MART OF SCIENCE IN
MOLECULAR BIOTECHNOLOGY

KU’s master’s degree in molecular biotechnology program prepares students for advanced careers in molecular biotechnology-oriented clinical, industrial and research laboratories. During the 2-year (40 credit hour) non-thesis program, students obtain training in the use and application of the latest methodologies and instrumentation as well as critical thinking, trouble shooting, and communication skills.

The application of these skills to research and development is emphasized. The innovative curriculum is structured to provide broad-based knowledge and hands-on experience through course work and practica performed in biotechnology settings. Together with state-of-the-art research facilities and excellent faculty, the University of Kansas Medical Center is a premier location to study molecular biotechnology.

Applicants for this program are accepted online. Detailed instructions on how to apply are posted on the molecular biotechnology program (http://www.kumc.edu/school-of-health-professions/molecular-biotechnology/how-to-apply.html) website. Students are admitted for the fall semester only. Applications for the fall semester must be received by February 1 for first consideration.

Admission requirements:

- A bachelor’s degree in a life science (e.g., biochemistry, biology, cell biology, clinical laboratory science, microbiology, molecular biosciences, etc.) from a regionally accredited institution is required and must be documented by submission of official transcripts indicating the degree has been conferred. The bachelor’s degree can be in progress at the time of application, but must be completed prior to start of the program. An applicant with a bachelor’s degree in another life science may be considered for admission provided the prerequisite course work has been successfully completed. Official transcripts for any courses from all institutions attended are also required.

Students with degrees from outside the U.S. are subject to transcript evaluation indicating the degree is equivalent to a U.S. bachelor’s, master’s or doctoral degree and meets the minimum cumulative grade-point average requirement. To meet this requirement, applicants must submit an official copy of the transcript evaluation report conducted by either World Education Services (http://www.wes.org) or Educational Credential Evaluators (https://www.ece.org). The evaluation must also include a course-by-course evaluation to also determine if prerequisite course requirements have been met.

Please note: transcripts and grades earned outside the U.S. must be evaluated, even if classes were taught in English and the transcript is written in English. For example, transcripts from India and other former British colonies with widespread English language use must also be evaluated.

- Applicants must possess a cumulative grade-point average of at least a 3.0 on a 4.0 scale for his or her bachelor’s degree program.
- Applicants who are not native speakers of English, whether domestic or international, must demonstrate they meet the minimum English proficiency requirement.
- A background check is required during the admission process; it may affect the student’s eligibility to enter the program.
- An official copy of the Graduate Record Examination score must be sent from Educational Testing Service to KU Medical Center using ETS institutional 6895. The general exam must have been taken within the last two (2) years and include verbal, quantitative and analytical scores. A subject test is not required.
- The following prerequisite courses must be completed before beginning the program:
  - Biochemistry – one semester
  - Calculus – one semester
  - Cell biology – one semester
  - Chemistry (general) – two semesters
  - Chemistry (organic) lecture and laboratory – at least one semester
  - Genetics – one semester
  - Physics – one semester

- A current resume or curriculum vitae is required and must include information on the applicant’s educational, professional, and research background. This document should include a history of both paid and unpaid research and laboratory experience, and any honors and awards. Also include, in chronological order, a list of titles, authors, and complete references for any publications or abstracts on which the applicant’s name appears.

- A personal statement that describes applicant’s educational goals and career objectives will be submitted with the online application.

- Three references from a faculty member, advisor, employer or other person familiar with the applicant’s work and character are required. The recommendations may not be obtained from family members, friends, etc.

- Interview - the most qualified applicants will receive an invitation for an interview.

Applicants will be assessed based on these requirements. Students not meeting the above requirements may be eligible for provisional admission. After an applicant has been admitted, a program may defer an applicant’s admission for one year after which time the applicant must submit a new application.

Admission requirements are subject to change. In most cases, use the catalog of the year student entered the program. Other years’ catalogs.

The Master of Science in Molecular Biotechnology (M.S.) program is a two year non-thesis program that provides broad-based knowledge and skills to prepare students for advanced careers in molecular biotechnology-oriented clinical, industrial, and research laboratories. Students receive training in the use and application of advanced methodologies and instrumentation as well as critical thinking, troubleshooting, and communication skills. The application of these skills to research and development is emphasized. The curriculum is divided between core courses and practicum. The majority of the core courses (see list below) are completed during the first year of enrollment with the three practica completed during the second year in the program.

Degree Requirements:

- Degree requirements are normally completed within 2 years of admission to the degree program although a maximum of 7 years is allowed.
- Cumulative grade-point average (GPA) of at least a 3.0 for all KU graduate coursework.
- Successful completion of the core courses and the practicum which totals to 40 credit hours.

Core Courses (26)

- Genetics – one semester
- Calculus – one semester
- Cell biology – one semester
- Chemistry (general) – two semesters
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Core Courses (26)
The core curriculum includes biochemistry, molecular genetics, cell structure, cell signaling, research ethics, biotechnology issues, scientific writing, and radiation safety, and provides a solid foundation in the field. Practical skills are built through lecture and laboratory coursework in the theory and application of a broad range of nucleic acid- and protein-based molecular biotechnologies.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CLS 710</td>
<td>Molecular Techniques I</td>
<td>2</td>
</tr>
<tr>
<td>CLS 711</td>
<td>Molecular Techniques Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CLS 720</td>
<td>Molecular Techniques II</td>
<td>2</td>
</tr>
<tr>
<td>CLS 721</td>
<td>Molecular Techniques Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>CLS 730</td>
<td>Current Issues in Biotechnology</td>
<td>1</td>
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<tr>
<td>CLS 740</td>
<td>Journal Club</td>
<td>1</td>
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<tr>
<td>CLS 742</td>
<td>Scientific Issues Writing</td>
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</tr>
<tr>
<td>GSMC 850</td>
<td>Proteins and Metabolism</td>
<td>2</td>
</tr>
<tr>
<td>GSMC 851</td>
<td>Molecular Genetics</td>
<td>2</td>
</tr>
<tr>
<td>GSMC 852</td>
<td>Introduction to Biomedical Research I</td>
<td>2</td>
</tr>
<tr>
<td>GSMC 853</td>
<td>Cellular Structure</td>
<td>2</td>
</tr>
<tr>
<td>GSMC 854</td>
<td>Cell Communication</td>
<td>2</td>
</tr>
<tr>
<td>GSMC 855</td>
<td>Introduction to Biomedical Research II</td>
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</tr>
<tr>
<td>BIOL 702</td>
<td>Laboratory Practice: Radiation Safety Procedures</td>
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<tr>
<td>BIOL 703</td>
<td>Radioisotopes and Radiation Safety in Research</td>
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</tr>
<tr>
<td>GSMC 856</td>
<td>Introduction to Research Ethics</td>
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**Practicum (14)**

For the three required practica, students work with investigators, laboratory staff, and other members of the practicum site in the ongoing activities of the practicum site. In a research-oriented practicum, students initially participate in an ongoing research project that leads to independent research activities. While enrolled in a practicum, the primary academic obligation is at the practicum site, and students engage in their practicum-associated activities on a full-time basis (i.e., eight hours a day, Monday through Thursday).

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<thead>
<tr>
<th>Course Code</th>
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<th>Hours</th>
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<tr>
<td>CLS 750</td>
<td>Practicum I</td>
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<tr>
<td>CLS 751</td>
<td>Practicum II</td>
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<tr>
<td>CLS 752</td>
<td>Practicum III</td>
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</table>

**Total Hours: 40**

- Successful completion of a general examination (http://catalog.ku.edu/graduate-studies/kumc/#programtext) the semester the student will graduate. This is a comprehensive examination, consisting of written and oral components. To satisfy the written component, students write a grant proposal. Successful completion of the written component is required prior to taking the comprehensive oral examination of general knowledge of molecular biotechnology concepts and applications.
- Enrollment in a minimum of one (1) credit hour the semester the student will graduate.

Degree requirements and course descriptions are subject to change. Any courses taken as an equivalent must be approved by the Graduate Director and the Office of Graduate Studies. In most cases, use the catalog of the year student entered the program. Other years’ catalogs.

**Typical Plan of Study**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>GSMC 850</td>
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<td>GSMC 853</td>
<td>2</td>
<td>BIOL 702</td>
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<td>GSMC 854</td>
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<td>BIOL 703</td>
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<td>2</td>
<td>CLS 750</td>
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</tr>
<tr>
<td>GSMC 856</td>
<td>1</td>
<td>CLS 720</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>CLS 710</td>
<td>2</td>
<td>CLS 721</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS 711</td>
<td>2</td>
<td>CLS 730</td>
<td>1</td>
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**Year 2**

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 740</td>
<td>1</td>
<td>CLS 742</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>CLS 751</td>
<td>5</td>
<td>CLS 752</td>
<td>5</td>
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</tbody>
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**Technical Standards**

Graduates of this program must have the knowledge and skills to function in a broad variety of research environments, including academic, industrial, and clinical settings. Therefore, the following abilities and expectations must be met by all students in the program.

1. **Essential Observational Requirements**

A Master of Science in Molecular Biotechnology student must be able to perform the following duties:

- Observe and perform laboratory procedures in which biological materials (e.g., proteins, nucleic acids, body fluids, cultured cells, and cellular samples) are analyzed by molecular biological methods.
- Characterize the color, odor, clarity, and viscosity of biological materials, reagents, or chemical reaction products.
- Read and comprehend text, numbers, and graphs displayed in print and other visual displays.
- Perform comparative observations of text, movement, shapes, graphs, colors, etc.

2. **Essential Movement Requirements**

A Master of Science in Molecular Biotechnology student must possess the ability to do the following:

- Move freely and safely about a laboratory.
- Reach laboratory benchtops and shelves, and lift a minimum of 25 pounds.
- Travel to laboratory sites for practical experience – sites may be located anywhere within the Kansas City metropolitan area.
- Perform moderately taxing continuous physical work over several hours.
• Control laboratory equipment and adjust instruments to perform laboratory procedures.
• Use an electronic keyboard generate, calculate, record, evaluate, and transmit information, and to operate laboratory instruments.

3. Essential Communication Requirements
A Master of Science in Molecular Biotechnology student must have the ability to complete the following responsibilities:

• Read and comprehend technical and professional materials (e.g., textbooks, journal articles, handbooks, and instruction manuals).
• Follow verbal or written instructions in order to correctly and independently perform laboratory procedures.
• Effectively, confidently, and sensitively converse with scientific staff at practicum sites regarding laboratory tests.
• Communicate verbally and in a recorded format (writing, typing, graphics, or telecommunication) with faculty members, fellow students, staff, and scientific staff.
• Independently prepare papers, prepare laboratory reports, and take paper, computer, and laboratory practical examinations.

4. Essential Intellectual Requirements
A Master of Science in Molecular Biotechnology student must exercise the following capabilities:

• Intellectual skills, including comprehension, measurement, mathematical calculation, problem solving, reasoning, integration, analysis, comparison, self-expression, and criticism.
• Sufficient judgment to recognize and correct performance deviations.

5. Essential Behavioral Requirements
A Master of Science in Molecular Biotechnology student must be capable of the following skills and abilities:

• Manage the use of time and be able to systematize actions in order to complete professional and technical tasks within realistic constraints.
• Possess the emotional health necessary to effectively employ intellect and exercise appropriate judgment.
• Demonstrate appropriate affective behaviors and mental attitudes to not jeopardize the emotional, physical, mental and behavioral safety of other individuals with whom there is interaction in academic and practicum settings.
• Possess the mental and emotional rigor to demonstrate respect to all people, including fellow students, faculty, and other individuals at practicum settings, without showing bias or preference on the basis of race, color, age, sex, religion or creed, national origin or ancestry, gender expression, gender identity, disability, veteran status, sexual orientation or genetic testing & screening.
• Perform technical procedures while experiencing the stresses of research environments (e.g., large number of tasks to complete in a limited amount of time), emergent demands (e.g., changes in procedures), and potentially distracting environments (i.e., high noise levels, crowding, complex visual stimuli).
• Adapt to professional and technical change and be flexible and creative.
• Recognize potentially hazardous materials, equipment, and situations and proceed safely in order to minimize risk of injury to self and nearby individuals.
• Honesty, compassion, a respect for ethics and responsibility. The student must be forthright about errors or uncertainty. The student must be able to critically evaluate her or his own performance, accept constructive criticism, and look for ways to improve. The student must be able to evaluate the performance of fellow students and tactfully offer constructive comments.

KU Medical Center is committed to equal opportunity for students with disabilities. All students admitted to the KU molecular biotechnology program must be able to meet the technical standards requirements and expectations with or without accommodation(s). Reasonable accommodations will be considered and may be made to qualified students who disclose a disability, so long as such accommodation does not significantly alter the essential requirements of the curriculum and the training program, or significantly affect the safety of patient care. Students who disclose that they have a disability are considered for the program if they are otherwise qualified. Qualified students with a disability who wish to request accommodations should provide appropriate documentation of disability and submit a request for accommodation to the following office:

Cyn Ukoko, Academic Accommodations Office
913-945-7035 (711 TTY)
cukoko@kumc.edu
1006 Dykes Library