**II.2.6 ANALYTICAL CHEMISTRY**

**A. Course description:**

**1. Credit points: 3 ECTS**

**2. Time commitment**

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| --- | --- | --- | --- | --- | --- |
| Items | Lecture | Tutorial/  Exercise | Practice/  Assignment | Lab-work | Total |
| No. of hours | 17 | 7 |  | 9 | 33 |

**3. Prerequisites**

General chemistry, Probability and Statistics

**4. Recommended background knowledge**

**5. Subject description**

This course will introduce and illustrate the analytical approach to chemical analysis, in particular environmental analysis.  Participants will learn how to properly make measurements and record them, see how to measure the important physical and chemical properties of samples and learn how to quantify and minimize measurement error.  Students will be encouraged to develop problem solving skill and apply these to solve the real chemical problems.

The practical in laboratory will reinforce students’ skill to do chemical analysis of environmental samples.

**6. Objectives & Outcome**

After this course, the successful student will:

* be able to evaluate if a measurement is statistically significant and, if it is, report the value of the measurement to the correct precision
* be aware of the capabilities of many measurement techniques and be able to select an appropriate technique for measuring the composition of a sample
* recognize when measurement science can contribute to the solution of a problem, and also recognize aspects of a problem that can not be dealt with by measurement
* know how to make a buffer and understand why buffers are important
* know how to make a working curve, a working curve using internal standards, a determination using standard additions, and know when to use each approach
* understand the importance of reagent blanks and instrumental background be able to compute speciation in a complex mixture at equilibrium understand and can apply common analytical methods including titration and gravimetric analysis.

**7. Assessment/ Evaluation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Component | Attendance | Exercises | Practicals | Midterm | Final |
| Percentage % | 10 | 10 | 20 | 10 | 50 |

**8. Prescribed Textbook(s)**

[1]David Harvey. Modern Analytical Chemistry. McGraw-Hill, 2000

[2] Daniel C. Harris. Quantitative Chemical Analysis. Seventh Edition. W. H. Freeman and Coompany, 2007.

**B. Course content**

1 Introduction of analytical chemistry

2 Basic Tool of analytical chemistry

-Significant numbers in analytical chemistry

- Unit for Expressing concentration

- Basic equipment and instrumentation

- Preparing solution

- The laboratory notebook- Statistics in analytical chemistry

3 Sample preparation

4 Equilibrium chemistry

Acid-base reactions, Complexation Reactions, Precipitation Reactions, Redox Reaction

5 Volumetric titration

- Acid-base Titration

- Complexation Titration

- Precipitation Titration

- Redox Titration

6 +Expt. 1: Determination of Alkalinity and hardness of surface water.

+ Expt. 2: Determination of chloride, DO, COD of waste water

7 Gravimetric Methods of analysis

+ Expt. 3: Gravimetric determination of sulfate in soil sample.

8 Principles of Instrumental Analysis

- Calibrations, standardizations and blank corrections

-Spectroscopic method

- Electrochemical Analysis

- Chromatography and other separation techniques

9 Selecting anal method and QA/QC in analytical laboratory

**C. Reference Literature:**

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| [1].Gary D. Christian. Fundamentals of Analytical Chemistry. Sixth Edition. John Wiley & Sons |
| [2]. D. Kealey & P.J. Haines. Analytical chemistry. Instant notes. BIOS Scientificc Publishers Ltd. |