

2.1.2 Description of courses

BS7002 Foundation Course in Structural, Computational & Chemical Biology

The aim of this course is to ensure the graduate students to have fundamental knowledge on topics of structural and computational biology. Topics covered include: computational tools in bioinformatics, biological databases, combinatorial libraries, structural prediction of proteins, biophysical principle of biomolecular assembly, and enzymatic mechanisms.

BS7003 Graduate Seminar Course

To provide the graduate students a broad view on cutting edge research in the biological sciences. A series of seminars will be arranged to provide the graduate students a broad view on cutting edge research in the biological sciences. Speakers invited are faculty members of local universities, principle investigators of research institutes, and overseas visiting academics.

BS7109 Special Topics in Structural Biology

To keep students working in structural & computational biology acquainted with the current development of the subject. To acquire an in-depth understanding of the three dimensional atomic structure of biological macromolecules and the relationship between the conformation of proteins and nucleic acids with the biological activities of binding, transport, signaling and catalysis.

BS7204 Current topics in Biochemistry

This course is designed to be an intensive study of current research topics in modern Biochemistry. It will start with a brief review of basic physical and chemical principles in the field of Biochemistry and students will utilize these principles as vehicles to analyze and understand complex biological systems and processes at the molecular level, as illustrated by the examples chosen from current literature. A large portion of the course is devoted to the discussion of enzymes and other proteins with novel structures and functions.

Many proteins discussed in the class are important for understanding disease pathogenesis and developing new therapeutics. Two important experimental techniques (MS and NMR) in biochemical research will also be discussed. Journal articles from current literature will be assigned to students for presentation and discussion. The goal is to encourage the students to read and analyze primary literature critically by exposing them to the frontiers of biochemical research.

BS7307 Current Topics in Genetics & Genomics

To keep students working in Genomics and Genetics acquainted with the current development of the subject and offer them the opportunity to explore the topic of Genetics and Genomics in more depth and intensity. It aims to cover most recent advances in Genetic and Genomics research in order to bring the students from the realm of textbooks to the reality of contemporary science.

BS7313 Immunomics

Molecular biology, computer and information technologies have transformed immunology research. As a result it is difficult to do cutting edge immunology research without usage of computational tools and access to databases. Immunomics is a new field that combines traditional immunology with immunoinformatics, systems biology, high through-put genomics and proteomics technologies. This combination results in a powerful extension of genomics and proteomics which enables immunology research on system level. Students will be introduced to immunomics by using original research papers and reviews. Students learn in theory and praxis about data-driven research, hypothesis formulation and systems (biology) level thinking applied to disease relevant topics in immunology. Prerequisites are a working knowledge of bioinformatics, immunology and genetics.

BS7405 Current topics in muscle biology and neuromuscular diseases

This course uses skeletal muscle development as a paradigm to teach latest concepts in developmental biology and organogenesis. It also emphasizes the importance of "chalcones" in organ growth and size regulation. This highly research focused course is an essential components of modern biology and is included in the curriculum of graduate students as a part of "Current concepts. Another compelling reason to introduce this course is to give the graduate students a chance to learn and integrate the muscle developmental biology with state of the art therapeutic applications of stem cell biology and gene therapy. Given that the booming biotech industry in Singapore requires potential employees with concepts in modern biology such as stem cells, it is only appropriate to teach this course to the graduate students who will be potentially seeking employment and/or research careers.

The aims and objectives of the course are to gain in depth knowledge in

- skeletal muscle biology
- its development and disease that affect muscles
- Muscle stem cells and its applications
- Gene therapy

BS7406 Current Topics in Cell Biology

To keep students working in Molecular & Cell Biology acquainted with the current development of the subject. Through presentations and discussions of current topics in cell biology, we hope that students will have the opportunity to explore the up-to-dated knowledge and advanced techniques in cell biology research. In addition, this course will help students to develop the ability in evaluating experiments critically and stimulating their creative thinking.

BS7408 Current Topics in Immunology

To keep students working in Molecular & Cell Biology acquainted with the current development of the subject. Selected topics in immunology will be covered in greater depth. This course requires students to perform literature searches and reading of original publications and review articles on selected areas in immunology. Students are also required to participate actively in small group discussions, presentations, and report writings.

BS7411 Current Topics in Virology / Microbiology

To keep students working in Molecular & Cell Biology acquainted with the current development of the subject. It offer students the opportunity to explore the topic of Virology and Microbiology in more depth and intensity. Strong focus will be placed on a good understanding of challenges of emerging and re-emerging infectious diseases.

BS7413 Molecular Embryology

The proposed course will expose students to the model organisms, concepts, techniques and original research that constitute modern studies in embryonic development. Lectures by experts within and beyond the School of Biological Sciences will be complemented by study and class discussion of current papers from the scientific literature. Each student will be required to give a short (30 min) oral presentation summarizing key aspects of the background and results of the papers under study. Students will also write a term paper requiring familiarization with a current area of developmental research and proposals for further experimentation. This term paper will take the form of a mini grant proposal. A component of the final grade will be derived from participation in class discussions. Our knowledge of the molecular mechanisms underpinning embryogenesis has undergone unprecedented growth, and now impacts all areas of biological and clinical research.

BS7001 Foundation Course in Molecular & Cell Biology

The aim of this course is to ensure the graduate students to have fundamental knowledge on topics of molecular and cell biology. Topics covered include: molecular and cellular mechanisms, genomic manipulations, control of gene expression, molecular immunology, virology, cancer biology, and hereditary diseases.

BS7003 Graduate Seminar Course

To provide the graduate students a broad view on cutting edge research in the biological sciences. A series of seminars will be arranged to provide the graduate students a broad view on cutting edge research in the biological sciences. Speakers invited are faculty members of local universities, principle investigators of research institutes, and overseas visiting academics.

BS7101 Basics of TCM

This subject aims to give students a firm grounding in understanding the human physiological and pathological pathways, as well as the different basic principles used in disease prevention in Traditional Chinese Medicine (TCM). As drug discovery programme involve compounds and formulations from Traditional Chinese Medicine, students engaged in this area of research should benefit from some basic knowledge of Traditional Chinese Medicine.

BS7107 Computational Biology and Modeling

Students engaged in research in modelling will need to be familiarized with the relevant techniques. In this subject basic ideas for understanding biological phenomena using principles from underlying physical and chemical foundations used in computer modelling approaches are introduced. Emphasis will be on how these computational tools are applied to biological areas such as protein folding, membrane fusion, enzyme activity, drug-target interaction. These methods are illustrated with modern computer based laboratory practicals with graphical display of biological molecules. A variety of computational methods and modeling strategies are introduced, such as classical force field based on quantum theory and coarse grained models. Basic sampling techniques, such as Monte Carlo, molecular dynamics and Langevin dynamics simulation will be described.

BS7210 Pharmacology

With research programme in drug discovery, it is important for students in this discipline to acquire knowledge in pharmacology. This course consists of a series of lectures aiming at providing students with the necessary background knowledge pertaining to the field of pharmacology. Classes of drugs used clinically are introduced in a systematic approach, according to the major organ systems in the human body. Throughout the course, students will also engage in exercises where case studies are analyzed based on the topics covered.

BS7212 Drug Discovery and Development/Biotechnology

To keep students working in Chemical Biology & Biotechnology acquainted with the current development of the subject. Deals with the principles and technologies involved in the transition from basic biological research to the development of novel drugs.

BS7213 Functional genomics and proteomics

Genomics and proteomics are necessary tools for research in all areas of biological sciences. The progress in these fields are so fast that constant up-dating the techniques is necessary. Students will learn contemporary methods for genomic and proteomic analyses with emphasis on proteomic technologies and the application of proteomics to a wide range of biomedical researches. The course will cover mass spectrometry and microarray-based technologies, both for nucleic acids and proteins; the theory and practice on use of mass spectrometry for genotyping, gene expression analysis, protein identification and posttranslational modification characterizations; and protein expression analyses using different quantitative genomics and proteomics methods. Students will also be exposed to applications of these technologies in biomedical researches such as disease association studies, cancer research, stem cell, regenerative medicine, infective disease, pharmacology, and drug discovery.

BS7414 Advanced Microscopy

The course will enable graduate students to develop theoretical and hands-on expertise with light microscopes, teaching graduate students different advance imaging techniques that are commonly used in biological sciences research.