MEMORANDUM

Date: December 8, 2016

To: Mark Archambault, Chair, Undergraduate Curriculum Committee

Through: Hamid K. Rassoul, Dean, College of Science

From: Richard B. Aronson, Head, Department of Biological Sciences

Subject: An Option in Genomics and Molecular Genetics for Biological Sciences

The attached paperwork describes a ‘new’ option proposed for the Department of Biological Sciences. Genomics and Molecular Genetics updates the curriculum and the name of the Molecular Biology option (major code 7025) and will replace it.

Included in this package are the rationale for the changes, a discussion of teach-out of the Molecular Biology option (7025), an assessment rubric, a catalogue description for the proposed Genomics and Molecular Genetics option, and a flow-chart.

Thank you.
Florida Institute of Technology

ADDING A NEW MAJOR OR MINOR TO THE CURRICULUM

Please provide the following information when requesting a new major or minor (program or option) to be added to the curriculum. Only new majors, minors and options are assigned a new code and print on the diploma. The code will be assigned by the Office of the Registrar and information emailed to all appropriate personnel.

COLLEGE: College of Science
DELIVERY MODE(S): Classroom (classroom, online)

DEPARTMENT: Biological Sciences
CAMPUS/SITE(S): Melbourne

PROGRAM TO BE ADDED □ Major □ Minor [ ] Option for Biological Sciences (existing degree program)

NOTE: Only Majors, Minors and Options receive new codes and print on the diploma; use Option for new program name to appear with existing degree name.

☐ Associate of Arts (A.A.) ☐ Master of Business Administration (M.B.A.) ☐ Educational Specialist (Ed.S.)
☐ Associate of Science (A.S.) ☐ Master of Education (M.Ed.) ☐ Doctor of Business Administration (DBA)
☐ Bachelor of Arts (B.A.) ☐ Master of Public Administration (M.P.A.) ☐ Doctor of Philosophy (Ph.D.)
☐ Bachelor of Science (B.S.) ☐ Master of Science (M.S.) ☐ Doctor of Psychology (Psy.D.)
☐ Master of Arts (M.A.) ☐ Master of Science in Aviation (M.S.A.) ☐ Graduate Certificate
☐ Master of Arts in Teaching (M.A.T.)

OTHER ADDITION TO THE CURRICULUM NOTE: Only Majors, Minors and Options receive new codes and print on the diploma; use the Adding a New Concentration or Specialization form if the new program represents less than a full degree curriculum.

PROGRAM TITLE Restricted to 30 characters, including spaces

Genomics and Molecular Genetics

ACADEMIC YEAR TO BE INITIATED: FALL 2017 ADVISOR FOR NEW PROGRAM Dr. Charles Polson

New programs are available beginning with the fall term in which they appear in the University Catalog

ROUTING APPROVALS: 1) Department head/program chair and college dean approve and sign form. 2) The chief academic officer reviews and approves business plan of the program in terms of financial viability and impact on the university mission and signs form. 3) Graduate Council or Undergraduate Curriculum Committee approves academics and signs form. 4) The chief academic officer reviews and signs form, and forwards to the Catalog & Curriculum Manager.

1) Richard B. Anderson 12/18/16
   Department Head/Program Chair
2) Monica Haloga 12/12/16
   Chief Academic Officer
3) Chair, Graduate Council Date
   OR
   Chair, Undergraduate Curriculum Committee Date
4) Chief Academic Officer Date

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GWVSDAX CIPC Code Operator Initials/Date

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R4-216-2/16
Department of Biological Sciences
Genomics and Molecular Genetics (major code 70XX)
Programmatic Modifications and Change-of-Name
To Replace Molecular Biology Option (major code 7025)

I. Introduction
The Department of Biological Sciences proposes a ‘new’ option, Genomics and Molecular Genetics, to update the content and name of the existing option in Molecular Biology (major code 7025). The proposed changes will modernize the curriculum, reflecting the rapid changes in the field of molecular biology that were in part spurred by the sequencing of the human genome, and to ensure that students are well prepared to enter graduate programs and the biotechnology workforce.

II. Programmatic Modifications
Some of the courses required in the existing Molecular Biology option will become restricted or technical electives in the new program. This will provide a focused set of core courses for the program while still allowing students flexibility. These and other changes are outlined on the accompanying flow charts. Courses required in the Molecular Biology option that will become electives include:

- BIO 2010 Microbiology, 4 credit hours
- BIO 3220 Developmental Biology, 4 credit hours
- BIO 3210 Mammalian Physiology, 4 credit hours
- BIO 4210 Plant Physiology, 4 credit hours

BIO 2801 Biometry will move from Spring of the Junior year to Spring of the Sophomore year. This change will make the first two years of the new program identical to other departmental options, making it easier for students to transfer between options in the department early in their careers. BIO 2801 will remain the computer-literacy course for the program. The number of Technical Electives are increased from 3 credit hours to 6 credit hours to allow students more flexibility in the program. The university core will be satisfied by this program, as will be the requirements for computer literacy (BIO 2801) and 2 Q-courses (BIO 4120 and BIO 4130 remain core courses and are Q courses).

The required courses will include:
- BIO 2110 General Genetics
- BIO 2801 Biometry
- BIO 4301 Cell Biology
- BIO 4010 Biochemistry I
- BIO 4110 Biochemistry 2
- BIO 4101 Molecular Biology
- BIO 4102 Advanced Molecular Biology

There will be no hidden prerequisites. The total credits required will remain at 129.
III. Name of the Program

The name of the program will be Genomics and Molecular Genetics (major code 7xxx). There are two strategic rationales for the change of name. The first is to improve marketing and increase enrollment. Anecdotal information from the Office of Admission and other sources suggests that prospective students are more familiar with the terms genetics and genomics than they are with molecular biology. The new name is expected to improve marketability, and ultimately enrollment numbers, of this program. Second, in the past several years, since the sequencing of the human genome, the traditional field of molecular biology has expanded to include studies of whole genomes, with the result that the new field of Genomics has emerged. Our program needed to be updated to communicate to students and their families that we will prepare them for this exciting new field.

IV. Teach-Out of 7025

Genomics and Molecular Genetics will be effective 1 August 2017. All incoming students who sign up for Molecular Biology (7025) through July 2017 will be encouraged to switch to the replacement option. Option 7025 will, therefore, be taught out and terminated at the end of the 2020–21 academic year at the latest, but possibly earlier.

V. Assessment

A revised rubric for assessment accompanies this proposal.
Assessment Rubric for Genomics and Molecular Genetics Option
Revised from Molecular Genetics Biology Option

Outcomes/Objectives

1. Understand principles of biology (DSK)
   - Graduates will explain fundamental principles of biology
   - Measure: Students will answer embedded questions in exams of General Genetics (BIO 2110) that address principles of inheritance a topic that all biology students should understand. (O: 1)
     - Target: 75% of students will attain a grade of 80% or better on embedded questions in exams of General Genetics (BIO 2110).
   - Measure: Students will answer embedded questions in exams of Biochemistry (BIO 4010) that address principles of metabolic pathways, a topic that all researchers in the field of molecular genetics should understand. (O: 1)
     - Target: 75% of students will attain an 80% on embedded questions in exams of Biochemistry (BIO 4010).

2. Prepared to Enter Graduate School in molecular cell biology/genetics/genomics (DSK)
   - Graduates will answer embedded questions in exams of core courses in Genomics and Molecular Genetics that address fundamental principles that all Genomics and Molecular Genetics students should understand.
     -- Measure: Students will answer embedded questions in exams of Genetic Engineering (BIO 4120) and Nucleic Acid Analysis (BIO 4130) that address synthetic biology and genomic analysis, fundamental principles that all molecular students should understand.
     - Target: 75% of students will attain an 80% or better on embedded questions in exams of Genetic Engineering and Nucleic Acid Analysis (BIO 4120 and 4130)
   - Measure: Students will answer embedded questions in exams of core Genomics and Molecular Genetics courses. These questions will address fundamental principles that all molecular students should understand such as DNA function (replication and transcription) and generation and analysis of genomic information (O: 2)
     - Target: 75% of students will attain a grade of 80% or better on embedded questions in Molecular Biology (BIO 4101) and Advanced Molecular Biology (BIO 4102).

3. Give effective oral presentation (COM)
   - Graduates will give an effective oral presentation about an aspect of biology learned from the literature or laboratory research.
     - Measure: Students will give an oral presentation in the capstone course in Genomics and Molecular Genetics (Nucleic Acids Analysis) that will include an introduction to pertinent literature. Presentations will be evaluated using a rubric.
     - Target: 75% of students will attain an 80% or better on the introductory section of their oral presentation for Nucleic Acids Analysis (BIO 4130)
   - Measure: Students will give an oral presentation in the capstone course in Genomics and Molecular Genetics that will include a discussion of the students' own thoughts or findings in relation to the presentation topic. Presentations will be evaluated using a rubric.
4. Compose effective written presentation (COM)
   - Graduates will compose an effective research paper based on an aspect of biology learned from laboratory or field research.
   - Measure: Students will write a laboratory report for General Genetics (BIO2110) that will include a discussion of their laboratory findings. Reports will be evaluated using a rubric. (O: 4)

   - Target: 75% of students will attain an 80% or better on the discussion section of the laboratory report for General Genetics (BIO2110).

   - Measure: Students will write a research paper in the core course in genomics and molecular genetics that will include a discussion of their research findings. Papers will be evaluated using a rubric.

   - Target: 75% of students will attain an 80% or better on the discussion section of their research paper for Advanced Molecular Biology (BIO 4102)

5. Demonstrate problem solving skills (CT)
   - Graduates will demonstrate an ability to solve problems in biology.
   - Measure: Students will answer embedded problem solving questions in exams of General Genetics (BIO 2110). (O: 5)

   - Target: 75% of students will attain an 80% or better on embedded problem solving questions in exams of General Genetics (BIO 2110).

   - Measure: Students will answer embedded problem solving questions in the capstone course Cell Biology

   - Target: 75% of students will attain an 80% or better on embedded problem solving questions in exams of Cell Biology (BIO 4301).

6. Ability to integrate biological principles in problem solving (CT)
   - Graduates will demonstrate the ability to effectively integrate biological principles into solving related problems.
   - Measure: Students will develop a research project and write a paper based on their findings in Nucleic Acids Analysis (BIO 4130). Papers will be evaluated using a rubric.

   - Target: 75% of students will attain an 80% or better on the project development section of their research paper Nucleic Acids Analysis (BIO 4130).
Catalogue Description for Option in Genomics and Molecular Genetics

The Genomics and Molecular Genetics option for the Bachelor of Science in Biology focuses on coursework and practical training to prepare students for graduate studies or entry-level positions in the modern biotechnology workforce. Our program provides students with access to modern genetic, genomic, cellular, and molecular approaches to the study of biology. In addition to the relevant biology coursework, the program features a solid foundation in chemistry, biochemistry, physics, and mathematics. Students are encouraged to seek out individual research experiences with departmental faculty for course credit. The final year focuses on an open lab experience to empower students as independent thinkers with the technical and troubleshooting skills that are in demand for careers in academic and government research labs, as well as pharmaceutical and biotechnology companies.
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**TOTAL CREDITS REQUIRED: 129**

*AP, advanced placement by testing, equivalency exam, etc.;
†Free Elective for exempted transfer students
§BIO/BME/CHM/PSY4521

**SIGNATURES:**
Student: ___________________________
Advisor: ___________________________
Department Head: ___________________

**REMARKS/EXTRA COURSES:**
________________________________________

Suggestions/comments:
INSTRUCTIONS AND GUIDELINES FOR COMPLETING FLOWCHART FOR BIOLOGICAL SCIENCES/Genomics and Molecular Genetics (70XX)

Complete all parts in ink except for advisor's temporary notes in pencil, erased before submission.

Use the flowchart for the year that represents the student's academic peer group based on majority of curriculum (mainly biology and chemistry courses) satisfied upon entry to FIT.

Enter full name and full student number.

The only entries under "GRADE" column are earned grades: A–F; TC (official transfer credit); AP (official advanced placement); EE (FIT equivalency exam). If student re-took course, entry might appear as "F/C).

The only entries under "SUBSTITUTION" are alphanumeric FIT course numbers either from transfer credit evaluation or for courses taken at FIT; no substitutions allowed for named required courses (except as noted below under "TRANSFER STUDENTS").

TRANSFER STUDENTS: students formerly matriculated at other colleges and universities (not high-school students with college credit) exempt from FYE-1000; enter "EX", indicating exemption, under "SUBSTITUTION" column and enter a 1-credit-hour free elective; entry might appear as "EX/FREE: BIO-4991 (1 of 3 cr); if awarded AA degree (NOT AS degree) on transfer evaluation sheet, HU electives may substitute for HUM-2051 and HUM-2052 if no transfer credit for them; entry might appear as "AA EX/HU: LNG-1301"; only use of SCI transfer credits is for free elective for actions require submission of a substitution form.

FREE ELEC: any course taken at FIT or by transfer credit at 1000-level or above.

HUM CORE: HUM-2052, 2142, 2212, 2213, 2331, 2332, or 3333.

HUM ELEC: any FIT course (taken at FIT or by transfer credit) with "HU" at end of course description in FIT catalog; also, MSC-4002; or any transfer course designated "HUM XXXX Humanities Elective" (or similar) on Registrar's transfer credit evaluation sheet.

LIB ARTS ELEC: any course covered here under "HUM ELEC" and "SOC SCI ELEC"; all non-required courses with prefixes COM, HUM, LNG, MUS, PSY; BUS-1801, BUS-2601, BUS-3404, BUS-3501, BUS-3801, BUS-4503, BUS-4520; EDS-1005, EDS-1502, EDS-1503, EDS-2502, EDS-2503, EDS-3131, EDS-4081; up to 6 credits of MSC-XXXX.

REST ELEC: approved subjects: BIO, CHM, ENS, ISC-4000, ISC-5016, OCN; PSY-4521; courses designated as non-majors not allowed; 1000-level courses not allowed except the few allowable 1-credit courses, usable only twice as restricted electives unless taken as the laboratory component with its lecture component: BIO-1200, BIO-1500, BIO-2332 (if MTH-2332 not used), BIO-4990, CHM-1091, CHM-4901, COM-2012, ENS-3105, ENS-4901, ENS-4911, OCN-3110, OCN-3211, OCN-3311, OCN-3411, OCN-3433, OCN-4901, OCN-4911.

SOC SCI ELEC: any FIT course (taken at FIT or by transfer credit) with "SS" at end of course description in FIT catalog; also, MSC-4002; or any transfer course designated "S S XXXX Social Science Elective" (or similar) on Registrar's transfer credit evaluation sheet.

TECH ELEC: approved subjects: AHF, AVS, BCM, BIO, BME, CHE, CHM, CIS, CON, CSE, CVE, ECE, ENS, ISC, MAE, MET, MTH, OCE, OCN, ORP, P-IY, SPC, SPS, SWE, SYS; PSY-3423, PSY-4521; courses designated as non-majors (e.g., BIO-3010) not allowed; approved levels include 3000 and 4000 as well as graduate courses; levels 1000 and 2000 allowed except: AVS-1101, AVS-1102, AVS-1202, BIO-1162, BIO-1XXX transfer credit, BIO-2332 if MTH-2332 used for graduation credit, CHM-1100, CSE-1101, CSE-2234, CSE-2400 (or any other statistics course), MTH-1000, MTH-1603, MTH-1701, MTH-1702, MTH-1801, MTH-2332 if BIO-2332 used for graduation credit, MTH-2401.

Be certain to submit substitution forms immediately for elective courses, any substitutions, and special situations.