UNIVERSITY COLLEGE MANGALORE

ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ಕಾಲೇಜು, ಮಂಗಳೂರು

A Constituent College of Mangalore University

(Reaccredited by NAAC with 'A' Grade and College with Potential for Excellence)

Office of the Principal,
U.P. Malya Road, Hampanakatta
Mangalore 575 001

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ಯು.ಪಿ. ಮಲ್ಯ ರಸ್ತೆ, ಹಂಪನಕಟ್ಟ
ಮಂಗಳೂರು 575 001

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M.Sc. in CHEMISTRY

[POs, PSOs, COs]

CBCS (CHOICE BASED CREDIT SYSTEM)

(From 2016-17 Batch onwards)

CHEMISTRY
PROGRAMME OUTCOMES:

PO 1	Master of Science in Chemistry basically aims at the training of students with a detailed knowledge base in Chemistry of potential utility in academia as well as Industry through advanced course work and laboratory work in the department and a project work in industries or premier institutions.
PO 2	To qualify NET/GATE/SET/Civil Services and other competitive examinations.
PO 3	For exploring global level research opportunities for doctoral and post-doctoral studies.
PO 4	For professional employment in different domains such as academics, industries, analytical laboratories, scientific organizations, entrepreneurship, administrative positions etc.
PO 5	For enhancing the connectivity between academic and industrial institutions.

PROGRAMME SPECIFIC OUTCOMES

PSO 1	Students equip themselves with up-to-date knowledge in the field of frontierareas of chemistry.
PSO2	Attain confidence to take up R & D positions in teaching, higher educationinstitutions, public sector & private companies.
PSO 3	Get motivated to take up higher studies
PSO 4	Students able to use their knowledge in day to day life and work for betterment of society.
PSO 5	Understand the social responsibility of chemistry in educating general public aboutprotection of environment against pollution.
PSO 6	Knowledge & Confidence to clear nation level competitive examinations.
PSO 7	To make use of the chemistry knowledge to analyze real samples like food samples,biological samples, pharmaceutical products and environmental samples.
PSO 8	To propose/develop lost effective and novel methods of synthesis of bioactive compounds/ nanomaterials and in turn to design target oriented drugs to treat differentdiseases.
PSO 9	To propose/develop simple and accurate analytical methods as alternatives for theexisting standard/official methods for the analysis of complex matrices/clinical samples.

PSO 10	To develop energy storage materials and fuel cells.

COURSE OUTCOMES:

FIRST SEMESTER

Course	**Details**
Code	**CH H 401**
Title	**INORGANIC CHEMISTRY**
Programme	M. Sc CHEMISTRY
Year / Semester	FIRST/FIRST
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

Learning Objectives :

To enable the students to acquire knowledge on inorganic chemistry topics.

Expected Learning Outcomes:

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

CO 1. Students learn the basics of ionic and covalent bonding, lattice energy, hydration energy,

CO 2. This course enables the students to understand VSEPR theory and MOT theory.

CO 3. This course will Enlighten the students to understand Noble gas chemistry, Graphiticcompounds, HSAB Concept,

CO 4. Theories of redox indicators and sampling techniques.

Course	Details
Code	**CH H 402**
Title	**ORGANIC CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

Learning Objectives :

To enable the students to acquire knowledge on organic chemistry topics.

Expected Learning Outcomes :

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

CO 1. Enable the students to learn the bonding in organic systems, various aspects ofaromaticity, electronic effects, acidity and basicity of organic compounds.

CO 2. To gain knowledge on methods of determination of reaction mechanism, various reactionintermediates and aliphatic nucleophilic substitution reactions.

CO 3. To understand the detailed aspects of optical and geometrical isomerism.

Code	**CH H 403**
Title	**PHYSICAL CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100

Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

Learning Objectives :

To enable the students to acquire knowledge on physical chemistry topics.

Expected Learning Outcomes :

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

CO 1. To understand the theoretical basis of catalysis, corrosion and various complexreactions which find relevance in biological processes and are of industrial importance.

CO 2. The students are introduced to the modern techniques developed for the practicalapplications of these concepts in different areas of science and technology.

CO 3. This course enable the students to handle issues related to corrosion in the day to day life and in industrial reactors; enzyme mediated reactions in biochemistry, biotechnology and pharmaceutical chemistry etc.

Code	**CH S 404**
Title	**INORGANIC SPECTROSCOPY AND ANALYTICAL TECHNIQUES**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

Learning Objectives: To enable the students to acquire knowledge on inorganic spectroscopy and analytical techniques.
Expected Learning Outcomes : Upon the completion of this course, the students will be able to : **CO 1.** Students learn the basic principles and applications of ESR Spectroscopy, NQR Spectroscopy, **CO 2.** Students can be familiarizing with Mossbauer Spectroscopy, Photoelectron spectroscopy, Atomic absorption Spectroscopy, Emission Spectroscopy, Molecular Luminescence Spectroscopy and Light Scattering methods. **CO 3.** The students also trained in the field of Ion Exchange Chromatography, Exclusion Chromatography and Thermal methods **CO 4.** Overall students can solve the problems related to spectroscopy

Code	**CH S 406**
Title	**MOLECULAR SPECROSCOPY & DIFFRACTION TECHNIQUES**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam
Learning Objectives: To enable the students to acquire knowledge on molecular spectroscopy & diffraction techniques**.**	

Expected Learning Outcomes :

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

CO 1. Deals with the understanding of the spectroscopic techniques which are based on the interaction of the electromagnetic radiation in the microwave, infrared and X-ray region with the molecules.
CO 2. The techniques introduced here are major characterization techniques employed to understand the chemical composition of compounds and the physical characteristics.
CO 3. The course has multidisciplinary relevance as these techniques are used in various fields namely, chemistry, physics biology and materials science.
CO 4. Student be able to learn instrument like x-ray, TEM, SEM and their applications

Code	**CH P 407**
Title	**INORGANIC CHEMISTRY PRACTICALS – I**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	Practical
Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of inorganic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

Learning Objectives :

To get better understanding of inorganic chemistry concepts.

Expected Learning Outcomes :

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

CO 1. Students have hands on experience on the analysis of Hematite Dolomite, Pyrolusite,Solder,
CO 2. Analysis of Halide Mixture, Colorimetric Determination, Gravimetric determinations andStatistical Analysis of Data.
CO 3. To understand Complex metric determination and hardness of water
CO 4. It enables the students to learn Statistical Analysis of Data.

Code	**CH P 408**
Title	**ORGANIC CHEMISTRY PRACTICALS – I**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/FIRST
Type	Practical
Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of organic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

Learning Objectives :

To get better understanding of organic chemistry concepts.

Expected Learning Outcomes :

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

CO 1. Enlighten the students to understand the method of organic preparation by utilizingvarious kinds of organic reactions,
CO 2. To understand isolation and purification of products.
CO 3. To understand oxidation reactions
CO 4. To learn substitution reaction.

Code	**CH P 409**
Title	**PHYSICAL CHEMISTRY PRACTICALS - I**
Programme	M. Sc CHEMISTRY
Year / Semester	FIRST/FIRST
Type	Practical
Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1

Pedagogy	Hands on practical sessions to learn the concept of physical chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. Experiments have been designed which make use of the concepts of electrochemistry,thermodynamics, solution chemistry and surface chemistry.

CO 2. Students get hands on experience in use of various instruments.
CO 3. It able to understand the theoretical concepts.
CO 4. To learn Specific and molar refractivity, viscosity, poacher etc.

Code	**CH H 451**
Title	**ADVANCED INORGANIC CHEMISTRY**
Programme	M. Sc CHEMISTRY
Year / Semester	FIRST/SECOND
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. Students study Symmetry and Group Theory,

CO 2. Chemistry of higher Boranes, Phosphazene polymers,

CO 3. Advances aspects of MOT theory, Trends of transition metals in periodic tables,Methods of reduction of oxide ores in this course

Code	**CH H 452**
Title	**ADVANCED ORGANIC CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	HARD CORE
Total Credits	3

Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. Students gain an understanding of all details of aliphatic/ aromatic electrophilic substitution reactions and aromatic nucleophilic substitution reactions.
CO 2. Students learn about various free radical reactions and elimination reactions including pyrolytic eliminations.
CO 3. Students gain an understanding of formation and hydrolysis of esters, Addition ofcarbon-carbon multiple bonds and addition to carbon-heteroatom multiple bonds.

Code	**CH H 453**
Title	**ADVANCED PHYSICAL CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. It is an advanced level course which helps to understand the concepts of physics and their subsequent applications in the field of chemistry.
CO 2. The concepts of chemical thermodynamics helps in the design of processes in chemicalindustries.
CO 3. The concepts of statistical thermodynamics find relevance in understanding the nature ofsolids and metals in specific.
CO 4. It enables to understand chemical bonding, photochemistry and spectroscopy

Code	**CH S 454**
Title	**ORGANIC SPECTROSCOPIC TECHNIQUES**
Programme	M. SC CHEMISTRY

Year / Semester	FIRST/SECOND
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. Enable the students to understand the principle, theory, instrumentation and applicationsof UV-Visible, Electronic, NMR (^{1}H, ^{13}C, ^{19}F, ^{31}P) and Mass spectroscopy.
CO 2. To solve the composite problems involving the applications of UV-Visible, IR, NMR (^{1}H&^{13}C) and Mass spectroscopic techniques.
CO 3. To develop the ability to analyze the spectrum and arrive at the correct structure ofcompound.
CO 4. Overall students can get confidence in solving spectroscopic problems.

Code	**CH E 456**
Title	**ENVIRONMENTAL, ELECTRO AND POLYMER CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. It is an elective course offered to students from disciplines other than chemistry.
CO 2. It aims at enhancing their general understanding of chemistry. Few important topics suchas sources and detection of air pollution, batteries as power sources, devices of solar energy conversion,
CO 3. Polymers used in day to day life and for medical and technical applications will be taught.
CO 4. Awareness of plastic pollution and technique of plastic waste management

Code	**CH P 457**
Title	**INORGANIC CHEMISTRY PRACTICALS-II**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	Practical
Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of inorganic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. The students have hands on experience in the qualitative analysis of mixtures ofInorganic Salts containing 3 cations in which 1 less common metal ion and 2 anions.

CO 2. Students learn the systematic methods of separation techniques.

CO 3. Apart from inorganic radicals they also learn the separation organic radicals.

CO. 4. Qualitative Analysis of mixtures of Inorganic Salts containing 3 cations and 2 anions (1 less common metal ions like Tl, W, Mo, V, Zr, Th, U, Ce, Ti and Li to be included among anions organic acid radicals, phosphate, borate and fluoride separation included).

Code	**CH P 458**
Title	**ORGANIC CHEMISTRY PRACTICALS-II**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	Practical

Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of organic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. Student gain the in-depth knowledge and skill in organic separations, Purifications, qualitative analyses.
CO 2. Separation of binary mixtures of organic compounds containing both mono andbifunctional groups
CO 3. Students learn preparation of suitable derivatives.

Code	**CH P 459**
Title	**PHYSICAL CHEMISTRY PRACTICALS- II**
Programme	M. SC CHEMISTRY
Year / Semester	FIRST/SECOND
Type	Practical
Total Credits	2
Total Contact Hours	48
Contact Hours per Week	4
Examination Duration	4
Max. Marks	30 (IA) + 70 =100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of physical chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. In continuation with the practical course introduced in the first semester, this course provides opportunity to students to test the concepts learnt in the basic physical chemistrycourse CH H 403.
CO 2. Experiments have been designed on thermodynamics, kinetics, surface and interface chemistry. With the training gained.
CO 3. Students able to handle issues related to metallurgical processes, waste water treatment, energy efficient processes, action of soaps and detergents etc.

Code	**CH H 501**
Title	**COORDINATION CHEMISTRY**
Programme	M. SC CHEMISTRY

Year / Semester	SECOND/THIRD
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. The students learn spectral properties of complexes, interpretation of spectra
CO 2. Photochemistry of metal complexes, Magnetic behavior of metal complexes,
CO 3. Spectral applications of coordination compounds,
CO 4. Reactions mechanisms in Transition metal complexes, Electron transfer reactions.

Code	**CH H 502**
Title	**ORGANIC REACTION MECHANISM AND HETEROCYCLIC CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. Students gain the in-depth knowledge about ten organic name reactions, theirmechanisms and synthetic uses with multiple examples.

CO 2. Students learn about the mechanism and synthetic utility of various kinds of thirteenmolecular rearrangement reactions with diverse examples.

CO 3. Students gain knowledge on principles of photochemistry and diverse types ofphotochemical reactions of organic molecules with multiple examples, concepts ofpericyclic reactions, diverse types of electro cyclic, cyclo addition and sigmatropic reactions with multiple examples.

CO 4. Students understand the systematic nomenclature of various types of heterocycliccompounds with multiple examples.

CO 5. Students get the sound knowledge on the structure, synthesis and reactions of variousthree, four, five, six and seven membered simple and fused heterocyclic compounds.

Code	**CH H 503**
Title	**SOLID STATE CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. It is an interdisciplinary course falling at the boundary of physics and chemistry.

CO 2. It is aimed at understanding the properties of solids and their possible applications inmaterials science as superconductors, semiconductors, liquid crystal materials and asmagnetic materials.

CO 3. Importance has been given to the methods of preparation of solids, understanding the structure-property relationships and their possible applications.

CO 4. Importance has also been given to the advanced topics of nanomaterials.

Code	**CH S 504**
Title	**MEDICINAL AND NATURAL PRODUCTS CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. Students gain an understanding on the classification and nomenclature of drugs, modern theories of drug action and drug design.

CO 2. Students able to know classification, synthesis and mode of action of antipyretic analgesic drugs, general anesthetics, local anesthetics, cardiovascular drugs, antineoplastic agents and antiviral drugs with suitable examples.

CO 4. Students get a good understanding of isolation, classification,

CO 5. Methods of structure elucidation and synthesis of various types of alkaloids, terpenoids and steroids with suitable examples.

Code	**CH E 506**
Title	**ANALYTICAL & GREEN CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3

Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. To understand the basic principles and theory of UV-Visible, Electronic, Infra- Red, Nuclear Magnetic Resonance and Mass Spectroscopy.

CO 2. To study the utility of these techniques in structure elucidation of simple organicmolecules.

CO 3. To know about water cycle, water sources, water quality, significant measurements ofwater parameters and treatment of water for drinking and industrial purposes.

CO 4. To learn about principles and use of green chemistry in laboratory synthesis.

CO 5. To understand the basic principles and utility of sonochemistry and Microwave inducedorganic synthesis.

Code	**CH P 507**
Title	**INORGANIC CHEMISTRY PRACTICALS – III**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	Practical
Total Credits	3
Total Contact Hours	72
Contact Hours per Week	6
Examination Duration	6
Max. Marks	30(IA) + 70 = 100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of inorganic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. The students have hands on experience in the Analysis of Brass, Cu-Ni alloy, Stainless Steel,

CO 2. Type Metal and quantitative analysis of the constituents & mixtures containing thefollowing radicals Fe^{+} Ni, Fe^{+} Ca, Cr^{+} Fe.

CO 3. This course also train the students in Separation and determination of Mg2+/Zn2+,Zn2+/Cd2+ by Ion-Exchange Chromatography in Part A and in Part B

CO 4. Determination of COD, Phosphorus, DO, Nitrate, Alkalinity of Water.

Code	**CH P 508**
Title	**ORGANIC CHEMISTRY PRACTICALS – III**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	Practical
Total Credits	3
Total Contact Hours	72
Contact Hours per Week	6
Examination Duration	6
Max. Marks	30(IA) + 70 = 100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of organic chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. Enable the students to understand and learn the principle of quantitative estimation ofdifferent types of organic molecules,

CO 2. Methods of organic preparations using multistep synthetic protocol,

CO 3. Isolation and purification of intermediate and final products,

CO 4. Use of computers in the study of conformation and geometry of some simple organicmolecules.

Code	**CH P 509**
Title	**PHYSICAL CHEMISTRY PRACTICALS – III**

Programme	M. SC CHEMISTRY
Year / Semester	SECOND/THIRD
Type	Practical
Total Credits	3
Total Contact Hours	72
Contact Hours per Week	6
Examination Duration	6
Max. Marks	30(IA) + 70 = 100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of physical chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

Expected Learning Outcomes :

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

CO 1. This practical course give training to students on important electrochemical techniquesnamely,

CO 2. Conductometry, potentiometry, voltametry and polarography.

CO 3. In addition, they are introduced to nuclear and radiation chemistry experiments.

CO 4. This course enhances the skill of students in quantitative analysis

Code	**CH H 551**
Title	**BIOINORGANIC CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. In this course, students learn metal and non-metal ions in biological systems,
CO 2. Biological nitrogen fixation, Photocatalysis,
CO 3. Transport and storage of dioxygen, Metal storage and Transport, Metalloproteins asenzymes,
CO 4. Therapeutic uses of metals, Metal complexes as drugs, Treatment of toxicity due toinorganics.

Code	**CH H 552**
Title	**ORGANIC SYNTHETIC METHODS**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. To acquire knowledge on the various reagents employed for oxidation and reduction ofvarious kinds of organic molecules.
CO 2. To understand the various methods of halogenations of carbonyl compounds, benzylicand allylic halogenations.
CO 3. To understand the synthetic design with diverse chemical reactions, planning of organicsynthesis and functionality.
CO 4. To learn the principles and technologies used in disconnection approach, the utility ofprotecting group strategy in organic synthesis and retrosynthetic analysis.

Code	**CH H 553**
Title	**ELECTROCHEMISTRY AND REACTION DYNAMICS**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	HARD CORE
Total Credits	3
Total Contact Hours	45
Contact Hours per Week	3

Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. It is an advanced course on two different topics, electrochemical processes and theoreticalaspects of chemical kinetics. The first part deals with concept and applications of electrocatalysis and processes taking place at the electrode and the solution interface.
CO 2. This course content trains students on alternate methods of synthesis using electrochemical concepts.
CO 3. Introduces the student to theoretical basis of understanding the rates of complex reactions,
CO 4. Arriving at the mechanism of various inorganic and organic reactions and knowledge of advanced techniques with the use of lasers in characterizing intermediates complex chemical reactions.

Code	**CH S 554**
Title	**ORGAN METALLIC CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. The students will learn Historical development of Organometallic compounds, Classification,
CO 2. Nomenclature, Transition metal to carbon multiple bonded compounds, Transition metal carbon pi complexes,
CO 3. Catalysis by organometallic compounds, Homogeneous catalysis by organometallics, Hydrocarbonylation of olefins,
CO 4. Ziegler-Natta catalyst and Water Gas Shift reactions in this course

Code	**CH S 555**
Title	**POLYMER CHEMISTRY**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	SOFT CORE
Total Credits	3
Total Contact Hours	36
Contact Hours per Week	3
Examination Duration	3
Max. Marks	30 (IA) + 70 =100
Total Modules	3
Pedagogy	Lecture with practical problems being worked out, Chalk and talk, PPT presentations, Seminars and presentations
Evaluation Method	Two Internal Assessment Examinations, One End Semester Exam

CO 1. This is an introductory course on highly useful materials, namely the polymers. Thecourse content is of interdisciplinary interest.
CO 2. It deals with types, techniques of preparation and characterization of plastics, rubber and fiber materials.
CO 3. The applications of these materials in daily life, engineering and biomedical field havebeen emphasized.
CO 4. The students are exposed to the problems of polymer waste management and thestrategies developed to minimize plastic pollution.

Code	**CH P 557**
Title	**INORGANIC CHEMISTRY PRACTICALS – IV**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	Practical
Total Credits	3
Total Contact Hours	72
Contact Hours per Week	6
Examination Duration	6
Max. Marks	30(IA) + 70 = 100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of physical chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. The students have practical experience in determination of Na, K, Li and Ca by Flame photometry, Solvent extraction of Ni(II) and UO_2(II),
CO 2. Preparation and analysis of complexes, Measurement of Magnetic susceptibility,
CO 3. Determination of composition of complexes by Job's method, Mole ratio method, Sloperatio method,
CO 4. Determination of stability constants by Turner Anderson method, Bejrrums method and Polarography method.

Code	**CH P 558**
Title	**PHYSICAL CHEMISTRY PRACTICALS-IV**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	Practical
Total Credits	3
Total Contact Hours	72
Contact Hours per Week	6
Examination Duration	6
Max. Marks	30(IA) + 70 = 100
Total Modules	1
Pedagogy	Hands on practical sessions to learn the concept of physical chemistry.
Evaluation Method	One Internal Assessment Examination, One End Semester Exam

CO 1. Includes large number of kinetic experiments from which students are made to choose five experiments which illustrate different principles of chemical kinetics. They are also expected to learn concepts of thermodynamics by carrying out 5 experiments from the respective section. The course also includes two experiments from polymer chemistry topics and two experiments from spectroscopy. In addition to the above knowledge, the students are trained to develop skill of using computers to draw chemical structures, to plot the data and to carry out calculations

Code	**CH P 559**
Title	**PROJECT WORK AND DISSERTAION**
Programme	M. SC CHEMISTRY
Year / Semester	SECOND/FOURTH
Type	HARD CORE
Total Credits	4
Total Contact Hours	80
Contact Hours per Week	8
Examination Duration	Not applicable
Max. Marks	30(IA) + 70 = 100

Total Modules	1
Pedagogy	Seminars and presentations ,Chalk and talk, PPT presentations,
Evaluation Method	Two Internal Assessment Seminars, One Semester End Evaluation.

CO 1. To design the project by collecting required background material by referring theliterature
CO 2. To understand the functioning and safety features in the industry.
CO 3. To improve the experimental and soft skills.
CO 4. To learn various analytical and instrumental techniques and interpretation of analyticaldata.