

# CHEM3027A: ANALYTICAL CHEMISTRY

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**Effective Term**

Semester A 2025/26

## Part I Course Overview

**Course Title**

Analytical Chemistry

**Subject Code**

CHEM - Chemistry

**Course Number**

3027A

**Academic Unit**

Chemistry (CHEM)

**College/School**

College of Science (SI)

**Course Duration**

One Semester

**Credit Units**

3

**Level**

B1, B2, B3, B4 - Bachelor's Degree

**Medium of Instruction**

English

**Medium of Assessment**

English

**Prerequisites**

Nil

**Precursors**

Nil

**Equivalent Courses**

BCH3027A Analytical Chemistry

**Exclusive Courses**

Nil

**Additional Information**

Note: CHEM3027A does not contain any practical component, and has a credit unit value of three (3).

## Part II Course Details

### Abstract

This course aims to enable students to develop an understanding of the principles of analytical chemistry with an emphasis on the common analytical methods and instruments. It builds upon introductory courses in analytical chemistry and extends the scope to include the more in-depth principles of analytical chemistry and the functions of equipment for qualitative and quantitative analysis. In this course, students will gain knowledge in analytical, environmental and separation techniques and designing innovative analytical methods, and opportunities of presentation of experimental results. This course offers students knowledge and skills that will allow them to undertake courses in analytical chemistry and instrumental analysis at a more advanced level. Additionally, it prepares graduates with knowledge, discovery capability, and experience in analytical chemistry for industrial applications, laboratory analysis and research studies.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply the principles of common analytical techniques including chromatography, atomic spectroscopy, mass spectrometry, potentiometry and fluorescence spectroscopy.	45	x	x	
2	Explain the functions of analytical instruments employed in the above techniques and design innovative analytical methods.	45	x	x	
3	Select, design and justify the most appropriate techniques for a range of samples.	10			x

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
Lectures and tutorials	In lectures and tutorials, students will develop an understanding on the principles and applications of various analytical techniques including chromatography, atomic spectroscopy, mass spectrometry, potentiometry and fluorescence spectroscopy.	1	1.5

2	Lectures and tutorials	In lectures and tutorials, students will develop an understanding on the functions of common analytical instruments leading to the design of innovative analytical methods.	2	1
3	Tutorials	In tutorials, students will discuss and compare common analytical techniques, design and select the most appropriate techniques for different samples from a discovery approach.	3	0.5

**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3	10	-	Yes
2	Tests	1, 2, 3	20	It is part of the summative assessment, where the learning outcomes of students will be evaluated.	No

**Continuous Assessment (%)**

30

**Examination (%)**

70

**Examination Duration (Hours)**

3

**Minimum Continuous Assessment Passing Requirement (%)**

40

**Minimum Examination Passing Requirement (%)**

40

**Assessment Rubrics (AR)****Assessment Task**

Assignments

**Criterion**

ABILITY to develop an understanding on principles of analytical techniques

**Excellent (A+, A, A-)**

Demonstrates a excellent level of understanding and application of analytical techniques principles.

**Good (B+, B, B-)**

Shows a significant understanding and application of analytical techniques principles.

**Fair (C+, C, C-)**

Exhibits a moderate understanding and application of analytical techniques principles.

**Marginal (D)**

Displays a basic understanding and application of analytical techniques principles.

**Failure (F)**

Does not reach even marginal levels of understanding and application of analytical techniques principles.

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**Assessment Task**

Tests

**Criterion**

ABILITY to describe and explain basic concepts of analytical chemistry to solve problems

**Excellent (A+, A, A-)**

Demonstrates a excellent level of ability to describe and explain basic concepts of analytical chemistry and solve related problems.

**Good (B+, B, B-)**

Shows a significant ability to describe and explain basic concepts of analytical chemistry and solve related problems.

**Fair (C+, C, C-)**

Exhibits a moderate ability to describe and explain basic concepts of analytical chemistry and solve related problems.

**Marginal (D)**

Displays a basic ability to describe and explain basic concepts of analytical chemistry and solve related problems.

**Failure (F)**

Does not reach even marginal levels of ability to describe and explain basic concepts of analytical chemistry and solve related problems.

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**Assessment Task**

Examination

**Criterion**

ABILITY to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems

**Excellent (A+, A, A-)**

Demonstrates a excellent level of ability to describe, explain, and integrate concepts of analytical chemistry and apply them effectively to solve problems.

**Good (B+, B, B-)**

Shows a significant ability to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems.

**Fair (C+, C, C-)**

Exhibits a moderate ability to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems.

#### **Marginal (D)**

Displays a basic ability to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems.

#### **Failure (F)**

Does not reach even marginal levels of ability to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems.

## **Part III Other Information**

### **Keyword Syllabus**

#### Chromatographic Separations

Theory of chromatography.

#### Gas Chromatography

Principles. Carrier gases, stationary phases and detectors. Applications. GLC and GSC.

#### High Performance Liquid Chromatography

Principles. Instrumentation. Mobile and stationary phases. Partition, bonded-phase, adsorption, ion-exchange and size-exclusion chromatography. Applications.

#### Atomic Spectrometry

Principles. Instrumentation. Interferences. Effects of temperature. Applications.

#### Mass Spectrometry

Principles. Ion sources, mass analysers and transducers. Applications.

#### Potentiometry

Principles. Reference and indicator electrodes. Glass electrodes. Ion-selective electrodes. Applications.

#### Fluorescence Spectroscopy

Principles. Instrumentation. Applications.

### **Reading List**

#### **Compulsory Readings**

<b>Title</b>	
1	Nil

#### **Additional Readings**

<b>Title</b>	
1	Fundamentals of Analytical Chemistry 9th Edition, Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch, Brooks Cole, 2014.
2	Principles of Instrumental Analysis 7th Edition, Douglas A. Skoog, F. James Holler and Stanley R. Crouch, Brooks Cole, 2017.