies based on current demands. CO2: To gain a better understanding of the current state and evolution of the environment. CO3: To have a better understanding of pollution and the steps that can be taken to prevent it familiarise yourself with green chemistry.

20	MCHM402A	Green and Nano Chemistry	CO4: To gain a better understanding of bio-catalytic reactions. CO5: To investigate the fundamental notion of nanomaterials. CO6: To understand how nanoparticles are classified. CO7: To familiarize oneself with the physical and chemical approach for production of nanomaterials. CO8: To gain a better understanding of nanomaterial biosynthesis. CO9: To gain knowledge on nanocomposite materials. CO10: To investigate the dangers of nanotechnology with better understanding of nanotechnology's safety.
21	MCHM402B	Photo Chemistry	CO1: Formulate the macroscopic and quantum laws of the absorption of light by molecules and solids CO2: Describe the various deactivation processes of molecular excited states CO3: Quote the various types of photochemical reactions CO4: Represent the mechanisms of natural photochemical processes CO5: Explain the basic principles of the thermodynamics and kinetics of photoinduced electron transfer
22	MCHM402C	INDUSTRIAL AND FUEL CHEMISTRY	CO1: Have sound knowledge of cosmetics and perfumes. CO2: Become well equipped to design, carry out, record and analyze the industrial preparations. CO3: Understand the ethical, historic, philosophical, and environmental dimensions of problems and issues facing industrial chemists. CO4: Become skilled in problem solving, critical thinking and analytical reasoning. CO5: Identify and solve chemical problems and explore new innovative areas of research.