

## **BSc (Hons) Chemistry For Analysis (Upgrade)-Part Time - SC311**

### **1. Aims and Objectives**

The BSc (Hons) Chemistry For Analysis is an upgrade to the DCAIT course (Diploma in Chemical Analysis and Instrumental Techniques) designed to enable DCAIT holders as well as holders of a diploma in chemistry or their equivalent to obtain a BSc (Hons) degree in the specified programme.

The undergraduate will gain theoretical and practical experience in analytical sciences and their applications in the chemical, biological, pharmaceutical, forensic, environmental, food and agricultural sectors.

The program's training deals with fundamental chemical principles, key laboratory techniques and modern chemical instrumentations which will enable the student to adapt to exciting technological advances in chemistry.

### **2. General Entry Requirements**

As per General Entry Requirements for admission to the University for undergraduate degrees.

### **3. Programme Requirements**

- Successful completion of the DCAIT programme or a Diploma in Chemistry or its equivalent.
- Pass at GCE 'A' Level in at least 2 Science subjects (Mathematics, Chemistry, Physics, Biology or Food and Nutrition).

### **4. Programme Duration**

**Normal** - 2 years

**Maximum**- 4 years

### **5. Credit System**

15 Hours Lectures and/or Tutorials - 1 Credit

30-45 Hours of Practical Work – 1 Credit

**6. Credits Required for Award: 45 (105 including 60 credits from Diploma)  
Breakdown as follows:**

**Credits from:**

| <b>Degree</b>                    | <b>Core Taught Modules</b> | <b>Project</b> |
|----------------------------------|----------------------------|----------------|
| BSc(Hons) Chemistry For Analysis | 36                         | 9              |

**7. Assessment**

Each module will carry 100 marks (i.e. expressed as %) and will be assessed as follows (unless otherwise specified).

Assessment will be based on a written examination of 3 h for 4 credit modules and 2 h for 3 credit modules and on continuous assessment carrying 30% of total marks. Continuous assessment may be based on laboratory work, and/or assignments and should include at least 1 class test/assignment.

An overall total of 40% for combined continuous assessment and written examination components would be required to pass a module, without minimum thresholds within the individual continuous assessment.

Students who have not covered the contents of the modules CHEM 3004Y and CHEM 3005Y in their Diploma programme will have to enroll for these modules and satisfactorily complete them for degree award. Students will be assigned a grade **S** for satisfactory completion of the modules. No credit/grade points will be earned and the marks/grades obtained will not be considered in CPA/GPA computation.

**8. List of Modules**

| <b>Code</b>     | <b>Module</b>                          | <b>Hrs<br/>L + P</b> | <b>Credits</b> |
|-----------------|--|----------------------|----------------|
| <b>Year III</b> |  |                      |                |
| CHEM 3006Y(5)   | Research Methodology                   | 60 + 0               | 4              |
| CHEM 3007Y(5)   | Food Chemistry                         | 45 + 45              | 4              |
| CHEM 3008Y(5)   | Analytical & Spectroscopic Techniques  | 50 + 20              | 4              |
| CHEM 3009Y(5)   | Agricultural Chemistry & Soil Analysis | 45 + 30              | 4              |
| CHEM 3010Y(5)   | Supramolecular Chemistry               | 45 + 0               | 3              |
| CHEM 3012Y(5)   | Computational Chemistry & Chemometrics | 30 + 30              | 3              |
| CHEM 3004Y(5)*  | Quality Control and Quality Management | 40 + 10              | 0              |
| CHEM 3005Y(5)*  | Forensic Investigation and Analysis    | 37.5 + 15            | 0              |
| <b>Year IV</b>  |  |                      |                |
| CHEM 3020Y(5)   | Project                                | -                    | 9              |
| CHEM 3013Y(5)   | Polymer Science                        | 55 + 10              | 4              |
| CHEM 3014Y(5)   | Medicinal Chemistry                    | 55 + 10              | 4              |
| CHEM 3015Y(5)   | Environmental Science II               | 40 + 10              | 3              |
| CHEM 3016Y(5)   | Forensic Chemistry                     | 40 + 10              | 3              |

**\*Applicable to students who have not covered the contents of these modules in their Diploma programme.**

## **9. Outline Syllabus**

### **CHEM 3004Y(5) - QUALITY CONTROL AND QUALITY MANAGEMENT**

Quality Assurance, quality control in applied chemical analysis, importance of laboratory accreditation, overview of requirements of ISO/IEC 17025, simple statistical calculations in analytical chemistry, proficiency testing and its interpretation, internal audits in laboratories, hazards analysis critical control point (HACCP), GLP.

### **CHEM 3005Y(5) - FORENSIC INVESTIGATION AND ANALYSIS**

Analysis of paints, inks, drugs, glass using spectral and analytical techniques; introduction to DNA fingerprinting; introduction to analysis of fire residues.

### **CHEM 3006Y(5) - RESEARCH METHODOLOGY**

Description of Data; Data collection, Exploration and Visualization; Graphical presentations of data (e.g. bar chart, line graph), statistical package (SPSS), Hypothesis Tests: correlation, independent t-tests, ANOVA, Chi-square test, analysis of variance correlation, multiple regression, Linear Models; Sampling Methods; Experimental Design, spreadsheet models in quantitative analysis.

Presentation and Data Presentation Skills; Research Writing Skills - for articles and reports; purpose of literature review, sources of literature, planning and conducting literature search, communication skills via knowledge transfer of scientific information; effective use of information in the library; survey skills.

### **CHEM 3007Y(5) - FOOD CHEMISTRY**

The chemistry of natural pigments, flavours and major food products including dairy products, fat products, fried foods, meat, egg and cereals (flour, rice). Chemistry and applications of food additives: sugar replacers; antimicrobial agents; antioxidants; colouring agents. Chemistry and mechanisms of fat modification processes to control formation of trans fatty acids. Chemistry and applications of polysaccharides in foods. Enzymatic and non-enzymatic browning in foods. Colloid chemistry of food systems. Chemical basis of sensory perception.

International and local food standards including the Mauritius Food Act and Food Regulations. Application of chemical, instrumental and sensory methods to determine nutritive value, quality, safety and compliance with food standards. Analysis of selected food products, food additives and contaminants. Sampling plans and methods. Sample preparation. Control of factors which affect reliability of analyses. Good laboratory practices.

### **CHEM 3008Y(5) - ANALYTICAL & SPECTROSCOPIC TECHNIQUES**

Topics related to analytical and spectroscopic procedures in chemical analysis, sample preparation and characterization techniques related to IR, NMR, mass, electronic spectroscopy, magnetochemistry, X-ray spectroscopy and other spectroscopic techniques; Chromatography: HPLC, Flash, GC-MS, LC-MS, GC-MS/MS, LC-MS/MS; SEM-EDS, ICP-MS, ICP-OES; solid phase extraction and other pre-concentration techniques; air monitoring measurement methods (analysis of SO<sub>2</sub>, NO<sub>2</sub>, CO, ozone, total suspended particles, trace metals, persistent organic pollutants).

### **CHEM 3009Y(5) - AGRICULTURAL CHEMISTRY & SOIL ANALYSIS**

Agrochemicals: Chemistry and metabolism of pesticides (organochlorines, organophosphates, carbamates, pyrethroids, dinitrophenols, phthalimides, triazines, inorganics, botanical pesticides, bio-pesticides, etc.) and fertilisers (straight, complex, compound mixed, blended, substituted ureas, etc). Pesticide and fertiliser design, manufacture and formulations. Chemical, photo- and microbial degradation processes in the environment, and in target and non-target species. Fertiliser and pesticide residue analysis in soil, water, and agricultural commodities. Analysis of organic fertilizers. Agronomic value of fertilizers.

Soil: Soil as a natural body. Weathering. Factors and processes in soil formation. Soil profile and taxonomy. Soil sampling and analysis for the physical, physico-chemical, biological and mineralogical properties of soil, including soil, air, water, temperature, organic matter and soil organisms. Soil biology. Concepts of soil productivity and fertility. Soil amendments. Soil pollution. Heavy metals, Polyaromatic Hydrocarbons (PAH) and Persistent Organic Pollutants (POP) in soils. Soil bioremediation.

### **CHEM 3010Y(5) - SUPRAMOLECULAR CHEMISTRY**

Introduction to supramolecular chemistry, molecular forces, common supramolecules, experimental techniques in supramolecular chemistry, host/guest chemistry, molecular recognition, amphiphile organization, supramolecular design strategy & nanotechnology.

### **CHEM 3012Y(5) - COMPUTATIONAL CHEMISTRY & CHEMOMETRICS**

Computational chemistry (development, challenges and limitations): Fundamentals of computational methods (molecular mechanics, *ab initio*, density functional theory methods); Applications to chemistry related problems.

Chemometrics: Fundamentals of statistics, signal processing and time-series analysis, optimisation and experimental design, pattern recognition and classification, modeling of data; Applications to chemical analysis.

### **CHEM 3013Y(5) - POLYMER SCIENCE**

Basics of polymers, nomenclature, stereochemistry, isomerism, molar masses, polymerization techniques, analysis, characterization and instrumental techniques used; structure-property relationships.

### **CHEM 3014Y(5) - MEDICINAL CHEMISTRY**

Enzyme and enzyme inhibition, enzyme inhibitors as drugs with particular reference to antihypertensive drugs, enzyme kinetics; introduction to the Hansch equation:  $\log \rho$ , Swain and Lupton parameters; methods of administration of drugs, absorption, metabolism and excretion pathways of medicinal drugs, drug solubility; gastrointestinal drugs; inorganic drugs: Preparation, storage and analysis, Metals in medicine.

### **CHEM 3015Y(5) - ENVIRONMENTAL SCIENCE II**

Integrated coastal zone management, indicators, environmental impact assessment, environmental hazards, ecotoxicity, nutrient cycling, mercury contamination, natural and anthropogenic inputs in the coastal zone, ocean resources and seafood, urban smog, air pollution control and monitoring and other selected topics.

### **CHEM 3016Y(5) - FORENSIC CHEMISTRY**

Identification and analysis of fingerprints, footwear impressions and toolmarks, firearm and analysis of gunshot residue, analysis of blood, semen, saliva and other biological tissues. Classification and analysis of explosives.

### **CHEM 3020Y(5) - PROJECT**

Research project approved by the department and conducted under the supervision of academic(s) from the department or jointly with other departments of the university or staff from external institutions.