Overview / General Information

The lecture component of this course considers how the analysis of samples from the body for various constituents can give insight into pathological processes. Included are the principles for tests routinely carried out in a clinical biochemistry laboratory, and the biological understanding of test results. Specific subjects considered are clinical enzymology, heme catabolism, liver function toxicology and therapeutic drug monitoring, principles of immunoassays, blood lipids, porphyrins, endocrinology, gastric and GI function, fetal-placental function, and biochemical tumor markers.

The lab component of this course allows the student to observe and perform numerous manual procedures. Manual methods allow the student to observe chemical reactions which are not visible in automated methods and practice technical skills such as organization, preparation, pipetting, measuring, and trouble-shooting. One of the main goals is to help the student become technical proficient with an emphasis on the validity and analysis of results.

Policy about course outlines can be found in §23.4(2) of the University Calendar.

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Course Coordinator(s) / Instructor(s)

Classroom Lectures
Dr. Monika Keelan
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Laboratory Sessions:
Amanda VanSpronsen
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Open door policy, email or phone to guarantee time

Course Learning Objectives

A. A broad understanding of enzyme classification, structure, function (kinetics and factors affecting reaction rate), as well as knowledge of the tissue sources of a variety of clinically important enzymes.

B. A good understanding of the biochemistry and pathophysiology associated with many tests routinely performed in a clinical biochemistry laboratory, with an appreciation of the differences
in the pediatric, adult, and geriatric populations.
  a. Heart diseases, lipid/lipoprotein metabolism
  b. Liver diseases, pancreatitis/pancreatic insufficiency, gastrointestinal tract diseases
  c. Tumor markers and their role in the management of cancer
  d. Haemoglobin metabolism and assessment of porphyrins
  e. Endocrine system, hormone regulation and assessment of hormone disorders
  f. Semen analyses in fertility investigations
  g. Fetal well-being, high risk pregnancy assessment, neonatal screening

C. A good knowledge of the **physical chemistry and clinical significance** behind most of the tests routinely

D. An insight into **therapeutic drug monitoring**, as well as an understanding of the **mechanisms of the major toxicants** and the role of the clinical lab in the evaluation of **exposure to toxicants**.

E. An insight into the integration of the knowledge acquired in all disciplines of laboratory medicine, through **discussion of appropriate case reports**.

F. **Skills to work and learn together** in small groups to **assess and investigate problems**.

G. The ability to perform specific manual clinical chemical tests with:
   a. **Precision, accuracy and efficiency**, with recognition for safety and quality control
   b. Appropriate **scientific vocabulary, laboratory mathematic and communication skills**, as well as an introduction to the concept of **professionalism**
   c. **Proper reagent and instrumentation use** as well as proper collection of samples

H. A basic understanding of the **principles and components of several types of instrumentation** used in clinical chemistry laboratory.

**Methods of Instruction:**

**Lectures:**
Each lecture is delivered in a classroom with state-of-the-art audio-visual equipment. Lecturers use MS PowerPoint to deliver the visual content, and on occasion use movie clips and animation to bring a concept to life. Each lecture begins with a list of the learning objectives for the lecture topic. Key messages are reinforced at least three times: text on the slide, visual example or case study, and in lecture summary points. Sample questions and case studies are discussed in class and provided in written from for practice prior to written examinations. Instructors use a variety of interactive teaching techniques to engage students in the classroom.

Guest lecturers are a feature of the course and include clinical chemists with special interests (quality control, carbohydrate testing, protein analyses, immunoassays, POCT), as well as peer health professionals (e.g. respiratory technologists – acid-base disorders).

Graduate students in the Department of Laboratory Medicine and Pathology are also provided opportunities to deliver a lecture to this group of undergraduate students, if they are registered in the Graduate Teaching and Learning Program. This is a formal program that requires attendance at workshops on teaching skills, and demonstration of teaching skills.

**Discovery Learning:**
Effective communication skills are important within the laboratory workplace, but are becoming increasingly important beyond the lab as health care models shift towards collaboration among health professionals rather than a lead (e.g. doctor) requesting information and making decision on his/her own. Improved communication between laboratory and other health professionals regarding the proper patient preparation for sample collection to ensure test validity, as well as the advantages and
limitations of the tests requested, will better serve the goal of quality health care for each patient. This is an interactive small group learning activity that takes place over three lecture sessions. Each small group works together to identify problems in a situation, what they need to know about the topic in order to understand why the problem arose, and then develop an approach towards resolving the situation.

**Flipped Classroom:**
This is a type of blended learning where students watch a series of short video lectures at home and then participate in activities during class time to inquire about the lecture content, test their skills (e.g. quiz), or apply the knowledge during class time.

**Lab:**
Each lab session will begin with a pre-lab discussion in the MLS classroom in CSB. The majority of the time will be spent in the practical laboratory, where the students will complete a lab procedure individually, in pairs, or small groups. Teaching assistants are present and will serve as technical and knowledge resources, and will evaluate the student’s practical work. The use of case studies and worksheets will also be employed.

**Distribution of Marks**

- **Lecture**  
  - Student Participation 5%  
  - Midterm exam 20%  
  - Final exam 35%  
  - Total 60%
- **Laboratory**  
  - Lab Templates 5%  
  - Professionalism 5%  
  - Quiz 1 10%  
  - Quiz 2 10%  
  - Proficiency Testing 25%  
  - Comprehensive Written Exam 45%  
  - Total 40%

**Late Laboratory Assignments will be docked 50% per day that they are late.**
Students are required to obtain a minimum grade of 60% in the laboratory in order to gain credit in MLSCI 263.

**Attendance:**

**Lecture:**  
Please note that an excused absence is a privilege, not a right, and is granted at the discretion of the course instructor in the case of term work, or the Director of Medical Laboratory Science in the case of the final exam. For details of the University’s attendance policy regarding missed term work and missed final examinations, see 23.3 of the University Calendar.

**Lab:**  
Attendance in the laboratory sessions is mandatory. Should illness or significant personal difficulties prevent you from attending a lab, you must notify the MLS office at 780-492-6601 or the instructor at 780-492-0989, BEFORE the lab starts.
Failure to notify the instructor may result in a grade of zero on laboratory assignments during the missed lab period. Granting of an excused absence is up to the discretion of the instructor. The student is responsible for ensuring that they learn the missed material. If the quiz or midterm is missed, the weighting will be transferred to the final comprehensive written exam.