Doctor of Philosophy Program in Molecular Biology and Bioinformatics (International program)

In reviewing process, the subjects will be slightly adapted

Clarification of the code

Example 3((3)-0-6)

Number of credit((lecture hrs*)-lab hrs*-self-study hrs*)

*hrs per week

318-501 Molecular Biology for Biological Science 2(2-0-4)

The key genomic technologies; computational approaches for prognostics, diagnostics, and treatment of plant and animal diseases; How to sequence, assemble, and analyze the function and structure of genomes; explore methods for determining the heritability of traits & diseases; how to identify target genes

318-502 Molecular Biology for Physical Science 2(2-0-4)

Essential aspects of cell biology and molecular biology, macromolecules and organization of the cell, cell cycle and signal transduction, DNA structure and organization, the genetic code, and gene expression and its regulation, polymerase chain reaction and genome sequencing; function and structure of genomes analysis; explore methods for determining the heritability of traits & diseases; target genes identification

318-503 Bioinformatics I 2(1-2-3)

Using local blast; phylogenetic tree; primer design; microRNA target prediction; protein structures prediction and analysis; protein-protein interaction prediction and analysis using computer programs; searching and analyzing of variants by open source software; genome-wide association studies

318-504 Bioinformatics II 2(1-2-3)

Quality control checking of NGS sequence reads by open source programs, sequence assembly, gene ontologies finding, and transcriptome analysis; comparative genome analysis with programs; systems biology

318-505 Experimental Model Organisms 4(4-0-8)

Using model organisms to study biochemical and physiological functions in human; applications, advantages and disadvantages of using model organisms (yeast, plant, insect, mice and crustacean); using cultured human cells model for study of specific tissue functions and diseases

318-506 Production of Recombinant Protein 2(2-0-4)

Fermentation technology and bioprocessing, kinetics and thermodynamics of fermentation; batch and continuous fermentation; bioreactor design, operation and control, scale up; type and selection of bioreactor for production of recombinant protein; uses of recombinant protein in agricultural and medical application

318-507 Intellectual Properties 1(1-0-2)

Surveys intellectual property laws, including patents, copyrights, trademarks, design protection, how to apply for a patent, look for technology that is available for licensing

318-508 Functional Genomics 2(2-0-4)

Using genomic data to study gene expression and function on a global scale (genome-wide or system-wide), gene transcription, translation and protein-protein interactions; high-throughput methods

318-509 Systems Biology 2(1-2-3)

Cellular and population-level systems biology; synthetic biology; modeling of genetic networks; cell-cell interactions; computational methods for analysis and simulation biological networks; phenotype prediction based on systems biology approaches; genomics; transcriptomics; Metabotomics; proteomics

318-510 Protein Technology and Engineering 2(2-0-4)

Interaction among chemical structure of proteins and physical properties of proteins; properties of enzymes; kinetics of enzymes; biochemical techniques of protein purification; proteomics; protein database; modeling of 3D structure and its modification by genetic engineering

318-511 Genetic Engineering 3(2-3-4)

Definition and application of genetic engineering; structure and function of DNA; flow of genetic information; recombinant DNA technology; cloning; site directed mutagenesis; sequencing; gene expression; the impacts of genetic engineering in medicine; environmental and agriculture; biosafety

318-512 Software development for Bioinformatics 2(1-2-3)

Software development for bioinformatics using problem-based learning, getting requirements from users, software design; DNA and protein databases design; programming for retrieving and processing the database; program testing; program maintenance

318-513 Data Mining for Bioinformatics 2(1-2-3)

Data mining, process of data mining, data preparation, bioinformatics problem-based learning model, association rules, k-nearest neighbor classification, decision tree classification, neural networks classification, support vector machine classification, feature selection

318-514 Industrial system biology management 2(2-0-4)

Industrial management; management theory; planning, analysis and control for manufacturing system; GMP system; risk management; uses of industrial management knowledge in agricultural and medical application

318-515 Metabolomics 2(2-0-4)

Trace analysis of partial or total metabolites in an organisms and the association of chemicals in biomolecule system

318-516 Bioinformatics for beginner 2(1-2-3)

To pack with valuable information that introduces student to this new discipline. Easy-to-follow step by step through bioinformatics task. Get the tools to analyze sequences, use of databases, works with DNA and protein sequences, conduct similarity searches, build a multiple sequence alignment, edit and publish alignments, visualize protein 3-D structures, construct phylogenetic trees

318-517 Interaction between Food and Genes 2(2-0-2)

Research has shown that nutrients comprising foods affect gene expression, The process through which the DNA (deoxyribonucleic acid) comprising our genes is converted to RNA (ribonucleic acid) and proteins are produced, The various proteins formed at discrete points in this process function as enzymes (essential compounds that aid biochemical reactions), hormones, and other substances on which life depends, Thus, this interaction can be of considerable significance, The amount, form, and even the frequency of nutrients consumed can affect protein manufacture, resulting in less protein being produced, less than optimal functional forms of proteins, or no protein at all. Depending on individual genetic variations and age, these effects may result in varying individual responses to environmental factors, such as diet and drugs, The effects can be overt, such as the effects of vitamin deficiency diseases, or more subtle and complex, as in the manifestation of type 2 diabetes,

predisposition to obesity, and other chronic diseases, Discoveries in genetics and nutrition make it possible to creates opportunities to prevent disease and improve quality of life through functional foods and tailored diets

318-671 Seminar in Molecular Biology and Bioinformatics I 1(0-2-1)

Analysis of the literature from current literature in molecular biology and bioinformatics; presentation and interpretation of research findings; understand the code of conduct for researchers

318-672 Seminar in Molecular Biology and Bioinformatics II 1(0-2-1)

Seminar in topics in advanced molecular biology and bioinformatics; emphasize the rationale for research projects and the presentation and interpretation of research findings

318-673 Seminar in Molecular Biology and Bioinformatics III 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-674 Seminar in Molecular Biology and Bioinformatics IV 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-675 Seminar in Molecular Biology and Bioinformatics V 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-676 Seminar in Molecular Biology and Bioinformatics VI 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-677 Seminar in Molecular Biology and Bioinformatics VII 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-678 Seminar in Molecular Biology and Bioinformatics VIII 1(0-2-1)

Presentation and discussion of up-to-date research with guest speakers and visiting scientists

318-681 Special Topics in Molecular Biology and Bioinformatics I 1(1-0-2)

Independent study on interesting issues in progress or new findings in molecular biology and bioinformatics

318-682 Special Topics in Molecular Biology and Bioinformatics II 1(1-0-2)

Independent study on interesting issues in progress or new findings in molecular biology and bioinformatics

319-501 Techniques in Genomics and Proteomics 2(1-3-2)

Current and emerging technologies and approaches for genome sequencing; gene and protein expression, microarray, protein localization and protein-protein interactions

319-503 Science Communication 2(1-2-3)

To make scientific activity more understandable

319-504 Biosafety 1(1-0-2)

The safety and quality control issues related to product development in the biotechnology industry; issues related to government regulations; cartagena protocol on biosafety; act on biosafety of modern biotechnology; risk assessment, safety, storage and disposal of hazardous materials; the information pertains to a laboratory for Biosafety Level 1-4 (BSL1-4) facilities; biosafety guidelines

319-693 Thesis 36(0-108-0)

To equip candidate with some research skills and experience in molecular biology and bioinformatics under supervision of a thesis committee

319-694 Thesis 48(0-144-0)

To equip candidate with some research skills and experience in molecular biology and bioinformatics under supervision of a thesis committee

319-695 Thesis 72(0-216-0)

To equip candidate with some research skills and experience in molecular biology and bioinformatics under supervision of a thesis committee

326-641 Advanced Bacteriology 3(3-0-6)

Presentation and group discussion of current knowledge from published articles on bacteriology

326-651 Advanced Immunology 3(3-0-6)

Presentation and group discussion of current knowledge from published articles on immunology

326-681 Advanced Virology 3(3-0-6)

Presentation and group discussion of current knowledge from published articles on virology

330-602 Advance Cell Biology 3(2-3-4)

Light microscopes and electron microscopes; ultrastructures of cells and organelles; differentiation, specialization and cell aging and death, cancer cell; methods for cytological and cytochemical analysis and cell/tissue culture

344-563 Database Management Systems 3(3-0-6)

Database system architecture; relational database and normalization process; database models and database design; relational database languages; relational algebra and relational calculus languages; database security and integrity; transactions and concurrency control

344-564 Information Retrieval 3(3-0-6)

Information retrieval models; retrieval evaluation; query language and operations; text and multimedia operations; indexed and searching; parallel and distributed information retrieval; libraries and bibliographical systems; digital libraries

344-571 Artificial Intelligence 3(3-0-6)

Concepts and theories of intelligent systems; searching techniques; Heuristic search; propositional logic; predicate logic; production systems; logic reasoning systems; deductive and inductive inference systems; uncertainty; knowledge representation such as frame; conceptual graph; recursive transition network; introduction to Prolog programming; overview on expert system; machine learning; neural network; robotics; computer vision and natural language processing

347-531 Biological Statistics and Research Methodology 4(3-2-7)

Science research methodology; inferential statistics; sampling survey techniques; experimental designs; simple correlation and simple linear regression analysis; multiple linear regression; computer software applications

347-532 Applied Statistics for Research 3(3-0-6)

Introduction to data analysis; normal distribution; sampling distributions; estimation and hypothesis testing; one way analysis of variance; correlation and simple linear regression analysis; multiple linear regression; chi-square test; strategies for selecting appropriate statistical methods; computer software applications

660-711 Philosophy and Methodology of Dental Research 2(2-0-4)

Definition and types of research, how to acquire knowledge, reliability of bioinformatics, analysis of problems, research design, ethics, and how to read and criticize paper

660-791 Animal Cell Culture in Medical Research 2(1-3-2)

การศึกษาภาคทฤษฎีและทดลองทางห้องปฏิบัติการเพาะเลี้ยงเซลล์และเนื้อเยื่อ โดยเฉพาะเซลล์สัตว์ชั้นสูง เพื่อนำมาใช้ในงานทดลอง วิจัยทางทันตแพทย์ อาทิ การทดสอบความเป็นพิษของวัสดุทางทันตกรรม ปัจจัยที่กระตุ้นการเจริญของเซลล์ และการสื่อสารของเซลล์ เป็นต้น

Study of theory and laboratory technique in cell and tissue culture, particularly mammalian cells for experimental research such as toxicity test for dental materials, mitogenic factors, and cell communication