The Master Degree in Medical Laboratory Sciences / Clinical Microbiology, Immunology or Serology is awarded by the Faculty of Graduate Studies at Jordan University of Science and Technology (JUST) upon the fulfillment of the following requirements:


2. Successful completion of (34) credit hours in one of the following tracks:

**First: Thesis Track**

1. Compulsory Requirements: (16) credit hours as follows:

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM 713</td>
<td>Molecular and Cellular Pathogenesis</td>
<td>2</td>
</tr>
<tr>
<td>LM 721</td>
<td>Advanced Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>LM 722</td>
<td>Advanced Molecular Biology</td>
<td>2</td>
</tr>
<tr>
<td>LM 731</td>
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</tr>
<tr>
<td>LM 792</td>
<td>Advanced Clinical Laboratory Management</td>
<td>2</td>
</tr>
<tr>
<td>LM 795</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>LM 796</td>
<td>Advanced Clinical Laboratory Training</td>
<td>1</td>
</tr>
<tr>
<td>LM 797</td>
<td>Research Methods and Research Proposal</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Elective Requirements: (9) credit hours from the following*:

<table>
<thead>
<tr>
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<th>Course Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LM 733</td>
<td>Advanced Clinical Microbiology and Immunology I /Bacteriology</td>
<td>3</td>
</tr>
<tr>
<td>LM 734</td>
<td>Advanced Clinical Microbiology and Immunology II /Immunology</td>
<td>3</td>
</tr>
<tr>
<td>LM 735</td>
<td>Advanced Clinical Microbiology and Immunology III /Virology and Parasitology</td>
<td>3</td>
</tr>
<tr>
<td>LM 736</td>
<td>Special Topics in Immunology and Serology</td>
<td>3</td>
</tr>
<tr>
<td>LM 737</td>
<td>Special Topics in Clinical Microbiology</td>
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</tr>
</tbody>
</table>

* The student may study not more than 3 credit hours from courses of 700 or 800 level offered by other programs related to his field of study upon approval of the Dean of Graduate Studies based on the recommendation of the departmental graduate studies committee.
3. Master Thesis (LM799): total of (9) credit hours as follows:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>LM799 A</td>
<td>Master Thesis</td>
<td>9</td>
</tr>
<tr>
<td>LM799 B</td>
<td>Master Thesis</td>
<td>6</td>
</tr>
<tr>
<td>LM799 C</td>
<td>Master Thesis</td>
<td>3</td>
</tr>
<tr>
<td>LM799 D</td>
<td>Master Thesis</td>
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</tr>
</tbody>
</table>

Second: Comprehensive Exam Track

1. Compulsory Requirements: (25) credit hours

<table>
<thead>
<tr>
<th>Course Symbol and Number</th>
<th>Course Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LM 707</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>LM 712</td>
<td>Advanced Biostatistics &amp; Computer Application</td>
<td>2</td>
</tr>
<tr>
<td>LM 713</td>
<td>Molecular and Cellular Pathogenesis</td>
<td>2</td>
</tr>
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<td>3</td>
</tr>
<tr>
<td>LM 738</td>
<td>Advanced Diagnostic Microbiology Practical Training I / Clinical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>LM 739</td>
<td>Advanced Diagnostic Microbiology Practical Training II / Immunology and Serology</td>
<td>3</td>
</tr>
<tr>
<td>LM 792</td>
<td>Advanced Clinical Laboratory Management</td>
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</tr>
<tr>
<td>LM 795</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>LM 796</td>
<td>Advanced Clinical Laboratory Training</td>
<td>1</td>
</tr>
<tr>
<td>LM 798</td>
<td>Comprehensive Exam</td>
<td>0</td>
</tr>
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3. Passing the Comprehensive Exam (LM798) : zero credit hour.
Course Description

LM 707 Independent Study: (3 Credit Hours)
Supervised individual study of an approved topic. Student will choose a topic approved by the course coordinator, do the necessary library research, write a term paper in a review form complete with a lecture outline and references, and arrange a presentation. The review is expected to be a thorough review of the appropriate literature in a critic, analytical manner. A faculty member will supervise the student in developing a subject for review and must approve the written review.

LM 712 Advanced Biostatistics and Computer Application: (2 Credit Hours)
This is a graduate course covering basic principles of biometry and fundamental principles of statistical methods, and application to current computer software.

LM 713 Molecular and Cellular Pathogenesis: (2 Credit Hours)
Study disease mechanisms at the molecular and cellular level through description of the genes involved, the genetic lesions they suffer and the function of the proteins they specify in relation to the pathology of the disease (s) in which they are implicated. Discussion will include Oncogenes and tumour suppressor genes dealing with their identification and function, tyrosine kinases, transcription factor oncogenes, the role of chromosome translocations in oncogenes activation and involvement of oncogenes/tumour suppressor genes in control of the cell cycle, in addition, The regulation of cell division dealing with cell cycle kinetics, transformation, gap junctions and signal transduction

LM 721 Advanced Biochemistry: (3 Credit Hours)
Advanced comprehensive study of the molecular organization, physiological functions and bioenergetics principles of biomoleles amino acids, proteins, enzymes, carbohydrates, lipids and nucleic acids. Emphasis is on the structure-function relationships, solution behavior and metabolism of bimolecular

LM 722 Advanced Molecular Biology: (2 Credit Hours)
Advanced comprehensive study of the molecular organization, properties, and physiological functions of genetic material. In addition, a complete description of general methods for genetic manipulation including restriction analysis, cloning vectors, library construction, southern bolts, and polymerase chain reaction. Applications to biotechnology include over expression, transgenic organisms, AIDS, DNA diagnostics, and gene therapy.

LM 731 Advanced Medical Microbiology: (3 Credit Hours)
Advanced comprehensive study of microorganisms that influence human health and disease in addition to discussion of the immune response to infectious agents and Immnopathology. Emphasis on identification/diagnosis and microbial attributes and mechanisms that facilitate infectious disease, discussion of the immune response will include antibody structure and genetics, B cell recognition, T cell receptor, major histocompatibility complex, T cell recognition, regulation of the immune response, immune mediators, humoral and cellular effect or mechanisms
LM 733 Advanced Clinical Microbiology and Immunology I/ Bacteriology: (3 Credit Hours)
Discusses the bacteria and fungi that are pathogenic to man, including pathogenesis, relevant clinical symptoms, and diagnostic criteria. Emphasizes the laboratory procedure used in their diagnosis and organism characteristics used for identification.

LM 734 Advanced Clinical Microbiology and Immunology II/ Immunology: (3 Credit Hours)
A survey of the components of the immune system that intensively considers the most recent developments in antibody structure, antigenic analysis, and antigen-antibody reaction and how they are important in the control or mediation of human disease. Topics will include recent advances in theoretical and practical aspects in assessment of immunological diseases as autoimmune, congenital immune deficiency, and acquired immune deficiency diseases.

LM 735 Advanced Clinical Microbiology and Immunology III/ Virology and Parasitology: (3 Credit Hours)
Discusses the parasites and viruses that are pathogenic to man, including pathogenesis, relevant clinical symptoms, and diagnostic criteria.

LM 736 Special Topics in Immunology and Serology: (3 Credit Hours)
This course involves recent trend in studying laboratory role in the diagnosis of Autoimmune diseases, immune deficiency diseases, and tumerimmunology.

LM 737 Special Topics in Clinical Microbiology: (3 Credit Hours)
Discussion of recent trends and unconventional identification, and antibiogram testing of pathogenic microorganisms, with emphasis an automation and direct detection.

LM 738 Advanced Diagnostic Microbiology Practical Training I/Clinical Microbiology: (3 Credit Hours)
Experience in isolation, identification, and susceptibility testing procedures in microbiology and in correlating theoretical knowledge with clinical practice, interpreting the clinical significance of microbial cultures, ensuring adequate quality through performance and interpretation of quality control procedures, and addressing administrative issues of specimen acceptability, work flow, method assessment, and appropriate use of interpretive guidelines.

LM 739 Advanced Diagnostic Microbiology Practical Training II / Immunology & Serology: (3 Credit Hours)
Students will obtain practical experience in diagnostic immunology, and serology. Skills in serological and immunological methods will be further developed and integrated with other clinical laboratory data. Emphasize will be on problem-solving, trouble-shooting, and quality control measures in immunology and other related topics. Students will also obtain additional experience in specimen collection, processing, and management, method assessment, and appropriate use of interpretive guidelines.

LM 792 Advanced Clinical Laboratory Management: (2 Credit Hours)
An advanced course in laboratory management covering topics such as laboratory organization, regulations, accreditation, method evaluation, staffing, competency assessment, cost analysis and containment, inventory control, test utilization, laboratory information systems, and marking.
LM 795 Seminar: (1 Credit Hour)
Discussion of current topics in specific areas of diagnostic molecular biology, genetics, clinical microbiology, hematology and clinical biochemistry. One hour of group discussion per week. Alternatively, guest lecturers will speak on special topics.

LM 796 Advanced Clinical Laboratory Training: (1 Credit Hour)
Practice and conducting laboratory tests at various clinical sites, gain experience in applying quality control rules, and use of automated systems. Regular lab meetings with the supervisors will give students the opportunity to correlate results of different laboratory tests from all disciplines with clinical history.

LM 797 Research Methods and Research Proposal: (2 Credit Hours)
Discussion of problem definition, experimental design, and research methods in specific areas of clinical laboratory sciences, writing original research proposal, and oral presentation defense of the proposal.

LM 798 Comprehensive Exam: (zero Credit Hour)
Comprehensive Examination of the student in core courses of medical laboratory sciences to include biochemistry, molecular biology, microbiology, biostatistics, and specialty track.

LM 799 Master Thesis: (9 Credit Hours)
Individualized laboratory research and thesis preparation for a master degree candidates. The master thesis is to be carried out under the supervision of a faculty member and the work must represent an original contribution to the medical laboratory sciences. The candidate must submit the completed thesis to a committee and successfully defend it according to the Graduate Studies regulations.