Doctoral of Philosophy Program in Systems Biosciences
(International Program)
Revised Program in 2021

1. **Program Title:** Doctor of Philosophy Program in Systems Biosciences (International Program)
2. **Name of Final Award**
   Full Title English : Doctor of Philosophy (Systems Biosciences)
   Abbreviation English : Ph.D. (Systems Biosciences)
3. **Responsible Units**
   3.1 Awarding Institution: Faculty of Graduate Studies, Mahidol University
   3.2 Teaching Institution: Institute of Molecular Biosciences, Mahidol University
4. **Status of the Program Accreditation**
   4.1 The Program was revised in 2021.
   4.2 The revised curriculum has been offered from Semester 1 of academic year 2021 onwards.
   4.3 The Mahidol University Council approved the Program in its meeting 570 on July 21, 2021.
5. **Philosophy of the Program**
   The Program prepares graduates to work as independent researchers and instructors in academic institutions and in the government and private sectors, in multidisciplinary fields of biosciences. The Program emphasizes flexibility in pursuing different research paths within systems biosciences as well as provides interdisciplinary training to meet individual professional goals of each student.
6. **Expected Learning Outcomes**
   Upon completing the program, students should be able to:
   6.1 comply with ethical codes of conduct both personally and professionally.
   6.2 demonstrate core principles and comprehensive knowledge in systems biosciences.
   6.3 integrate innovative concepts and ideas from relevant disciplines.
   6.4 critically evaluate and solve sophisticated problems in systems biosciences.
   6.5 independently synthesize new knowledge with originality.
   6.6 demonstrate responsibility, interpersonal and team skills, and leadership, both individually and in groups.

6.7 analyze statistical data and scientific information from relevant databases using information technology applications.

6.8 effectively communicate relevant knowledge and research findings both orally and in writing to different audiences.

7. Admission Requirements

7.1 Applicants for Plan 2.1

1) Holding an M.Sc. degree in medical science, biological science or a related area from an institution accredited by the Ministry of Higher Education, Science, Research and Innovation
2) Having a cumulative GPA of no less than 3.50 or having at least one scientific publication in a peer-reviewed academic journal indexed in Scopus or Web of Knowledge
3) Having English proficiency examination scores as required by the Faculty of Graduate Studies
4) Other exceptions may be considered by the Program Director and the Dean of the Faculty of Graduate Studies

7.2 Applicants for Plan 2.2

1) Holding an M.D., D.D.S., D.V.M., B.Pharm., or a B.Sc. in medical science, biological science or a related area, OR studying in a Ph.D.–M.D. or Ph.D.–D.D.S. program from an institution accredited by the Ministry of Higher Education, Science, Research and Innovation
2) Having a cumulative GPA of no less than 3.50
3) Having English proficiency examination scores as required by the Faculty of Graduate Studies
4) Other exceptions may be considered by the Program Director and the Dean of the Faculty of Graduate Studies

8. Selection Process

8.1 Applicants must pass an English proficiency test (TOEFL/IELTS) as required by the Facultyof Graduate Studies.

8.2 Applicants who have qualified English score are selected for an interview conducted in English by the program's faculties. Justification is based on five criteria: English proficiency, knowledge, research skills, intelligence and personality.

8.3 Final judgment will be made under the consideration of the Administrative Program Committee in concurrence with the Dean of Faculty of Graduate Studies, Mahidol University.

9. Educational Management System

9.1 System: two-semester credit system, one academic year consists of two regular semesters, each with no less than 15 weeks of study

9.2 Summer Session: There is a 6-week Summer Semester in year 1, or as considered by the Curriculum Committee.

10. Program Structure

10.1 Curriculum Structure

Plan 2.1 For students holding an M.Sc. degree

Required courses		9 credits
Elective courses	no less than	3 credits
Dissertation		36 credits
Total	**no less than**	**48 credits**

Plan 2.2 For students holding a B.Sc. degree

Required courses		14 credits
Elective courses	no less than	10 credits
Dissertation		48 credits
Total	**no less than**	**72 credits**

10.2 Courses Offered

Plan 2.1 For students holding an M.Sc. degree

(1) Required courses 9 credits

		Credits (lecture – practice – self-study)
MBSB 501	Systems Biosciences	3(3-0-6)
MBSB 502	Applied Systems Biosciences	3(3-0-6)
MBSB 505	Molecular Diagnosis and Therapy	3(3-0-6)

(2) Elective courses no less than 3 credits

MBSB 601	Stem Cell and Regenerative Biology	3(3-0-6)
MBSB 602	Cellular and Molecular Biology of Thalassemia	3(3-0-6)
MBSB 604	Virus – Cell Interactions and Immunity	3(3-0-6)
MBMG 610	Innovation in Research	1(1-0-2)
EGBE 523	Advanced Biomedical Image Processing	3(3-0-6)
SCBC 617	Bioinformatics and Molecular Systems Biology	2(2-0-4)
SIBD 601	Integrated Biodesign in Medicine	3(3-0-6)

SIBD 602	Cutting-edge Technology for Biodesign Capstone	3(3-0-6)
SIBS 512	Precision Medicine	2(1-2-3)
SIIM 617	Advanced Flow Cytometry	2(1-2-3)
SIRE 503	Medical Bioinformatics	2(2-0-4)

In addition to the elective courses mentioned above, a student, with the approval of the curriculum committee or their advisor, may register for other courses in international programs offered by other faculties within Mahidol University or ones offered by other universities.

(3) Dissertation

MBSB 699	Dissertation	36(0-108-0)

Plan 2.2 For students holding a B.Sc. degree

(1) Required courses 14 credits

MBSB 501	Systems Biosciences	3(3-0-6)
MBSB 502	Applied Systems Biosciences	3(3-0-6)
MBSB 504	Techniques in Systems Biosciences	2(0-6-2)
MBSB 505	Molecular Diagnosis and Therapy	3(3-0-6)
MBSB 513	Topics of Current Interest in Systems Biosciences	1(1-0-2)
MBSB 514	Colloquia in Systems Biosciences	2(2-0-4)

(2) Elective courses no less than 10 credits

MBSB 601	Stem Cell and Regenerative Biology	3(3-0-6)
MBSB 602	Cellular and Molecular Biology of Thalassemia	3(3-0-6)
MBSB 604	Virus – Cell Interactions and Immunity	3(3-0-6)
MBMG 610	Innovation in Research	1(1-0-2)
EGBE 523	Advanced Biomedical Image Processing	3(3-0-6)
SCBC 617	Bioinformatics and Molecular Systems Biology	2(2-0-4)
SIBD 601	Integrated Biodesign in Medicine	3(3-0-6)
SIBD 602	Cutting-edge Technology for Biodesign Capstone	3(3-0-6)
SIBS 512	Precision Medicine	2(1-2-3)
SIIM 617	Advanced Flow Cytometry	2(1-2-3)
SIRE 503	Medical Bioinformatics	2(2-0-4)

In addition to the elective courses mentioned above, a student, with the approval of the curriculum committee or their advisor, may register for other courses in international programs offered by other faculties within Mahidol University or ones offered by other universities.

(3) Dissertation

MBSB 799 Dissertation 48(0-144-0)

10.3 Course Code Description

The first two alphabets are the abbreviation of the Institute/Faculty offering the course.

MB = Institute of Molecular Biosciences

EG = Faculty of Engineering

SC = Faculty of Science

SI = Faculty of Medicine Siriraj Hospital

The latter two alphabets are the abbreviation of the department or the major offering the course.

MG = Molecular Genetics and Genetic Engineering Program

SB = Systems Biosciences Program

BC = Department of Biochemistry

BD = Biodesign in Medicine

BE = Department of Biomedical Engineering

BS = Biomedical Sciences

IM = Department of Immunology

RE = Office of Research and Development

The 3 digits starting with 5 or 6 (5XX and 6XX) indicate that the courses are in the graduate level.

10.4 Research Project of the Program

The Program offers research projects on different topics as follows:

1) Molecular medicine
2) Genome editing and cell-based technology
3) Thalassemia
4) Bioinformatics
5) Multi-omics study
6) Vaccine development

10.5 Study Plan

Plan 2.1 For students holding an M.Sc. degree

Year	Semester 1	Semester 2
1	MBSB 501 Systems Biosciences 3(3-0-6) Elective courses 0-3 credits **Total 3-6 credits**	MBSB 502 Applied Systems Biosciences 3(3-0-6) MBSB 505 Molecular Diagnosis and Therapy 3(3-0-6) Elective courses 0-3 credits **Total 6-9 credits**
	Summer Qualifying Examination	
2	MBSB 699 Dissertation 9(0-27-0) Elective courses 0-3 credits **Total 9-12 credits**	MBSB 699 Dissertation 9(0-27-0) Elective courses 0-3 credits **Total 9-12 credits**
3	MBSB 699 Dissertation 9(0-27-0) **Total 9 credits**	MBSB 699 Dissertation 9(0-27-0) **Total 9 credits**

Plan 2.2 For students holding a B.Sc. degree

Year	Semester 1	Semester 2
1	MBSB 501 Systems Biosciences 3(3-0-6) MBSB 504 Techniques in Systems Biosciences 2(0-6-2) Elective courses 0-3 credits **Total 5-8 credits**	MBSB 502 Applied Systems Biosciences 3(3-0-6) MBSB 505 Molecular Diagnosis and Therapy 3(3-0-6) Elective courses 0-3 credits **Total 6-9 credits**
	Summer Qualifying Examination	
2	MBSB 513 Topics of Current Interest in Systems Biosciences 1(1-0-2) Elective courses 0-3 credits MBSB 799 Dissertation 6(0-18-0) **Total 7-10 credits**	MBSB 514 Colloquia in Systems Biosciences 2(2-0-4) Elective courses 0-3 credits MBSB 799 Dissertation 6(0-18-0) **Total 8-11 credits**
3	MBSB 799 Dissertation 9(0-27-0) Elective courses 0-3 credits **Total 9-12 credits**	MBSB 799 Dissertation 9(0-27-0) Elective courses 0-3 credits **Total 9-12 credits**
4	MBSB 799 Dissertation 9(0-27-0) **Total 9 credits**	MBSB 799 Dissertation 9(0-27-0) **Total 9 credits**

11. Graduation Requirements

To graduate and be awarded the degree,

3.1 Total time of study should not exceed the study plan.

3.2 Students must complete the minimum credit requirement of coursework and thesis as follows,

3.2.1 A minimum of 12 credits of coursework and 36 credits of thesis, a total of 48 credits, for Plan 2.1 students

3.2.2 A minimum of 24 credits of coursework and 48 credits of thesis, a total of 72 credits, for Plan 2.2 students

3.3 Students must have a minimum GPA of 3.00.

3.4 Students must pass the English Proficiency Standard of Doctoral Program Students set by the Faculty of Graduate Studies, Mahidol University.

3.5 Students must pass qualifying examination.

3.6 Students must participate in skills development activities of the Faculty of Graduate Studies, Mahidol University.

3.7 Students must have parts of the dissertation work published as a research article or a manuscript accepted for publication in an international peer-reviewed academic journal. However, if the student is awarded a scholarship, the number of research articles accepted for publication must be in line with the requirements of the funding sources.

3.8 Students must pass a public oral dissertation defense examination evaluted by the thesis defense examination committee appointed by the Faculty of Graduate Studies and submit the dissertation to the Faculty of Graduate Studies according to Mahidol University regulations on graduate studies.

12. Job Opportunities

12.1 Academics in biological sciences and relevant disciplines

12.2 Researchers in governmental organizations or private sectors

12.3 Innovators or entrepreneurs