



Program Structure and Specification
Doctor of Philosophy Program in Biochemistry
 (International Program)
 Curriculum Last Revised in 2018
 for
Students Entering in Academic Year 2021

- 1. Program Title** Doctor of Philosophy Program in Biochemistry (International Program)

- 2. Name of Degree**
 Full name : Doctor of Philosophy (Biochemistry)
 Abbreviation : Ph.D. (Biochemistry)

- 3. Responsible Units**
 3.1 Department of Biochemistry, Faculty of Science, Mahidol University
 3.2 Faculty of Graduate Studies, Mahidol University

- 4. Philosophy and Expected Learning Outcomes of the Program**
 - 4.1 Philosophy of the Program:**
 Our program believes that novel knowledge and wisdom of students could be obtained from hands-on research. Students will conduct research under close-supervision and mentorship of academic staffs.
 - 4.2 Expected Learning Outcomes of the Program:**
 Expected Learning Outcomes of our doctoral program are formulated according to the recommended “Standard for Doctoral Degrees in the Molecular Biosciences” published by International Union of Biochemistry and Molecular Biology in 2011 as following:
Upon completion of the doctoral program, graduates must be able to:
 - 4.2.1 demonstrate proper ethical conduct for research and scientific professions.
 - 4.2.2 demonstrate effective English communication skills in both verbal and writing.
 - 4.2.3 independently operate international-standard laboratory experiments in biochemistry.
 - 4.2.4 translate frontier knowledge in biochemistry to other audiences.
 - 4.2.5 analyze scientific questions and research finding using theoretical framework and principles in biochemistry to come up with rational explanation or discussion.
 - 4.2.6 critically evaluate scientific merit of up-to-date biochemistry knowledge and literature.
 - 4.2.7 formulate a novel research proposal with scientifically-sound experimental design.
 - 4.2.8 create new knowledge or concept in biochemistry in the form of international research publication

5. Admission Requirements

- 5.1 Applicants must hold, or expect to hold before enrollment, a bachelor's degree in any area of science, or a bachelor's degree in clinical, dental, pharmaceutical, veterinary and other health sciences with GPA of at least 3.50. Applicants from institutions outside Thailand must hold the equivalent of a Thai bachelor's degree from a college or university recognized by Office of the Higher Education Commission.
- 5.2 Applicants must hold, or expect to hold before enrollment, a master's degree in Biochemistry, Chemistry, Biology, Molecular Biology or related areas with GPA of at least 3.50.
- 5.3 Applicants must meet the minimum English language proficiency requirement set by the Faculty of Graduate Studies, Mahidol University.
- 5.4 Applicants whose credentials differ from above requirement could apply to the program if the permission is granted by the Administrative Program Committee in concurrence with the Faculty of Graduate Studies.

6. Selection Method

Applicants are selected based on academic/research credentials and interview. International applicants may be subjected to phone/online interview and must provide proof of financial support during the study period to be considered for admission. 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.

7. Academic System

7.1 Semester system

Semester

7.2 Credit Assignment

The number of credits assigned to each subject is determined as follows:

- 7.2.1 Lecture or discussion consuming 15 hours per semester is equal to 1 credit hour.
- 7.2.2 Laboratory or practice consuming 30 hours per semester is equal to 1 credit hour.
- 7.2.3 Thesis consuming 45 hours per semester is equal to 1 credit hour.

8. Language

English is used in teaching and learning as well as in the assessment processes.

9. Registration

- 9.1 Students must register as full time students.
- 9.2 Students must register for no less than 9 credits and no more than 15 credits per regular semester, or according to program study plan.

10. Evaluation and Graduation Requirements

10.1 Evaluation

Student evaluation is in accordance with the rules and regulations of Mahidol University. (See details at <http://www.grad.mahidol.ac.th>)

10.2 Graduation Requirements

- 10.2.1 Students holding a bachelor's degree must register for no less than 24 credits of coursework and 48 credits of thesis. Total credits acquired must be no less than 72 credits.
- 10.2.2 Students holding a master's degree must register for no less than 12 credits of coursework and 36 credits of thesis. Total credits acquired must be no less than 48 credits.

All students must

- 10.2.3 obtain accumulative GPA of at least 3.50.
- 10.2.4 meet the minimum English language proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
- 10.2.5 pass a written qualifying examination.
- 10.2.6 pass the professional and personal skills development according to the rules and regulations of the Faculty of Graduate Studies, Mahidol University.
- 10.2.7 present thesis and pass the oral thesis examination according to the regulations of Faculty of Graduate Studies, Mahidol University.
- 10.2.8 obtain at least one publication or a manuscript that has been accepted for publication in an international peer-reviewed journal according to regulations of Faculty of Graduate Studies, Mahidol University.

11. Library

Our Stang Mongkolsuk Library possesses more than 10,000 books. Many journals can be accessed online. Besides, a lot of text books and journals (in both electronic and printed formats) are available at other libraries within Mahidol University.

12. Program Structure

12.1 The number of credits required for the program

- 12.1.1 number of credits required for the program is no less than 72 credits (for students from B.Sc.)
- 12.1.2 number of credits required for the program is no less than 48 credits (for students from M.Sc.)

12.2 Curriculum Structure

The program is set according to the Ministry of Education Announcement titled "Standard Criteria for Graduate Studies 2005", with specified plan A(2) curriculum.

12.2.1 For students with a bachelor's degree

(1) Required Courses	15	credits
(2) Elective Courses no less than	9	credits
(3) Dissertation	48	credits
Total no less than	72	credits

12.2.2 For students with a master's degree from Department of Biochemistry, Faculty of Science, Mahidol University

(1) Required Courses	6	credits
(2) Elective Courses no less than	6	credits
(3) Dissertation	36	credits
Total no less than	48	credits

12.2.3 For students with a master's degree from other programs

(1) Required Courses	8	credits
(2) Elective Courses no less than	4	credits
(3) Dissertation	36	credits
Total no less than	48	credits

12.3 **Course Requirements**12.3.1 Required CoursesCredits (lecture-lab-self study)*For students from B.Sc.*

	SCBC	603	Advanced Biochemistry Laboratory	2 (0-4-2)
*	SCBC	609	Structure and Mechanism of Enzymes	2 (2-0-4)
*	SCBC	610	Modern Metabolism	2 (2-0-4)
*	SCBC	612	Functional Genetics and Genomics	2 (2-0-4)
	SCBC	613	Advanced Skills in Biochemical Research	3 (2-2-5)
	SCBC	614	Advanced Biochemistry Seminar I	1 (1-0-2)
	SCBC	615	Advanced Biochemistry Seminar II	1 (1-0-2)
	SCBC	616	Advanced Biochemistry Seminar III	1 (1-0-2)
	SCID	502	Cell Science	2 (2-0-4)
	SCID	506	Concepts of Molecular Bioscience	2 (2-0-4)
	SCID	518	Generic Skills in Science Research	1 (1-0-2)

* Students select to enroll one of these three courses most related to the student's research.

For students from M.Sc. from Department of Biochemistry, Faculty of Science, Mahidol University

	SCBC	613	Advanced Skills in Biochemical Research	3 (2-2-5)
	SCBC	614	Advanced Biochemistry Seminar I	1 (1-0-2)
	SCBC	615	Advanced Biochemistry Seminar II	1 (1-0-2)
	SCBC	616	Advanced Biochemistry Seminar III	1 (1-0-2)

For students from M.Sc. from other programs

*	SCBC	609	Structure and Mechanism of Enzymes	2 (2-0-4)
*	SCBC	610	Modern Metabolism	2 (2-0-4)
*	SCBC	612	Functional Genetics and Genomics	2 (2-0-4)
	SCBC	613	Advanced Skills in Biochemical Research	3 (2-2-5)
	SCBC	614	Advanced Biochemistry Seminar I	1 (1-0-2)
	SCBC	615	Advanced Biochemistry Seminar II	1 (1-0-2)
	SCBC	616	Advanced Biochemistry Seminar III	1 (1-0-2)

* Students select to enroll one of these three courses most related to the student's research.

12.3.2 Elective CoursesCredits (lecture-lab-self study)

	SCBC	607	Current Topics in Biochemistry	3 (3-0-6)
	SCBC	611	Current Protocols in Biomolecular Research	1 (1-0-2)
	SCBC	617	Bioinformatics and Molecular Systems Biology	2 (2-0-4)
	SCBC	618	Stem Cell and Cancer Bioscience	3 (3-0-6)
	SCID	500	Cell and Molecular Biology	3 (3-0-6)
	SCID	502	Cell Science	3 (3-0-6)
	SCID	503	Systemic Bioscience	3 (3-0-6)
#	SCID	506	Concepts of Molecular Bioscience	2 (2-0-4)
	SCID	507	Microscopic Technique	1 (0-2-1)
	SCID	508	Biomolecular and Spectroscopy Techniques	1 (0-2-1)
	SCID	509	Separation Techniques	1 (0-2-1)
	SCID	510	Immunological Methods	1 (0-2-1)

	SCID	511	Gene Technology	1 (0-2-1)
	SCID	512	Receptor Binding and Enzyme Kinetic Assays	1 (0-2-1)
+	SCID	518	Generic Skills in Science Research	1 (1-0-2)
	SCBT	602	Gene Regulation	3 (3-0-6)

Required AUDIT course for M.Sc. graduate from other programs.

+ Recommended as electives for M.Sc. graduate from other programs

Note: Besides the above elective courses, students can enroll in other courses offered by graduate programs of Mahidol University with approval from the program director, major advisor, or program administrative committee.

12.3.3	<u>Dissertation</u>		<u>Credits (lecture-lab-self study)</u>	
	SCBC	699	Dissertation	36 (0-144-0)
	SCBC	799	Dissertation	48 (0-192-0)

12.3.4 Research Projects of the Program

Staff at the Department of Biochemistry has received many research grants from local agencies (e.g. National Science and Technology Development Agency (NSTDA), Thailand Research Fund (TRF), TRF-Golden Jubilee, National Research Council of Thailand (NRCT)) and overseas granting agencies (e.g. World Health Organisation (WHO), Wellcome Trust and Third World Academy of Science (TWAS)). Major research interests in the Department are:

- Parasite and bacterial biochemistry and molecular biology
- Protein and enzyme structure and function
- Molecular metabolism and gene regulation
- Biochemistry and molecular biology of cancers
- Plant biochemistry
- Biochemistry and molecular biology of shrimp pathogens
- Biological and biomedical nanotechnology
- Bone metabolism and ion transport
- Systems biology and bioinformatics

12.4 **Course Code Explanation**

Two first letters represent the abbreviated name of Faculty

SC = Faculty of Science

GR = Faculty of Graduate Studies

The third and fourth letters represent the abbreviated name of responsible units

ID = Inter-departmental Courses

BC = Department of Biochemistry

BT = Department of Biotechnology

MI = Department of Microbiology

PM = Department of Pharmacy

TX = Toxicology Graduate Program

The first numbers (5XX and 6XX) represent postgraduate program level.

12.5 Study Plan

For students from B.Sc.

Year	Semester 1			Semester 2		
1	SCID 502 SCID 506 SCID 518 SCBC 609 SCBC 610 SCID 500	Cell Science Concepts of Molecular Bioscience Generic Skills in Science Research Structure and Mechanism of Enzymes Modern Metabolism Elective Courses <i>Recommended elective course</i> Cell and Molecular Biology	2(2-0-4) 2(2-0-4) 1(0-2-1) 2(2-0-4) * 2(2-0-4) * 4-5 credits 3(3-0-6)	SCBC 603 SCBC 612	Advanced Biochemistry Laboratory Functional Genetics and Genomics Elective Courses	2(0-4-2) 2(2-4-0) * 4-5 credits
		Total	9-12 credits		Total	6-9 credits
2	SCBC 613 SCBC 614	Advanced Skills in Biochemical Research Advanced Biochemistry Seminar I <i>Qualifying Examination</i>	3(2-2-5) 1(1-0-2) 4 credits	SCBC 615	Advanced Biochemistry Seminar II <i>Qualifying Examination</i>	1(1-0-2) 1 credit
		Total	4 credits		Total	1 credit
3	SCBC 799	Dissertation <i>Proposal Presentation</i>	8(0-32-0) 8 credits	SCBC 616 SCBC 799	Advanced Biochemistry Seminar III Dissertation (continued)	1(1-0-2) 8(0-32-0)
		Total	8 credits		Total	9 credits
4	SCBC 799	Dissertation (continued)	8(0-32-0) 8 credits	SCBC 799	Dissertation (continued)	8(0-32-0) 8 credits
		Total	8 credits		Total	8 credits
5	SCBC 799	Dissertation (continued)	8(0-32-0) 8 credits	SCBC 799	Dissertation (continued)	8(0-32-0) 8 credits
		Total	8 credits		Total	8 credits

* Students select to enroll 1 of these 3 courses most related to the student's research.

For students from M.Sc. from Department of Biochemistry, Faculty of Science, Mahidol University

Year	Semester 1			Semester 2		
1	SCBC 613 SCBC 614	Advanced Skills in Biochemical Research Advanced Biochemistry Seminar I Elective Courses <i>Qualifying Examination</i>	3(2-2-5) 1(1-0-2) 0-6 credits 4-10 credits	SCBC 615	Advanced Biochemistry Seminar II Elective Courses <i>Qualifying Examination</i>	1(1-0-2) 0-6 credits
		Total	4-10 credits		Total	1-7 credits
2	SCBC 699	Dissertation <i>Proposal Presentation</i>	9(0-36-0) 9 credits	SCBC 616 SCBC 699	Advanced Biochemistry Seminar III Dissertation (continued)	1(1-0-2) 9(0-36-0)
		Total	9 credits		Total	10 credits
3	SCBC 699	Dissertation (continued)	9(0-36-0) 9 credits	SCBC 699	Dissertation (continued)	9(0-36-0) 9 credits
		Total	9 credits		Total	9 credits

For students from M.Sc. from other programs

Year	Semester 1			Semester 2		
1	SCID 506	Concepts of Molecular Bioscience	2(2-0-4) #	SCBC 612	Functional Genetics and Genomics	2(2-0-4) *
	SCBC 609	Structure and Mechanism of Enzymes	2(2-0-4) *		Elective Courses	0-4 credits
	SCBC 610	Modern Metabolism	2(2-0-4) *			
		Elective Courses	0-4 credits			
SCID 518	<i>Recommended electives</i> Generic Skills in Science Research	1(0-2-1)	Total	0-6 credits		
2	SCBC 613	Advanced Skills in Biochemical Research	3(2-2-5)	SCBC 615	Advanced Biochemistry Seminar II	1(1-0-2)
	SCBC 614	Advanced Biochemistry Seminar I	1(1-0-2)		Qualifying Examination	
		Qualifying Examination			Qualifying Examination	
		Total	4 credits		Total	1 credit
3	SCBC 699	Dissertation Proposal Presentation	9(0-36-0)	SCBC 616 SCBC 699	Advanced Biochemistry Seminar III Dissertation (continued)	1(1-0-2) 9(0-36-0)
		Total	9 credits		Total	10 credits
4	SCBC 699	Dissertation (continued)	9(0-36-0)	SCBC 699	Dissertation (continued)	9(0-36-0)
		Total	9 credits		Total	9 credits

* Students select to enroll 1 of these 3 courses most related to the student's research.

Required AUDIT course for M.Sc. graduate from other programs.

13. Qualifying Examination

Before taking the qualifying exam, student must

- meet the minimum English language proficiency requirement of the Faculty of Graduate Studies, Mahidol University.
- pass SCBC 506 and one of the three subjects: SCBC 609, SCBC 610, SCBC 612 with at least B
- pass SCBC 613

If student fails to pass the qualifying examination at the first attempt, a reexamination will be scheduled, which required approval from the qualifying exam committee.

14. Dissertation Research Proposal Presentation

After passing the qualifying examination, students must submit a document to the Faculty of Graduate Studies for appointment of Dissertation Research Proposal Committee consisting of at least 3 faculty members, one of which is student's major advisor while other two can be any academic staff within or outside Mahidol University. After approval of dissertation research proposal, this same committee will serve as Dissertation Advisory Committee monitoring and providing guidance to student regarding his/her doctoral research.

15. Dissertation Defense

Upon completion of doctoral research and dissertation writing and approval from the Dissertation Advisory Committee, students must submit a document to the Faculty of Graduate Studies for appointment of the Dissertation Defense Committee consisting of at least 5 members: a committee chair, an external examiner and the Dissertation Advisory Committee (at least 3 members). After passing the oral dissertation defense, students must submit the final written dissertation to the Faculty of Graduate Studies.

16. Collaboration with Other Departments

Many of our faculty members are members of multidiscipline research centers such as Center for Excellence in Protein and Enzyme Technology, Center of Excellence for Vectors and Vector-Borne Diseases, Center of Excellence for Shrimp Molecular Biology and Biotechnology, Center of Calcium and Bone Research, Center for Neuroscience, Integrative Computational Bioscience Center. We also have collaborations with scientists at other research institutes and universities in Thailand and overseas.

17. Students Job Opportunities

A large number of our student alumni work as staff in universities, researchers in research institutes, or as scientists in food, pharmaceutical, cosmetic and chemical industries.