

Western University of Health Sciences

Graduate College of Biomedical Sciences

Master of Science in Biomedical Sciences (MSBS)

2018/2019 Catalog

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Graduate College of Biomedical Sciences

Master of Science in Biomedical Sciences (MSBS)

Accreditation

Western University of Health Sciences is accredited by the Senior College and University Commission of the Western Association of Schools and Colleges (WASC). WASC's statement of accreditation status can be found at <http://www.wascsenior.org/institutions/western-university-health-sciences>. You may contact WASC at 985 Atlantic Avenue, Suite 100, Alameda, CA 94501. Phone: (310) 748-9001, Fax: (310) 748-9797, E-mail: wascsr@wascsenior.org. WASC is a non-profit organization that evaluates the quality and educational effectiveness of schools, colleges, and universities. WASC is one of six regional accreditation agencies in the United States. While it is not officially regulated by the government, it is regularly reviewed by the US Department of Education and the Council for Higher Education Accreditation.

Please refer to the specific college sections of this catalog for further information on program and professional accreditations.

Complaints Regarding WASC Accreditation Standards

Western University of Health Sciences is committed to meeting and exceeding the standards for accreditation of colleges and universities as described by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges (WASC). It is the policy of Western University of Health Sciences that a student, employee, or other constituent of the University that believes that they University may not be in compliance with the standards of accreditation has a right to file a complaint can view the complaint submission process at: <http://www.wascsenior.org/comments>.

General Information

Program Overview

A minimum of 40 semester units is required for completion of the MSBS program. The program emphasizes training in modern methodology in the biomedical sciences with a broad range of skills and expertise acquired through core courses, electives, and research.

The MSBS currently offers a variety of learning experiences for students interested in pursuing a career or PhD in research, those interested in gaining acceptance to a professional health sciences program (e.g. DO, PA, DDS) or preparation for career opportunities in Translational Medicine, Bioinformatics, Healthcare Bioinformatics, and Biomedical Intellectual Property. Please see the Curriculum Offerings Section of this catalog for specific requirements of the MSBS degree and Research or Pre-Professional Concentrations.

Program Faculty

Program faculty are from the Graduate College of Biomedical Sciences, and the Colleges of Osteopathic Medicine, Veterinary Medicine, Pharmacy, Dental Medicine, Optometry and Podiatry. Their research interests span from cell biology, pharmacology, molecular biology, microbiology, biochemistry, structural biology, immunology, neuroscience, anatomy, and physiology, to genomics and bioinformatics.

Personal Competencies for Admission and Matriculation

A candidate for admission to the MSBS program must possess, or be able to achieve through a reasonable accommodation, certain intellectual, social, behavioral, and physical abilities, that would enable the individual to acquire the knowledge and technical skills needed to complete program curriculum and formulate a culminating thesis within their specific field of study. Upon matriculation to the program, the student must continue to possess, or be able to achieve through a reasonable accommodation, the personal competencies outlined below throughout their progression in the MSBS program. Graduates of the program are eligible for a myriad of possible futures including working in the biomedical sectors and further study toward a PhD or professional degree. As a result, it is preferred that students have the intellectual ability to learn, integrate, analyze, and synthesize numerical, visual, and textual information within the field of biomedical sciences' research. They should also be able to effectively and accurately integrate this information and communicate it to others by both oral and written means.

A candidate for the MSBS program is preferred to have the following abilities and skills, and be able to perform all of the following essential functions, which include but are not limited to the areas below. For candidates or students who require a reasonable accommodation in order to meet the competencies outlined below, please contact the Harris Family Center for Disability and Health Policy/Accommodation and Resource Center (CDHP/AARC) at (909) 469-5297.

Under all circumstances, a candidate or student should be able to perform the following in a reasonably independent manner, with or without a reasonable accommodation:

Intellectual and Cognitive Abilities

Candidates should demonstrate abilities in measurement, reasoning, analysis, and synthesis of acquired data and knowledge.

Communication

Candidates should be able to demonstrate oral and written communication skills, which include generating clear articulations of their research and formulating scientific arguments.

Collaboration

Candidates should demonstrate the ability to participate in an inclusive learning community such as working within a team amongst other students and laboratory staff.

Laboratory and Research Experience

Candidates are preferred to have a prior hands-on laboratory experience.

Ethical Standards

Candidates should demonstrate the ability to reason through ethically questionable situations

Admissions Policies and Procedures

Non-Discrimination Policy

In accordance with all applicable federal, state, and local laws, Western University of Health Sciences (WesternU) is committed to ensuring a campus community free from unlawful discrimination. Accordingly, Western prohibits unlawful discrimination on the basis of race, color, national or ethnic origin, religion or religious creed, sex or gender (including gender identity or expression), marital status, sexual orientation, disability, age, genetic information, military or veteran status, or any other characteristic protected under applicable law, in the administration of its programs or activities. WesternU also prohibits unlawful harassment, including Sexual Harassment. Lastly, WesternU is committed to providing equal access to and equal opportunities to all members of its campus community in accordance with all applicable laws.

This non-discrimination policy applies to applicants, students, and alumni. Additional nondiscrimination information can be found in the Nondiscrimination, Anti-Harassment, and Anti-Retaliation Policy, located in the University Catalog.

Reasonable Accommodation for Disabilities

Candidates and students must be able to perform all the essential functions of the program with or without reasonable accommodation. A student who discloses a disability and requests accommodation will be referred to the Harris Family Center for Disability and Health Policy (CDHP). The student will be asked to provide documentation of the disability for the purposes of determining appropriate accommodations. The Graduate College of Biomedical Sciences will provide reasonable accommodations but is not required to make modifications that would substantially alter the nature or requirements of the program. A student with questions regarding reasonable accommodation can contact the CDHP office.

Admissions Requirements

The application requirements shown in this catalog apply to applicants who are seeking entry for the 2018/2019 academic year. Current admission and application requirements for the MSBS program, including prerequisite coursework requirements, can be located on the [Prospective Student website](#).

Applicants must possess a Bachelor of Science degree with a strong science component. The minimum criteria for admission are listed below. Meeting these criteria, however, does not guarantee admission to the program.

- A completed Western University of Health Sciences Graduate Application form (including all supplemental information for international applicants).
- Official transcripts of all undergraduate and graduate coursework, with an overall Grade Point Average (GPA) of 2.5 or greater on a 4-point scale.
- Official test scores for the general aptitude portion (verbal, quantitative, and analytical) of the Graduate Record Examination (GRE) taken within the last five (5) years, with a score greater than or equal to 300 on the combined verbal and quantitative. Alternatively, adequate MCAT, PCAT, OAT, or DAT scores will be accepted in lieu of GRE scores.
- Three letters of reference from individuals familiar with the applicant's scholarship, and research potential. One letter must be from a science faculty member

Application Deadlines

Applications must be received (including all supporting application materials) no later than May 1 for the fall semester (August), and no later than October 1 for the spring semester (January). The pre-professional concentration requires a fall start date. Completed applications that arrive before the deadline may be considered on a rolling basis.

Applicants with Foreign Coursework

Applicants who wish to use coursework completed outside the United States must submit their transcripts for evaluation to a [Western University of Health Sciences Approved Service](#) at the candidate's expense. A course-by-course evaluation is required and all coursework must be designated as undergraduate, graduate or professional. Western University of Health Sciences only honors evaluations from a WesternU-approved service. The official evaluation must be included with the supplemental application packet.

International Students

International students and any other applicants who are not U.S. citizens and who are living in the U.S. should be prepared to provide proof of legal U.S. residency at the time of interview. Proof of legal U.S. residency is required prior to any offer of acceptance. For detailed information, please visit our web page for [International Students](#).

WesternU/Institut Polytechnique LaSalle Beauvais Exchange Program

Western University of Health Sciences has entered into an agreement with Institut Polytechnique LaSalle Beauvais to facilitate faculty and student exchange. To that end, WesternU will allow Institut Polytechnique LaSalle Beauvais students to matriculate as non-degree MSBS students for up to 10 units.

The normal length of stay of exchange students shall be one semester. In exceptional cases and with the advance agreement of WesternU and LaSalle Beauvais, the length may be up to one academic year (two semesters). Students will pay tuition and fees at their home institution and are exempted from paying tuition and fees at their host university. Participating students shall be subject to the rules and regulations of the host university. For additional information regarding the exchange program, please contact the MSBS program.

WesternU/LA BioMed Internship Program

Western University of Health Sciences has entered into an agreement with LA BioMed (www.labiomed.org). Based on this agreement graduate students will have the opportunity to spend internships in the laboratories of scientists at LA BioMed during the summer.

Transfer Credit

Students may apply up to 15 graduate level credits from another university, professional school or nationally accredited institution provided the student earned a grade of "B" or above. The Dean of GCBS must approve all transfer credit, and the decision of the Dean is final.

Registration

All WesternU students are required to register by the registration deadlines specified by the University Registrar. Registration dates are posted on the [Registrar's Office](#) website. Failure to register by the deadline may be grounds for administrative withdrawal. All students registering after the posted deadline will be assessed a \$30.00 per business day late fee.

Full tuition and fees and all prior debts must be paid in full on or by posted deadlines each academic year. Matriculation is subject to the satisfactory completion of all academic requirements and payment of all outstanding debts to the University. The receipt of the final transcript(s) from all colleges/universities attended and a physical examination with documentation of required immunizations (if applicable) prior to registration are additional requirements for incoming students.

Registration Late Fee Appeals

If you are assessed late fees for a registration period, you may submit an appeal to the Registrar. For additional information on the appeal process, please see the [Registration Late Fees](#) page on the Registrar's Office website.

Student Health Insurance Requirement

All full-time students at Western University of Health Sciences are required to have active health insurance while enrolled. All students are automatically assessed half of the entire year's insurance premium and will be enrolled in the student health insurance plan until they submit proof of coverage that meets the University's requirements. For additional information on student health insurance requirements and/or waiving out of the student health insurance plan, please see the [Student Health Insurance](#) page on the Registrar's Office website.

New Student Orientation/Welcome Week

Attendance at all Welcome Week activities is mandatory for all incoming first-year students. For additional information on Welcome Week activities for the Graduate College of Biomedical Sciences, Master of Science in Biomedical Sciences program, please visit:

<http://www.westernu.edu/students/welcome-week/>.

Student Initiated Changes in Enrollment Status

Course Drop/Withdrawal

Students may voluntarily drop a class by completing the necessary paperwork. Course drops are processed as follows:

0-20% of Course Completed (Based on Course Start/End Dates)	Course is removed from student's registration and will not appear on student's academic transcript.
20-99% of Course Completed (Based on Course Start/End Dates)	Course is assigned a grade of 'W' to indicate the student withdrew from the course. 'W' grades will appear on the student's academic transcript, but will not be included in the student's GPA calculation.
100% of Course Completed (Based on Course Start/End Dates)	Course is assigned the grade earned.

Leave of Absence

A student may request a Leave of Absence (LOA) with the occurrence of a medical emergency or illness, personal issues, financial hardship, or military service. Students must be in good academic standing to be eligible for a Leave of Absence. For additional information on the University's Leave of Absence policy, please see 'Student Initiated Changes in Enrollment Status' in the University Catalog, General Academic Policies and Procedures section.

Withdrawal from University/Academic Program

Matriculation at the University is a privilege granted in consideration of specified levels of performance and of maintaining the established standards of scholarship and personal and professional conduct. The University reserves the right to require withdrawal at any time it deems necessary to safeguard its standards of scholarship, conduct, and orderly operation. The student concedes this right by act of matriculation. For additional information on withdrawing from the MSBS program, please see 'Student Initiated Changes in Enrollment Status' in the University Catalog, General Academic Policies and Procedures section.

Full-Time/Part-Time Status

All MSBS students enrolled in at least 10.00 units are considered full-time students. Students enrolled in 7.50 – 9.99 units are considered three-quarter-time students. Student enrolled in 5.00 – 6.59 units are considered part-time students.

Time Limits

The Master of Science in Biomedical Sciences program is designed to be completed in two (2) years of full-time study. The requirements for the degree must be fulfilled within three (3) years from the date of matriculation to the program. Students who are unable to meet the three-year time limit for the MSBS program may be subject to administrative withdrawal.

Tuition and Fees

By action of the Board of Trustees, MSBS tuition and fees for the 2018/2019 academic year (subject to change) are as follows:

\$807.00	Per Unit
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Other Fees and Expenses

\$30.00	Registration Late Fee (Per Business Day)
\$350.00	Graduation Fee
\$470.00	Annual Parking Permit (Auto)
\$25.00	Parking Permit Replacement Fee
\$40.00	Locker Key Replacement Fee
\$10.00	Official Transcript (Each)
\$21.00	Rush Transcript, First Class Mail (Each)
\$25.00	Rush Transcript, Federal Express (Each)
\$10.00	Student ID Replacement Fee
\$TBD	Breakage Fee (Replacement Cost)

Financial Support

Financial support, which includes scholarship, is available to a small number of qualified applicants on a limited, competitive basis.

General Academic Policies and Procedures

Attendance and Participation

Students will come prepared and adhere to established times for classes, assessments, laboratories, rotations and meetings. Student attendance is required at all scheduled instructional periods. Absence from instructional periods for any reason does not relieve students from responsibility for the material covered during the periods missed. In order to receive an excused absence for instructional sessions, exams and assignments, it must be due to medical and emergency grounds and a TOR should be submitted and approved.

Three or more unexcused absences will be viewed as violations of the Standards of Academic and Professional Conduct, will be noted in the student's Academic Progress Portal (APP) record, and will be grounds for a meeting with the Student Performance Committee (SPC). Consequences of this meeting may include placing the student on conduct probation or conduct suspension. If a student is reported as having arrived late to a class three times without an excuse, a note will be made in their APP indicating their lack of promptness. Additionally, students with more than six unexcused tardies will be viewed in violation of the Standards of Academic and Professional Conduct, and will be called for a meeting with the SPC. Consequences of this meeting could include placing the student on conduct probation or conduct suspension.

Vacation

Students receive three weeks' vacation each year; two weeks over the Winter Break and one week for Spring Break. Students may not expect to take more time than this and may not leave early or return late from the break. Vacations are not provided during academic semesters.

Graduation Requirements

Obtaining the Master of Biomedical Sciences Degree will be based on cumulative GPA (minimum of 3.0). Students in different concentrations may have additional requirements, including a dissertation for the research track and a portfolio of documents generated by the student over the 2-year program. These requirements may include reports from internships, special assignments for some of the classes and research project reports. The faculty advisor and the student advisor committee will help the student select topics and mentor the student in his/her progress.

MSBS candidates are required to present their dissertation or portfolio to the Student Advisory Committee for approval. In addition, students will be required to defend their dissertation or portfolio during an oral presentation at the end of their program to the Student Advisory Committee. The oral defense may also include questions based on the required course work completed by the student. The Student Advisory Committee consists of at least three faculty members (the faculty advisor plus two other faculty members). The Chair and at least one other member of the committee must be full time faculty at Western University of Health Sciences. Upon approval by the Dean, GCBS or his/her designee, a fourth member from within Western University of Health Sciences may be eligible for appointment to the committee.

Upon satisfactorily passing all exams, students are to provide an electronic copy of their thesis to the Associate Dean of Research.

Faculty Advisor and Research, Portfolio, and Internship

The faculty advisor serves as the Chair of the Student's Advisory Committee and helps the student in the choice of electives and research project or portfolio topic. Further, the faculty advisor may also assist the student in obtaining a research assistantship if funds are available. The Chair is responsible for the satisfactory academic progress of the student, and must hold committee meetings with the student on a regular basis.

Issues/Dispute Resolution Procedure

When an issue or dispute arises between students, the issue/dispute resolution process starts with communication among the involved students. If the problem is not resolved, the matter should be brought to the Director of Student Affairs and the Associate Dean of Academic Affairs, followed by the GCBS Dean. If the matter has not been resolved at those levels, the final arbiter is the Provost/COO.

When an incident arises involving a faculty member, the first step in the issue/dispute resolution process is discussion with the faculty member. If the matter is not satisfactorily resolved at that level, the matter should be referred to the Associate Dean of Student Affairs, and GCBS Dean, in that order. The final arbiter is the Provost/COO.

When an incident arises involving a staff member, the dispute resolution process begins with the Director of Student Affairs, followed by the Associate Dean of Academic Affairs, then the GCBS Dean. The Office of Human Resources is the final arbiter.

Failure to follow this sequence of steps will only serve to delay the appropriate resolution of the issue or dispute as the matter will only be referred back to the correct level in this chain of responsibility.

Standards of Academic Integrity, Professionalism and Student Conduct

The University Standards of Academic Integrity, Professionalism, and Student Conduct, can be located in the University section of the most current catalog. The standards outlined below are in addition to those outlined in the University Catalog. Students are expected to be aware of, and abide by, both University and College policies.

GCBS Honor Code

Honesty and integrity are among the most valued traits of academic researchers and health care professionals. Each student is expected to assume personal responsibility for those traits. Academic dishonesty includes cheating, plagiarism, using unauthorized resources during examination(s), sabotaging other students and mentors' research as well as signing another person's name to an attendance or examination document. Matters of academic dishonesty and professional misconduct will be handled consistently with the University's guidelines for Hearings involving alleged violations of the standards of professional conduct as described in the University's General Academic Policies and Procedures. Any individual who witnesses or becomes aware of a possible violation of the Honor Code is bound to report the incident. Staff or students must report the incident to a faculty member and faculty members must report the incident to the GCBS Dean.

Violations

Upon receipt of an allegation of misconduct, the GCBS Dean either will address the matter directly or will appoint an ad-hoc committee of the Faculty and student of the program to investigate the allegation and forward a recommendation on a course of appropriate action to the GCBS Dean. Potential sanctions could include placing the student on probation; require the student to undertake specific remedial activities, suspension for a defined period of time, or dismissal from the program. Decisions of the Dean in matters of conduct may be appealed following the procedure outlined in the 'Student Appeal Process' section of the University Catalog.

Standards of Academic Progress

MSBS students must maintain a cumulative GPA of 3.00 or higher on a semester basis to be considered making satisfactory academic progress (SAP).

Student Performance Committee

The Graduate College of Biomedical Sciences Student Performance Committee (SPC) is charged with the following responsibilities: (a) to review at the end of each semester the academic achievement and comprehensive evidence of progress of all students who are pursuing the MSBS degree (particular attention will be given to students in academic difficulty as their grades are made available to the SPC by the Registrar and/or course faculty); and (b) to receive reports from the Director of Students Affairs and/or the Associate Dean of Academic Affairs regarding any student whose professional or personal conduct is deemed unsatisfactory. Appropriate professional and personal conduct is defined by the University's and College's Standards of Academic Integrity, Professionalism and Student Conduct. At the time of the semester evaluation of each student by the GCBS SPC, if a student is found not to be meeting satisfactory academic progress because of failure to meet GPA requirements or time to degree limit is exceeded, the student may be subject to either dismissal or administrative withdrawal.

Graduation

A student will be recommended for the Master of Science in Biomedical Sciences degree provided that he/she:

1. Is not on probation or suspension and has completed all prescribed academic requirements with a cumulative grade point average of 2.75 or higher and has no outstanding grade of "I", "NCR," or "I" A 2.00 (C) grade earned in any class may be applied toward graduation only if the cumulative grade point average at the time of application for graduation continues at a minimum of 3.00 (B).
2. Has satisfactorily completed and orally defended a written portfolio.
3. Has demonstrated no serious deficiencies in ethical, professional, or personal conduct, as defined in the University Catalog, General Academic Policies and Procedures section, which would make it inappropriate to award the degree of Master of Science in Biomedical Sciences.
4. Has complied with all the legal and financial requirements of the University, as stated in the University Catalog.
5. Has attended in person and participated in the Commencement ceremony at which time the Master of Science in Biomedical Sciences degree is conferred. Unless special permission has been granted by the Dean, each student must participate in his or her respective commencement ceremony. If the Dean grants special permission for excusal from commencement, the graduate may be required to present him/herself to the Dean, GCBS or his/her designee, at another specified date before their diploma will be released. Requests for excusal will only be granted for extenuating circumstances, such as a prior military commitment, or death in the family.

Students may participate in commencement activities provided they will complete all requirements of the program by December 31 of that calendar year. No student will receive his or her degree until he/she has completed all requirements for graduation. Degrees will be dated as appropriate to completion date.

Adverse Actions

Probation

Students may be placed on Probation for the following reasons (these are in addition to the reasons listed in the Standards of Academic Progress section of the University Catalog).

1. Inadequate academic progress as determined by the Student Performance Committee. This includes, but is not limited to, receiving a “U” grade in any course or system.
2. A semester or cumulative grade point average below 2.75.
3. When directed to repeat a year for academic reasons.
4. Failure to perform in a professional manner.
5. Serious deficiencies in ethical or personal conduct.

A student placed on probation for receiving a grade of “U” or for a semester or cumulative GPA less than 2.75 in a given semester will be removed from probation after one semester provided he/she has regained a cumulative GPA of at least 2.75 and/or has remediated the failed course. Students on probation are to remove themselves from all leadership roles in co-curricular activities associated with the University and/or with professional associations.

Financial Aid Warning Policy

If a student is not achieving satisfactory academic progress (SAP) they may be placed on “Financial Aid Warning” status for the next payment period and continue to receive Title IV aid for that period. Students who fail to make SAP by the end of that payment period lose Title IV aid eligibility.

It is the policy of the Financial Aid Office (FAO) that once a student has been placed on academic probation for not meeting SAP standards as defined by the college, the FAO will automatically place the student in a Financial Aid Warning status. During the next academic term if the student does not meet SAP standards and the college places the student on academic suspension the student will no longer be eligible for financial aid. If the student appeals the academic suspension and the appeal is approved, financial aid will be reinstated. If the student is directed to audit courses those courses may not be covered by financial aid.

Tutorial Assistance Program

A Tutorial Assistance Program (TAP) has been established to assist students experiencing academic difficulty. Students will be recommended for this program by a faculty advisor or professor. Students may self-identify to TAP to receive assistance. The tutors will be chosen on the recommendation of the faculty in each discipline. Group tutoring is the methodology most used by the TAP department. For assistance, contact the Learning Enhancement and Academic Development Office (LEAD).

Remediation

Where deemed appropriate, the Student Performance Committee, after consultation with the course coordinator and/or the Dean (or his/her designee) may recommend any one of the following options:

- Successful completion of a comprehensive examination.
- Successful completion of a series of exams.
- Repeating the course.

Recommendations regarding remediation will be made on an individual basis after considering all pertinent circumstances. The final decision will be made by the GCBS Dean, based upon the recommendation of the SPC. Course remediation by exam(s) will take place during the summer following the year in which the student failed the course. Remediation by repeating the course will take place at the time that the course is offered during the following academic year. All summer remediation exams will take place no sooner than June 1 and no later than August 1 of the following summer after the student has failed a course. Students who require remediation but are unavailable on the designated examination date will not be allowed to progress in the curriculum and will be placed on academic suspension. The grade either earned upon remediation of the course, by exam or repeating the course, will replace the original course grade.

A student who is required to remediate a course must be notified in writing by the GCBS Dean (or his/her designee) at least 15 working days prior to the remediation date, or within 15 working days after the close of the academic year in which the student is presently enrolled, whichever comes first. Notification must either be sent by Certified Mail or hand-delivered to the student and must be acknowledged with the signatures of the GCBS Dean (or his/her designee) and the student.

The score/grade achieved by remediation will be the score/grade recorded except that the highest score/grade a student may earn by options 1 or 2 (above) is a score of "C." The grade achieved by remediation will be recorded on the transcript next to the original grade.

If a student is directed to repeat a course (option 3); the grade for the repeated course will be recorded on the official transcript. Only the most recent grade received for a repeated course will be included in the student's GPA calculation. Students will be charged full tuition for repeated coursework.

Academic Suspension

Students may be placed on Academic Suspension if there is a period of non-enrollment caused by the need to repeat a failed course.

No student is eligible for Title IV, HEA programs if they are placed on Academic Suspension. Students on Academic Suspension are not registered as an active matriculant and should use this time to remediate the deficiency for which the Academic Suspension was levied.

Dismissal

Students may be dismissed if they earn more than two failing grades ("U" or "NCR"). If the cumulative grade point average remains below 3.00 after the student completes a total of nine (9) graded credit units subsequent to being placed on academic probation, the student may be dismissed from the program. The student may be readmitted only after completion of a remediation plan recommended by the Student Advisory Committee. No course work taken as part of that remediation plan will be counted toward the

MSBS degree or incorporated into the student's cumulative grade point average. Graduate level courses for which grades below "C" were earned may not be repeated during that remediation period.

Students who receive a "U" grade for GCBS 6999 (Research and Portfolio and Internship) may be dismissed regardless of GPA or academic standing in the program.

Student Appeal Process

At the conclusion of each academic term, the Student Performance Committee will review whether students have met the established Standards of Academic Progress in the curriculum. Recommendations by the Student Performance Committee are advisory to the Dean of the Graduate College of Biomedical Sciences, who will make the final decision.

In accordance with WesternU policy, the Dean's decision may be appealed by the student to the Provost of Western University of Health Sciences. The Provost may convene an advisory panel, and the decision of the Provost is final. For additional information, please see 'Student Appeal Process' section of the University Catalog.

Evaluation and Grading

Program Outcomes

Critical Thinking

The MSBS graduate will be able to identify and understand critical issues in biomedical sciences. They should possess the ability to challenge and evaluate information using evidence-based research principles, as well as synthesize and integrate knowledge in the discipline, leading to new ideas, approaches, and research.

Breadth and Depth of Knowledge

The MSBS graduate will understand the current and historical theories, concepts, and models of biomedical sciences. They should possess the ability to access, evaluate the literature of the discipline, and understand the major issues in the current state of knowledge. They should also possess an ability to transcend traditional disciplinary boundaries and effectively conduct original, discovery-based or applied research in biomedical sciences under the direct guidance of a faculty member.

Interpersonal Skills

The MSBS graduate will possess the ability to write and speak about the current issues of biomedical sciences to peers, practitioners and the public. They should be able to articulate and demonstrate knowledge of the discipline and write and present scholarship information to professionals.

Collaboration Skills

The MSBS graduate will be able to collaborate with other members of the research team, with colleagues (both within the discipline and across related disciplines), and if appropriate, with other communities of interest in the conduct of a research program.

Ethical and Moral Decision Making (Humanistic Skills)

The MSBS graduate will understand and exhibit the professional standards for responsible and ethical conduct of research in biomedical sciences.

Life-Long Learning

The MSBS student should be able to engage in life-long, self-directed learning to maintain and expand competence in the discipline, including staying abreast of current issues, methods and approaches in biomedical sciences.

Evidence-Based Research

The MSBS student will have a solid grounding in the literature pertaining to a particular question and be able to understand and appropriately use the methods and techniques used for advancing knowledge in their field of study. They should be capable of designing, working within, and coordinating multi-disciplinary research programs.

Grading Scale

Final course grades are given based upon the traditional 4-point letter system, as follows:

<u>Grade</u>	<u>Equivalent</u>	<u>GPA Points</u>
A	Outstanding	4.00
A-	Excellent	3.70
B+	Very Good	3.30
B	Good	3.00
B-	Above Average	2.70
C+	Satisfactory	2.30
C	Marginally Passing	2.00
U	Unsatisfactory	0.00
CR	Credit	N/A
NCR	No Credit	N/A

Administrative Grades

<u>Grade</u>	<u>Equivalent</u>	<u>GPA Points</u>
AU	Audit	N/A
I	Incomplete	N/A
W	Withdrawal	N/A
M	Missing	N/A

Audit

An "AU" (Audit) is assigned to a student who pays tuition for the course and attends class activities but does not complete examinations and does not receive course credit. However, under certain circumstances, at the discretion of the College Dean, a student who is repeating or undergoing remediation may be required to complete course examinations and/or other required work products while auditing the course for no grade.

Missing Grades

A grade of 'M' for Missing will be input by the Office of the Registrar if a student's grade is not available by the deadline for grade submission. An 'M' grade is not included in the GPA calculation and will be replaced by the grade earned in the course once submitted by the course director/instructor. 'M' grades should not be used by the program in place of an Incomplete (I) grade.

Incomplete

An Incomplete grade ("I") will only be assigned to students whose professional commitments and/or personal responsibilities prevent him or her from completing the requirements of the course. A student may remove an incomplete by completing course requirements within the following six calendar months or the final grade will be permanently recorded as a "U." This rule applies regardless of the student's enrollment status. A student not enrolled during the following six months must still successfully remove the "I" grade. The instructor must certify any grade changes. The "I" grade will remain on the student's transcript, along with the final grade assigned by the instructor.

Grade Reports

Official grades are turned in to the Registrar by the Graduate College of Biomedical Sciences, at which time the online student records system, BanWeb, is updated. Official grade reports and unofficial transcripts will be available on the BanWeb student records system throughout the academic year.

Grade Appeals Process

If a student believes there is just cause to dispute a grade for a course, the procedure is as follows: Within five (5) days of receipt of the course grade, the student must make an appointment with the course instructor(s) who issued the grade. Upon written request from the student, the course instructor(s) shall review the case with the student, and a decision shall be made by the course instructor to affirm or modify the grade. Within ten (10) working days of the student's written request, the course instructor shall notify the student in writing of the decision. If warranted, a copy of the Grade Change Form shall be sent to the student and the Director of Student Affairs.

Within five (5) working days following written notification to the student regarding the instructor's decision, the student may appeal the decision in writing to the Associate Dean of Academic Affairs. The appeal request must be accompanied by a narrative explaining the basis for the appeal. The narrative should fully explain the student's situation and substantiate the reason(s) for advocating a review of the prior decision of the instructor. The Associate Dean of Academic Affairs may grant an appeal only if a claim of (1) bias, (2) the appearance of new material and documentable evidence that was not available at the time of the instructor's decision, or (3) procedural error that unfairly affected the decision-making process is substantiated by the Associate Dean of Academic Affairs. Upon written request from the student with a valid appeal rationale, the Associate Dean of Academic Affairs shall review the case and make a recommendation to the GCBS Dean. Within seven (7) working days, the GCBS Dean shall issue a decision in writing to the student, which may affirm, modify, or reverse the previous action of the instructor. The Dean's decision is final in all course grade appeals.

Unit Calculation

As of the 2016/2017 academic year, the Graduate College of Biomedical Sciences defines one unit for every 15 contact hours.

Curriculum Offerings

To obtain a Master of Science in Biomedical Science, students must complete a minimum of 40 units, which includes 14 units of Core Required Courses, 4 units of Research, Portfolio, and/or Internships, and 22 units of Electives.

Core Required Courses

Subject/Course #	Course Title	Units
GCBS 5040	Molecular and Cellular Basis of Life	2.00
GCBS 5051	Genetics	2.00
GCBS 5060	Introduction to Biotechnology	2.00
GCBS 5080	Biological Systems in Human and Animal Disease I	2.00
GCBS 5081	Biological Systems in Human and Animal Disease II	2.00
GBCS 5086	Bioinformatics	3.00
GBCS 5090	Biomedical Statistics and Research Design Part I	2.00
Total Required Units:		15.00

Research, Portfolio, and Internships

Subject/Course #	Course Title	Units
GCBS 6999	Research and Thesis	0.00 – 8.00
GCBS 7000	Research and Internship	0.00 – 8.00
Total Required Units:		Up to 8.00

Elective Courses

Subject/Course #	Course Title	Units
GCBS 5031	Principles of Biomedical Ethics	1.00
GCBS 5082	Clinician and Society	3.00
GCBS 5087	Bioinformatics Part II	4.00
GCBS 5088	Medical Informatics	2.00
GCBS 5091	Biomedical Statistics and Research Design Part II	2.00
GCBS 5503	Advanced Toxicology	3.00
GCBS 6000	Graduate Seminar	2.00
GCBS 6001A	Nutrition in Medicine Seminar Series	1.00
GCBS 6001B	Nutrition in Medicine Seminar Series	1.00
GCBS 6101	Advanced Topics in Immunology	2.00
GCBS 6401	Advanced Topics in Structural Biology	2.00
GCBS 6501	Advanced Topics in Neurobiology	2.00
GCBS 6502	Introduction to Neuroscience	4.00
GCBS 6503	Neuroanatomy	4.00
GCBS 6504	Neurophysiology	4.00
GCBS 6505	Neuropathology	4.00
GCBS 6506	Neuropharmacology	2.00
GCBS 6507	Neuroimaging	2.00
GCBS 6508	Critical Readings in Clinical Neurosciences	2.00
GCBS 6509	Statistical Techniques in Clinical Neurosciences: Meta-Analysis	2.00
GCBS 6510	Clinical Trials in Neuroscience	2.00

Subject/Course #	Course Title	Units
GCBS 6601	Special Research Experience	2.00 – 4.00
GCBS 6700	Path for FDA Approval of New Drugs and Devices	3.00
GCBS 6701	Directed Reading	1.00 – 5.00
GCBS 6800	Nutritional Sciences Exchange Program	8.00
GCBS 6900	Preclinical Research	2.00
GCBS 6901	Clinical Research	4.00
Total Required Elective Hours:		Up to 21.00

Research Concentration

Students wishing to obtain a concentration in research will be required to complete 15 units of core-required courses, and 25 units of Research, Portfolio and/or Internship, and Electives Courses.

Pre-Professional Concentration

Students wishing to obtain a Pre-Professional concentration will be required to complete 28 units of Core Required Courses (see below) during their first year of enrollment.

The second year requires 12 units of elective courses chosen from the list above. It is also possible to apply graduate level credits from another university, professional school, or nationally accredited institution, provided the student earned a grade of “B” or above. The Dean of GCBS must approve all transfer credits, and the decision of the Dean is final.

Core Required Courses

Subject/Course #	Course Title	Units
GCBS 5020	Critical Learning & Communication Skills Health Professions I	1.00
GCBS 5021	Critical Learning & Communication Skills Health Professions II	1.00
GCBS 5025	Anatomy	3.00
GCBS 5040	Molecular and Cellular Basis of Life	2.00
GCBS 5050	Biochemistry – Disease and Nutrition	3.00
GCBS 5051	Genetics	2.00
GCBS 5075	Physiology of Human Visceral Systems	3.00
GCBS 5079	Microbiology: Biological Systems in Human Disease	4.00
GCBS 5080	Biological Systems in Human and Animal Disease I	2.00
GCBS 5081	Biological Systems in Human and Animal Disease II	2.00
GCBS 5083	Clinical Environments in Health Care	2.00
GCBS 5088	Medical Informatics	2.00
GCBS 6001B	Nutrition in Medicine Seminar Series	1.00
Total Required Units:		28.00

Course Descriptions

All courses are awarded letter grades, except when indicated otherwise.

GCBS 5020 Critical Learning and Communication Skills in the Health Professions I (2.0 units)

The first part of a two-semester sequence intended to expose students to myriad techniques and approaches for being a successful graduate student and for becoming a life-long learner. Students will have the opportunity to study and apply practical techniques to maximize comprehension, retention of material, critical and abstract thinking, interpersonal communication, and team-based learning. In addition, students will explore myriad aspects of group performance. The course will also emphasize numerous aspects of graduate-level education including the management of time and stress; increasing focus, concentration, motivation, and memory; study skills and strategies; learning assessment; and approaches to test taking.

GCBS 5021 Critical Learning and Communication Skills in the Health Professions II (2.0 units)

The second semester of a two-semester sequence intended to expose students to myriad techniques and approaches for being a successful graduate student and for becoming a life-long learner. Students will have the opportunity to study and apply practical techniques to maximize professional development. Students will explore aspects of group performance; including peer reviews, learning assessments, situational judgement, critical analysis, inter-professional education, and special group projects. The course will emphasize effective written and oral communication with a capstone presentation.

GCBS 5025 Anatomy (3.0 units)

Material covered in this regional approach to anatomy includes the shoulder and upper limb, thorax and its viscera, abdomen and its viscera, the pelvis, its viscera, the male and female perineum and lower limb. The objectives include the mastery of nomenclature and spatial relationships of human anatomical systems. It is expected that students will understand the anatomical portion of selected clinical correlations.

GCBS 5031 Principles of Biomedical Ethics (1.0 unit)

This course is divided into three portions. The first is a didactic lecture that will cover general ethical philosophy that pertains to the biomedical sciences. The course will then shift to case-based small group discussions. First social and medical issues such as treatment of severe communicable diseases and genetic engineering will be discussed allowing for application of ethical philosophy to current biomedical debates. Lastly, the course will cover the responsible conduct of research and discuss real scientific cases. Once completed students should be able to identify ethical issues and understand the various viewpoints that support solutions to ethical problems and real world consequences of ethical maleficence in the biomedical sciences.

GCBS 5040 Biochemical and Cellular Basis of Life (2.0 units)

This course covers a wide range of topics in molecular and cellular basis of life. The goal of this course is to provide an integrative view of the general principles in molecular biology, biochemistry, cellular physiology, metabolism, and basic histology.

GCBS 5050 Biochemistry – Disease and Nutrition (3.0 units)

This course covers biochemical molecules and metabolic pathways that are essential for homeostasis, with a focus on macronutrient and micronutrient metabolism. Energy metabolism, bioenergetics, advanced metabolism of carbohydrates, lipids and proteins, vitamins, trace elements and major minerals will be covered. This course will expand understanding of the biological roles of nutrients and their metabolism using knowledge of physiology, biochemistry, cell biology, and molecular biology. Topics will include the energetics of metabolism; the structure and metabolism of amino acids, proteins, carbohydrates, and lipids; and the integration of metabolic systems. Clinical case studies related to the course topics will be discussed.

GCBS 5051 Genetics (2.0 units)

This course provides a strong foundation in basic and applied genetics, from DNA structure to heritable human disorders. Basic processes will be discussed within the context of widely used plant, invertebrate and vertebrate models.

GCBS 5060 Introduction to Biotechnology (2.0 units)

This course will provide theoretical knowledge, hands-on laboratory experience, and practical computer skills necessary and sufficient to start practical work in biotechnology projects.

GCBS 5075 Physiology of Human Visceral Systems (3.0 units)

This course will examine human physiology and histology in an integrated fashion. It will cover the following systems: endocrine, cardiovascular, respiratory, digestive, and urinary systems. The course will focus on several themes, including the complementarity of structure and function, the interrelationships of body organ systems and the maintenance of homeostasis. The course will consist of didactic and practical (that will focus on the quantitative aspect of physiology) components

GCBS 5079 Microbiology: Biological Systems in Human Disease (4.0 units)

This course presents an integration study on the basics of microbiology, including microbial structure, function, metabolism, genetics, and the relationship of microbes with the host and host-defense mechanisms. In addition, the major pathogenic microbes (bacteria, viruses, fungi, and protozoa) and the diseases they cause will be discussed. The students will be expected to learn basic and clinical lab techniques as well as their application in the identification of various microbes.

GCBS 5080 Biological Systems in Animal and Human Disease I (2.0 units)

The primary goal of this course is to provide an integrative view of the general principles in human and animal systems biology and related diseases, in the context of homeostasis and related phenomena. A secondary goal of this course is to foster student-centered learning skills and the confounding a variety of academic and scientific resources including textbooks, primary literature, review papers, scholarly online databases, and peer group discussions.

GCBS 5081 Biological Systems in Human and Animal Systems (2.0 units)

The course is designed to provide first year biomedical graduate students with an introduction to human and animal pathology by studying diseases that affect the nervous system, immune system, musculoskeletal system, cardiopulmonary system and/or other body systems. Students will gain an appreciation of biomedical research methods that can be used to characterize pathological mechanisms and produce new therapies for disease. In addition to didactic lectures, students will engage in self-directed study to assimilate biomedical technologies, pathophysiology, and molecular and cellular biology knowledge as well as research design methods in the context of specific body systems and/or diseases. Subjects covered may include genetic disorders, virology, microbial pathogens, toxicology, and autoimmunity.

GCBS 5082 Clinician and Society (3.0 units)

The Clinician and Society course will provide the pre-health care professional student with the opportunity to experience and begin to understand the multi-faceted and complex nature of the health care professions as they relate to society. The student will gain insight into the many social components that both influence and shape health care practice and the societal perspectives that influence how the health care practitioner is perceived by society. At the end of this course, students will be able to describe the historical development of modern health care practice and the contributions of health care practitioners from antiquity to the present who made key contributions to the evolution of medicine and medical practice. Students will discuss the history of osteopathic medicine in the United States and the unique philosophical and practical contributions that Andrew Taylor Still made to medicine. The history of osteopathic medicine in California, as well as the history of podiatry, optometry, dentistry, and veterinary medicine will be covered. Major elements of medical professionalism why it is critical in the practice of the health sciences will be emphasized through the course.

GCBS 5083 Clinical Environments in Health Care (2.0 credits hours)

This course provides a critical experiential learning opportunity placing the clinical provision of care in its broader context, integrating both theory and practice. The learner constructs knowledge, attitudes, skills, competencies, and understanding through direct experience through a learning process.

GCBS 5086 Bioinformatics Part I (3.0 units)

This course will introduce students to concepts, methods, and tools in the analysis of biological information and genomic data. Bioinformatics is an inter-disciplinary field that lies at the intersection of biology, mathematics, and computer science. As this is an introductory course, no programming experience is required and most of the analysis of data will leverage online tools and resources. Students are expected to enter the class with a strong background in molecular biology, biochemistry, cell biology, and genetics. The course is designed to facilitate student-centered learning of core bioinformatics concepts such as literature searching, ontology development and applications, biological sequence analysis, pairwise and multiple sequence alignments, sequence database searching, homology detection, protein domain identification, protein structure modeling, structural genomics, functional genomics, comparative analysis of gene/protein function, phylogenetic analysis, and gene expression analysis. Students who successfully complete this course will be able to apply basic bioinformatics reasoning and methods to specific research questions and projects.

GCBS 5087 Bioinformatics II (4.0 units)

This course will provide students with the technical skills necessary to use informatics technology and tools in biomedical research, medical records, data storage, retrieval, and interpretation. It will also provide skills and knowledge to evaluate biomedical decision-making, and how cognitive methods can be used to develop and implement clinical practice guidelines. It will train students to use database management systems for the management, analysis, and interpretation of datasets using a variety of existing software tools. Students will work on one or more informatics projects throughout the duration of the class and will acquire the necessary computational proficiency and bioinformatics knowledge needed to complete the project(s). As part of the class, students will be expected to identify, read, and understand resources required to complete the project such as software manuals and previously published papers. An important theme in bioinformatics is collaboration across multiple disciplines, subsequently this class will require students to demonstrate proficiency in writing, discussing and presenting various aspects of their project to different audiences ranging from biological scientists and medical doctors to computer scientists. Students who successfully complete this class will be able to apply advanced bioinformatics reasoning and methods to specific research questions and projects. Prerequisite: GBCS 5086 (Bioinformatics Part I).

GCBS 5088 Medical Informatics (2.0 Units)

This course will focus on the health informatics infrastructure with an emphasis on the applications and responsibilities associated with electronic medical records. The course will cover natural language processing in biomedical sciences, medical imaging informatics, ethics in medical informatics, methods for evaluating and assessing technology, electronic health records, and the management of clinical information in health care organizations. Additionally, the course will explore aspects of consumer health informatics and the application of medical informatics to public health.

GCBS 5090 Biomedical Statistics and Research Part I (2.0 units)

This course will introduce students to the key concepts in descriptive and inferential statistics required for the successful independent analysis of large clinical and/or biological datasets. Various topics will include central tendency, variability, statistical power, hypothesis testing, conditional probability, correlation analysis, analysis of variance, and regression analysis. An important goal of this class is to transform the student into a competent and proficient statistician who can carry out a detailed statistical analysis of real world data and explain the analysis and its significance to others. In order to achieve this goal the course will be taught in a manner that facilitates student-centered learning and requires students to work together to learn, explain and communicate statistical concepts. Students will learn to identify, understand, discuss, and evaluate the statistical methods and findings presented in published research papers. Students will apply their knowledge of statistics to problem sets and projects throughout the course. Because the application of statistics requires access to powerful and scalable statistical software, this course requires students to become proficient with the freely available software package R, which is widely used in applications ranging from clinical trials to genomic analysis. Students who successfully complete this class will be able to apply statistical reasoning and methods to specific research questions and projects.

GCBS 5091 Biomedical Statistics and Research Design Part II (2.0 units)

This course will provide students the technical skills necessary to design, manage, analyze, and interpret biomedical research projects with large and complex data sets. Students will work on one or more statistical projects throughout the duration of the class and will acquire the necessary statistical and computational proficiencies needed to complete the project(s). As part of the class, students will be expected to identify, read, and understand resources required to complete the project such as software manuals and previously published papers. An important theme in biomedical statistics is collaboration across multiple disciplines, subsequently this class will require students to demonstrate proficiency in writing, discussing and presenting various aspects of their project to different audiences ranging from biological scientists and medical doctors to statisticians and grant reviewers. Students who successfully complete this class will be able to apply advanced statistical reasoning and methods to specific research questions and projects. Prerequisite: GCBS 5090 (Biomedical Statistics and Research Design Part I).

GCBS 5503 Advanced Toxicology (3.0 units)

Toxicology is the study of poisons. According to the alchemist Paracelsus, all substances are poisons and the dose differentiates a poison from a remedy. This course will focus on the principles of toxicology and mechanisms of toxicity. Examples of major toxic spills and human exposures will be discussed. Case-based problems will be used to apply principles of toxicology and illustrate the major adverse health effects associated with environmental toxins.

GCBS 6000 Graduate Seminar (2.0 – 8.0 units)

This course exposes graduate students to high-caliber basic and applied research through campus wide research seminar series, sponsored by many colleges on the Pomona campus. Students are assigned reading material related to the seminar topic and engage in an informal discussion of the topic, led by a faculty member, before attending the seminar. The course is taught by a cross-section of faculty members who mentor GCBS students in their research labs. Students may also have opportunities to interact with guest speakers in informal settings before or after the seminars.

GCBS 6001A Nutrition in Medicine (1.0 unit)

The Nutrition in Medicine lecture series includes eight sessions at a frequency of approximately one session per month beginning in September and ending in April. The content of each session will be largely focused on nutrition as it relates to a specific topic in human health and wellness. We will be presenting information on the many aspects of the science of nutrition and the lifestyle determinants of health; we will also discuss the much-more-difficult “art” of how to actually interact with patients and have conversations related to these topics.

GCBS 6001B Nutrition in Medicine (1.0 unit)

Continuation of the Nutrition in Medicine lecture series includes eight sessions at a frequency of approximately one session per month beginning in September and ending in April. The content of each session will be largely focused on nutrition as it relates to a specific topic in human health and wellness. We will be presenting information on the many aspects of the science of nutrition and the lifestyle determinants of health; we will also discuss the much-more-difficult “art” of how to actually interact with patients and have conversations related to these topics.

GCBS 6101 Advanced Topics in Immunology (2.0 units)

This advanced course will address concepts and principles of immunology as they relate to disease and/or disease prevention. Topics will include cells, organs, and effector systems involved in cell-mediated, humoral-mediated and innate immunity. Examination of the regulatory interactions among different components of the immune system and the deleterious effects of aberrant immune processes will occur.

GCBS 6501 Advanced Topics in Neurobiology (2.0 units)

This advanced elective course will discuss concepts in neurobiology. It will be based in critical evaluation and discussion of recently published papers in a variety of fields in neurobiology.

GCBS 6502 Introduction to Neuroscience (4.0 units)

This course is the prerequisite to GCBS 6503-7 sequence and is offered in June and December each year. Content includes review of relevant neuroscience literature in didactic and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6503 Neuroanatomy (4.0 units)

Content includes review of relevant neuroanatomical core science literature in didactic and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6504 Neurophysiology (4.0 units)

Content includes review of relevant neurophysiological core science literature in didactic and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6505 Neuropathology (4.0 units)

Content includes review of relevant neuropathological core science literature in didactic and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6506 Neuropharmacology (2.0 units)

Content includes review of relevant neuropharmacological core science literature in didactic and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6507 Neuroimaging (2.0 units)

Content includes review of relevant neuroimaging core science literature in didactic, practical, and assessed tutorial sessions. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments and a comprehensive final written examination.

GCBS 6508 Critical Readings in Clinical Neurosciences (2.0 units)

Content includes directed readings in focused areas of clinical neuroscience, including but not limited to: CNS tumors, CNS trauma, Stroke, Epilepsy, Degenerative Diseases, History of Neuroscience, etc. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments, oral presentations during neuroscience grand rounds, and a comprehensive final written examination.

GCBS 6509 Statistical Techniques in Clinical Neurosciences: Meta-Analysis (2.0 units)

Content includes review of the scope, strengths, and limitations of Meta-Analysis techniques in validating the clinical effectiveness of clinical interventions as applied in the neurosciences. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments, oral presentations during neuroscience grand rounds, and a comprehensive final written examination.

GCBS 6510 Clinical Trials in Neuroscience (2.0 units)

Content includes review of the scope, strengths, and limitations of clinical trials in furthering management of CNS diseases. With special emphasis on clinical trials for management of trauma, stroke, and epilepsy, basic information on clinical trials, including what they are, why they are important, and how they are funded will be surveyed. Various clinical trial registries, including those of the NIH and WHO will be introduced. Students will be assigned a faculty mentor/tutor. Assessment includes tutorial session rubric assessments, oral presentations during neuroscience grand rounds, and a comprehensive final written examination.

GCBS 6601 Specialty Research Experience (2.0 – 4.0 units)

Assigned laboratory experiences introducing students to the research techniques and protocols under the guidance of faculty members at Western University of Health Sciences.

GCBS 6700 Path for FDA Approval of New Drugs and Devices (3.0 units)

This course will provide a scientific, regulatory, and organizational review of the FDA drug and device approval process in the US. In addition, this course will examine the rationale underlying the agency's formation, its enforcement authority, its continued reevaluation of measures to ensure public health and ways in which this affects the premarket approval process and post-approval marketing of new drugs. This course will also detail the logic and scientific rationale underlying requirements for preclinical, clinical testing and post market surveillance required by the FDA for drug approval and the post-marketing process. Topics covered will be FDA organization and operations; the pharmaceutical/device product development process; product characterization and pre-clinical evaluation; pharmacology/toxicology for new drugs; INDs, (Investigational New Drug Applications), clinical investigations, bioresearch monitoring; GxPs (Good xPractices) and CMC (Chemistry, Manufacturing and Control) requirements.

GCBS 6701 Directed Reading (1.0 – 5.0 units)

This course is an independent study course consisting of individualized readings in various topics in the biomedical sciences. Directed readings allow detailed study of topics pertinent to research encountered in laboratory rotations or subjects that are not otherwise addressed in the MSBS curriculum. The student will be expected to work with an instructor to develop a reading list and to define course objectives.

GCBS 6800 Nutritional Sciences Exchange Program (8.0 units)

Students will better understand the complex relationships between food chain, dietary habits, and human health as consumer and public health issue. Course work includes human physiology, nutrition, nutrigenomics, and nutraceuticals with emphasis on European or Mediterranean nutrition and health. Course offered January – May; language of Instruction is English. Prerequisite: Approval of Dean, GCBS or designee.

GCBS 6900 Preclinical Research (4.0 units)

This course will present a detailed overview of nonclinical experimental design, current issues and trends surrounding animal use, cost/benefit considerations in preclinical planning, and strategies underlying in vitro and in vivo testing for small molecules and biologics drug development.

GCBS 6901 Clinical Research (4.0 units)

This course will cover detailed practical instruction on how to design cross-sectional, cohort, and case-control studies. We will focus on determining the required sample size to achieve a statistical power of 0.8 (or greater) for different study design. Energy will be spent on designing randomized blinded trials (either single blinded or double blinded). We will also deal with enhancing casual inference in observational studies. Ethical issues, surveys, data management will be covered in the course as well. Prerequisite: Knowledge of biostatistics and some concept of epidemiology or approval from the course instructor.

GCBS 6999 Research and Thesis (1.0 – 4.0 units, CR/NCR)

This is a required course for students in the research concentration. Repeatable to a maximum of 8 units.

GCBS 7000 Research and Internship (1.0 – 4.0 units, CR/NCR)

Completion of a portfolio is an option in lieu of a thesis for the Master of Science in Biomedical Sciences degree program. The portfolio will be based on a research project that the student works on during their enrollment in the MSBS program. The faculty advisor (portfolio advisor) will help the student select a topic and mentor the student in his/her progress. Students are expected to prepare a portfolio proposal, attend regular meetings with course instructors and his/her portfolio/faculty advisor. Submission and oral defense of the written portfolio is required to complete the program. The last part of the portfolio defense includes a comprehensive examination. Repeatable to a maximum of 8 units.

Honors and Awards

The following awards are considered for presentation to MSBS students annually:

Dean' List

Who's Who Among Students in American Colleges and Universities

Academic Calendar

Fall 2018	
August 6-10, 2018	Orientation/Welcome Week (Year 1)
August 11, 2018	Convocation/White Coat Ceremony (Year 1)
August 13, 2018	Fall Classes Begin
September 3, 2018	Labor Day – No Classes
October 8, 2018	Columbus Day – No Classes
November 21, 2018	Thanksgiving Recess Begins @ 5:00 p.m.
November 26, 2018	Fall Classes Resume
December 21, 2018	Fall Classes End
December 22, 2018	Winter Recess Begins
Spring 2019	
January 7, 2019	Spring Classes Begin
January 21, 2019	Martin Luther King Day – No Classes
February 18, 2019	President’s Day – No Classes
March 25, 2019	Spring Break Begins
April 1, 2019	Spring Classes Resume
May 22, 2019	Spring Classes End
May 22-24, 2019	Commencement