



## Oregon Institute of Technology at Oregon Health & Science University Joint Program in *CLINICAL LABORATORY SCIENCE*

OHSU-Clinical Laboratory Science Program  
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### ***The Clinical Laboratory Scientist***

Clinical Laboratory Science, also called medical technology, is a profession that combines the challenges and rewards of medicine with laboratory science. Clinical laboratory scientists perform many and varied laboratory analyses and use critical thinking in determining the correctness of test results. They recognize the interdependency of testing information and have knowledge of physiologic and pathologic conditions affecting results in order to validate them. In many health care settings, they provide data used by physicians in determining the presence, extent, and, as far as possible, causes of disease.

Clinical laboratory scientists:

- Develop and establish procedures for collecting, processing, and analyzing biological specimens;
- Performs analytical tests of blood, body fluids, and other substances;
- Integrate and relate data generated by various clinical laboratory departments while making decisions regarding possible discrepancies;
- Confirm abnormal results;
- Establish and execute quality control and quality assurance measures;
- Establish and perform preventive and corrective maintenance of instrumentation;
- Develop, evaluate and select new techniques, instruments and methods;
- Interact with other health care professionals to provide patient care;
- Provide leadership in educating health personnel and the community;
- Participate in continuing education for growth and maintenance of professional competence;
- Exercise principles of management, safety & supervision.

Source: National Accrediting Agency for clinical Laboratory Sciences, Chicago, Illinois, 1995.

Tests and procedures are performed or supervised by laboratory scientists in hematology, coagulation, microbiology, immunohematology, immunology, clinical chemistry and urinalysis. Subspecialty areas include molecular diagnostics, cytogenetic, fertility testing, flow cytometry, tissue typing, bone and skin banks, forensics and infection control. There are opportunities for graduates to work in hospital laboratories, clinics, physician offices, public health agencies, research and industry. As medical knowledge continues to expand, for those who choose a career as a laboratory professional, the opportunity and the challenge never ends.

### ***The Clinical Laboratory Science Program***

Oregon Institute of Technology (OIT) and Oregon Health & Science University (OHSU) now jointly offer the Clinical Laboratory Science Program, established in 1933 at Oregon Health & Science University. The CLS Program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAALCS).

The structured 15-month program, which begins in early September, is busy and intense and includes 12-months of technical instruction and practical experience, followed by a 3-month clinical laboratory internship. Forty hours a week are spent in laboratory practice and lecture with additional study time required. The scope of responsibilities is explored with emphasis placed on principles used in diagnostic laboratory testing. Graduates are well prepared to enter the profession of clinical laboratory science and have many diverse career opportunities available to them.

Students are required to pass a criminal background check and urine drug screen. Contact the department office for more information.

The CLS program provides undergraduate college instruction at the senior level, the completion of which leads to a joint baccalaureate degree from OIT and OHSU. A student may enter the program with or without a baccalaureate degree. Those students entering the program without a degree must have completed at least 103 transferable quarter hours at an accredited college, community college and/or university prior to matriculation and be eligible for an OIT/OHSU baccalaureate degree upon completion of the program. Although students may apply while in the process of completing the admission requirements, those admitted must provide a final transcript prior to registration to certify the completion of all required courses.

### ***Admission/Program Requirements***

Undergraduate work of at least 103-quarter credit hours must include the following required courses. (Semester credit-hours x 1.5 = quarter credit hours.)

**Survey courses do not qualify as fulfillment of chemistry or biological science prerequisites.**

- **Chemistry** – at least 24-quarter credit hours of lectures and laboratory experience. No required courses. Suggested courses include general chemistry, inorganic chemistry, organic chemistry, biochemistry, quantitative analysis and physical chemistry.
- **Biological Sciences** – at least 24-quarter credit hours. One course in microbiology/bacteriology is required. Immunology is required as part of microbiology or as a separate course. Genetics, physiology and anatomy are recommended.
- **Mathematics** – One college level mathematics course is required. Minimum requirements are met by courses recognized as prerequisites for admissions to college physics. Courses in statistics, physics and electronics are strongly recommended.
- **7-Year Limitation:** Individuals who have met admission requirements seven or more years prior to application to the CLS Program must

complete additional academic work to qualify. This may be accomplished by:

- Completing a course in biochemistry and in microbiology (bacteriology). These courses must be acceptable toward a major in the appropriate area or be certified by the college or university as equivalent, and a grade of “C” or better must be achieved in each course.
- Receiving credit by examination in biochemistry and in microbiology (bacteriology). If a grade is given for credit by examination, a grade of “C” or better must be achieved in each course. Arrangements to request credit by examination must be made between the individual and an accredited college or university offering the appropriate examination.
- Achieving a CLEP score at or above the 50<sup>th</sup> percentile on both the biology and chemistry examinations. Further information can be obtained by writing to the Education Testing Service, CLEP Box 592, Princeton, NJ 08540.

### ***Degree Requirements***

Candidates for the joint OIT/OHSU baccalaureate degree must complete a minimum of 186-quarter credits with a cumulative GPA of 2.00 or better. Requirements for the baccalaureate degree are as follows: *\*Note: If you enter the CLS Program already the recipient of a baccalaureate degree, these requirements will have been satisfied.*

**Written English/English Composition** – 6 credit hours. WR121, 323 or equivalent.

**Group Requirements** – A minimum of at least 9 credit hours in each of Humanities and Social Sciences:

- **Humanities:** Courses may include English (does not include 6 hours of written English composition), history of art or music, appreciation of art or music, foreign languages (excluding first-year courses), linguistics, philosophy, speech, and theater arts.

- Social Science: Courses may include anthropology, economics, general social science, history, political science psychology, religion and sociology.

### ***CLS Curriculum and Course Descriptions***

The curriculum contains the following courses listed by term, class number, credit hours, title, and a brief description:

#### ***CLS 406 Biometry (2 credits)***

Problem solving related to clinical laboratory determinations to include: solution preparation, systems of measurement, dilutions, factors, graphs and standard curves, and generation of laboratory results from raw data. Descriptive and inferential statistics related to clinical laboratory science and quality control to include: measures of central tendency, probability, distributions, hypothesis testing, confidence intervals, Z-scores, t-tests, chi-square, correlation and regression analysis, and ANOVA.

Prerequisite: Admission to the Clinical Laboratory Science

#### ***CLS 410 Clinical Microbiology I (2 credits)***

Lecture course studying the major bacterial organisms pathogenic for man. Includes culture methods, morphological characteristics, isolation methods, and identification of these organisms. Discussion of the bacterial structures and processes, genetic determinants, normal flora, host-parasite relationships, sterilization techniques, epidemiological methods, antimicrobics, and principles of laboratory diagnosis of infectious diseases.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

#### ***CLS 411 Clinical Microbiology II (2 credits)***

Lecture course studying the major spirochetes, mycobacteria, actinomycetes, chlamydia, rickettsia, fungi, and viral organisms pathogenic for man. Includes discussion of bacteria causing zoonotic diseases. Includes discussion of skin and wound infections, bone and joint infections, eye, ear, and sinus infections, dental and respiratory infections, enteric infections and food poisoning, urinary tract

infections, central nervous system infections, intravascular infections, bacteremia, endotoxemia, infections of the fetus and newborn, sexually transmitted diseases, infections in the immunocompromised patient, nosocomial infections, and hospital infection control.

Prerequisite: CLS 410 or consent of the instructor.

#### ***CLS 412 Pathophysiology (2 credits)***

Lectures reviewing processes that underlie many different disease states and health deviations. The study of the most common disease processes in humans and their correlation with laboratory findings are explored.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

#### ***CLS 415 Clinical Chemistry I (6 credits)***

The theory, practical application and technical performance of chemical procedures. Fundamentals of quantitative chemical analysis in the determination of endogenous and exogenous substances in body fluids such as blood, urine, spinal fluid, amniotic fluid and ascites. Emphasis areas will encompass amino acids, proteins, carbohydrates, lipoproteins, lipids, enzymes, renal and liver functions analytes, GI function related analytes, electrolytes, trace elements, hemoglobin and porphyrins, and hormones, bone metabolism, nutrition, pregnancy and fetal development analytes, and geriatric considerations.

Prerequisite: Admission to the Clinical Laboratory Science Program

#### ***CLS 416 Clinical Chemistry II (2 credits)***

The theory, practical application and technical performance of chemical procedures. Fundamentals of quantitative chemical analysis in the determination of endogenous and exogenous substances in body fluids such as blood, urine, spinal fluid, amniotic fluid and ascites. Emphasis areas will encompass therapeutic drug monitoring, toxicology, and method evaluation.

Prerequisite: CLS 415

#### ***CLS 419 Immunohematology (2 credits)***

Emphasis on theory and laboratory techniques used in blood banking including blood typing, major blood group antigens and antibodies including their

role in transfusion medicine, cross matching and antibody identification. Current practices in blood donation, component therapy and medical-legal aspects are also covered.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 420      *Clinical Immunology (3 credits)***

Fundamentals of humoral and cellular immunity, to include innate and adoptive immunity, organs and tissues of the immune system, principles of immune activation, immunoglobulin and receptor biochemistry, immunogenetics, cytokines, the complement system, white blood cell populations, and phagocytic mechanisms. Clinical applications to include protective immunity, immunodeficiency conditions, inflammation, immune mediated diseases, neoplasms of the immune system, transplantation, and cancer immunology. An overview of immunoassay and serology testing formats.

Prerequisites: Admission to the Clinical Laboratory Science Program

**CLS 440      *Practicum: Specimen Collection (1 credit)***

Provides theory, demonstrations and practice of medical laboratory techniques pertaining to the science of specimen collection or phlebotomy.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 441      *Practicum: Instrumentation (1 credit)***

Principles and applications of the instruments in use in the modern clinical laboratory. Basic principles of instrument operation for methods of detection, with emphasis on maintenance and safety. Instrumentation formats to include: spectrophotometry, electrochemistry, osmometry, electrophoresis, particle analysis, and measurement of radioactive decay.

Prerequisite: Admission to the Clinical Laboratory Science Program

**CLS 442      *Practicum: Hematology (6 credits)***

Normal development and function of blood cells; mechanisms of hemostasis; basic pathophysiology of hematological and hemostasis

disorders; laboratory procedures pertaining to hematology and hemostasis; microscopic examination of blood films; and correlation and interpretation laboratory data for disease states

**CLS 443      *Practicum: Transfusion Medicine (4 credits)***

Coordinated lecture and laboratory practice. The principles of immunohematology as applied to Transfusion Medicine with special emphasis upon blood groups and types, techniques demonstrating antigen-antibody reactions; donor collection, processing, storage and hazards of transfusions, blood components and quality control are covered.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 444      *Practicum: Microbiology (6 credits)***

Emphasis on clinical laboratory techniques. Methods include discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving, and interpretation of results. Includes study of the culture, morphological characteristics, serologic methods, isolation and identification of bacterial organisms. Includes safety, specimen collection, microscopic methods, and antimicrobial susceptibility. Organisms include normal and pathogenic gram positive cocci, gram negative cocci, gram positive bacilli, gram negative bacilli, spirochetes, anaerobes, and related organisms with emphasis on organisms seen in a clinical laboratory. Includes discussion of chlamydia, mycoplasma, and rickettsiae.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 445      *Practicum: Mycology (2 credits)***

Emphasis on clinical laboratory techniques. Methods include microscopy, discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving, and interpretation of results. Includes study of the culture and morphological characteristics of normal and pathogenic fungi and yeast with emphasis on organisms seen in a clinical laboratory.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 446      *Practicum: Parasitology (2 credits)***

Emphasis on clinical laboratory techniques. Methods include microscopy, discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving, and interpretation of results. Includes study of normal and pathogenic parasitic organisms with emphasis on organisms seen in a clinical laboratory.

Prerequisite: Admission to the Clinical Laboratory Science Program or consent of the instructor.

**CLS 447      *Practicum: Chemistry (6 credits)***

Principles of chemical analysis, quality control, laboratory utilization, and safety. Hands-on exercises, demonstrations, and computer tutorials illustrating chemical analysis and data evaluation in a clinical chemistry laboratory. Discussion of case studies using problem-solving methods to analyze and interpret relevant chemical analysis data.

Prerequisite: CLS 441

Co requisite: CLS 415

**CLS 448      *Practicum: Immunology/Infectious Serology (2 credits)***

Techniques in immunologic and serologic procedures. Hands-on exercises, demonstrations, and computer tutorials illustrating immunoassay analysis and data evaluation in a clinical immunology and infectious serology laboratory. Discussion of immunoassay systems to include spectrophotometry, nephelometry, turbidimetry, fluorescence, electrochemiluminescence, radioassay, and flow cytometry, instruction and practice of testing methods and interpretation to include precipitation, agglutination, receptor-ligand, complement, microscopy, electrophoresis, and cell-mediated assays. Discussion of case studies using problem-solving methods to analyze and interpret relevant immunology and serology data.

Prerequisite: CLS 420, CLS 441

**CLS 449      *Practicum: Urinalysis (2 credits)***

Study of urine with emphasis on urinalysis techniques, renal function, physical examination, chemical examination, microscopic examination, renal disease, and metabolic disorders. Methods

include microscopy, discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving, and interpretation of results.

**CLS 452      *Practicum: Advanced Hematology Techniques (2 credits)***

Microscopic examination of blood films and body fluids; instrumentation methodologies for analyzing cellular components of blood; analysis and interpretation of disease states. Prerequisite: Successful completion (a C or better) of CLS 442.

**CLS 453      *Practicum: Advanced Transfusion Medicine Techniques (2 credits)***

Provides directed study, review and advanced problem solving and critical thinking related to Transfusion Medicine. May include, but not be limited to, discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving and interpretation of results.

Prerequisites: Successful completion (a grade of C or better) of CLS 443

**CLS 454      *Practicum: Advanced Microbiology Techniques (2 credits)***

Advanced techniques and review of microbiological organisms. Includes study of bacterial, fungal, and parasitic organisms and associated techniques. Methods include microscopy, discussion, case histories, computer tutorials, hands-on exercises, demonstrations, problem solving, and interpretation of results.

Prerequisites: Admission to the Clinical Laboratory Science Program, CLS 410, CLS 411, CLS 444, CLS 445, and CLS 446.

**CLS 457      *Practicum: Advanced Chemistry/Immunology Techniques (2 credits)***

Directed study, review, and demonstration of advanced methods and instruments in use in clinical or research laboratories. These may include, but not be limited to tissue typing, molecular methods, automated systems, flow cytometry, and chromatographic methods.

Prerequisite: CLS 447, CLS 448

**CLS 461      *Clinical Laboratory Management I***  
**(2 credits)**

Principles and fundamentals of management responsibilities: regulation and public financing of clinical laboratories; financial management-- productivity, budgeting, cost accounting; information systems; quality assessment.

**CLS 462      *Clinical Laboratory Management II***  
**(2 credits)**

Principles and fundamentals of supervision and management: communication, team building, recruitment, selection and training; employee performance; ethical considerations.

Prerequisite: CLS 461

**CLS 463:      *Practicum: Clinical Laboratory Management III*** (1 credit)

Applications of principles learned in CLS 461 and 462 are studied using cases studies, computer models and projects.

Prerequisite: CLS 462

**CLS 470      *Clinical Laboratory Externship*** (16 credits)

Sixteen weeks of clinical laboratory experience at an OIT approved clinical site correlating knowledge and skills presented in lectures and labs. Designed for the development of skills necessary for entry into professional practice. Students work under the direct supervision of certified clinical laboratory scientists.

Prerequisites: Successful completion of all academic course work in the Clinical Laboratory Science Program.

**National Certifying Examination**

Upon satisfactory completion of the program, the student is eligible to take one or both of the two nationally recognized certifying examinations: The Board of Registry examination given by the American Society of Clinical Pathologists (ASCP) and/or the National Certifying examination given by the National Certification Agency (NCA). Upon passing either of the examinations, the student is certified as a clinical laboratory scientist by the ASCP or NCA, or both.

**General Information**

**Application Process:** An admission application may be obtained from the CLS Admissions Coordinator. No applications can be accepted on-line. Applications are available after October 1<sup>st</sup> and are accepted until the class is filled. If application is made before March 1<sup>st</sup>, the \$50.00 application fee is waived. The mailing address for the Admission Packet is:

OHSU  
3181 SW Sam Jackson Park Rd.  
CLS Admission Coordinator, Mail code: MTGH  
Portland, Oregon 97201-3098  
503-494-8698

All graduates of foreign institutions must provide an official evaluation of their academic credentials prepared by an international credentialing agency.

**Financial Aid:** Financial Aid is through Oregon Institute of Technology (OIT) at Klamath Falls. Please direct all questions and concerns to the OIT Financial Aid Office.

The phone number is (541) 885-1280. The e-mail address is >dollars@oit.edu>. A student seeking admission who needs financial aid should complete the "Free Application for Federal Student Aid" (FAFSA). March 1<sup>st</sup> is OIT's priority deadline. OIT's school code is 003211. Students who file after that date will still have eligibility. However, some funds are limited and may be expended by that priority date.

**Non-Discrimination Policy**

Oregon Institute of Technology does not discriminate on the basis of race, color, national origin, gender, disability, age, religion, marital status, or sexual orientation in its programs and activities. The following office is designated to handle inquiries regarding this policy: Office of the Director for Campus Access and Equal Opportunity, Oregon Institute of Technology, phone: (541) 885-1031.

### **Students with Disabilities**

OIT is committed to accommodating the needs of students with disabilities whenever possible. Students with disabilities who anticipate needing accommodations should contact the office of Services for Students with Disabilities, LRC235, as soon as possible in advance of enrollment, to ensure timely provision of services. Questions may be directed to: Services for Students with Disabilities, phone (541) 885-1031.

### **Housing**

The Residence Hall, located at OHSU's campus, is open to all students. For information call 503-494-7747, well in advance of the start of the program.

### **CLS Accrediting Agency**

The Clinical Laboratory Science Program is accredited by NAACLS:

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)  
8410 W. Bryn Mawr Avenue, Suite 670  
Chicago, IL 60631-3415  
Phone: (773) 714-8880  
Fax: (773) 714-8886  
Email: [naaccls@naaccls.org](mailto:naaccls@naaccls.org) <http://www.naaccls.org/>

### **Foreign Transcript Evaluation Agencies**

All graduates of foreign institutions must provide an official evaluation of their academic credentials prepared by a credentialing agency.

### **International Education Research Foundation, Inc.**

P.O. Box 66940  
Los Angeles, CA 90066  
Phone: (310) 390-6276  
Fax: (310) 397-7686

### **Foundation for International Services, Inc.**

21540 30<sup>th</sup> Drive, S.E. Suite 320  
Bothell, WA 98021  
Phone: (425) 487-2245  
Fax: (425) 487-1989

### **World Education Services, Inc.**

PO Box 26879  
San Francisco, CA 94126-6879  
Phone: (800) 414-0147  
Fax: (415) 677-9333

### **Credentialing Agencies**

The Clinical Laboratory Science student may receive credentialing through either the ASCP, or the NCA. For more information about the credentialing process, contact the ASCP or NCA.

### **American Society for Clinical Pathologists (ASCP)**

2100 W. Harrison Street  
Chicago, IL 60612-3798  
Phone: (312) 738-1336  
<http://www.ascp.org/>

### **National Certifying Agency**

P.O. Box 15945-289  
Lenexa, KS, 66285  
Phone: (913) 438-5110  
Fax: (913) 541-0156  
<http://www.appleapro.com/nca/>