



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

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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 | | 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 | Total | 1 credit |
| | | Qualifying Examination | 4 credits | | | | |
| | Total | 4 credits | | | | | |
| 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.