



GRADUATE STUDENT HANDBOOK

**BioPharmaceutical Engineering School Practice School
(BioPhEPS)**

www.cheps-kmutt.com

KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI



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Sponsored and in collaboration with



A Message from the Director

Welcome to the BioPhEPS family!

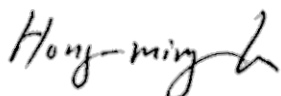
Our mission is a simple one: to train and produce top chemical engineers to help Thailand's burgeoning biopharmaceutical industry compete in the new global economy.

This *Graduate Student Handbook* is meant to provide you with essential information and to answer frequently asked questions that you may have about the BioPhEPS program. Please take a moment to go through the pages. Of particular interest are the program's policies, important dates, and how the practice stations work.

As BioPhEPS is an evolving curriculum and the handbook is by no means comprehensive, you are encouraged to periodically visit our website for the latest information and new additions to the handbook. Moreover, everyone at BioPhEPS is committed to helping you make a smooth transition from your undergraduate study into graduate study. So please feel free to let us know how we can make your learning in the next two years as educational and as enjoyable as possible.

Finally, I wish you good luck with your studies and a pleasant stay at KMUTT. Happy learning!

Sincerely,



Dr. Hong-ming Ku
Program Director
Biopharmaceutical Engineering Practice School
KMUTT, Bangkok
May, 2016

INTRODUCTION

1. General Information about BioPhEPS

The Biopharmaceutical Engineering Practice School (BioPhEPS) Program at King Mongkut's University of Technology Thonburi (KMUTT) is a two-year international program leading to a Master's degree in Chemical Engineering. This intensive yet practical program was developed in collaboration with National Science Technology and Innovation Office (STI), which is tasked with producing policies and plans to promote science, technology, and innovation in Thailand. BioPhEPS offers full scholarships worth 500,000 baht over 2 years to qualified candidates.

2. What Is BioPhEPS All About?

The BioPhEPS program believes in hands-on approach to engineering education and training. To expose its students to real-life problems, the program emphasizes developing close ties and partnerships with the biopharmaceutical industry and the private sector.

Besides technical competency, one of BioPhEPS' major objectives is to instill "professionalism" into its graduate students. A professional can accept responsibility, can direct the efforts of himself and others to achieve preset goals, and is a self-motivated and result-oriented person. BioPhEPS students are treated as fellow professionals, whose contributions through new ideas, concepts, and approaches, are appreciated by the program faculty. In addition, the program is committed to fostering the following attributes in its students:

- Organization and planning
- Leadership and team work
- Engineering judgement
- English communication
- Engineering economics and management
- Presentation skill

CURRICULUM

1. BioPhEPS Curriculum

Just like ChEPS, the BioPhEPS curriculum consists of spending the first year on campus doing graduate coursework, and spending the second year undertaking one semester of individual thesis project and one semester of practical training.

BioPhEPS coursework includes:

- Cell Biology
- Biochemical Engineering
- Intermediate Transport Phenomena
- Chemical Reaction Engineering
- Physical Chemistry of Pharmaceuticals
- Mathematical Analysis for Chemical Engineering
- Introduction to Development and Manufacturing of Biopharmaceuticals
- Biopharmaceutical Industry
- Good Manufacturing Practice in Pharmaceutical Industry
- Pharmaceutical Manufacturing Design Problem
- Graduate Seminar

Figure 1 depicts a timeline of the BioPhEPS curriculum.

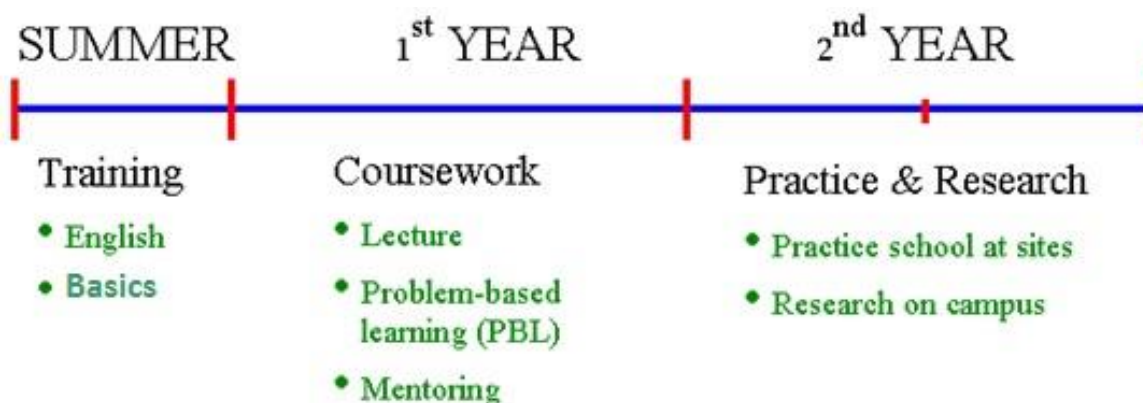


Figure 1: Timeline of BioPhEPS Curriculum

2. Curriculum Structure and Coursework

2.1 Curriculum Structure

The BioPhEPS coursework is highly structured and fairly rigid, since the program emphasizes intensive learning and training. Elective courses are virtually non-existent, although the required courses offer a very comprehensive exposure to various fields in chemical engineering. On the other hand, more open-ended problems and training in areas that are of interest to the students are done through problem-based learning (PBL) in the first

year, and special research theses and industrial projects in the second year.

The following table shows the various components of the BioPhEPS curriculum, which confers a degree in Master of Engineering (ME) upon graduation.

| | |
|--|-------------------|
| <i>Master of Engineering (Chemical Engineering)</i> | |
| <i>Total program credits</i> | <i>52 credits</i> |
| <i>Program components</i> | |
| <i>A. Compulsory Courses</i> | <i>40 credits</i> |
| <i>B. Elective Courses</i> | <i>0 credits</i> |
| <i>C. Special Research Project</i> | <i>6 credits</i> |
| <i>D. Intensive Industrial Research Projects</i> | <i>6 credits</i> |

2.2 Required Coursework

Summer, Year 1

| | |
|---|------------------|
| BIT 511 Cell Biology for Engineers | 3 credits |
| CHE 540 Biochemical Engineering | 3 credits |
| LNG 601 Foundation English for International Programs | 3 credits |
| Total | 9 credits |

Semester 1, Year 1

| | |
|--|-------------------|
| CHE 592 Special Topic I: Physical Chemistry of Pharmaceutics | 3 credits |
| CHE 592 Special Topic II: Biopharmaceutical Science & Technology | 3 credits |
| CHE 644 Applied Chemical Engineering Thermodynamics | 3 credits |
| CHE 651 Mathematical Analysis for Chemical Engineering | 3 credits |
| CHE 681 Pharmaceutical Design Problem I | 3 credits |
| Total | 15 credits |

Semester 2, Year 1

| | |
|--|-------------------|
| CHE 593 Special Topic: Good Manufacturing Practice | 3 credits |
| CHE 594 Special Topic: Biopharmaceutical Industry | 3 credits |
| CHE 610 Intermediate Transport Phenomena | 3 credits |
| CHE 642 Chemical Reaction Engineering | 3 credits |
| CHE 682 Pharmaceutical Design Problem II | 3 credits |
| CHE 783 Graduate Seminar | 1 credit |
| Total | 16 credits |

Semester 1, Year 2

| | |
|--|------------------|
| CHE 791 Intensive Industrial Research Project I | 3 credits |
| CHE 792 Intensive Industrial Research Project II | 3 credits |
| Total | 6 credits |

Or

| | |
|----------------------------------|------------------|
| CHE 790 Special Research Project | 6 credits |
| Total | 6 credits |

Semester 2, Year 2

CHE 791 Intensive Industrial Research Project I 3 credits

CHE 792 Intensive Industrial Research Project II 3 credits

Total 6 credits**Or**

CHE 790 Special Research Project 6 credits

Total 6 credits

Note that in the second year, some of the students will work on their research projects while others will be interned at practice stations in Semester 1. Their roles are subsequently reversed in Semester 2.

4. Timeline and Important Milestones of BioPhEPS Program

A BioPhEPS student will follow one of the following two timelines depending upon the sequence of the on-site practice school and special research on campus.

| | Month | Duration | Plan |
|----------------|-------------------|----------|--|
| Year I | January | 1 month | Recruitment |
| | June – July | 2 months | Summer session |
| | August | 1 week | Break |
| | August – December | 5 months | First semester |
| | January | 1 week | Break |
| | January – May | 5 months | Second semester |
| Year II | June | 1 week | Break |
| | July | 2 weeks | Thesis proposal |
| | August – December | 5 months | Academic research on campus or practice school on site |
| | January | 1 week | Break |
| | January – May | 5 months | Academic research on campus or practice school on site |

BIOPHEPS POLICIES

The BioPhEPS program regards all its students as professionals and trusts them with their ethical judgement. However, certain policies have to be laid out beforehand to maintain an atmosphere of equality and fairness for all.

1. Policies for On-Campus Program

On campus, all academic work such as homework assignments or tests or individual projects should be done according to the guidelines provided by the course instructor. A student who uses improper means to complete the academic work should do so at his/her own risk. In the event of discovery of such an incident, a severe disciplinary action will be taken against the involved student(s) and multiple incidents of this nature may lead to expulsion from the program.

While the BioPhEPS program offers several facilities and equipment to its students for completing their academic work, each student is also required to own a personal laptop. Students must use these facilities responsibly and report any misuse to one of the BioPhEPS faculty or staff members as soon as possible. The following are the specific guidelines for the use of the BioPhEPS facilities:

1. The BioPhEPS facilities, including computers and LCD projectors, are meant for only BioPhEPS graduate students. Unauthorized use by an OUTSIDER should be reported to a BioPhEPS faculty or staff as soon as possible.
2. The BioPhEPS students must use the BioPhEPS facilities, including computers, for doing their academic work only.
3. Students are NOT permitted to install unauthorized software or other programs on the BioPhEPS computers. Also, students are NOT allowed to change major hardware/software configurations on any of the BioPhEPS computers or other equipment without prior approval from the BioPhEPS administration.
4. The BioPhEPS program will tolerate only normal wear and tear of the equipment used by the BioPhEPS students. Therefore, students must handle the BioPhEPS equipment, including computers, in a proper manner to avoid any damage. The students may be **FINED FINANCIALLY** for excessive damage to the BioPhEPS equipment, including computers, resulting from improper handling/use.

2. Policies for On-Site Program

The BioPhEPS students work within the company and on the company's problems using the company's resources and equipment, but they are not company employees. Rather, the students work for academic credit under the guidance of site-director/resident faculty at the site.

Although the students act like company employees while working on site, they are not

subjected to any leave or other benefits that the company offers to its employees. The students have to follow the schedule of the BioPhEPS program. In case of an emergency, the student should notify the site director/resident faculty as soon as possible.

BIOPHEPS OPERATING PROCEDURES

1. Admission

Completing the academic, research, and extra-curricular requirements of the BioPhEPS graduate program requires hard work, dedication, persistence, creativity, and an ambition to excel. For this reason, only the best students are being sought who can meet the high standards set by the program.

The admission procedure is a multi-step process and may involve visits of the BioPhEPS faculty members to various universities for student recruitment, applications screening, and interviewing. Prospective students should apply by submitting a completed application form before a deadline set forth by the program. This deadline is usually at the end of December.

2. Design Problems (PBL Projects)

All students are trained during the first year at KMUTT in order to be prepared for the practice school in the second year. The training comes in two forms, namely coursework and problem-based learning (PBL), a.k.a. design problems. The coursework consists of a number of courses typical in a normal Master's program in Chemical Engineering but also tailor-made for the field of biopharmaceutics. The design problems may be thought of as mini-site-projects. There is one design problem (per student group) in each semester in the first year. The objective is to better prepare the students by familiarizing them with real-life problems, though smaller in scale than site projects, and training them in report writing and oral presentations.

2.1 Nature of Design Problems

The following are some guidelines for the design problems that BioPhEPS is looking for:

- (a) The design problem should come from a real process/operation or from published literature. An ideal candidate is one which is too small to be made into a site project and yet the company is still interested in finding a solution or one in a journal where all major results are given.
- (b) The problem should be well-defined (as opposed to being open-ended), and its scope should be such that it can be completed by a team of 3-4 students within 8 weeks working on a total of approximately 30 hours per week.

2.2 Format of Design Problems

A group of 3-4 students will work in team on one design problem. There is no team leader and each group member is expected to contribute equally to the project. A total of 8-10 weeks will be allocated to solving the problem, which usually is the last two months of an academic semester. One or more advisors, usually a KMUTT staff, are assigned to oversee each project. The advisors ensure that satisfactory progress is being made and assist the students in both technical problems and writing. During the 8-10 weeks of the projects,

progress is monitored with bi-weekly discussions, reports, and oral presentations. The company engineers (if any) need not participate in these activities which take place at KMUTT. At the end of the 8-10 weeks, the design problem will culminate in a Final Presentation in which the students present their findings to the sponsors or BioPhEPS staff.

3. On-Site Practice Problems

Following two semesters of graduate lectures on campus, students spend one semester in the second year of their program at a Practice School site. A feature that distinguishes the BioPhEPS from other programs that cooperate with industry is the presence of full-time faculty resident at the industrial sites where students work. Selected BioPhEPS faculty members serve as the site directors. In addition, faculty members from the main campus regularly visit the sites to attend presentations and to advise the students on technical matters. Engineering staff from the industrial plant outline possible projects to the resident faculty and serve as consultants. The site directors screen potential problems based on the following three criteria:

- The project should have sufficient educational value for the student by stressing the application of chemical engineering fundamentals.
- The solution should require a broad range of skills, including technical ability, original thought, initiative and judgement.
- The results should be useful to the host company and achievable in the time allotted.

The site projects may have an experimental component involving collection and analysis of data. Frequently, they will involve direct use of process-scale equipment.

There is an on-site practice school handbook that describes in details the on-site practice school operation and its academic requirements. A student must obtain a copy this on-site practice school handbook from the BioPhEPS administrative office.

4. Academic Project or Thesis Research

The BioPhEPS students work on their thesis research individually for one semester during the second year of the program under the guidance of a thesis committee. The committee members monitor the student's progress on a regular basis towards a successful completion of the thesis research. The student is required to submit copies of a written thesis to all the committee members at least one week in advance of the scheduled final thesis examination.

All available research topics will be announced and posted by BioPhEPS faculty sometime in February of the second year. All second-year students, regardless of whether they will conduct their research on campus in the first or second semester, must submit and defend their research thesis proposals in mid-July. After that, about half of the students will be interned at practice stations, while the remaining will stay behind at KMUTT to carry out their research. For those working on research, there will be a total of two progress presentations, approximately one every 6 weeks, to keep the advisor and the research committee abreast of their work. A progress written report is also expected to be submitted

one week before the oral presentation. All students must defend their research project at the end of the five-month period. In the unlikely event that a student is unable to complete his or her work in the allotted five months, an extension into the summer of the second year may be granted. However, the student may be asked to pay for the extra tuition fee in the summer or even fined 50,000 baht if the delay is a direct result of negligence or poor performance by the student.

5. Graduation

A total of 52 credits are required for graduation from the BioPhEPS program. The second year academic research project or thesis is awarded 6 credits and so does the practical training undertaken at the industrial site. The remaining 37 credits should be completed through various core courses offered by the BioPhEPS program. After completing all the academic and research requirements of the program, a student receives a Master's Degree of Engineering in Chemical Engineering.

In addition to the required credit hours, BioPhEPS students are required (both university policy and BioPhEPS policy) to pass an English proficiency test before graduation by making the following score on the English test:

- 500 on the ITP-TOEFL (paper-based) offered by the School of IT at KMUTT

However, BioPhEPS students who took LNG601 automatically fulfill the university's English requirement but not the BioPhEPS' requirement. To fulfill the BioPhEPS' English requirement, each student must score at least 500 once on the paper-based TOEFL (PBT), which can either be administered by BioPhEPS (the students' admission PBT scores can be used for this purpose) or be taken at the School of IT at KMUTT.

Alternatively, a BioPhEPS student may take an official TOEIC (Test of English for International Communication) test and must score at least 650 in order to fulfill the BioPhEPS' English requirement.

RULES AND PROCEDURES OF BIOPHEPS SPECIAL RESEARCH PROJECTS

1. Rules for Special Research Projects

1. BioPhEPS staff will post topics, advisor(s), co-advisor(s), thesis committee, and timetable for presentations during the 3rd week of February.
2. Students should inform BioPhEPS administration about the selection of their research topics and begin their theses by the beginning of March.
3. Each student is required to give a proposal presentation by the middle of July.
4. Each student is required to give two progress presentations and a thesis defense presentation, which are evenly spread out during the five-month duration of the research.
5. For each presentation, students are required to inform the BioPhEPS administration about the date and the time at least three days before the presentation.
6. Students are required to submit a written report (e.g. proposal, progress, etc.) to the thesis committee at least three days before each presentation.
7. Each student is required to submit a draft copy of the thesis report to the committee and to the BioPhEPS administration at least one week before the thesis defense date.
8. Students are required to submit the Thesis Committee Confirmation Form to the BioPhEPS office before all presentations.
9. Students should submit a proposal form (U.1) including the advisor's signature to the BioPhEPS administration after the proposal presentation.
10. Students should have the committee members sign the U.2 form after their presentations on the thesis progress date.
11. Students are required to submit a U.1 form including the advisor's signature to the BioPhEPS administration at least three weeks before the thesis defense.
12. Students should have the committee members sign the U.3 form after their presentations on the thesis defense date.
13. Students must correct their thesis final reports and submit them to the Faculty of Engineering within 30, 45 or 60 days (at the discretion of the committee) after their thesis defense date.

14. Some research projects may offer extra stipends to the students. Students who receive monthly stipends (as loan) from BioPhEPS will not receive this extra money directly. Instead, the extra money will be deducted from the outstanding balance that the students owe to BioPhEPS upon their graduation. For those who do not borrow monthly stipends from the program, the extra money from the research group will be transferred directly to the students' bank accounts.
15. Some research projects may involve overseas collaboration and require that students spend a few months conducting research at an overseas institution. In such cases, it is the students' responsibilities to shoulder the costs and expenses of these trips. However, some overseas collaborators will provide small allowances to the student, while BioPhEPS will partially sponsor the airfare of the trip. The exact amount depends on the geographical location of the overseas universities.

Notes:

- Any student who does not follow these regulations will not be allowed to complete his/her thesis in one semester, unless prior exception is granted by the BioPhEPS staff.
- **If the students fail to complete the research in one semester due to poor performance and negligence, they will be fined 50,000 bath to maintain their status as KMUTT students.**
- BioPhEPS staff can help students with technical writing, particularly with the thesis reports. However, such students will need to contact the technical writing advisor early in the semester to work out a writing timetable.

2. Thesis Advisor(s) and Committee

Each research project will have at least one advisor. Some projects may have co-advisors.

A thesis proposal and a thesis defense require that a committee be present to evaluate the student's work. The research advisor will recommend and select committee members based on their expertise and qualifications in the field of research. The minimum number of committee for each research project is two. One of the committee members must come from inside ChEPS/BioPhEPS/ChE Department. Industrial sponsors can be committee members, provided that they have Master's or PhD degrees and must possess expertise in the field of research.

FREQUENTLY USED FORMS

The forms that are frequently used by BioPhEPS students for various purposes are listed below. They are also available for downloads at ChEPS' website at www.cheps-kmutt.com.

| Types of Form |
|---|
| 1. Special Research Project Selection Form |
| 2. Thesis Committee Confirmation Form |
| 3. Committee Contact Information Form |
| 4. Bor 1 (บ.1) |
| 5. Bor 2 (บ.2) |
| 6. Bor 3/1 ((บ.3/1) |
| 7. Wor Sor 1 (วศ.1) |
| 8. Special Research Project Evaluation Form |
| 9. Thesis Submission Form |
| 10. Debt Clearance Form (ใบปลดหนี้) |
| 11. Copyright Transfer Agreement Form |
| 12. Student Profile Form |

BIOPHEPS FACULTY MEMBERS AND STAFF

BIOPHEPS ADVISORY BOARD



1. **NAME** : Assoc. Prof. Dr. Sakarindr Bhumiratana
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RESEARCH AREAS/INTEREST

- Biogas research and development
- Transport properties of food materials
- Algal technology
- Research management, strategic and socio-economic activities



2. **NAME** : Assoc. Prof. Dr. Suvit Tia
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RESEARCH AREAS/INTEREST

- Pyrolysis and combustion of solid fuels, fluidized bed combustion
- Thermal storage and processing
- Energy conservation and management
- Design and development of chemical processes



3. **NAME** : Dr. Hong-ming Ku
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RESEARCH AREAS/INTEREST

- Process simulation and modeling
- Process optimization
- Optimization techniques and algorithms
- Engineering education such as PBL and design of practice-based curricula

BIOPHEPS FACULTY MEMBERS



1. **NAME** : Assoc. Prof. Dr. Asawin Meechai
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RESEARCH AREAS/INTEREST

- Applying metabolic engineering, systems biology and bioinformatics approaches to understand complex mechanisms in *Saccharomyces cerevisiae*, *Mucor rouxii*, *Spirulina platensis*, *Plasmodium falciparum*, *Mycobacterium tuberculosis*, and Cassava.

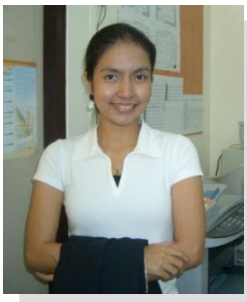


2. **NAME** : Assist Prof. Dr. Jindarat Pimsamarn
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RESEARCH AREAS/INTEREST

- Membrane technology gas separation by polymer membrane
- Biochemical engineering: enzyme production from bacteria and molds
- Material science and engineering: applications of gymsum



3. **NAME** : Dr. Saranya Thonglek
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RESEARCH AREAS/INTEREST

- Engineering education and work-integrated learning (WIL)



4. **NAME** : Assoc. Prof. Dr. Kwanchanok Pasuwat
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RESEARCH AREAS/INTEREST

- Controlled release of anticancer drugs from a biodegradable polymer system
- Microfluidics biosensor detection system



5. **NAME** : Assist. Prof. Dr. Dujduan Waraho-Zhmayer
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RESEARCH AREAS/INTEREST

- Synthetic Biology
- Protein Engineering (especially Antigen – Antibody Engineering)
- Metabolic Engineering
- In-vitro biosensors/immunosensors



6. **NAME** : Assst. Prof. Rungtiva Palangsuntikul, Dr.rer.nat.
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RESEARCH AREAS/INTEREST

- Chemical sensors and biosensors
- Computational Chemistry
- Computer aided molecular drug design



7. **NAME** : Assst. Prof. Dr. Boonserm Kaewkamnerdpong
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RESEARCH AREAS/INTEREST

- Bio-inspired Artificial Intelligence
- Neuroimaging and Neuroinformatics
- Educational Neuroscience
- Swarm robotics
- Nanorobotics



8. **NAME** : Dr. Sirinrath Sirivisoot
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RESEARCH AREAS/INTEREST

- Nanotechnology
- Biomaterials and biomedical devices



9. **NAME** : Dr. Nongluk Plongthongkum
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RESEARCH AREAS/INTEREST

- DNA methylation study in cancer
DNA methylation serves as an important layer of epigenetic regulation on the human genome activity. It plays crucial role as a key regulator of gene expression. Accumulating evidence suggests that aberration of DNA methylation is a characteristic feature of cancer development. Unlike genetic alterations, DNA methylation is a reversible process. Monitoring DNA methylation changes during tumorigenesis allows for early diagnosis of cancer progression and prognosis.



10. **NAME** : Dr. Tassaneewan Laksanasopin
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RESEARCH AREAS/INTEREST

- Point-of-care testing using microfluidic or lab-on-a-chip technologies



11. **NAME** : Mr. Wairuj Dechmahitkul
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RESEARCH AREAS/INTEREST

- Product development
- Bioprocess engineering

BIOPHEPS ADMINSTRATIVE STAFF



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