The Michener Institute of Education at UHN
Cytogenetics Theory & Techniques I

Course Information

Instructor Name: xxxxxxxxx
Email: xxxxxxxxxx
Phone: xxxxxxxxxx
Office Location: xxxxxxxx
Office Hours: By Appointment
Course Website: Blackboard

Textbooks
Arsham, M.S., Barch, M.J., & Lawce, H.J. (2017). The AGT Cytogenetics Laboratory Manual (4th Edition). Hoboken: Wiley Blackwell. ISBN 9781119061229. Required.
Ronald, C., Scherer, S. & Hamosh, A. (2023). Thompson & Thompson Genetics and Genomics in Medicine (9th Edition). Philadelphia: Elsevier. ISBN 9780323547628: Required.
McGowan-Jordan, J., Hastings, R.J. & Moore, S. (2020). ISCN 2020: An International System for Human Cytogenomic Nomenclature. Basel: Karger. ISBN: 978-3-318-06704-0. Required.

Learner Supplies
Michener Branded Labcoat
Personal computer with minimum technology requirements as per

Pre/Corequisites
Prerequisite Entry to Program

Course Start Date: September 5, 2023
Total Credits: 17 credits
Total Hours: 218.4
There are 167.5 instructional hours in this course, including lectures, tutorials, and laboratory sessions. The remaining hours are for self-study and self-assessment of karyotype and nomenclature packages which are completed independently.
Number of Weeks: 13 weeks

External Standards

This course is linked to the following categories and competencies from the Canadian Society for Medical Laboratory Sciences (CSMLS) Clinical Genetics Competency Profile (2016):

1. Safe Work Practices - 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.10, 1.11, 1.12, 1.14
2. Data and Specimen Collection and Handling - 2.01, 2.02, 2.03, 2.04, 2.05, 2.07, 2.08, 2.09
3. Specimen Preparation and Pre-analytical Processing - 3.02, 3.03, 3.03.01, 3.04, 3.04.01, 3.05, 3.05.01, 3.06, 3.06.01, 3.07, 3.07.01, 3.10, 3.10.01
4. Equipment, Instruments and Reagents - 4.01, 4.02, 4.02.01, 4.04, 4.05, 4.06
5. Analysis - 5.01, 5.02, 5.03, 5.04, 5.10, 5.11, 5.12, 5.13
6. Recording and Reporting - 6.01, 6.02, 6.03, 6.05, 6.07, 6.08
7. Quality Management - 7.02, 7.03, 7.04, 7.06, 7.07, 7.08, 7.09, 7.10, 7.11, 7.12
8. Resource Management - 8.04
9. Communication and Interaction - 9.01, 9.03
10. Professional Practice - 10.06, 10.10

Course Description

This course will provide the foundational theory and hands-on experience of laboratory techniques currently used in diagnostic Cytogenetics laboratories. The student will acquire the knowledge, skills and techniques required to process Cytogenetic specimens from receipt to chromosome analysis and interpretation. The course is comprised of Laboratory, Tutorial and Lecture components.

Course Grading Information

Grading Scale – Performance Assessment Tasks (PATs)

% PAT Title Week Due
2 Cell Culture, Equipment & Aseptic Techniques Quiz 2
2 Harvest Theory Quiz 4
2 Accessioning Assessment 5
10 Karyotype Test #1 6
2 Blood Setup Technical Performance 7
10 Midterm 8
10 Karyotype Test #2 9
2 Slide Making & Staining Quiz 11
4 Onscreen Chromosome Analysis 11
3 Microscope-Based Chromosome Analysis 12
10 Karyotype Test #3 12
2 Long-Term Cultures Quiz 13
10 Unknowns 14
1 Preventative Maintenance/Weekly Duty Responsibilities Completed Throughout Semester
30 Final Exam Fall Exam Period
Final Exam Week (TBA)

In order to pass the course, students must complete all the following:
• Obtain a minimum grade of 60% on all karyotype tests
o Should a student be unsuccessful on one karyotype test, they will be offered remediation and one further attempt to achieve the 60% pass rate on that karyotype test. The student must then obtain a minimum grade of 60% on all subsequent karyotype tests the first time
• Obtain a minimum grade of 70% for the final exam
• Obtain a minimum grade of 60% overall
Note: A penalty of 10% is deducted for each 24-hour period (or part thereof) that an assignment is late

Program Outcomes Covered in This Course

This course supports the students' attainment of the knowledge, skills and attitudes expected of a Genetics Technology Program Graduate as per the CSMLS. Graduates will be highly competent professionals who:

1. Have developed a broad scientific/genetic knowledge base and practical skills.
2. Apply critical thinking skills to constructively solve problems.
3. Practice and promote the principles of continuous quality improvement including professional development and using personal initiative to improve laboratory practices.
4. Practice to ensure the safety of patients, colleagues, self, and the environment.
5. Contribute to the health care and education of the public, promote patient welfare, and respect the patient's dignity and confidentiality.
6. Are integral members of the health care team that share knowledge that is essential to the diagnosis and treatment of disease, promote learning, and collaborate with other professionals in providing effective patient care.
7. Are responsible and accountable for professional acts and practices according to standards of practice as well as legislation and regulations governing the profession.
8. Abide by the CSMLS Code of Professional Conduct.
9. Use effective interpersonal skills to maintain a professional relationship with clients and health care professionals.
10. Use all available resources to provide service in a timely, accurate, and cost-effective manner.

Course Competencies and Learning Objectives

1. Demonstrates safe practices according to established protocols, safety guidelines, and existing legislature
   Learning Objectives
   1.a. Uses the principles of standard precautions to minimize dangers to self and others (CSMLS 1.01)
   1.b. Demonstrates the use of appropriate personal protective equipment when required (CSMLS 1.02)
   1.c. Uses infection control practices and uses good laboratory hygiene (CSMLS 1.03)
   1.d. Understands the potential dangers posed by biological specimens, laboratory supplies and equipment (CSMLS 1.04)
   1.e. Demonstrates the usage of laboratory safety equipment in a correct and safe manner (e.g. Fume hoods, biological safety cabinets) (CSMLS 1.05)
   1.f. Demonstrates the use of WHMIS and existing legislation for the labelling, handling, storing, and disposing of chemicals, reagents and solutions (CSMLS 1.06)
   1.g. Demonstrates the use and disposal of sharps appropriately (CSMLS 1.07)
   1.h. Applies universal precautions and existing legislation to handle, transport, store, and dispose of biological and other hazardous materials (CSMLS 1.08)
   1.i. Demonstrates the appropriate method for disinfection/sterilization within the lab, while minimizing the associated risks and hazards associated with such method (CSMLS 1.09, 1.10)
   1.j. Understands and applies when needed the appropriate measures for spill containment and clean-up for biological and other hazardous materials (CSMLS 1.12)
   1.k. Understands and applies when needed the procedure for responding to and reporting incidents related to safety and personal injury within the laboratory (CSMLS 1.11, 1.14)
2. Demonstrates accurate data and specimen collection and handling according to established protocols
   Learning Objectives
   2.a. Understands the requirements regarding specimen collection, transportation, and storage (CSMLS 2.01)
   2.b. Verifies that all required data between the specimen and requisition match (CSMLS 2.02)
   2.c. Assesses the suitability of the sample for testing, including sample volume and integrity (CSMLS 2.03)
   2.d. Verifies that the required clinical information is present on the requisition (CSMLS 2.04)
   2.e. Verifies the suitability of the test requested for the referral reason (CSMLS 2.05)
   2.f. Demonstrates appropriate data entry and retrieval from the laboratory information system (CSMLS 2.07)
   2.g. Identifies discrepancies during specimen data entry and initiates corrective action as required (CSMLS 2.08)
   2.h. States the CCMG guidelines for specimen retention (CSMLS 2.09)
3. Evaluates the completion of pre-analytical processing on a variety of specimen types while following established protocols
   Learning Objectives
   3.a. Uses resources efficiently during specimen processing (e.g. time, equipment) (CSMLS 3.02)
   3.b. Completes culture set up for cytogenetic specimens (CSMLS 3.03)
   3.c. Completes culturing of cytogenetic specimens (CSMLS 3.04)
   3.d. Completes culture harvest for cytogenetic specimens (CSMLS 3.05)
   3.e. Assesses the quality of short term culture preparations throughout processing and initiates corrective action as required (CSMLS 3.03.01, 3.04.01, 3.05.01)
   3.f. Prepares slides for cytogenetic analyses (CSMLS 3.06)
   3.g. Assesses the quality of slide preparations and initiates corrective action as required (CSMLS 3.06.01)
   3.h. Completes staining of slides for cytogenetic analyses (CSMLS 3.07)
   3.i. Assesses the quality of stained slide preparations and initiates corrective action as required (CSMLS 3.07.01)
   3.j. Completes culture maintenance for long term cytogenetic specimens (CSMLS 3.10)
   3.k. Assesses the quality of long term culture preparations throughout processing and initiates corrective action as required (CSMLS 3.10.01)
4. Uses laboratory equipment and prepares reagents according to established protocols
   Learning Objectives
   4.a. Applies the principles of light microscopy for specimen assessment and analysis (Brightfield, Inverted and Phase Contrast) (CSMLS 4.01)
   4.b. Uses computer software to capture, enhance and annotate metaphase images, as well as create karyotypes (CSMLS 4.02, 4.02.01)
   4.c. Uses and maintains standard laboratory equipment (e.g. centrifuges, incubators, waterbaths, pipettes) (CSMLS 4.04)
   4.d. Understands the function of standard laboratory equipment and identifies basic malfunctions (CSMLS 4.05)
   4.e. Understands the preparation of cytogenetic reagents and culture media (CSMLS 4.06)
5. Evaluates patient data using scientific knowledge and skills to provide accurate genetic information according to established protocols
   Learning Objectives
   5.a. Understands the relationship between clinical information, limits of laboratory analyses, the test result, and their impact on patient care (CSMLS 5.01)
   5.b. Analyzes GTG stained metaphase chromosomes (CSMLS 5.02)
   5.c. Analyzes GTG stained karyotypes (CSMLS 5.03)
   5.d. Analyzes special stained chromosomes (CSMLS 5.04)
   5.e. Recognizes variant or abnormal genetic findings and states appropriate follow up if required (CSMLS 5.10)
   5.f. Understands the need for further genetic testing and states appropriate follow up if required (CSMLS 5.11)
   5.g. Determines the clinical significance of cytogenetic findings in relation to the patient's referral reason (CSMLS 5.12)
   5.h. Assesses the quality of test results and states corrective action as required (CSMLS 5.13)
6. Uses appropriate terminology, worksheets, reports and established protocols to effectively communicate accurate laboratory results
   Learning Objectives
   6.a. Records procedures and observations throughout specimen processing and analysis according to established protocols (CSMLS 6.01)
   6.b. Records pertinent quality control information according to established protocols (e.g. band resolution, quality of preparations) (CSMLS 6.02)
   6.c. Uses the current ISCN system to describe cytogenetic results (CSMLS 6.03)
   6.d. Demonstrates critical appraisal of recorded documentation to ensure accurate test results (CSMLS 6.05)
   6.e. States CCMG guidelines for retention of test records (CSMLS 6.07)
   6.f. Demonstrates the maintenance of patient confidentiality (CSMLS 6.08)
7. Uses principles of quality management to ensure the generation of high quality laboratory results
   Learning Objectives
   7.a. Completes laboratory testing using established policies and protocols (CSMLS 7.02)
   7.b. Records and assesses quality control data (e.g. daily QC readings, band resolution) (CSMLS 7.03)
   7.c. Uses appropriate controls to validate analyses where required (CSMLS 7.04)
   7.d. Records data in accordance with quality assurance procedures (e.g. weekly trends of QC readings) (CSMLS 7.06)
   7.e. Identifies deficiencies in the workplace that may affect testing quality (CSMLS 7.07)
   7.f. Completes assigned duties in accordance with preventative maintenance program (e.g. weekly maintenance) (CSMLS 7.08)
   7.g. Understands reagent quality control (CSMLS 7.09)
   7.h. Applies concepts of quality control with respect to the use of new reagents (CSMLS 7.10)
   7.i. Applies appropriate attention to detail skills to ensure specimens are correctly identified at all times during processing and analysis (CSMLS 7.11)
   7.j. Applies reflection for the purpose of continuous quality improvement and risk management to promote quality clinical laboratory services (CSMLS 7.12)
8. Applies critical thinking skills towards the efficient use of materials in the lab
   Learning Objectives
   8.a. Demonstrates the knowledge of inventory control through conservative use of resources (CSMLS 8.04)
9. Applies effective communication and teamwork skills
   Learning Objectives
   9.a. Understands concepts related to effective communication with other health care professionals, including: Active listening, verbal communication, non-verbal communication, written communication, barriers to effective communication, and use of technology appropriately to facilitate communication (CSMLS 9.01)
   9.b. Demonstrates effective teamwork skills while completing tasks (CSMLS 9.03)
10. Applies the standards of professional practices when working on specimen to protect the patient's right to a reasonable standard of care
    Learning Objectives
    10.a. Understands concepts related to the welfare and confidentiality of the patient, including respect for the dignity, values, and beliefs of the patient (CSMLS 10.06)
    10.b. Recognizes potentially dangerous situations and understands the right to refuse to participate in such activities (CSMLS 10.10)

Academic Policies

Please refer to Michener's Academic Policies located at: .
Changes to course outlines are governed by The Michener Institute's Course Management Policy located here: https://michener.ca/discover-michener/policies/course-management-policy/
Please note that the Michener Institute of Education at UHN may be required to modify content and/or mode of delivery and/or mode of assessment of any course in order to comply with institutional directives or emergency orders from government officials in relation to the ongoing situation with the COVID-19 virus. All changes will be reviewed programmatically to ensure all competencies are covered and program requirements satisfied.

Turnitin
This course may leverage the use of Turnitin, a software platform that helps to support students in their writing by ensuring submitted works meet Michener's standards for academic integrity. Normally, students will be required to submit their written assessments to Turnitin for a review of originality. In doing so, students will allow their work to be included as source documents in the tool's reference database, where they will be used solely for the purpose of verifying originality. Students may opt out of this process by contacting their course instructor at the beginning of the course, in which case the course instructor will arrange alternative methods to verify originality. Refer to Michener's Learning Resource Centre for guidelines on how to properly reference in academic writing.

Minimum Technology Requirements
Refer to Michener's current minimum technology requirements. For Helpdesk support and FAQs please click here.

Accessibility and Accommodations
Students with diverse learning needs are welcome in this course. If you have a disability that may require accommodations, please visit Michener's Accessibility & Accommodations Services, or contact accessibility@michener.ca.
The Institute provides reasonable accommodation of the needs of students who observe religious holy days other than those already accommodated by ordinary scheduling and statutory holidays. Students have a responsibility to alert members of their faculty in a timely fashion to upcoming religious observances and anticipated absences and instructors will make every reasonable effort to avoid scheduling tests, examinations or other compulsory activities at these times. Please see Michener's Religious or Spiritual Observance Policy for more information.

Library Resources for Students
The Learning Resource Collaboratory Virtual Portal is your gateway to information: From this website, find your one-stop-shop for all your program information needs under our Program Resource Guides. You have questions? We have answers! Chat with a Librarian at lrc@michener.ca.

Learning Supports
The Student Success Network provides learning supports to help students achieve academic success. Workshops are available to be tailored to meet your learning needs by a learning facilitator. Peer tutoring is also available to support your academic progress. Please contact success@michener.ca for more information.