Savitribai Phule Pune University

(Formerly University of Pune)

Styaniketan's

Adv. M. N. Deshmukh Arts, Science and Commerce College Rajur

B.Sc. in Chemistry

(Faculty of Science & Technology)

Course Outcomes

T.Y. B. Sc. Chemistry

(As Per National Education Policy-2020)

Semester-V

CHE-301-MJ-T: PHYSICAL CHEMISTRY II

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic concepts of electrochemistry, nuclear chemistry, and quantum chemistry.
CO-2	Explain principles of electrochemical cells, radioactive decay, and quantum models.
CO-3	Apply Nernst equation, decay laws, and quantum models to solve problems.
CO-4	Analyze electrochemical systems, nuclear processes, and quantum models.
CO-5	Evaluate applications of batteries, radioisotopes, and quantum concepts.
CO-6	Formulate solutions using electrochemical, nuclear, and quantum principles.

CHE-302-MJ-T: INORGANIC CHEMISTRY II

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of MOT, coordination complexes, d- and f-block elements, and organometallic chemistry.
CO-2	Explain bonding, structure, and properties of inorganic systems.
CO-3	Apply concepts to determine bond order, stability, and reactivity.
CO-4	Analyze trends in coordination complexes and d- and f-block elements.
CO-5	Evaluate catalytic behavior and applications of organometallic systems.
CO-6	Illustrate bonding models and structure–property relationships.

CHE-303-MJ-T: ORGANIC CHEMISTRY II

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of aromatic substitution, heterocyclic chemistry, named reactions, stereochemistry, and retrosynthesis.
CO-2	Explain mechanisms, reactivity, and stereochemical aspects of organic compounds.
CO-3	Apply principles to predict products and plan synthetic routes.
CO-4	Analyze reaction pathways, stereochemical outcomes, and synthetic strategies.
CO-5	Evaluate reaction efficiency, selectivity, and applicability in organic synthesis.
CO-6	Illustrate mechanisms, stereochemical relationships, and retrosynthetic disconnections.

CHE-304-MJ-T: ANALYTICAL CHEMISTRY II

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of gravimetric analysis, thermal methods, and chromatographic techniques.
CO-2	Explain principles and instrumentation of analytical methods.
CO-3	Apply analytical techniques for quantitative determination and separation.
CO-4	Analyze data from gravimetric, thermal, and chromatographic methods.
CO-5	Evaluate accuracy, efficiency, and applications of analytical techniques.
CO-6	Illustrate working principles and methodologies of instrumental analysis.

CHE-305-MJP: PHYSICAL CHEMISTRY PRACTICAL I

Course Type: Major Practical **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall principles of potentiometry, pH metry, radioactivity, and colligative properties.
CO-2	Explain experimental techniques and underlying concepts
CO-3	Perform experiments to determine pKa, EMF, Ksp, and molecular weight.
CO-4	Analyze experimental data, graphs, and results from electrochemical and physicochemical methods.
CO-5	Evaluate accuracy, errors, and reliability of experimental observations and results.
CO-6	Prepare systematic laboratory reports.

CHE-306-MJP: INORGANIC CHEMISTRY PRACTICAL I

Course Type: Major Practical Credits: 2

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall principles of gravimetric estimation, inorganic preparations, and qualitative analysis.
CO-2	Explain experimental procedures and chemical reactions involved in analysis and synthesis.
CO-3	Apply techniques for estimation, preparation, and identification of inorganic compounds.
CO-4	Analyze experimental data and observations from gravimetric and qualitative methods.
CO-5	Evaluate accuracy, errors, and results of analytical experiments.
CO-6	Prepare systematic laboratory reports and industrial visit documentation.

CHE-310-MJ-T: POLYMER CHEMISTRY

Course Type: Major Elective Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of polymer classification, polymerization, processing, and industrial polymers.
CO-2	Explain polymerization mechanisms, techniques, and properties of polymers.
CO-3	Apply principles to relate structure, properties, and processing of polymers.
CO-4	Analyze polymerization methods, degradation processes, and material behavior.
CO-5	Evaluate applications and environmental impact of polymers.
CO-6	Illustrate polymer structures, mechanisms, and processing techniques.

CHE-311-MJ-T: ENVIRONMENTAL CHEMISTRY

Course Type: Major Elective Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of environmental chemistry, pollution, and sustainability.
CO-2	Explain chemical processes in atmosphere, water, soil, and ecosystems.
CO-3	Apply principles to assess environmental quality and pollution control methods.
CO-4	Analyze sources, effects, and mechanisms of environmental pollution.
CO-5	Evaluate remediation strategies, green chemistry approaches, and regulations.
CO-6	Illustrate environmental processes, treatment methods, and sustainable practices.

CHE-312-MJ-T: BIOCHEMISTRY

Course Type: Major Elective Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall concepts of biomolecules, enzymes, and nucleic acids.
CO-2	Explain structure and functions of carbohydrates, lipids, proteins, and vitamins.
CO-3	Apply biochemical principles to understand reactions and metabolic functions.
CO-4	Analyze properties and behavior of biomolecules and enzyme activity.
CO-5	Evaluate biological roles and significance of biomolecules and enzymes.
CO-6	Illustrate structures, mechanisms, and functions of biomolecules.

CHE-313-MJP: ORGANIC CHEMISTRY PRACTICAL I

Course Type: Major Elective Practical **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall principles of separation, organic reactions, and derivative formation.
CO-2	Explain experimental procedures, mechanisms, and qualitative analysis methods.
CO-3	Apply techniques for separation, synthesis, and identification of organic compounds.
CO-4	Analyze observations, reaction outcomes, and purity of products.
CO-5	Evaluate efficiency, yield, and environmental aspects of organic reactions.
CO-6	Prepare laboratory reports with mechanisms and results.

CHE-321-VSC-P: APPLIED ANALYTICAL CHEMISTRY

Course Type: VSC **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall principles and procedures of analytical techniques.
CO-2	Explain the working and applications of analytical methods.
CO-3	Apply analytical and instrumental techniques for sample analysis.
CO-4	Analyze experimental and instrumental data for interpretation of results.
CO-5	Evaluate accuracy and applicability of analytical methods.
CO-6	Design and perform analytical procedures using suitable techniques.

CHE-331 FP: FIELD PROJECT

Course Type: FP **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic chemistry concepts related to environmental and field-based studies.
CO-2	Explain methodologies, sampling techniques, and procedures used in field-based chemical investigations.
CO-3	Apply standard laboratory and field techniques for sampling, experimentation, and data collection.
CO-4	Analyze experimental and survey data to interpret chemical and environmental conditions scientifically.
CO-5	Evaluate local environmental or chemical problems and suggest suitable chemistry-based solutions.
CO-6	Design and prepare scientific reports, presentations, and project documentation based on field/research findings.

CHE-341-MN-T: INTERDISCIPLINARY CHEMISTRY

Course Type: Minor Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic concepts of analytical chemistry, sampling, and quality assurance.
CO-2	Explain principles and applications of spectroscopic and analytical techniques.
CO-3	Apply statistical and calibration methods in analytical chemistry.
CO-4	Analyze applications of spectroscopy, polymers, nanomaterials, and batteries.
CO-5	Evaluate renewable energy resources and sustainable technologies.
CO-6	Develop interdisciplinary understanding for practical chemical applications.

Semester-VI

CHE-351-MJ-T: PHYSICAL CHEMISTRY III

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall fundamental concepts of molecular spectroscopy, crystal structure, and solid-state kinetics.
CO-2	Explain principles of microwave, IR, Raman spectroscopy, and crystallographic methods.
CO-3	Apply spectroscopic relations and crystallographic equations to solve numerical problems.
CO-4	Analyze spectral data, crystal parameters, and solid-state reaction kinetics.
CO-5	Evaluate applications of spectroscopy and X-ray methods in structure determination.
CO-6	Develop approaches to interpret molecular structure and reaction mechanisms using theoretical concepts.

CHE-352-MJ-T: INORGANIC CHEMISTRY III

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Define mechanisms, catalysis, bioinorganic systems, solids, nanomaterials, and MOFs.
CO-2	Explain reactions, catalysis, biological metals, electronic properties, and materials.
CO-3	Solve problems on mechanisms, catalysis, bioinorganic systems, and solids.
CO-4	Analyze reactions, catalytic processes, biological roles, and material behavior.
CO-5	Justify properties and applications of inorganic systems and materials.
CO-6	Derive theoretical explanations of inorganic processes.

CHE-353-MJ-T: ORGANIC CHEMISTRY III

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall the basic concepts of UV, IR, NMR spectroscopy and natural products.
CO-2	Explain principles of UV, IR, NMR spectroscopy and natural products.
CO-3	Solve problems based on UV, IR, and NMR spectral data.
CO-4	Analyze spectral data for structure determination of organic compounds.
CO-5	Justify structures of organic molecules using combined spectral evidence.
CO-6	Derive structures of organic compounds from spectral data.

CHE-354-MJ-T: ANALYTICAL CHEMISTRY III

Course Type: Major Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Define spectrophotometry, AAS, flame photometry, and electrochemical methods.
CO-2	Explain principles, instrumentation, and interferences in analytical techniques.
CO-3	Solve numerical and analytical problems in spectroscopic and electrochemical methods.
CO-4	Analyze spectral and electrochemical data for quantitative estimation.
CO-5	Justify selection of analytical methods based on accuracy and limitations.
CO-6	Derive relationships and interpretations in analytical measurements.

CHE-355-MJP: PHYSICAL CHEMISTRY PRACTICAL II

Course Type: Major Practical **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall principles of refractometry, spectrophotometry, conductometry, and viscosity.
CO-2	Explain experimental techniques and physicochemical concepts.
CO-3	Apply calculations to determine physical parameters.
CO-4	Analyze experimental data and observations.
CO-5	Evaluate accuracy and errors in results.
CO-6	Prepare laboratory reports.

CHE-356-MJP: ORGANIC CHEMISTRY PRACTICAL II

Course Type: Major Practical **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall laboratory techniques, safety rules, and instrumentation.
CO-2	Explain principles of spectroscopy, estimation, extraction, and chromatography.
CO-3	Perform experiments for spectral interpretation, estimation, and separation.
CO-4	Analyze spectral data and experimental observations.
CO-5	Evaluate accuracy of results and justify procedures used.
CO-6	Design and execute experiments following proper methodology and safety.

CHE-360-MJ-T: MATERIAL CHEMISTRY

Course Type: Major Elective Theory Credits: 2

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall classification, properties, and fundamental concepts of materials.
CO-2	Explain synthesis approaches and characteristics of nanomaterials.
CO-3	Apply theoretical concepts to explain material behavior and synthesis methods.
CO-4	Analyze characterization data from techniques such as XRD, SEM, TEM, and spectroscopy.
CO-5	Evaluate the suitability of different materials for specific applications.
CO-6	Propose material selection strategies for advanced technological applications.

CHE-361-MJ-T: FORENSIC CHEMISTRY

Course Type: Major Elective Theory **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic concepts, principles, and scope of forensic chemistry.
CO-2	Explain classification and effects of narcotic drugs and psychotropic substances.
CO-3	Apply analytical techniques for identification of drugs and forensic samples.
CO-4	Analyze forensic data related to drug testing and crime scene evidence.
CO-5	Evaluate procedures used in crime scene investigation and forensic analysis.
CO-6	Develop strategies for forensic investigation and reconstruction of crime scenes.

CHE-362-MJ-T: MEDICINAL CHEMISTRY

Course Type: Major Elective Theory Credits: 2

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic concepts, terminology, and classification of drugs.
CO-2	Explain physicochemical properties and mechanisms of drug action.
CO-3	Apply medicinal chemistry concepts to classify and study therapeutic agents.
CO-4	Analyze structure–activity relationships and drug–receptor interactions.
CO-5	Evaluate the therapeutic importance and pharmaceutical applications of drugs.
CO-6	Design approaches for rational drug development and dosage formulation.

CHE-363-MJP: INORGANIC CHEMISTRY PRACTICAL-II

Course Type: Major Elective Practical **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall the principles, reactions, safety procedures, and analytical methods used in inorganic chemistry practicals.
CO-2	Explain the concepts of volumetric analysis, flame photometry, spectrophotometry, chromatography, and nanomaterial synthesis.
CO-3	Apply quantitative and instrumental analytical techniques for estimation, separation, purification, and synthesis experiments.
CO-4	Analyze experimental observations, spectral data, chromatographic separations, and periodic trends in inorganic systems.
CO-5	Evaluate the accuracy, precision, efficiency, and environmental significance of different inorganic experimental methods and reactions.
CO-6	Design and perform inorganic chemistry experiments involving nanomaterial synthesis, complex formation, and analytical determinations using suitable methodologies.

CHE-371-VSC-T: PHARMACEUTICAL ANALYTICAL CHEMISTRY

Course Type: VSC **Credits: 2**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Recall basic concepts of pharmaceuticals, dosage forms, and analytical terms.
CO-2	Explain physicochemical properties and impurity testing methods of drugs.
CO-3	Apply analytical techniques for identification and assay of pharmaceuticals.
CO-4	Analyze data obtained from UV, IR, HPLC, and optical rotation methods.
CO-5	Evaluate quality and purity of pharmaceutical formulations using standards.
CO-6	Design suitable analytical approaches for drug analysis and quality control.

CHE-381-OJT: ON JOB TRAINING

Course Type: OJT **Credits: 4**

Course Outcomes (COs)

CO No.	Course Outcome Statement (COs) *After learning the course, the students are able to -*
CO-1	Apply theoretical chemistry concepts in practical and industrial environments.
CO-2	Operate and understand basic analytical instruments and laboratory techniques.
CO-3	Demonstrate professional ethics, laboratory safety, and teamwork.
CO-4	Analyze chemical processes, observations, and experimental data effectively.
CO-5	Prepare technical reports and communicate scientific findings professionally.
CO-6	Develop employability and entrepreneurship skills in chemistry-related sectors.