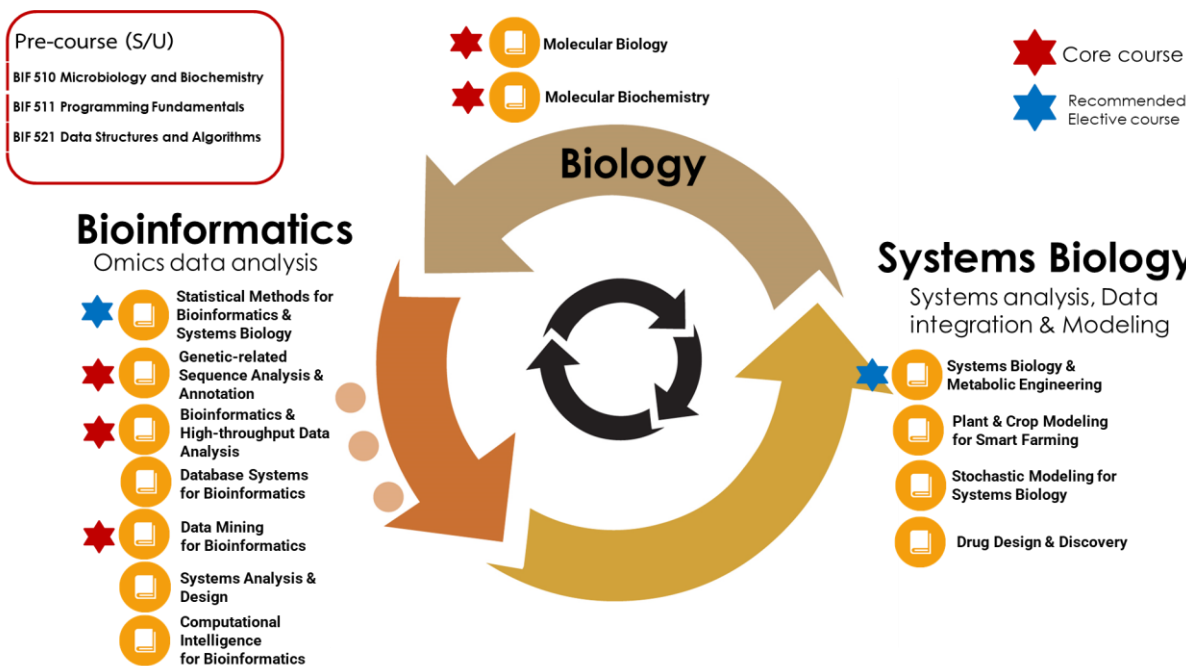# MSc in Bioinformatics & Systems Biology

Our international MSc programs are designed for students who desire focused training in the elements of biology, computer science, and information technology needed for a successful career in the exciting new discipline of Bioinformatics & Systems Biology. Students in our programs will receive comprehensive training in omics analysis, database design and management, software engineering and programming (including web-based development), simulation techniques and modeling, and data integration. Each student will apply their skills to a practical research project, where they will design and implement a solution to a real-world problem under the guidance of an experienced mentor.

PROGRAM LEARNING OUTCOMES

1) Solves biological problems using appropriate bioinformatics and systems biology approaches

1A: Explains foundations of biology, computing, statistics, and mathematics relating to bioinformatics and systems biology.
1B: Analyzes high-throughput biological data by integration of knowledge from different disciplines (biology, computing, statistics, and mathematics)
1C: Formulates research questions or hypotheses based on guidelines with an understanding of the role of bioinformatics and systems biology in it.
1D: Solves research problems/tests hypothesis by selecting effective bioinformatics and systems biology methods.

2) Communicates accurate information relating to bioinformatics and systems biology to diverse stakeholders

3) Takes part competently in diverse teams to accomplish a common goal by sharing their own ideas and accepting others' opinions

4) Values self and others with an understanding of ethical and social issues

CURRICULUM

Pre-course (S/U)
BIF 510 Microbiology and Biochemistry
BIF 511 Programming Fundamentals
BIF 521 Data Structures and Algorithms

Molecular Biology
Molecular Biochemistry

Core course
Recommended Elective course

Biology

Bioinformatics
Omics data analysis

Statistical Methods for Bioinformatics & Systems Biology
Genetic-related Sequence Analysis & Annotation
Bioinformatics & High-throughput Data Analysis
Database Systems for Bioinformatics
Data Mining for Bioinformatics
Systems Analysis & Design
Computational Intelligence for Bioinformatics

Systems Biology
Systems analysis, Data integration & Modeling

Systems Biology & Metabolic Engineering
Plant & Crop Modeling for Smart Farming
Stochastic Modeling for Systems Biology
Drug Design & Discovery

STUDY PLAN

MSc Track A (Coursework + Research Track)
1-Year Courseworks
1-Year Research
Total Credits = 38

MSc Track B (Coursework + Research + Internship Track)
1-Year Courseworks
6-Month Special Research Study / 6-Month Internship
Total Credits = 38

STUDY @

Schools of Bioresources and Technology (Bangkhuntein)

Schools of Information Technology (Bangmod)

Criteria for applicants

🙂 A bachelor's degree in biological sciences, computer science, computer engineering, medical sciences, chemistry, mathematics, statistics, or related disciplines.

🙂 (Optional) English test score (TOEFL iBT, IELTS or TETET)

Bioinformatics and Systems Biology Research ➡ Deep-tech Applications

- Personalized medicine
- Personalized nutrigenomics
- *In silico* drug discovery and design
- Microbiome for heath & well-being
- Smart farming & breeding
- Synthetic biology for future food

Microbiome & Metagenomic Analysis
Metagenomics is the study of genetic materials (of microbiome) derived directly from environmental samples using high-throughput sequencing technology. Microbiome is important for human, animal and plant health, including maintaining environmental balance.

Medical Bioinformatics
Bioinformatics plays an important role to analyze biomedical data for studying human health and diseases e.g. cancer, Alzheimer, Autism, etc. The research leads identifications of biomarkers for diagnosis, prognosis and prediction of drug response.

Plant Systems Biology
Modeling a (crop) plant to predict the phenotype under the exposed condition. Omics data analysis, biological network reconstruction and mathematical modeling have been applied to study the dynamic regulation inside plant cells, aiming to precision science for tailor-made yield and quality of phyto-products.

Drug Design and Discovery
Bioinformatics & systems biology empower the research to gain insights into drug-receptor interactions, potential gene / protein targets, structures and functions of biomolecules, allowing the designing of new effective drugs and therapies while saving cost and time.

International journal publications from our academic staffs & students

nature COMMUNICATIONS
nature microbiology
nature genetics
COMMUNICATIONS BIOLOGY
frontiers in Microbiology
SCIENTIFIC REPORTS
BMC Genomics
BMC Systems Biology
Nucleic Acids Research
Genes & Development
THE EMBO JOURNAL
PLoS one
Biotechnology Journal Systems & Synthetic Biology · Nanobiotech · Medicine
AMERICAN SOCIETY FOR MICROBIOLOGY Journal of Bacteriology
OMICS A Journal of Integrative Biology
BIOTECHNOLOGY BIOENGINEERING
processes
PeerJ
GCAT TACG GCAT genes
FEMS MICROBIOLOGY LETTERS

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Updated in 2021 (Improved MSc curriculum in 2021)