

MASTER OF SCIENCE IN IMMUNOLOGY

Vision

A dynamic, inclusive and globally competitive centre of excellence in teaching, research and service to humanity.

Mission

To provide quality education and training, and promote scholarship and community service for sustainable development.

Identity

A community of scholars' committed to the generation and dissemination of knowledge and cultivation of wisdom for the welfare of society.

Philosophy

Sensitivity and responsiveness to societal needs and the right of every person to knowledge.

ENTRY REGULATIONS

The common regulations for all master's degree in the University shall apply.

The general regulations for master's degrees in the school of Pure and Applied Sciences shall apply.

The following shall be eligible for registration for the Master of Science degree in immunology.

A holder of a Bachelor of Science degree with at least an upper second class honours with any of the Biological science disciplines studied to Bachelor of Science degree level.

A holder of Bachelor of Education degree who has studied Zoology to degree level either as a major or as regular subject and has attained at least an upper second class honours degree and has studied another science subject to degree level.

Holder of a Bachelor of Science or Bachelor of Education degree a lower second class honours degree and has majored in Zoology may be accepted provided he can produce evidence of proven postgraduate research ability.

Holders of Bachelor of science degree must have done minimum of two units of immunology and passed with a minimum score of a C.

Duration and pattern of the Course

The Department of Zoology offers M.Sc Immunology programme by coursework and examinations and thesis.

The Master of Science degree in Immunology shall extend up to a period of at least eighteen months.

In the first year of study, students will take nine units of which all are core

In the second year, students will concentrate on their research work and present a thesis.

Course units

SZL841: Cellular immunology

SZL842: Immunochemistry

SZL843: Molecular immunology and immunogenetics

SZL844: Immunohaematology

SZL845: Clinical Immunology

SZL846: Immunology of parasitic and infections diseases

SZL847: Reproductive immunology

SZL848: Immunochemical techniques

SZL 800: Research methodology

SZL 801: Scientific data Analysis

UNITS DESCRIPTION

SZL 841: Cellular Immunology

Purpose: To expose learners to cellular. The course is intended to provide knowledge of cellular immunology as required at MSC levels for students of Immunology

Learning Outcomes

By the end of this course, the student should be able to:

1. Have abroad picture of immunology as discipline at Msc level
2. Understand cellular immunology as foundation for all the other Msc units

Course Content

Introduction of immunology as distinct discipline. Innate and adaptive immunity including cellular receptors. Overview of Cells, tissues and organs of immune system. Lymphocyte circulation and Homing of cells of immune system. MHC molecules, structures and function. Antigen processing and presentation and cellular interactions. Effectors mechanism: CTL, T helper cells, macrophages, neutrophils, NK cells. Cytokines and chemokines and their biological functions. Complements as effector mechanisms

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Further reading

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 842: Immunochemistry

Purpose: To expose learners to immunochemistry as applied in immunology. The course is intended to provide knowledge of chemistry as applied in immunology

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand chemistry principles as applied in immunology
2. Principles of antigen/ antibody interactions

Course Content

Antigens and immunogens: classes, types and immunogenicity. Immunoglobulins: structure, properties, isotypes, function and, production, Immunization, purification and characterization. Antigen anti-body, reactions: specificity, affinity, avidity and principles of antibody detection methods. Complement pathways, regulations, functions of complements, and measurement of individual complement proteins. Vaccine development: identification of vaccine candidate. Adjuvants and their role in vaccinations

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Further reading

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 843: Molecular immunology and immunogenetics

Purpose: To expose learners to principles of immunogenetics. The course is intended to provide knowledge of molecular immunology

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand molecular biology as applied in immunology

2. Principles of genetics as applied in immunology

Course Content

Molecular genetics: Structure of DNA, genomic DNA, extrachromosomal DNA and cDNA, MRNA and RNA. Transcription, Mutations. Principles of protein biosynthesis and analysis. Hybridization techniques, DNA sequencing, restriction enzymes, southern and northern blot techniques, Principle of immunogenetics: MHC genes structure, organization and polymorphism. Immunoglobulin and T cell receptor genes: generation, diversity, isotype, switching, immunoglobulin superfamily. Molecular mechanism involved in cellular responses to external stimuli

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

gene cloning, restriction fragment length polymorphism (RFLP) analysis, PCR.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 844: Immunohaematology

Purpose: To expose learners to principles of Immunohaematology. The course is intended to provide knowledge of immunology as it relates to blood

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand immunology as applied in hematology
2. Have knowledge on principles of immunology as applied in blood, blood products and blood transfusion

Course Content

Ontogeny and phylogeny, of the haemopoietic tissues in vertebrates. Blood: composition, functions and quantification. Erythropoiesis: developmental defects, disease association and management of erythropoietic disorders. Haemoglobinopathies. Blood grouping: ABO, Lewis, Rh-Fir, Kell, Kidd blood group systems and Duffy blood antigens. Blood matching: principles, procedures and applications. Blood banking: principles, quality assurance, screening and transfusion.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

gene cloning, restriction fragment length polymorphism (RFLP) analysis, PCR.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

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Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 845: Clinical Immunology

Purpose: To expose learners to principles of clinical immunology. The course is intended to provide knowledge of immunology in diseases

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand immunology relevant for management of diseases
2. Have knowledge on principles of immunology as applied in both infectious and non infectious diseases

Course Content

Adaptive immune response mechanism in viral, bacterial, fungal and parasitic infections. MHC products and-diseases. Autoimmune diseases. Autoantibodies. Immune complex diseases. Immunodeficiency diseases: lymphocyte defects,

antibody and complement defects, malignancies of the immune system, diagnosis and evasion of host immune surveillance.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

gene cloning, restriction fragment length polymorphism (RFLP) analysis, PCR.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 846: Immunology of parasitic and infectious diseases

Purpose: To expose learners to principles of Immunoparasitology. The course is intended to provide knowledge of immunology during parasitic infection relevant for their management

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand immunoparasitology as discipline
2. Have knowledge of immunology relevant in management parasitic infection

Course Content

Host resistance to infection: immune responses, microbial and parasite antigens. Host immune responses to parasites: protozoa, helminthes and ectoparasites. Parasites evasionof host immunity. Immunological diagnosis of parasitic infections. Immunodiagnostic reagents: preparation, and quality control and standaization. Immunization and immunoprophylaxis. Vaccines: development, New approaches to vaccine development.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

gene cloning, restriction fragment length polymorphism (RFLP) analysis, PCR.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

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Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 847: Reproductive immunology

Purpose: To expose learners to principles of reproductive immunology. The course is intended to provide knowledge of immunology relevant in reproduction

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand principles of reproductive immunology
2. Have knowledge of immunology relevant in human reproduction

Course Content

Materno-foetal relationships: uterus a privileged site, tolerance, maternal immune responses in pregnancy; foetal immune responses *in utero*. Neonatal immune responses. Passive immunity: neonates, children; antibody transfer transplacentally and in milk; inherent risk factors. Maternal and paternal sterility: Antigenic incompatibility, allergy, circulating and anti-gamete antibodies. Applications in family planning

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum plasma, semen and embryos. Basic anatomy of organs of

immune system and of reproduction in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

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SZL 848: Immunochemical Techniques

Purpose: To expose learners to principles of immunological techniques. The course is intended to provide knowledge of immunology diagnoses reagents preparation and research

Learning Outcomes

By the end of this course, the learners should be able to:

1. Understand principles of Immunology in diseases diagnoses
2. Have knowledge of immunology as applied in disease diagnoses, reagents preparation and research

Course Content

SZL 848: Immunochemical techniques

Practical procedures in microscopy: light, and electron, x-ray diffraction. Cell separation and cell and tissue culture techniques. Antigen-antibody reactions. Purification and characterization. Methods: HPLC, ELISA, SDS-PAGE, Western blot. Quantitation of single cells secreting immunoglobins and/or cytokines. DNA structure, Gene cloning and sequencing: RFLPs, and PCR, their application. Monoclonal antibodies: production and uses tumour imaging and drug targeting.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

gene cloning, restriction fragment length polymorphism (RFLP) analysis, PCR.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

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Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

BACHELOR OF SCIENCE PROGRAMMES

Immunology units

SZL 307: Fundamentals of Immunology

Purpose: This course will introduce the immunology as discipline to learners. The course is intended to provide basic concepts and knowledge of immunology which is required for understanding of body functions in relation to the environment which is a prerequisite in study of biological systems

Learning Outcomes

By the end of this course, the student should be able to:

1. Appreciate immunology as a discipline
2. Understand basic principles of immunology
3. Understand how immunology fits in biological systems

Course Content

Introduction to immunology: Concepts of immunity and definitions. Innate and specific immunity. self and non-self discrimination. Humoral and cell mediated immunity. Cells, organs and tissues of immune system: Ontogeny, structure and functions. Lymphocyte activation and traffic. Immuno-globulins structure, functions and diversity. Allergic reactions: Classification and Immunopathogenesis. Examples of diseases associated with allergic reactions .Introduction to auto immunity. Introduction to Immunological techniques in biomedical research and clinical medicine with emphases on practicals

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

SZL 407: Advanced of Immunology

Purpose: To expose learners to advanced concepts in immunology. The course is intended to provide more knowledge of immunology for learners in sciences inclined to deep understanding of body biological functions in relation to the environment

Learning Outcomes

By the end of this course, the student should be able to:

1. Understand advanced concepts of immunology
2. Understand how immunology fits in many other disciplines relevant in sciences for education, environment human and animal health

Course Content

Advanced concept in innate and adaptive immunity. Reticuloendothelial system, phagocytosis and killing mechanisms. T and B cells interactions and effectors

functions: Cytokines and their roles in immune system. Complement system: structure, activation pathways and biological roles. Tolerance. Autoimmunity and diseases. Introduction to transplantation. Tumour immunology.

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015

Further reading

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

SZL 408: Applied Immunology

Purpose: To expose learners to application of immunology in life sciences. The course is intended to provide practical knowledge of immunology in sciences relevant for learners and practitioners of biology as applied discipline

Learning Outcomes

By the end of this course, the student should be able to:

1. Apply of immunology knowledge and skills in teaching, research and practice
2. Understand the application of immunology in related disciplines relevant in sciences for education, environment, human and animal health

Course Content

Immunogenetics: MHC molecules structures, functions and genetic restriction of immune responses and HLA typing. Management of diseases using immunological principles: transplantation, immunosuppression and Immunotherapy, vaccines, transgenic models and gene therapy. Blood grouping

and transfusions. Reproductive immunology. Maternal, foetal and neonatal immune responses. Applications of Immunological techniques in diagnosis, research, and clinical medicine:-, Antigen/antibody reactions etc, hybridoma technology, gene cloning, Western blotting SDS-PAGE, DNA probes, polymerase chain reaction.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

Mode of Delivery

Lectures . Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment

LCD projector and computers, Black /white boards, smart board, Chalk, white board markers, dusters, Class hand outs,

Course Assessment:

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015

Further reading

Abbas A. K and Lichtman A. H. (2007) Basic Immunology. ISBN 13: 978-4160-2974-8

Chemtai A. K. (1998) Immunology. ISBN 9966-22-155-7.

Practical series covering: Handling of laboratory animals and bleeding, Preparation of serum and plasma. Basic anatomy of organs of immune system in laboratory animals, Blood cells and microscopy, cells identification, differential counts, antibody antigen reactions

Purpose: This course introduces the learner to specific roles of the structures and cells of the immune system. The interaction of the cells of the immune system leading to lymphocyte activation following antigen processing and presentation is a core information important to the learner to understand the immune system and how it controls infection. Immune response to specific disease causing pathogens is part of this course.

Learning Outcomes

By the end of this course, the student should be able to:

1. Understand the complement activation pathways and biological roles.
2. Describe the ontogeny and phylogeny of cells of immune system and associated lymphoid organs
3. Explain the role of reticuloendothelial system
4. Describe Antigen Presenting Cells, Antigen processing and Presentation of peptides to T lymphocytes in the context of Major Histocompatibility Complex (MHC) Class I and Class II Molecules.
5. Explain effector functions of T lymphocytes
6. Describe Hypersensitivity reactions, Transplantation, Tolerance and Autoimmunity.
7. Describe Tumours, their types, causes, immunity, immune evasion and immunotherapy.
8. Explain immunodiagnostic techniques and their applications in research and disease diagnosis
9. Describe conventional and current approaches to vaccine development and their applications.

Course Content

Complement system: structure, activation pathways and biological roles, Phagocytes and the reticuloendothelial system, Phagocytosis, Ontogeny and Phylogeny of the lymphoid architecture, Cellular interactions during immune response: Class I and Class II pathways of antigen processing and presentation, T cell effector functions: cytotoxicity, and cytokine, Hypersensitivity reactions, Transplantation, Tolerance, Autoimmunity, Tumour Immunology, Vaccine production.

Mode of Delivery

Lectures, Group assignments, Class discussion, Literature search and Practical sessions.

Instructional Material/Equipment**Course Assessment:**

Take away assignments, Practical session reports, Sit-in CATs and Final Examination.

Core Reading Material

Rezaei N. Aalaei-Andabili S. H. and Kaufman H. L. (2015). Introduction to Cancer immunology and immunotherapy. Doi 10. 1007/978-3-662-44006-3_1. Springer Verlag Berlin Heidelberg 2015.

Further reading

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