Hashemite University
Faculty of Allied Health Sciences
Department of Medical Laboratory Sciences

Course Syllabus

Course Title: Analytical techniques in biomedical labs	Course code: 140501336
Lecture time:	Credit hrs: 2

Academic lecturer

Name	Rank	Office number	Email address
Dr. Ismail Sami Al.Mahmoud	Assis Prof		ismails@hu.edu.jo

Course objectives: The course aims to provide students with comprehensive understanding of important topics in instrumental techniques and methods in biomedical labs. This course helps the students to build an advanced integrated knowledge of key subjects in analytical chemistry, including chromatography, photometry, atomic spectroscopy, mass spectrometry and microscopy.

Course text books and references:

- Principles and of instrumental analysis, *Holler, Skoog and Crouch* 6th edition
- The Physical and Chemical Basis of Molecular Biology, *Thomas E. Creighton*, 2010

week	Topics to be covered
1	**Introduction:** – Brief history of the development of analytical techniques – Types and applications of analytical techniques – Processing and flow of information by instruments
2	**Chromatography:** – Thin layer Chromatography (TLC) – Column Chromatography – Affinity Chromatography – Size exclusion (gel filtration) – Ion exchange Chromatography
3	**High Performance Liquid Chromatography (HPLC)** – How does it work? – Chromatogram characteristics – Data interpretation – Normal Phase HPLC – Reverse Phase HPLC – Size exclusion HPLC – Ion exchange HPLC – Different Applications of HPLC
4	**Gas Chromatography** – Principle of working – Types of Gas Chromatography – Gas chromatography (GC) instrumentation – Types of columns – Gas chromatography detectors
5	**Centrifugation** – Centripetal Vs Centrifugal forces – Types of rotors – RPM Vs RCF – Types of centrifuges – Right using and safety
6	**Electrophoresis** – Principle and types – Gel electrophoresis (horizontal, vertical) – PAGE electrophoresis – Capillary electrophoresis
7	**Spectroscopy** – Electromagnetic radiation – Photometry – Absorbance and transmittance – Anatomy of photometer instrument – Types of lamps – Types of wavelength selectors – Types of detectors
8	**Atomic spectroscopy** – Atomic absorption spectrophotometer – Atomic emission spectrophotometer

9	**Fluorometer and luminometer** – Principle of working – Components of the instrument – Applications in biomedical labs
10	**Cell counters (flow cytometers)** – Principle of cell counters (Electrical impedance (coulter principle), Light scattering, Fluorescent probing) – Haematology analysers, principle of action, interpretation of histograms – Fluorescence activated cell sorter (FACS)
11,12	**Mass Spectrometer** – Principle of working – Components of mass spectrometer – Interpretation of mass spectrum – Ionizers (Electrospray ionization, electron bombardments, MALDI) – Mass analysers (Magnetic sector, Quadrupole, Time of flight) – Mass detectors (microchannel plate, microchannel plate photomultiplier)
13	**Electro-analytical techniques** – Galvanic cells and electrodes – Potentiometery – ion selective electrode (ISE)
14	**Microscopy** **Light microscope:** – Bright field – Phase-contrast – Epi-fluorescence – Confocal – Two photon excitation – High resolution microscope **Electron microscope** – SEM – TEM
15	**Molecular techniques** – Polymerase chain reaction – Nested PCR – Allele specific PCR – Real time PCR – Restriction fragment length polymorphism (RFLP)

Student responsibilities and expectations:

- Excellent attendance is expected.
- At the beginning of the lecture, be on time.
- Switch off you mobile phone or put it on silent throughout the lecture.
- Exams are scheduled to be given at specific times throughout the semester, and you are expected to attend them all.

-Wish you all the best-