

**COLLEGE OF APPLIED AND HEALTH SCIENCES****ARAB101: Arabic 3 Credits**

This course aims to provide students skills of literary appreciation, skills of some types of expression: written, oral, practical and creative. At the same time, it focuses on two important language skills: reading and listening, with brief review for foundational Grammars and spelling roles, especially which are related to practical side of language using. To achieve that mission, students will study many texts from literature of some famous Arab poets and writers from many periods: old, medium, modern.

**ENGL 101: English Communication Skills I 3 Credits**

ENGL101 English Communication Skills 1 is offered by the CLFS (Centre for Language and Foundation Studies) as a post-foundation course to assist students in their college studies. It covers all 4 skills in English with emphasis on Speaking and Writing.

**ENGL102: English Communication Skills II 3 Credits**

The course is offered by the CLFS (Centre for Language and Foundation Studies) as a post-foundation course to assist students in their college studies. It covers all 4 skills in English with emphasis on Speaking and Writing.

**ISLM101: Islamic Civilization 3 Credits**

This course aims to introduce students to the concept of civilization, and the composition and evolution factors. It also introduces them to the most important political and administrative systems and economic and social development in the Islamic civilization, and aims to the statement of contributions to Islamic civilization in other civilizations, especially the European civilization, also aims to publicize the importance of the site Oman and how to interact with other previous civilizations in different eras, and the factors that allowed it to be a center of cultural divisions history.

**BIOL101: Biology I 3 Credits**

This course provides an opportunity to explore the nature of cells from prokaryote to eukaryotes. Biology is the study of different life forms and their interconnectedness with all other life forms. It provides opportunities to learn about the processes of all living things. Biologists contribute to medical and biotechnological advances. By studying Biology, students become more aware of ecological issues and develop more sustainable ways of using our natural resources e.g. soil, land, or water. The study of biology forms a firm foundation for all the other related courses including Food Science, Human Nutrition, Biomedical Science etc. that are relevant to the students of the College of Applied Sciences.

**BIOL181: Biology I Lab 1 Credit**

This course provides an opportunity to explore the nature of cells, from prokaryote to eukaryotes. Biology 1 Laboratory offers a variety of laboratory exercises on current concepts in cell and molecular biology using research-grade scientific equipment. Different teaching techniques, materials and instruments will

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be employed to provoke student's interest to enrich their understanding about the basic concepts and principles in cell and molecular biology. Numerous laboratory methods will be utilized in demonstrations and student experiments. Students will exercise critical thinking for interpreting laboratory results.

### **CHEM101: Chemistry I 3 Credits**

Chemistry is the study about the composition, properties, structure and reactivity of various forms of matter. CHEM 101 is an introductory chemistry course focusing on basic principles and concepts in chemistry. It provides the base for further studies in Food sciences and nutrition, such as food chemistry, Food analysis, pharmaceuticals, Research Skills, etc. It also enable student for understanding various engineering disciplines metallurgy, environmental sciences, applied/industrial sciences, as well as interdisciplinary areas like Nano science and technology etc. It includes topics such as chemical foundations, units and measurements, naming and formulae of inorganic compounds and ions, stoichiometry and mole concept, gases, chemical energetics, atomic structure and periodic table, chemical bonding, etc. It is designed for students who will continue their undergraduate degree programs in Engineering and Applied Sciences.

### **CHEM181: Chemistry I Lab 1 Credit**

This is a one-semester laboratory course intended as the companion course for Chemistry 101 theory and is an introductory lab course focusing on basic principles and concepts in Chemistry. It provides the basis for further studies in physical and biological sciences, environmental sciences, various engineering disciplines, applied sciences such as food sciences and nutrition, geology and metallurgy, pharmaceuticals, interdisciplinary areas like nano science and technology etc. Topics include laboratory safety, chemical measurements, significant figures, laboratory techniques, naming and chemical formulae of compounds, chemical reactions - acid -base titrations and cation & anion analysis, stoichiometry problems, calorimetric experiments for heat of reactions etc.

### **CHEM102: Chemistry II 3 Credits**

This is an introductory Chemistry course focusing on the basic chemical principles and concepts that are needed for the understanding of Chemistry for students who have already cleared Chemistry-I. The course covers introductory concepts of covalent bonding including Valence Bond and Molecular Orbital theories, Introductory chemical kinetics and Chemical equilibria, Solutions and colloids, colligative properties, Solid state Chemistry, Acids and bases, basic Electrochemistry, Free energy and entropy concepts, and basics of Analytical Chemistry. It is designed for students who will continue their undergraduate degree programs in Engineering and Applied Sciences.

### **CHEM182: Chemistry II Lab 1 Credit**

This is a one-semester laboratory course intended as the companion course for Chemistry 102 theory and is a lab course focusing on principles and concepts in Chemistry for students who have completed Chemistry 1. It provides the basis for further studies in physical and biological sciences, environmental

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sciences, various engineering disciplines, applied sciences such as food sciences and nutrition, pharmaceuticals, interdisciplinary areas like nano science and technology etc. Topics include laboratory safety, bonding in molecules, experiments on solutions, solubility and factors affecting solubility, colligative properties, colloids and emulsions, Chemical kinetics, Chemical equilibrium, pH and acid –base properties, buffer and salt hydrolysis, chromatography etc.

### **CHEM110: Green Chemistry 3 Credits**

Students learn the basic principles of green chemistry to evaluate the ecological and economical sustainability of chemicals and chemical processes. Toxicology and the environmental fate of chemicals are key components of these principles. Students will also develop specialist knowledge of green chemistry, which is increasingly important in industry as regulations tighten and chemical resources become harder to find. Knowledge of green chemistry will help students to adhere with regulation as they will learn about renewable feed stocks for the chemical industry, present and under development. They review the principles of catalysis, photochemistry and other interesting processes from the viewpoint of green chemistry. They perform laboratory experiments in which they apply some of the concepts previously learnt (stoichiometry, green metrics etc) and they put into practice some of the principles of green chemistry.

### **MATH101: Calculus I 3 Credits**

Students of Calculus I will develop the quantitative skills needed to be successful in subsequent courses in engineering and applied sciences. These skills will enhance their ability to analyze, solve and communicate their solutions to fellow professionals using the language of mathematics. Students will continue to use the web-based course supplement to access course material and communicate with classmates and the instructor. They will enhance teamwork and leadership skills by working in groups to achieve the solutions to designate exercises.

### **MATH102: Calculus II 3 Credits**

This is a three credit hours Calculus II course primarily designed for engineering students. Calculus I is necessary background of this course. The math contents of this course consist of three main topics: limits and continuity, differentiation, and integration. Calculus II course also is expected to support the students with different level of skills including knowledge, analyzing, and application skills. Those cognitive and other thinking skills will enhance student's ability to solve real life problems, meet engineering specialist requirements, play a good rule in graduates attributes, and help in achieving A'sharqiya university mission and vision.

### **Phys101: Physics I 3 Credits**

An understanding of the basic concepts of Physics is fundamental for developing students' understanding of the more applied scientific disciplines such as Chemistry, Biology and other Applied Sciences. Physics

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101 is an introductory Physics module focusing on basic principles and concepts in Physics. It is designed for students who will continue their undergraduate degree programs in Engineering and Applied Sciences.

### **Phys181: Physics I Lab 1 Credit**

Physics is an experimental science. The theory that is presented in lectures has its origins and is validated by experimental measurement. Phys181 explores the practical aspect of Physics and the basic principles and concepts in Physics as taught in theory are applied in the laboratory. It is designed for students who will take their undergraduate degree programs in Engineering and Applied Sciences.

### **CHEM201: Organic Chemistry I 3 Credits**

This course covers the basics and detailed description of organic structure, nomenclature, stereochemistry and reactions. The classes of organic compounds studied are hydrocarbons (alkanes, alkenes, alkynes), organic halides and alcohols. Introduction to elemental analysis and instrumental/physical methods for organic chemistry (UV-Vis, IR spectroscopy and mass spectrometry) is given.

### **CHEM206: Chemical Process Economics and Sustainable Development 3 Credits**

The course initially discusses the economic nature of chemical processes in terms of the different variables like feedstock, catalyst, energy, products, waste products and their interdependence in deciding the profitability. Economic evaluation of a chemical project and the techniques of evaluation are discussed. Optimization of operating costs and their techniques is described in detail. This course will also examine policy responses to environmental problems caused by economic development with special attention to innovation. Moreover, it covers the innovation for the environment, which is explored through a number of lectures and discussion meetings.

### **CHEM210: Environmental Chemistry 3 Credits**

This course describes basic atmospheric chemistry principles, water chemistry principles and soil chemistry principles and presents the chemistry behind current challenges to our air, water and soil environments. This course also focuses on understanding the linkages and interactions of these three environmental media and on gaining a quantitative understanding of how pollutants behave in the environment, on various sources of hazardous, non-hazardous, biodegradable and non-biodegradable waste materials, measures on pollution control and waste management. Focus on various applications of recycling recyclable and non-recyclable materials are included. Discussion of methods of manufacture and compositions of such materials will concentrate on advanced industrial applications for the reuse of non-recyclable waste materials. The course will also touch on the political aspect of recycling including consumer attitude and government incentives to encourage recycling.

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**CHEM211: Inorganic Chemistry I 3 Credits**

"CHEM 211 is an introduction to the concepts of Inorganic Chemistry concentrating on descriptive chemistry of the elements. The course is divided into three parts:

Part1: includes electronic structure and periodicity; bonding, types of chemical bonds; Lewis structure; octet rule; resonance; molecular structures; VSEPR model. Part2: systematic of chemical behaviors: acids and bases; redox reactions; solubility equilibria and; complex ions equilibria; solubility and solubility products; common ion effect, pH and solubility; precipitation and qualitative analysis; complex ions and solubility. Part3: descriptive chemistry of the main groups: a survey of the representative elements; atomic size and groups anomalies, abundance and preparation; ; the chemistry of hydrogen; the chemistry of the main group elements. "

**CHEM212: Analytical Chemistry I 3 Credits**

This is an introductory Analytical Chemistry course focusing on to provide theoretical and practical knowledge of elementary concepts of analytical chemistry which are required for professional activities in the chemically oriented sciences.

**CHEM214: Industrial Chemistry 3 Credits**

This is a course that will focus on industrial applications of the inorganic, organic and physical chemistry principles in manufacture of consumables used in the daily life by the masses. This course will also focus on industrial processes used in the production of major primary bulk chemicals (e.g., gases, acids, bases, fossil fuels) and their secondary commercial products (e.g., dyes, pesticides, drugs, polymers). Emphasis will be placed on a holistic understanding of the relationship between natural resources, chemical transformation and waste generation for a sustainable future based on insights derived from green chemistry and environmental chemistry.

**CHEM215: Food Chemistry and Analysis 3 Credits**

Shape The course applies basic scientific principles to food systems and practical applications. Chemical/biochemical reactions of carbohydrates, lipids, proteins and other constituents in fresh and processed foods are discussed with respect to food quality. Reaction conditions and processes that affect color, flavor, texture, nutrition and safety of food are emphasized. Students are given a role in the learning experience through group discussions and independent projects related to real world problems associated with the food industry. Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

**CHEM216: Polymer Chemistry 3 Credits**

"This course will cover synthesis and characterization of the most of the important types of polymers. Synthetic techniques include radical, cationic, anionic polymerization, copolymerization, Ziegler-Natta

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polymerization, step growth polymerization, suspension and emulsion polymerization, group transfer polymerization and metathesis polymerization.

Characterization of polymers include spectroscopic (Raman, infrared), mechanical (tensile, dynamic mechanical, rheological), microscopic (electron microscopy), physicochemical (intrinsic viscosity, differential scanning, calorimetry, gel permeation chromatography) and scattering (light, x-rays). "

### **CHEM281: Organic Chemistry I Lab      1 Credit**

This is a one-semester laboratory course intended as the co-requisite for Organic Chemistry 201 theory course, and is an introductory lab course focusing on basic principles and concepts in organic chemistry. In this course, students will investigate various organic reactions and a wide range of laboratory techniques and instruments. Topics include laboratory techniques, melting points, recrystallization, extraction, isolation of natural products (e.g. caffeine), distillation, test of functional groups, qualitative analysis of carbohydrates, proteins and fats, preparation of aspirin, soap, cyclohexene, cyclohexanone, benzoic acid, nitration of methyl benzoate, etc.

### **CHEM292: Analytical Chemistry I Lab      1 Credit**

This is a one-semester laboratory course intended as the companion course for CHEM212 theory and is a lab course focusing on principles and concepts in analytical Chemistry for students who have completed General Chemistry 1 and 2. It provides the basis for further studies in performing quantitative and qualitative experiments, and analyzing and discussing the obtained results.

### **CHEM294: Industrial Chemistry Lab      1 Credit**

This course based on instrumentals and chemical method for analysis of chemical materials. The student will apply his knowledge from course CHEM214 in the lab and analyses the data and observations.

### **CHEM296: Polymer Chemistry Lab      1 Credit**

This course based on basic experimental skills for the syntheses of conventional polymers via various polymerization techniques and understand the fundamental principles of polymer chemistry.

### **MATH203: Differential Equations      3 Credits**

This course will introduce to students to differential equations. Initially differential equations covered the methods to solve differential equations including first and second order differential equations and its applications. Next, the course will introduce to the separation of variables method to solve partial differential equations problem. Then, Laplace transform will be discussed as a method to solve differential equations. At the end of study, Laplace Transforms will be discussed to the students.

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**PHYS221: Mechanics and Thermodynamics 3 Credits**

Mechanics and thermodynamics are key subjects for the understanding of many areas of Applied Sciences and Engineering. This course covers various topics including units and measurements, vectors, motion along a straight line, motion in a plane, the laws of motion (Newton's), work and energy, potential energy, the conservation of energy, momentum and collisions, motion of an object about a fixed axis, conditions for equilibrium, law of universal gravitation, fluid mechanics, wave motion, sound waves, superposition and standing waves, thermal expansion of gases and ideal gases, heat and transfer of heat, laws of thermodynamics.

**STAT201: Statistics 3 Credits**

Students of Statistics will develop the skills needed to be successful in subsequent courses in college of applied science. These skills will enhance their ability to do research, by introducing the statistical methods of collecting, representing, analyzing data and testing Hypothesis. These statistics also help in a better decision making. Students will continue to use the web-based course supplement to access course material and communicate with classmates and the instructor. They will enhance teamwork and leadership skills by working in groups to achieve the solutions to designate exercises.

**APSC312: Professional Ethics 2 Credits**

This is an interdisciplinary course that gives background in implementing the professional ethics. The course will familiarize the students with updated laws and regulations in relation to job ethics. The course will also provide the students the professional ethical roles to increase student's ability to deal effectively with moral complexity in their future job.

**MNGT313: Entrepreneurship 3 Credits**

Are you an entrepreneur? That's the question many individuals are asking in this age of both corporate and government downsizing and follow-your-dream philosophy, post dot-com age of the Entrepreneurial start-up. This course is designed for those who plan to start, or who have already started their own business. Individuals who hold leadership or management positions within a business, who are part of an existing family-business, or who want to know what it takes to be successful as an entrepreneur will find real-world applications and solutions to the every-day challenges of owning and running a business here. In this course, students learn the essential attributes of an entrepreneur and the stages one goes through in taking the seed of an idea and growing it into a successful business. But it also takes more than a good business plan and money to succeed - entrepreneurs must understand that all too often, the strengths that helped them be successful as a start-up become liabilities to overcome in order to take it to the next level. This course provides practical insights into the differences between effective leadership and management by exploring the concepts of Emotional Intelligence in the workplace and determining how to identify and develop human capital – the lifeblood of every business.

**COLLEGE OF APPLIED AND HEALTH SCIENCES****CHEM300: Principles of Chemical Engineering 3 Credits**

The course describes the evolution of chemical industry and that of the production processes. The basic concepts of units and dimensions, the mole concepts, applications of mass and energy conservation laws are explained in a simplified way. Stoichiometric calculations based on material and energy balances of chemical conversions are included in the course. Moreover, this course handles the different engineering operations carried out in the chemical manufacture. They include distillation, crystallization, filtration, drying and liquid-liquid extraction. The theoretical understanding of the operations is followed by the description of the various equipment essential to carry out these operations are described.

**CHEM301: Organic Chemistry II 3 Credits**

An introduction to the concepts of organic Chemistry concentrating on descriptive chemistry of the functional group based molecules. The course is focus on three basic type of molecules organic molecules (aromatic or non-aromatic) which contain C, H, and O, organic molecules (aromatic or non-aromatic) which contain C, H, and N, organic molecules (aromatic or non-aromatic which contained C, H, O, and N). Synthesis, properties, name reaction, and application associates with it is a main focus of the course

**CHEM302 : Inorganic Chemistry II 3 Credits**

This course is introduced with an emphasis to make the methods and concepts of Inorganic Chemistry more clear and d block elements to develop problem solving skills to those students who had a year of General Chemistry for metal understanding. This course covers topics such as valance bond theory (VBT), crystal field theory (CFT), tetrahedral and octahedral geometry , CFT splitting, properties transition, lanthanide, and actinide elements

**CHEM304: Analytical Chemistry II 3 Credits**

Instrumental methods of chemical analysis have become the principal means of obtaining information in diverse areas of Science and Technology. A modern, well-educated scientist is one who is capable of solving problems with an analytical approach and who can apply modern instrumentation to problem solving. With this knowledge, the scientist can develop analytical methods to solve problems and obtain appropriately precise, accurate and valid information. The course contains the information necessary to develop a solid and fundamental understanding for a student in an upper level undergraduate class in instrumental analysis.

**CHEM310 :Petroleum Products and Processing 3 Credits**

The course explores the geology, exploration, drilling, production (surface and subsurface), reservoir engineering and management, distribution and transmission of oil and gas from practical and theoretical viewpoints. Students will develop the knowledge and the skills for problem solving in terms of development, design, business and economics management in oil and gas engineering which will assist them to make management and take scientific decisions in the workplace. This module explores the



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principles of exploration, drilling, production and development system in terms of the geology, the reservoir, acquisition, production and operations relating to oil and gas engineering. This module will give students specialized knowledge in gas science technology and gas processing covering subjects such as the liquefied natural gas industry, planning of gas supply systems, LPG technology and treatments of crude natural gas to reach accepted specifications.

### **CHEM312: Biochemistry      3 Credits**

This is an introductory course at the interface of biology and chemistry. It includes following topics: Energy & Energy Metabolism. Enzymes: types, kinetics & inhibitions, Carbohydrates: saccharides & their types, structure, function, digestion, assimilation. Metabolism: glucose – glycolysis, Kreb's cycle & electron transport chain reaction. Proteins: amino acids & peptide structure, function, digestion, assimilation, metabolism of proteins/amino acids, denaturation of proteins. Lipids: structure & function of essential & non- essential fats, their digestion, assimilation, metabolism of lipids/fats – oxidation. Micromolecules: role of vitamins in biochemical pathways, water- soluble and fat-soluble vitamins role of minerals in biochemical pathways, alcoholic and lactic acid fermentations. Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

### **CHEM313 : Physical Chemistry I      3 Credits**

This course is introduced with an emphasis to make the methods and concepts of Physical Chemistry more clear and interesting to students and to develop problem solving skills to those students who had a year of General Chemistry. This course covers topics such as properties of gases, chemical thermodynamics, phase equilibria, chemical equilibria and solutions.

### **CHEM 314: Unit Operations      3 Credits**

The course covers the different unit process employed in the organic chemical manufacture. They involve nitration, sulfonation, chlorination, alkylation esterification, hydrolysis etc. The discussion involves the use of different reagents used for the conversions and their merits and demerits over others employed in the industry. The effects of variation in the reaction parameters on the yield, conversion, purity and selectivity in each of the steps are discussed in detail. The discussion also involves the study of the real time processes as flow chart diagrams practiced in the industry. These flowcharts are generated from the manufacturing processes of pharmaceuticals, fine chemicals, specialty chemicals etc. Also the practical aspect of different chemical engineering operations is also explored.

### **CHEM315: Metallurgy      3 Credits**

This course focuses on the followings: Metals, ore deposits and minerals as well as mineral beneficiation. Metals, ore deposits and minerals covers an introduction to metallurgy, properties of metals and their structures in the context of the periodic table, commercial classification of metals and their uses, metal production and recycling, mineral occurrences and prospecting/mining of ores, properties of mineral and ores and sources of minerals. The course includes the topics such as: Use of metals by humans, recovery

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of metals, Geochemical classification of the elements, Beneficiation, some case studies, Hydrometallurgical processes, Metallurgy of Copper, Iron, Silicon, Aluminium, Siderophiles. Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

### **CHEM316: Phytochemistry 3 Credits**

The course aims to provide students with the necessary skills for extraction and separation of the active constituents obtained from natural sources (alkaloids, terpene, flavonoids, glycosides, hallucinating, and anticancer drugs) from plants in addition to the different methods of separation (chromatography). It will also provide knowledge for identification of active ingredients either in pure form or a mixture- as well as the different methods to evaluate these components and how to deal with the side effects of some components (if any). Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

### **CHEM320: Computers in Chemistry 3 Credits**

The course addresses scientific working fields of chemistry, computer science and information science. The course integrates chemical structure draw using cam-draw and analysis and prediction of NMR, FT-IR and other analytical data using software for characterization of molecules, and its correlation with experimental data. The course comprises central concepts for the computer-based application of organic molecules including proteins. Examples of such properties are structure (i.e., the expected positions of the constituent atoms), absolute and relative (interaction) energies, electronic charge density distributions, dipoles and higher multipole moments, vibrational frequencies, reactivity, or other spectroscopic quantities, and cross sections for collision with other particles. The bioinformatics part of the course addresses the construction and use of databases containing biological information, protein sequence comparisons and 3D structure of the molecules.

### **CHEM381: Organic Chemistry II Lab 1 Credit**

CHEM381 laboratory course intended as the co-requisite for Organic Chemistry II theory course, and it is focusing on training students in main laboratory techniques such as: Thin Layer Chromatography (TLC), extraction of an organic product from reaction mixture, carrying synthesis, product isolation and product purification. The students will develop skills in reporting the laboratory work in a research notebook following standard notebook formats.

### **CHEM382: Inorganic Chemistry II Lab 1 Credit**

The course focus on geometrical structure of metal and its compound, oxidation and reduction reaction of metal, and synthesis of some coordination compounds and its purification.



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**CHEM384: Analytical Chemistry II Lab 1 Credit**

CHEM384 laboratory course is intended to complement with the instrumental methods of chemical analysis. Students acquire skills in some analytical techniques; Gravimetric determination, different types of titrations, and some spectroscopic analysis. Students trains to prepare sample, and do quantitative analysis using different instruments. The course contains the information necessary to develop a solid and fundamental understanding for a student in an upper level undergraduate class in instrumental analysis.

**CHEM393: Physical Chemistry I Lab 1 Credit**

CHEM 393 introduces students to modern laboratory instrumentation and experimental techniques in physical chemistry. It consists of a number of experiments that use different techniques to explore fundamental concepts in spectroscopy, kinetics, and chemical thermodynamics. Students learn the fundamental physical principles behind each technique, use instruments to measure physical properties, and evaluate the data critically. This course is also intended to develop scientific writing skills by requiring two fairly detailed laboratory reports in scientific paper format.

**CHEM394: Unit Operations Lab 1 Credit**

The course covers the different unit process employed in the organic chemical manufacture. The effects of variation in the reaction parameters on the yield, conversion, purity and selectivity in each of the steps are performed practically in the lab.

**CHEM410: Materials Chemistry 3 Credits**

This is a course on Materials Chemistry focusing on theoretical component. This course discusses the fundamentals concept of Materials Sciences and classification of materials and includes topics such as symmetry elements and symmetry operations and crystallography and describes about crystal types and structure, details discussion on lattice planes and their identification, structural determination such as x- ray, neutron and electron diffraction, types of solids and close packing in solids, basic electrical, magnetic, mechanical and optical properties of solids and applications. This course also introduces the concepts of nanomaterials and their applications.

**CHEM411: Pharmaceutical and Medicinal Chemistry 3 Credits**

The course introduces Pharmaceutical Chemistry by giving an overview of the pharmaceutical industry. The pharmacopoeias of different countries are familiarized to the students. Different routes of drug administration with a brief discussion of the merits and demerits are followed by the significance of the inorganic chemicals of pharmaceutical importance. A few specific functional classes of inorganic compounds like antacids, diuretics, purgatives etc. are described. The medicinal section of this course introduces the method of classification of drugs based on structure and biological activity. Concept of acidity and basicity of drugs and pKa values, absorption and distribution of drugs based on physicochemical properties and drug metabolism are further discussed. Study of the chemistry of the

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different classes of drugs - nomenclature, classification, SAR, synthesis is included. Retrosynthetic analysis of relatively simple natural products and their synthesis are presented.

### **CHEM412: Science and Technology of Cosmetics and Perfumery Chemicals     3 Credits**

The course describes the common ingredients used in cosmetics, equipment's, plants and machinery for manufacture. Formulations of creams, hair care products, nail polish, lipsticks are discussed in detail. Stability tests and product specifications pertinent to each of these products are also given. Concept of product design, labeling, claiming and claim support understanding of current needs, translation of current needs to products are also included in the course with the view of the changing trends in the taste and aesthetic sense of consumers. A detailed study of reactions like hydrogenation, oxidation, reduction, epoxidation, hydrolysis, esterification, aldol condensation for perfumery chemicals is included in the course. Preparation of terpeneless and sesquiterpeneless oils, technology of preparation for alcohols, esters, aldehydes and ketones used as perfumery chemicals which find their common industrial use in many formulations are made part of the course. Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

### **CHEM413: Science and Technology of Soaps and Detergents     3 Credits**

"This course deals with the fundamentals of science and technology of soaps and detergents. This will cover various topics including historical relevance of soap and detergents, introduction to soap and detergent industry, types of soaps, raw materials required for making soap and detergent, chemistry of surfactants, soap and detergent, technology to make soap and detergent, recovery of glycerol, household cleaning products, and safety and related pollution issues. Student groups are given experiments that allow them to practice the theoretical concepts that conveniently performed in the laboratory.

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### **CHEM414: Catalysis     3 Credits**

The course addresses fundamental of catalysis, its theory, and applications in various fields. The course comprise on in general principle (units, mechanism, energetics and material's) classification of various type of catalysts. The course focus on industrial application of catalyst especially in oil and gas, fine and bulk chemical industries and non-conventional energy sector such as fuel and solar cells. The course also focuses on environmental and biocatalyst.

### **CHEM415: Nanotechnology Application in Chemical Industry and Applied Spectroscopy     3 Credits**

The traditional chemical industry has become a largely mature industry with many commodity products based on established technologies. Therefore, new product and market opportunities will more likely come from speciality chemicals, and from new functionalities obtained from new processing technologies. Nanotechnology is emerging as one of the principal areas of investigation that is integrating chemistry and materials science, that can be exploited to gain new market opportunities. The course addresses

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fundamental concept of nanotechnology and nano-materials, and its applications in various chemical industry and applied spectroscopy.

**CHEM489: Research Project 3 Credits**

An undergraduate Research Thesis/Report completed individually or in a group will be required to furnish under an allocated Faculty Member in a specialized area of research, mainly related to his/her Minor. In this course, students will be learning how to tackle realistic problems as they would be solved in the real world. Moreover, an atmosphere will be provided where student will have increased control over his/her thinking and implementing.

**CHEM491: Pharmaceutical and Medicinal Chemistry Lab 1 Credit**

This course is complement practical course for pharmaceutical and medicinal chemistry. It highlights the important principles in medicinal chemistry and drug design. In addition, multi-step synthetic procedures of some representatives from various pharmaco-therapeutical classes, i.e., Local Anesthetics, Analgesics–Antipyretics, Disinfectants, Antiseptics, Antibacterial Chemotherapeutics, Anti-Tuberculosis Drugs, or Antimycotic Agents, and estimation of their fundamental physicochemical descriptors.

**CHEM499: Internship 6 Credits**

Every student will undertake practical training in an approved industry or research organization. This shall include the real project-based assignments, research-based activities, team-work activities and safety and environmental awareness. The student will maintain a daily diary duly signed by the industrial/research supervisor. At the end of the internship, the student will submit a written report. He/she will be evaluated by a committee on the basis of his/her performance in the industry/research organization, final written report and oral presentation.