CYTOTECHNOLOGY — B.S.

Program director
Margaret A. Tavares

Medical director
Pamela J. Wat

Cytotechnology is a specialty within the broad field of clinical laboratory sciences. The cytotechnologist, working under the direction of a pathologist, detects cell changes caused by different disease processes and is able to differentiate between normal, atypical, and malignant cell changes. In recognizing microscopic abnormalities of cells and cellular patterns from various body sites, the cytotechnologist assists the pathologist in detecting cancer at its earliest and potentially most curable stage. As a result, physicians are able to diagnose and treat cancer long before discovering its existence by alternate methods.

Opportunities
Cytotechnologists work in hospitals, clinics, and independent pathology laboratories. The employment outlook for cytotechnologists is favorable, with the demand for trained technologists exceeding the supply. Cytotechnologists can advance to supervisory positions, participate in research activities, or become teachers in the field. Advancement is based on experience, skill, and advanced education.

The program
The two-year Cytotechnology Program leads to a Bachelor of Science degree. The Bachelor of Science degree program requires completion of two years of prerequisites at an accredited college or university. Accepted students transfer to the program at the junior year level. The program of study begins in the Fall Quarter. Upon satisfactory completion of the program, the student is awarded a Bachelor of Science degree and is eligible to take the national board of certification examination and become a registered cytotechnologist.

The junior year includes lecture and laboratory, with an emphasis on basic cytology courses. The senior year includes an eleven-week clinical practicum and advanced courses in histology, pathology, and laboratory management.

Program objectives
The primary objectives of cytologic education are to prepare individuals to perform with competency in the following areas:

1. Use the microscope to identify, evaluate, and diagnose with a high level of accuracy the cytologic nature of any existing pathological process.
2. Recognize the significance of symptoms, treatments, and/or pertinent clinical data that can be used in the evaluation of cellular morphology and the development of the differential diagnosis.
3. Follow laboratory procedures for preparation, acceptance and rejection of specimens, problem solving, and implementation of new procedures.
4. Read, evaluate, prepare, and present scientific research.
5. Implement measures that contribute to quality control of specimens, laboratory safety and regulation, and the practical aspects of laboratory organization and management.
6. Understand the responsibilities and ethical role of the profession.

Program learning outcomes
1. Evaluate cellular abnormalities with a level of accuracy by applying differential diagnoses in the framework of patient outcome management.
2. Demonstrate knowledge of the ethical role and responsibilities of the cytotechnologist.
3. Assess the results of quality assurance measures and institute proper procedures to maintain test accuracy.
4. Comprehend and apply sound principles of scientific research.
5. Advocate rules and regulations, with emphasis on patient and workplace safety.

Clinical affiliations
Multiple clinical affiliations enrich the student's clinical training by providing exposure to different specimen types in the clinical environments. During the eleven-week clinical practicum, supplemental training may be scheduled at any of the following clinical sites:

Primary affiliation
Loma Linda University Medical Center
Loma Linda, California

Supplementary affiliations
Loma Linda Pathology Group
Faculty Medical Offices
Loma Linda, California

Jerry L. Pettis Memorial Veterans Medical Center
Loma Linda, California

Physicians Automated Laboratory
Bakersfield, California

Quest Diagnostics
West Hills, California

Transportation to scheduled assignments
Transportation to scheduled clinical rotations is the responsibility of the student. Depending upon assignment, commute times may be up to two hours one way. During the clinical practicum, the senior-year schedule is a full-time week (40 hours/week; 8 hours/day).

Professional registration
Upon completion of the baccalaureate degree, the student is eligible to take the certifying examination given by the Board of Certification of the American Society for Clinical Pathology (ASCP), 33 West Monroe, Suite 1600, Chicago, IL 60603; telephone: 312/541-4999; fax: 312/541-4998. Information about qualifying examinations can be obtained from the program director.

Academic progression
A minimum grade of C (2.0) is required for all courses in the program. C-grades are not acceptable. A student who receives a grade less than C in any academic course or receives an unsatisfactory rating in clinical performance will be disqualified from the program for the remaining academic year. Readmission to the program will require reapplication.
Accreditation

The program is accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP)—1361 Park Street, Clearwater, FL 33756; telephone: 727/210-2350; fax: 727/210-2354—in collaboration with the Cytotechnology Programs Review Committee, which is sponsored by the American Society of Cytopathology (ASC), the American Society for Clinical Pathology (ASCP); the American Society for Cytotechnology (ASCT), and the College of American Pathologists (CAP). Information regarding cytotechnology accreditation status can be obtained from the CPRC at the American Society for Cytopathology, 100 West 10th Street, Suite 605, Wilmington, DE 19801; telephone: 302/543-6583, fax: 302/543-6597; Email: dmacintyre@cytopathology.org.

Admissions

In addition to Loma Linda University (http://llucatalog.llu.edu/about-university/admission-policies-information/#admissionrequirementstext) and School of Allied Health Professions (http://llucatalog.llu.edu/allied-health-professions/#generalregulationstext) admissions requirements, the applicant must also complete the following requirements:

- prerequisite course work at any accredited college before being admitted to the School of Allied Health Professions; projected course work that will be completed before beginning the program will be considered in the application process. Please note: Grades of C- are not transferable for credit.

Application deadlines

Applications to the Cytotechnology Program are accepted beginning January 1. Early submission of application is recommended. Applications continue to be reviewed and accepted until July 1 or until program is filled. Preference will be given to applicants whose completed application and transcripts are received by March 1. Complete an online application at <llu.edu/apply>. The B.S. degree program begins in September with the start of fall quarter.

Applicants must complete prerequisite course work at any accredited college or university admitted to the School of Allied Health Professions; projected course work that will be completed before beginning the program will be considered in the application process.

Prerequisite for Cytotechnology, B.S.

Humanities—20 units minimum (choose minimum of two areas from: history, literature, philosophy, foreign language, art / music appreciation / history)

- Included in the 20-unit minimum, 4 units of religion per year of attendance at a Seventh-day Adventist college or university

General biology with laboratory, complete sequence

Human anatomy and physiology with laboratory, complete sequence

Microbiology with laboratory

General chemistry with laboratory, complete sequence

Organic chemistry with laboratory, complete sequence

College mathematics (algebra or higher level)

Cultural anthropology or cultural diversity (one course)

Select 8 units from a minimum of two areas:

- Sociology, economics, geography, political science, psychology, anthropology
- English composition, complete sequence (minimum of 9 quarter units)
- Personal health or nutrition
- Two physical activity courses
- Electives to meet the minimum total requirement of 98 quarter units

For total unit requirements for graduation, see LLU General Education Requirements (http://llucatalog.llu.edu/about-university/division-general-studies/#courserequirementstext).

Program requirements

Junior Year

**Autumn Quarter**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CLSC 341</td>
<td>Gynecologic Cytology</td>
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<tr>
<td>CLSM 331</td>
<td>Biochemistry</td>
<td>5</td>
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<tr>
<td>AHCJ 328</td>
<td>Wholeness Portfolio I</td>
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<tr>
<td>RELT 423</td>
<td>Loma Linda Perspectives</td>
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**Winter Quarter**

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<tbody>
<tr>
<td>CLSC 351</td>
<td>Respiratory Cytology</td>
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<tr>
<td>CLSC 353</td>
<td>Urinary Tract and Prostate Cytology</td>
<td>3</td>
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<tr>
<td>AHCJ 402</td>
<td>Pathology I</td>
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<td>RELE 457</td>
<td>Christian Ethics and Health Care</td>
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**Spring Quarter**

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<td>Gastrointestinal Tract Cytology</td>
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<td>CLSC 364</td>
<td>Body Fluid Cytology</td>
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<td>CLSC 371</td>
<td>Cytopreparation Techniques</td>
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<td>CLSC 373</td>
<td>Histotechnology Techniques</td>
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<td>CLSC 381</td>
<td>Fine Needle Aspiration Cytology I</td>
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<td>AHCJ 403</td>
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**Senior Year**

**Summer Quarter 1**

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<td>Introduction to Radiographic Procedures I</td>
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<td>CLSC 382</td>
<td>Fine Needle Aspiration Cytology II</td>
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<td>CLSC 481</td>
<td>Supervised Cytology Research Project I</td>
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<tr>
<td>CLSM 435</td>
<td>Immunoassay and Molecular Diagnostic Techniques</td>
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**Autumn Quarter**

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<tr>
<td>AHCJ 498</td>
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<td>CLSC 302</td>
<td>Introduction to Radiographic Procedures I</td>
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<td>CLSC 411</td>
<td>Histopathology I</td>
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<td>CLSC 424</td>
<td>Hematology</td>
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<td>CLSC 482</td>
<td>Supervised Cytology Research Project II</td>
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<td>CLSM 451</td>
<td>Clinical Laboratory Management I</td>
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<td>RELR 415</td>
<td>Christian Theology and Popular Culture</td>
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**Winter Quarter**

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<tr>
<td>CLSC 406</td>
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<tr>
<td>CLSC 412</td>
<td>Histopathology II</td>
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<tr>
<td>CLSC 432</td>
<td>Current Research Techniques</td>
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<tr>
<td>CLSC 471</td>
<td>Advanced Cytology Practices I</td>
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<tr>
<td>CLSM 452</td>
<td>Clinical Laboratory Management II</td>
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Courses

CLSC 301. Introduction to Radiographic Procedures I. 2 Units.
Introduces the nature and description of radiographic procedures for the nonradiologic technologist, with an emphasis on radiographic procedures used in the collection of cytologic specimens. Applies principles, medical techniques, and instrumentation to a radiographic setting. Includes observation laboratory.

CLSC 302. Introduction to Radiographic Procedures II. 2 Units.
Introduces the nature and description of radiographic procedures for the nonradiologic technologist, with an emphasis on radiographic procedures used in the collection of cytologic specimens. Applies principles, medical techniques, and instrumentation to a radiographic setting. Includes observation laboratory.

CLSC 341. Gynecologic Cytology. 11 Units.
Study of the anatomy, histology, and cytology of the female genital tract—including cytohormonal changes, nonneoplastic abnormalities, premalignant and malignant lesions, and rare extraterine malignancies. Students interpret clinical history, explain significance of data, render diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 351. Respiratory Cytology. 8 Units.
Study of the anatomy, histology, and cytology of the respiratory tract—including fine needle aspiration of the lung. Students interpret clinical history, explain significance of data, render diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 353. Urinary Tract and Prostate Cytology. 3 Units.
Study of the anatomy, histology and cytology of the urinary tract—including the bladder, ureters, renal pelvis, kidney, and prostate. Students interpret clinical history, explain significance of data, render diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 357. Gastrointestinal Tract Cytology. 2 Units.
Study of the anatomy, histology, and cytology of the gastrointestinal tract—including the esophagus, stomach, small and large intestines, and colon. Students interpret clinical history, explain significance of data, render diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 364. Body Fluid Cytology. 5 Units.
Anatomy, histology, and cytology of fluids from serosal cavities, including CSF. Students interpret clinical history, explain significance of data, render diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 371. Cytopreparation Techniques. 3 Units.
Collection techniques; fixation and staining procedures; preparation of monolayers, smears, and cell blocks from various cytologic specimens. Includes basic laboratory skills, such as universal precautions, reagent preparation, centrifugation, pipetting, and micropipetting. Introduces basic laboratory operations, including quality control, quality assurance, laboratory safety, and emergency preparedness. Lecture, demonstration, and laboratory.

CLSC 373. Histotechnology Techniques. 1 Unit.
Technical preparation of tissue specimens for microscopic evaluation, with emphasis on special stains and immunohistochemistry. Lecture and observation laboratory.

CLSC 381. Fine Needle Aspiration Cytology I. 4 Units.
Study of the benign and malignant cells aspirated from thyroid, salivary gland, breast, liver, pancreas, lymph node, soft tissue masses, and other miscellaneous organs. Includes fine needle aspiration techniques, touch prep of cores preparation, and rapid on-site adequacy assessment. Students interpret clinical history, explain significance of data, render adequacy assessment and/or diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 382. Fine Needle Aspiration Cytology II. 6 Units.
Study of the benign and malignant cells aspirated from thyroid, salivary gland, breast, liver, pancreas, lymph node, soft tissue masses, and other miscellaneous organs. Includes fine needle aspiration techniques, touch prep of cores preparation, and rapid on-site adequacy assessment. Students interpret clinical history, explain significance of data, render adequacy assessment and/or diagnoses, and offer recommendations for further testing. Lecture and laboratory.

CLSC 384. General Cytology. 3 Units.
Provides further practical experience by working with routine cytology specimens. Includes cytopreparation; microscopic evaluation of gynecologic and nongynecologic specimens, with an emphasis on fine needle aspiration specimens, maintenance of regulatory statistics, and error identification.
CLSC 472. Advanced Cytology Practices II. 2 Units.
Expands clinical experience with advanced theory and techniques, including image-assisted screening, LIS operation, mock proficiency testing, and use of telepathology.

CLSC 481. Supervised Cytology Research Project I. 2 Units.
Research project under the supervision of the program director. Oral presentation and paper.

CLSC 482. Supervised Cytology Research Project II. 2 Units.
Research project under the supervision of the program director. Oral presentation and paper.

CLSC 494. Cytology Practicum. 11 Units.
Eleven weeks of clinical cytology internships in a variety of cytopathology laboratories. Students rotate through all phases of diagnostic service work and laboratory functions (pre-analytical, analytical, and postanalytical). Independent microscopic evaluation of gynecologic, nongynecologic, and fine needle aspiration specimens.