

Status: PENDING

PROGRAM REQUEST
Microbiology

Last Updated: Myers, Dena Elizabeth
06/29/2011

Fiscal Unit/Academic Org	Microbiology - D0350
Administering College/Academic Group	Arts And Sciences
Co-administering College/Academic Group	
Semester Conversion Designation	Re-envisioned with significant changes to program goals and/or curricular requirements (e.g., degree/major name changes, changes in program goals, changes in core requirements, structural changes to tracks/options/courses)
Current Program/Plan Name	Microbiology
Proposed Program/Plan Name	Microbiology
Program/Plan Code Abbreviation	MICRBIO-MS
Current Degree Title	Master of Science

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		61	40.7	44	3.3
Required credit hours offered by the unit	Minimum	53	35.3	36	0.7
	Maximum	53	35.3	42	6.7
Required credit hours offered outside of the unit	Minimum	8	5.3	2	3.3
	Maximum	8	5.3	8	2.7
Required prerequisite credit hours not included above	Minimum	0	0.0	0	0.0
	Maximum	0	0.0	0	0.0

Explain any change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the above table

These changes reflect an adjustment in the required Biochemistry elective. Under quarters students were required to complete 8 hours of Biochemistry electives; under the semester scheme this has been decreased to 2 hours. This is offset by an increased coverage of related topics in the first year core courses.

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals •

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? No

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Micro_MS_rev2.pdf: All documents
(Program Proposal. Owner: Daniels,Charles John)
- Microbiology MS cover letter.doc: NMS Division of Arts and Sciences cover letter
(Letter from the College to OAA. Owner: Andereck,Claude David)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Daniels,Charles John	06/02/2011 10:12 AM	Submitted for Approval
Approved	Daniels,Charles John	06/02/2011 10:14 AM	Unit Approval
Revision Requested	Andereck,Claude David	06/07/2011 02:22 PM	College Approval
Submitted	Daniels,Charles John	06/13/2011 01:54 PM	Submitted for Approval
Approved	Daniels,Charles John	06/13/2011 01:55 PM	Unit Approval
Revision Requested	Andereck,Claude David	06/15/2011 02:32 PM	College Approval
Submitted	Daniels,Charles John	06/21/2011 10:01 AM	Submitted for Approval
Approved	Daniels,Charles John	06/21/2011 10:02 AM	Unit Approval
Revision Requested	Andereck,Claude David	06/22/2011 11:09 AM	College Approval
Submitted	Daniels,Charles John	06/27/2011 03:40 PM	Submitted for Approval
Approved	Daniels,Charles John	06/27/2011 03:41 PM	Unit Approval
Approved	Andereck,Claude David	06/28/2011 11:33 AM	College Approval
Approved	Myers,Dena Elizabeth	06/29/2011 02:46 PM	GradSchool Approval
Pending Approval	Cameron,Erin Marie Soave,Melissa A	06/29/2011 02:46 PM	CAA Approval



College of Arts and Sciences

186 University Hall
230 North Oval Mall
Columbus, OH 43210

Phone (614) 292-8908
Fax (614) 247-7498

June 28, 2011

Dena Myers
Graduate School
250 University Hall
230 North Oval Mall
Campus

Dear Dena:

It is a pleasure to forward to you for your consideration the proposal for the masters program in Microbiology. The program has been revised from its quarter version mainly through the creation of a four course core curriculum for students in their first year. Both thesis and non-thesis options are available to students, depending upon their needs and interests.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at a meeting on June 7, 2011. Feedback from these discussions has been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,

David Andereck
Professor of Physics
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences



Department of Microbiology

484 West 12th Avenue
Columbus, OH 43210-1292

Phone (614) 292-2301
Fax (614) 292-8120

January 19, 2011

Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
CAMPUS

Re: Microbiology Degree Programs

Dear Colleagues,

The Department of Microbiology offers both undergraduate and graduate degree programs. At the undergraduate level, the department offers BS and BA degrees in Microbiology, and a minor in Microbiology. Through the graduate program the department awards MS and Ph.D. degrees in Microbiology.

The department used the transition to semesters as an opportunity to critically review our curriculum and each of our degree programs. During the 2009-2010 academic year the undergraduate and graduate curriculum committees carried out reviews of their courses and degree requirements. A number of factors were considered in the reviews, these included the responses from student surveys in undergraduate courses, discussions with current graduate students, comparisons of undergraduate and graduate programs at peer institutions, and recommendations from the American Society for Microbiology (ASM). The ASM is the national society for the discipline and its educational branch provides recommendations on the content and scope of microbiology degree programs. We were also guided by comments we received in our recent Unit Review and the review of our graduate program for the recent NRC graduate program review. Final plans for the BS and BA degrees, the minor, and the MS and Ph.D. degrees were approved by unanimous votes at a faculty meetings held on October 29, 2010. Recorded votes were 18 for and 0 against, and no abstentions, for all of the programs.

Both undergraduate and graduate programs have substantive changes in their core requirements and some courses will be revised or have expanded content. Consequently, we are presenting these programs as "re-envisioned".

The key changes in the programs are summarized below.

BS and BA programs:

1. The introductory series, MICRBIOL 520 (5 quarter hrs) and 521 (5 quarter hrs) were merged to a single course, MICRBIOL 4100 (5 semester hrs) with some content reassigned to other courses.
2. The core was expanded from four courses under the quarter system to six courses in semesters. These changes were made to accommodate topics repositioned by the merger of MICRBIOL 520/521 and to ensure the breadth of topics that are expected of all microbiology programs.
3. The minor in Microbiology will also use the new foundations course, MICRBIOL 4100, and students will take a subset of the remaining courses in the new core.
4. Course numbers of the quarter successors that are in the semester core have changed to reflect their new relationships; most others have retained similar numbering.

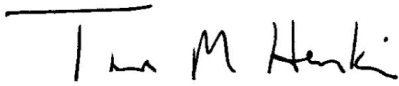
MS and Ph.D. programs:

1. In the re-envisioned graduate programs, students will complete a four-course core prior to completing their candidacy exam; this will include a new course covering general topics related to graduate research and ethics.

2. The remainder of the program, with respect to candidacy exams and research expectations, are essentially unchanged.

We are also preparing for increased advising demands, especially at the undergraduate level. We have developed a transition plan to direct students completing their undergraduate programs in first two years of the transition. As part of the plan, a bridge course will be offered to accommodate students that may be affected by the merger of MICRBIOL 520/521, and staff changes have been put in place to meet the expected increase for advising. An advising plan is also in place for students who will be in the pre-candidacy stage of their graduate programs. Each plan is designed to limit the possibility that a student will be delayed in graduation for reasons other than academic performance.

The department is excited about the new opportunities these changes will bring to our students, and the university community. We look forward to your response.



Tina Henkin, Ph.D.
Professor and Chair
Department of Microbiology



Charles J. Daniels, Ph.D.
Professor
Conversion Coordinator

Program Rationale

Background

Since our last major degree program revisions in 2001, the Department of Microbiology has performed a number of departmental reviews: the Unit Review request in 2007, which included a site visit from an external review committee; a Strategic Plan document for the CBS departmental reviews requested by Dean Platz in 2008, and a review of our graduate programs for the recent NRC graduate program review. During this time there have also been changes in the faculty: Dr. Henkin has assumed the chair position and we recruited two new faculty members, each bringing new and exciting research areas to the department. With inputs from these reviews, coupled with the changes within the department, we felt the transition to semesters was an ideal opportunity to review the undergraduate and graduate degree programs.

The review processes were similar for both undergraduate and graduate programs. The undergraduate and graduate studies committees, chaired by Drs. Daniels and Ibba, respectively, met with their members during the 2009-2010 academic year and prepared proposals for review by the full faculty. Our reviews were guided in part by suggestions originating from our internal reviews. We also reviewed the Microbiology programs of peer institutions, and considered the recommendations of the American Society For Microbiology (ASM). The ASM is the national society for the discipline and its educational branch provides recommendations on the content and scope of microbiology degree programs. These recommendations are viewed as benchmarks for undergraduate and graduate degree programs in the field. The faculty reviewed proposals in the autumn quarter of the 2010-2011 academic year. Final plans for the BS and BA degrees and the M.S. and Ph.D. degrees were approved by unanimous votes at a faculty meeting held on October 29, 2010. Recorded votes were 18 for and 0 against, and no abstentions, for all of the programs. Both undergraduate and graduate programs have substantive changes in their core requirements and some courses will have revised or expanded content. Consequently, we are presenting these programs as re-envisioned.

Revisions to the M.S. and Ph.D. degree programs

Current Graduate Programs Under Quarters:

Currently the Department of Microbiology grants thesis and non-thesis M.S. degrees and a thesis-based Ph.D. degree. All students enter the graduate program under the Ph.D. degree program; however, some students will choose to leave the program at the master's level and have the option to complete a thesis or non-thesis M.S. degree. The core requirements for coursework, seminar presentations and research rotations in the first two years are essentially the same for both M.S. and Ph.D. students. Upon successful completion of the core requirements students leaving the program at the master degree level with a non-thesis M.S. complete an exit exam with both written and oral components. Students choosing a thesis M.S. degree are exempted from the exit exam and instead present a research thesis document with an oral defense of their thesis. [Students may also satisfy the requirements for the non-thesis M.S. degree examination by successfully passing the Candidacy Examination.]

Under the quarter system Microbiology M.S. and Ph.D. students must complete at least 20 hours of graduate level Microbiology courses (excluding MICRBIOL 693, MICRBIOL 799, MICRBIOL 880, MICRBIOL 893 and MICRBIOL 999) and a minimum of 8 hours of 600-level or higher Biochemistry. A grade of B or higher is required in all courses. Students also enroll in Microbiology seminars (MICRBIOL 799 and MICRBIOL 880) every autumn, winter and spring quarter. M.S. degree students must make one presentation in MICRBIOL 880; this usually occurs during their second year.

Students also begin their laboratory rotations during the first quarter as MICRBIOL 693, Individual Studies; the total hour assigned to this course will vary depending on the student's course-load, but will not exceed 5 hours per term. After the completion of three five-week rotations, students have the opportunity to select a laboratory for their thesis research.

Since we don't formally accept students into the M.S. degree program, the decision to leave the program with a M.S. degree usually occurs at one of two time points. (Group-1) Some students may decide after completing the first year coursework and laboratory rotations to pursue a non-thesis M.S. degree. These students meet with the Graduate Studies committee (GSC) chairperson, or an advisor recommended by the GSC, to plan the remainder of the student's coursework. The GSC chairperson also assembles an examination committee for the student's exit examination when all program requirements have been met. (Group-2) Alternatively, some students will have selected a doctoral thesis advisor and completed their coursework under the guidance of their advisor and advisory committee, but chose to leave the program before or after they have completed the Candidacy Examination. This latter group of students often has completed sufficient research in their first two years to present a M.S. thesis; they may also choose the non-thesis M.S. option. In the Group-2 cases the student's advisor and advisory committee usually administer the exit exam or serve on the thesis defense committee. Group-1 or Group-2 M.S. students must complete the required Microbiology and Biochemistry coursework with a grade of B or higher, complete three five-week rotations in MICRBIOL 693, enroll in Microbiology seminars (MICRBIOL 799 and MICRBIOL 880) in autumn, winter and spring quarters each year they are enrolled and make one presentation in MICRBIOL 880.

Proposed M.S. Program Under Semesters:

We will not directly recruit students into M.S. degree programs; however, we anticipate that some students will leave the doctoral program as described in Group-1 and Group-2 scenarios above. The basic features of the semester-based master's and doctoral programs are similar to those under quarters; the main exception, and our rationale for describing the program as having significant revisions, is the inclusion of a four-course, 10 hour, core for the first year of the program. The first year core is designed to provide a strong background in microbial physiology and genetics, which are at the foundation of all areas of modern Microbiology. In addition to the core, students are required to complete laboratory rotations, and 8 hours of graded electives, which must include 2 hours of 5000-level or above Biochemistry. A grade of B or higher is required in all courses. All graduate students will enroll in Microbiology seminars (MICRBIOL 8899 and MICRBIOL 7899) throughout their program. M.S. students must make at least one presentation in MICRBIOL 8899, this usually occurs during their second year.

The first year core includes one new course, MICRBIOL 6010 Principles of Microbiology, which introduces students to microbial research using landmark papers in the field. The remainder of the core is composed of existing courses that will transition to semesters. Students may choose electives from a pre-approved list of classes, and other classes may be substituted with the approval of the student's advisory committee. In the case of Group-1 (see above) M.S. students, elective courses will be planned by the GSC chairperson or the assigned advisor.

Students will also begin their laboratory rotations during the first semester as MICRBIOL 6789, Research Principles and Techniques in Microbiology, and will complete three 7-week rotations before selecting a thesis advisor. Students choosing to leave the program with a M.S. degree will again likely fall into two groups; those declaring their intentions early, Group-1, and those deciding after they have completed the second year of the program, Group-2. Group-1 students will complete a non-thesis degree and be advised by the GSC chairperson or a faculty advisor, and Group-2 students will likely have the option to choose thesis or non-thesis options. M.S. students must complete the required Microbiology and Biochemistry coursework with a grade of B or higher, complete three 7-week rotations in MICRBIOL 6789, enroll in Microbiology seminars (MICRBIOL 8899 and MICRBIOL 7899) in autumn and spring semesters each year they are enrolled and make one presentation in MICRBIOL 8899. Group-1 and Group-2 students may register for Research, MICRBIOL 7998, or Independent study, MICRBIOL 7193 (Group-1); however, these hours will not fulfill any of the core or elective requirements.

Program Summary: M.S. Microbiology Requirements

	<u>Semester Hours</u>
First Year Core (10 hours)	
MICRBIOL 6010: Principles of Microbiology	2
MICRBIOL 6020: Microbial Physiology and Biochemistry	3
MICRBIOL 7020: Physiology Meets Pathogenesis	2
MICRBIOL 6080: Advanced Microbial Genetics	3
Research Rotations (10 hours)	
MICRBIOL 6789, Research Principles and Techniques in Microbiology (Laboratory Rotations: 1 st year)	10
Electives (8 hours)	
Students choose from an approved list of electives (Electives must include at least 2 hours of 5000-level or above Biochemistry)	8
Required Microbiology seminars (Au and Sp)	
MICRBIOL 7899: Microbiology Colloquium	1
MICRBIOL 8899: Seminar in Microbiology	1
MICRBIOL 7193: Individual Studies	variable#
MICRBIOL 7998: Research in Microbiology (pre-candidacy)	variable#
MICRBIOL 7999: Research in Microbiology-M.S. Thesis	variable#
Total hours (typical minimum)	44

#Students may enroll in MICRBIOL 7193 or 7998; however, these hours will not fulfill any of the core or elective requirements.

Program Summary: M.S. Microbiology Core and Electives

First Year

Autumn Semester

<u>Course</u>	<u>Semester Hours</u>
MICRBIOL 6010: Principles of Microbiology	2
MICRBIOL 6020: Microbial Physiology and Biochemistry	3
MICRBIOL 7899: Microbiology Colloquium	1
MICRBIOL 8899: Seminar in Microbiology	1
MICRBIOL 6789, Research Principles and Techniques in Microbiology (Laboratory Rotations)	5
	Total 12

Spring Semester

<u>Course</u>	<u>Semester Hours</u>
MICRBIOL 7020: Physiology Meets Pathogenesis	2
MICRBIOL 6080: Advanced Microbial Genetics	3
MICRBIOL 7899: Microbiology Colloquium	1
MICRBIOL 8899: Seminar in Microbiology	1
MICRBIOL 6789, Research Principles and Techniques in Microbiology (Laboratory Rotations)	5
	Total 12

Summer Semester

<u>Course</u>	<u>Semester Hours</u>
MICRBIOL 7193: Individual Studies or MICRBIOL 7998: Research in Microbiology	4
	Total 4

Program Summary: M.S. Microbiology Core and Electives (cont.)

Second Year

Autumn Semester

Course	Semester Hours
Electives	5
MICRBIOL 7899: Microbiology Colloquium	1
MICRBIOL 8899: Seminar in Microbiology	1
MICRBIOL 7193: Individual Studies or	
MICRBIOL 7998: Research in Microbiology	1
	Total 8

Spring Semester

Course	Semester Hours
Electives	5
MICRBIOL 7899: Microbiology Colloquium	1
MICRBIOL 8899: Seminar in Microbiology	1
MICRBIOL 7193: Individual Studies or	
MICRBIOL 7998: Research in Microbiology* or	
MICRBIOL 7999: Research in Microbiology-M.S. Thesis	1
	Total 8

*During the second year the hours in MICRBIOL 7998 for students in Group-2 may be higher if they have maintained the normal credit load typical of the doctoral students. The values shown reflect a scenario expected for a student making a decision to complete a non-thesis M.S. at the end of their first academic year.

Transition Plan:

We do not foresee any significant issues for current students who are still completing the coursework aspects of their program or students entering the program in the autumn of 2011. Students who have begun the program under quarters will complete their course requirements using the guidelines set forth under quarters. We do not require course sequences and the entering students will have completed their laboratory rotations, and chosen their thesis advisors, prior to the summer semester of 2012. Students that have chosen in their first year to leave the program with a M.S. degree, Group-1 students, will have ample opportunity to consult with the GSC chairperson concerning options to complete their requirements. Students deciding in their second year to leave with a M.S. degree, (Group-2) will have been advised by their thesis advisor, in consultation with the advisor committee, on the selection of courses needed to meet the requirements for Microbiology and Biochemistry course distribution and the overall credit hour requirements.

Below is a transition plan for a typical Group-1 student who enters the doctoral program in the autumn quarter of 2011 and decides to switch to a non-thesis masters degree program at the end of their first academic year (spring 2012). In this scheme the student accrues 36 quarter hours of credit (or 24 semester hours) during the three academic quarters. During this time the student completes 17 of 20 quarters hours of required Microbiology coursework, 4 of 8 quarters hours of required Biochemistry coursework, the required seminar courses and laboratory rotations. Rather than choosing a doctoral thesis mentor, this student transitions to non-thesis degree plan at the end of the spring quarter. Semesters begin in summer of 2012 and the student enrolls in MICRBIOL 7193, Individual Studies. In the following two semesters the student completes the Microbiology and Biochemistry coursework requirements, and continues with seminar courses and MICRBIOL 7193, Individual Studies. The only limitation for this student is that he or she will be excluded from choosing semester courses that are the direct descendants of courses taken during quarters. This should not be an issue since there will be ample choices. At this point the student will have earned the required 44 semester hour equivalents and should not be delayed in graduation provided he or she is making satisfactory progress toward the degree.

Transition Plan cont.:

2011	Autumn	Description	Credit Hrs	Comment
	MICRBIOL 661	Microbial Physiology	5	Meets Graduate Micro Requirement
	Elective		3	Meets Graduate Micro Requirement
	MICRBIOL 693	Individual Studies	2	GE-BioSci/Micro-PreRec
	MICRBIOL 799	Microbiology Colloquium	1	Lab Rotations
	MICRBIOL 880	Seminar in Microbiology	1	GE-BioSci/Micro-PreRec
			12	Quarter Total

2012	Winter	Description	Credit Hrs	Comment
	MICRBIOL 680	Advanced Microbial Genetics	3	Meets Graduate Micro Requirement
	MICRBIOL 702	Physiology Meets Pathogenesis	3	Meets Graduate Micro Requirement
	MICRBIOL 693	Individual Studies	4	Lab Rotations
	MICRBIOL 799	Microbiology Colloquium	1	Required Seminar
	MICRBIOL 880	Seminar in Microbiology	1	Required Seminar
			12	Quarter Total

2012	Spring	Description	Credit Hrs	Comment
	BIOCHEM 615	Biochem and MolBio III	4	Meets Graduate Biochem Requirement
	Elective		3	Meets Graduate Micro Requirement
	MICRBIOL 799	Microbiology Colloquium	1	Required Seminar
	MICRBIOL 880	Seminar in Microbiology	1	Required Seminar
	MICRBIOL 999	Research in Microbiology	3	Research (Pre-Candidacy)
			12	Quarter Total

2012	Summer	Description	Credit Hrs	Comment
	MICRBIOL 7193*	Individual Studies	4	Individual Studies (non-thesis MS)
			4	Semester Total

2012	Autumn	Description	Credit Hrs	Comment
	MICRBIOL 8050	The RNA World	2	Meets Graduate Micro Requirement
	BIOCHEM 6761	Adv. Biochem of Macromolecules	3	Meets Graduate Biochem Requirement
	MICRBIOL 7899	Microbiology Colloquium	1	Required Seminar
	MICRBIOL 8899	Seminar in Microbiology	1	Required Seminar
	MICRBIOL 7193*	Individual Studies	1	Individual Studies (non-thesis MS)
			8	Semester Total

2013	Spring	Description	Credit Hrs	Comment
	Electives		5	Free elective in area of specialization
	MICRBIOL 7899	Microbiology Colloquium	1	Required Seminar
	MICRBIOL 8899	Seminar in Microbiology	1	Required Seminar
	MICRBIOL 7193*	Individual Studies	1	Individual Studies (non-thesis MS)
			8	Semester Total

* MS thesis students may choose MICRBIOL 7998 Research (Pre-Candidacy) or MICRBIOL 7999 Research (MS-Thesis)

Semester Courses and Their Relationship to Existing Quarter Courses:

Required First Year Core
(10 Hours Required)

Semester Course Number	Course Title	Semester Hrs.		Quarter Equivalent Course	Quarter Hrs.	Notes
MICRBIOL 6010	Principles of Microbiology	2		NA		New course
MICRBIOL 6020	Microbial Physiology and Biochemistry	3		MICRBIOL 720	4	Direct conversion
MICRBIOL 6080	Advanced Microbial Genetics	3		MICRBIOL 680	3	Increased content
MICRBIOL 7020	Physiology Meets Pathogenesis	2		MICRBIOL 702	3	Direct conversion
	Total Hrs.	10				

Research and Laboratory Rotations

Semester Course Number	Course Title	Semester Hrs.		Quarter Equivalent Course	Quarter Hrs.	Notes
MICRBIOL 6789	Research Principles and Techniques in Microbiology	1-5		MICRBIOL 693	1-5	Direct conversion
MICRBIOL 7998	Research in Microbiology	1-5		MICRBIOL 999	1-5	Direct conversion
MICRBIOL 7999	Researchfor Thesis M.S.	1-5		MICRBIOL 999	1-5	Direct conversion

Required Seminars
(Both Autumn and Spring Semester Annually)

Semester Course Number	Course Title	Semester Hrs.		Quarter Equivalent Course	Quarter Hrs.	Notes
MICRBIOL 7899	Microbiology Colloquium	1		MICRBIOL 799	1	Direct conversion
MICRBIOL 8899	Seminar in Microbiology	1		MICRBIOL 880	1	Direct conversion

Electives: 8 Hours Required
(Must Include 2 Hours in Biochemistry)

Semester Course Number	Course Title	Semester Hrs.		Quarter Equivalent Course	Quarter Hrs.	Notes
MICRBIOL 6797	Study at a Foreign Institution	1-17		MICRBIOL 697	1-15	Direct conversion
MICRBIOL 6798	Study Tour at a Domestic or Foreign Institution	1-17		MICRBIOL 698.01	1-15	Direct conversion
MICRBIOL 7010	Cellular and Molecular Immunology	3		MICRBIOL 701	5	Direct conversion
MICRBIOL 7023	Molecular Immunology: Lecture	3		MICRBIOL 723.01	3	Increased content
MICRBIOL 7050	Fermentation Biotechnology	3		MICRBIOL 750	5	Direct conversion
MICRBIOL 7060	Advanced Topics in Molecular Microbiology	2		MICRBIOL 760	3	Direct conversion
MICRBIOL 7193	Individual Studies (non-Thesis)	1-5		MICRBIOL 893	1-5	Direct conversion
MICRBIOL 7536	Advanced Food Microbiology	3		MICRBIOL 736	3	Increased content
MICRBIOL 7724	Molecular Pathogenesis	3		MICRBIOL 724	5	Direct conversion
MICRBIOL 7889	Host-Pathogen Interactions: Research Seminar	1		MICRBIOL 795	1	Direct conversion
MICRBIOL 8032	Advanced Cellular Immunology	2		MICRBIOL 832	3	Direct conversion
MICRBIOL 8050	The RNA World	2		MICRBIOL 850	3	Direct conversion
BIOCHEM 5613	Biochemistry and Molecular Biology I	3		BIOCHEM 613	3	
BIOCHEM 5614	Biochemistry and Molecular Biology II	3		BIOCHEM 614	3	
BIOCHEM 5615	Biochemistry and Molecular Biology III	3		BIOCHEM 615	3	
BIOCHEM 6706	Advanced Biological Chemistry Lab	4		BIOCHEM 706	5	
BIOCHEM 6762	Advanced Biochemistry: Enzymes	1.5		BIOCHEM 762	3	
BIOCHEM 6763	Advanced Biochemistry: Membranes and Lipids	1.5		BIOCHEM 763	2	
BIOCHEM 6761	Advanced Biochemistry: Macromolecular Structure and Function	3		BIOCHEM 761/766	6	
BIOCHEM 7770	Advanced Biochemistry: Protein Engineering	2		BIOCHEM 770	3	
BIOCHEM 7775	Biophysical Chemistry	2		BIOCHEM 775	3	
BIOCHEM 8821	Advanced Enzymology	2		BIOCHEM 821	3	
BIOCHEM 8900	Advanced Biochemistry: Biomolecular NMR	2		BIOCHEM 905	3	
MOLGEN 5623	Genetics and Genomics	2		PCMB 623	4	
MOLGEN 5630	Plant Physiology	3		PCMB 630/631	6	
MOLGEN 5643	Plant Anatomy	3		PCMB 643	5	
MOLGEN 5700	Systems of Genetic Analysis	3		MOLGEN 700	3	
MOLGEN 5701	DNA Transactions and Gene Regulation	4		MOLGEN 701/702	6	
MOLGEN 5705	Advances in Cell Biology	2		MOLGEN 705	3	
MOLGEN 5715	Developmental Genetics	2		MOLGEN 715	3	
MOLGEN 5735	Plant Biochemistry	3		PCMB 735/736	6	
MOLGEN 5796	Current Topics in Signal Transduction	2		PCMB 796	3	
MOLGEN 6625	Plant Metabolic Engineering	2		PCMB 625	3	
MOLGEN 6725	Circadian Biology	2		PCMB 725	3	
MOLGEN 7540	Molecular Biology and Pathogenesis of Viruses	4		MOLGEN 770	3	
MOLGEN 7801	Research Seminar: Developmental Genetics	2		MOLGEN 880.01	1-3	
MOLGEN 7802	Research Seminar: Cell Biology	2		MOLGEN 880.02	1-3	
MOLGEN 7806	Gene Expression: Transcriptional Regulation	2		MOLGEN 880.06	1-3	
MOLGEN 7807	Gene Expression: Post-transcriptional Control	3		MOLGEN 880.07	3	