DEVI AHILYA VISHWAVIDYALAYA, INDORE

School of Chemical Sciences

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Program outcome and course outcome

DEVI AHILYA VISHWAVIDYALAYA

SCHOOL OF CHEMICAL SCIENCES

Our focus

‘Creative Learning’

School of Chemical Sciences is one of the premier centres of higher education in central India. As an acclaimed and leading science centre for academic excellence, school’s mission is to provide world class education and training for high flying careers in chemical sciences. As science and technology move faster and faster, globally it becomes more and more important for Indian institutions to make their presence on the international arena. To prepare academicians and trained chemist scientists for highly professional and top positions in drug and pharmaceutical industries, environmental and scientific organizations, school is running following programmes:

- **M.Sc. Chemistry**
- **M.Sc. Pharmaceutical Chemistry**
- **Ph.D.**

PROGRAMME OUTCOMES (POs)

Learning objectives of School of Chemical Sciences essentially focus on ‘Creative Learning’ of the students with a view to empower them with contemporary knowledge domain so as to enhance connectivity thereof towards academic and industrial institutions.

Programme outcomes basically aim at incorporation of chemical sciences in the mindset of students in an embedded state. With such association, students are expected to improve their critical thinking, accommodating both logical and intuitive approaches. With immense association of scientific approaches, new ideas may creep in the mind of students so that they can evolve innovative pathways. Standards and achievements are impressive for both taught courses and research.

Our distinguishing features are:

- Up-to-date knowledge of broad range of disciplines of chemical sciences
- Theoretical and practical knowledge of Instrumental Techniques
- Interpretation of various types of spectra viz., Nuclear Magnetic Resonance (NMR) , Electron Spin Resonance (ESR), Infrared (IR), Ultraviolet-Visible (UV-Visible), Mössbauer, XPS, and Mass.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Programme specific outcomes pertain to exploration of knowledge of chemical sciences with related disciplines. A student of School of Chemical Sciences after acquiring Master of Science degree will be able to:

PSO1: accelerate his/her thinking skills with the sound objective of problem solving at the forefront, on the basis of exposure to the curriculum based knowledge of chemical sciences.

PSO2: display greater respect to the cause –effect relationship which eventually creates new avenues and designs innovative pathways.

PSO3: integrate creative learning in his/her day-to-day activities with the needed confidence to embrace challenges.

PSO4: demonstrate broad mindedness with respect to knowledge penetration vis-a-vis knowledge accumulation in his /her professional activities.

PSO5: explore global level research opportunities for doctoral and post-doctoral studies.

PSO6: avail the benefit of enormous job avenues in different domains such as – academics, pharmaceutical industries, analytical laboratories, scientific organizations, entrepreneurship, administrative positions etc.

PSO7: display their true potential and get appropriate endorsement through qualifying NET/GATE/SET/State Civil Services and other competitive examinations.

PSO8: avail the opportunity to explore the knowledge of chemical sciences with related disciplines, in particular knowledge of synthetic methods, knowledge and application of analytical techniques with specific orientation towards industries.

Course Outcomes (COs)

Course outcomes essentially envision diverse aspects of chemical sciences. They provide due priority to classification mindset rather than compartmentalization mindset and interdependence of one segment over the other. Consequently, students orient themselves as pro-active learners thereby enhancing their problem- solving skills, rendering high priority on modern areas of chemical sciences including spectroscopic techniques, chromatographic techniques and medicinal chemistry. Spectral interpretation indeed is a unique practice prevalent in School of Chemical Sciences. Students are encouraged to adopt GREEN CHEMISTRY whenever possible with a sound objective of ensuring environmentally sustainable approach towards society.

(I) For M.Sc. Programs

INORGANIC CHEMISTRY I & II

Students after studying inorganic chemistry courses are expected:

CO1: to understand the shapes of the d orbitals and formation of delta bond, metal-metal quadruple (M≡M) and quintiple (M≣M) bonds;

CO2: to learn various theories of chemical bonding and there importance and applications;

CO3: to understand unsuspected structural principles and growing need of molecular bond theory to cope with unusaul stoichiometries of Boranes and its compounds;

CO4: to let the students learn, working with anhydrous solvents

ORGANIC CHEMISTRY I & II

Students after studying these areas of knowledge are expected:

CO1: to build a sound perception of a wide variety of chemical reactions of organic compounds so as to build a natural relationship with instant and effective connectivity;

CO2: to contribute meaningfully towards research and development domain of various organizations including pharmaceutical industries through carrying forward the insight generated through academic practices prevalent in school of chemical sciences;

CO3: to envision teaching as an attractive profession so that students after completing their education in this school , become active knowledge facilitators promoting teaching as rhythmic and enjoyable activity thereby enhancing the interest of further generations.

PHYSICAL CHEMISTRY I& II

Students after studying physical chemistry courses are expected:

CO1: to recognize the interplay of various physical chemistry concepts so that problem solving skills are promoted;

CO2: to enrich various concepts such as those from quantum chemistry, electrochemistry, thermodynamics, chemical kinetics etc.

GROUP THEORY AND SPECTROSCOPY

This course aims at helping the students to become acquainted with the basic concepts of Group Theory and Spectroscopy. After studying this course the student will be able:

CO1: to learn a systematic treatment of symmetry in chemical systems within the mathematical framework;

CO2: to get considerable insight into many of chemical and physical applications of group theory;

CO3: to develop acquisition of a theoretical framework considering background knowledge of spectroscopy;

CO4: to emphasise practical applications of point group theory in physics and chemistry by considering the symmetry of isolated molecules along with the involvement of selection rules in Infrared and Raman spectroscopy as well as electronic bonding, and electronic transitions.

CONCEPTS OF MATHEMATICS

After completion of this basic course the student will be able:

CO1: to solve mathematical problems applying theory of determinants, vectors, permutations and combinations etc.

CO2: to apply and solve problems using matrices, differentiation and integration.

CO3: to understand and apply the knowledge of mathematics in solving the problems encountered in the study of chemical sciences domain.

BIOLOGY FOR CHEMISTS

After successfully finishing this basic course, the student will be able:

CO1: to have the knowledge of core concepts pertinent to all areas of biology;

CO2: to get deep insight about the features of biological evolution, ecology and physiology.

COMPUTER APPLICATIONS IN CHEMISTRY

After completion of this basic course the student would be able:

CO1: to develop an understanding of the basics of computer science and to prepare them for continued professional development;

CO2: to illustrate the flowchart and design an algorithm for a given problem;

CO3: to develop proficiency in writing the programs in C languages/ FORTRAN;

CO4: to work on different softwares such as ACD lab for drawing the structures of molecules, Origin to plot the graphs as well as programs related to create pi-charts and bar diagram.

MOLECULAR SPECTROSCOPY

Students after studying these areas of knowledge are expected:

CO1: to recognize enhanced utility of modern spectroscopic methods in structure elucidation as well as analytical applications vis-a-vis conventional knowledge of chemical methods;

CO2: to promote active use of this knowledge in various domains such as Research and Development sector, quality control and quality assurance departments of industries as well as academic institutions.

ORGANIC PHOTOCHEMISTRY

On completion of this course, the student should be able:

CO1: to investigate the molecular basis for the study of photo- induced phenomena as well as a to carry very broad vision of the main techniques and applications in chemistry;

CO2: to build perception of photochemical and photo-physical processes along with mechanisms through suitable theoretical models

BIO-INORGANIC CHEMISTRY

Students who complete the course are expected:

CO1: to understand the importance of the metal to change the entire properties of organic compounds, heamoglobin and myoglobin when iron, chlorophyll when magnisium and vitamin B12 when cobalt is there in porphyrin ring;

CO2: to understand biological nitrogen fixation, and its mechanism;

CO3: to learn the biologically, Iron plays an important role in the transport and storage of oxygen and also eletron transport and there would be no life without iron;

CO4: role of small amounts of Metals in Biological Systems.

MEDICINAL CHEMISTRY

Students after studying these areas of knowledge are expected:

CO1: to develop an overall understanding of functioning as well as mode of action of various drugs in human life;

CO2: to consider drug design as a potential area so that appropriate contributions could be made as and when required;

CO3: to contribute value addition in quality control as well as quality assurance sections of various pharmaceutical industries.

CHEMISTRY OF POLYMERS

Students after studying these areas of knowledge are expected:

CO1: to recognize the importance of chemistry of polymers and to apply in professional careers on need based approach;

CO2: to create wide –spread awareness about utility of polymers in human life.

ADVANCES IN ANALYTICAL CHEMISTRY

Students after studying these areas of knowledge are expected:

CO1: to connect in an obvious mode with ongoing rapid transformation in hi-tech instrumentation operational in industries;

CO2: to develop qualitative and quantitative skills needed in applications of analytical chemistry;

CO3: to display appropriate professional talent through meaningful utilization of instruments based hands- on- training imparted in their student life.

ENVIRONMENTAL CHEMISTRY

Students after studying these areas of knowledge are expected:

CO1: to know about the Chemical composition of enviroment- atmosphere, hydosphere, lethosphere and biosphere;

CO2: to understand water, air and noise polution and their sources, effects and remedies;

CO3: to learn environmental toxicology and chemical speciation due to toxic heavy metals and toxic chemicals;

CO4: to know the history of environmental disasters throghout the world.

CHEMISTRY OF NATURAL PRODUCTS

Students after studying these areas of knowledge are expected:

CO1: to develop an overview of the field of natural product chemistry;

CO2: to identify different types of natural products, their occurrence, structure, biosynthesis and properties;

CO3: to explore the use of natural products as starting materials for medicines;

CO4: to carry out independent investigations of plant materials and natural products.

SOLID STATE CHEMISTRY AND NANOSCIENCE

After completion of the course the student should be able :

CO1: to gain a deep insight about the solid state reactions, basics of crystal defects with mathematical treatment, to know about the concentration of defects and their utility in current scientific domain and to comprehend the relation between structure and properties;

CO2: to understand the current trends and discoveries in the nanotechnology and its perspectives for applications in different fields;

CO3: to gain knowledge of different synthetic methods for fabrication of inorganic nanoparticles, one-dimensional nanostructures (nanotubes, nanorods, nanowires), thin films, nanoporous materials;

CO4: to develop fundamental knowledge of superconductivity and its use in modern day science and technology

BIO-ORGANIC CHEMISTRY

After successfully finishing the course, the student wil be able:

CO1: to correlate the chemical structure of biomolecules with reactivity and properties such as solubility, binding ability (hydrogen bond ability, lipophilicity, hydrophilicity).

CO2: to discuss similarities and differences between transformations of biomolecules in living systems and in vitro e.g., industrial synthesis.

(II) For Ph.D. Course Work Program

Research Methodology

Doctoral students after successfully finishing the course, will be able

CO1: to become active promoter of GREEN CHEMISTRY concepts;

CO2: to develop hands-on / operational practices of different sophisticated instruments

CO3: to create a platform for pursuing research activities in respective domains

Review of Literature

After successfully finishing the course, the student will be able:

to gain the knowledge and develop acquaintance with the existing literature studies, threading the different lines of development in their respective research domains.

Computer Applications

After successfully finishing the course, the student will be able:

CO1: to develop specialized computational skills;

CO2: to gain proficiency in working with different software, beneficial for their research studies

Advance Course: Interpretation of Spectra

After successfully finishing the course, the student will be able:

CO1: to develop theoretical and practical knowledge of different instrumental techniques;

CO2: to apply the knowledge of interpretation skills in their research problems.

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