College of Natural Sciences

Department of Biology

Curriculum for Master of Science (MSc) in

Biomedical Science

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July 2020

Arba Minch, Ethiopia
Curriculum for Master of Science (MSc) in

Biomedical Science

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1. Introduction

1.1. Historical Background

Arba Minch University (AMU) is located in Arba Minch town, south-west of Addis Ababa. It is founded at the eastern foot of the Gamo Mountains. It is adjacent to the two East Africa Rift Valley Lakes, Abaya and Chamo, which are separated by small mountain is called Yeegzer dildey mean “God’s bridge”. Primarily the University was established as Arba Minch Water Technology Institute in 1986 with the objective of creating skilled and qualified manpower vital for the effective exploration and utilization of water resources. The University was officially inaugurated in June 2004. During this time, it comprised four faculties (Natural Sciences, Social Sciences, Business and Economics, and, one institute and one school. Currently, there are five colleges such as: College of Natural Sciences, College of Medicine and Health Sciences, College of Agricultural Sciences, College of Social Sciences and Humanities, and College of Business and Economics, two institutes such as: Institute of Technology and Institute of Water Technology, and three schools such as: School of Graduate studies, School of Law and School of Pedogeological and Behavioral Sciences. At present, the University has enrollment capacity of about 40,000 students in all the programs.

College of Natural Sciences has seven departments (Biology, Chemistry, Geology, Mathematics, Physics, Sport Sciences and Statistics) comprising thirteen undergraduates, thirty-three masters and six PhD programs. The Undergraduate programs in the Biology Department includes Biology, Biotechnology and Laboratory Technology in Biological Sciences. Seven of the thirty-three masters and two of the six PhD programs in the College are hosted by Department of Biology. The Masters programs are Biotechnology, Botany, Zoological Sciences, Fishery Aquatic Sciences and Aquaculture, Environmental Sciences, Medical Entomology and Vector Control, and Wildlife Management. The PhD programs are Biotechnology, and Biodiversity Conservation and Management.
1.2. Vision and Mission of the Program

1.2.1. Vision

The Program aspires to be a competent Biomedical Science graduate program in Africa by 2035.

1.2.2. Mission

The Biomedical Science Program in the Department of Biology has a mission of producing highly qualified Biomedical Science graduates who can teach, do research and advocate in the control, prevention, diagnosis, and treatment of diseases.

1.3. Rationale of the Biomedical Science Program

Biology is a broad field of study within the Natural Sciences. It studies about life and living organisms including their physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution. For the better management of this broad field, Harmonization Team for Modular Harmonized Curriculum for BSc Degree Program in Biology at country level classified into ten major courses: Cellular Biology and Laboratory Techniques, Botanical Sciences, Zoological Sciences, Genetics and evolutionary Biology, Molecular Biology and Biotechnology, Microbial Biology, Biomedical Science, Ecological and Environmental Biology, Fisheries and Aquatic Sciences, and Biological Research Method and Applications. Based on the national direction and international experiences, the Department of Biology at Arba Minch University is striving to become a center of excellence in field of Biology by strengthening and opening graduate programs in each major field.

At this time, considering the demand of Biomedical Science specialists in the country, the University direction towards research university, and the human and physical resources in the Department, the Department of Biology is planning to commence a Biomedical Science Master’s Program.

Biomedical Science is an Applied Biology that tries to address medical issues. The field is an advanced internationally recognized and accepted field, which involves health oriented basic and applied research. Ethiopia is a country with high burden of infectious diseases and also before it able to tackle such diseases, the non-infectious diseases (non-communicable diseases) are on the
way to overlap and complicate the situation. These situations will continue and become a serious threat to health and socioeconomic development of the country unless more work is done on health problem solving researches. The dynamics of such diseases are very complex. The control, prevention, diagnosis, and treatment of such diseases require understanding of the biology of parasites, hosts and their environment. These require well designed Biomedical Science education with specialized focus on research.

To lessen the country’s health problem, the availability of adequate number of appropriately trained personnel is extremely crucial. Biomedical Research Institutions, Universities, Biomedical Companies, Federal, Regional and District Public Health Sectors require these personnel in their disease research, prevention, control, diagnosis, and treatment programs to deal with issues of infectious diseases. These involve basic and applied research, teaching, operational decision-making, and monitoring, evaluation and surveillance of disease Prevention and Control Programs.

Considering the existing human and physical resources in the Department of Biology and the University is located in the low lands of the country along with the rift valley, where infectious diseases are common. The area is usually known to have hot and humid weather conditions that naturally favor the spread of infectious diseases. In view of this, the Department believe that it is the right time to open the Biomedical Science Program at the right place to educate future Biomedical Scientists who will be part of the solution provider in the effort to solve the health problems of the country. For the time being, the Program mainly focus on infectious diseases.

1.4. Need assessment

Governmental universities get budget from public money collected via tax system. Educational programs require more investment to produce a qualified and competent professional. So, programs should not be opened randomly. Rather, it should be opened after the need assessment survey is conducted and if the demand based on assessment is confirmed. Therefore, need assessment for the Biomedical Science Master Program will be conducted by identifying potential direct beneficiaries before it opens in the Department of Biology, College of Natural Sciences, Arba Minch University. By introducing the main objectives and content of the program, expected or potential direct users of graduates will be communicated for their feedback
on the demand of the Biomedical Science specialists at MSc level. Potential employers/users of Biomedical Science graduates in Ethiopia are Universities, Research Institutions, Biomedical Companies, Federal Ministry of Health, Regional and Zonal Health offices and Health related NGOs. Institutions/organizations which will be participated in the need assessment survey and basic need assessment questions are listed in Appendix 1 and Appendix 2.
2. Program Objectives

2.1. General Objective

The main aim of this Biomedical Science Program is to produce qualified professionals/scientists who play key roles in the alleviation of human health problems through the application of biological principles in the control, prevention, diagnosis and treatment of infectious diseases.

2.2. Specific Objectives

- To produce competent graduates:
  - With advanced knowledge and understanding of medical issues related to infectious diseases.
  - With advanced knowledge of biological principles in the manipulation of infectious agents.
  - Who can identify human health problems and know how to address them by utilizing existing knowledge and/or new knowledge after carry out the necessary research project(s).
  - With appropriate attitude and willingness to incorporate biomedical research ethics.
  - With advanced skill to work on discovery and innovation via basic biomedical science research.
  - With appropriate skill to analyze contemporary health issues from multiple perspectives.
  - Able to have oral and written communication skill to convey their scientific results.

3. Graduate Profile

By the end of the program, students will able to demonstrate:

- Advanced knowledge and understanding of medical issues related to infectious diseases.
- Advanced knowledge and understanding of the basic biological principles in the manipulation of infectious diseases.
• Their ability to identify human health problems and strategy to tackle them via biomedical researches.

• Their knowledge in biomedical research ethics.

• Their ability to design and implement biomedical researches for discovery and innovation.

• Their ability to analyze contemporary health issues from multiple perspectives.

• Their ability to convey scientific results in oral presentation and written materials.

4. Quality assurance mechanisms

The program will implement the following quality assurance mechanisms to increase the competence. Different institutions will participate in the program implementation.

Table 1. Quality assurance approaches

<table>
<thead>
<tr>
<th>No.</th>
<th>Activities</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Regular seminars/workshops</td>
<td>Ensuring the graduate students to discuss on current topics and to improve their skill on scientific presentation</td>
</tr>
<tr>
<td>2</td>
<td>Inviting external examiners during thesis defense</td>
<td>Ensuring the standard with the other institutes</td>
</tr>
<tr>
<td>3.</td>
<td>Scientific presentation on national and/or international conferences</td>
<td>Ensuring the quality of the study/ disseminating the output</td>
</tr>
<tr>
<td>4.</td>
<td>Sample thesis evaluation by external reviewers</td>
<td>Ensuring the quality of the program/increasing the competence of the program</td>
</tr>
<tr>
<td>5.</td>
<td>Evaluation workshop with stakeholders</td>
<td>Assessing the impact of the graduates in research institutes, universities, biomedical companies, ministry of health, and health office at regional, zonal and district levels</td>
</tr>
<tr>
<td>6.</td>
<td>Introducing plagiarism checkers</td>
<td>Ensuring the quality of graduates’ work</td>
</tr>
<tr>
<td>7.</td>
<td>Publications in peer-reviewed journals</td>
<td>Ensuring the standard of the research work and the ability of graduates to communicate with professionals in science</td>
</tr>
</tbody>
</table>
5. Admission Requirements

To join the MSc program in Biomedical Science in the Department of Biology, applicants must meet the following admission requirements in addition to the AMU Senate legislation for graduate studies (Article 122).

5.1. Academic requirements

Applicants must have at least a bachelor degree in Biology, Laboratory Technology, Public Health, Pharmacy, Medicine, Animal Sciences, Animal Health, Veterinary Medicine, and other related fields. Besides, applicants should pass program specific entrance examination.

5.2. Non-academic requirements

Applicants should present two relevant letters of recommendations at least one from previous instructor.

Females are highly encouraged to join the program. Both male and females compute for 80% of available position and the remaining 20% is for females who cannot compute for 80% position but who fulfill the minimum entrance requirements. If females cannot use or satisfy the available opportunity, it will be used by male applicants.

Applicants with additional funding for research are advantageous. During competition, securing a research fund with evidence letter from funding organizations has 5% value as a bonus for competition.

6. Graduation Requirements

The graduates of Biomedical Science are expected to complete 37 Credit hours, score at least a CGPA of 3.00 and successfully defend MSc thesis. The Degree is awarded by AMU Senate according to AMU legislation.
7. Program Duration and Degree Nomenclature

7.1. Program Duration

The program is designed to be completed within two years. The 1st year of the program is dedicated to course work. Second year is dedicated to MSc seminar and MSc thesis. Whole or part of the MSc thesis research work can be done outside the University if it gets approval during proposal defense by the Department or DGC.

7.2. Degree Nomenclature

The English degree nomenclature of the program is Master of Science in Biomedical Science and the Amharic version is “Yesains master degree be የሰማಯንስ መስታወቂያ ያለንበት”.

8. Course Profile

8.1. Course Type

The Biomedical Science MSc program courses are classified into compulsory, supportive and elective courses. All compulsory courses and supportive courses have to be taken by graduate students. In addition, students are also expected to take two elective courses.

8.2. Course Coding

MSc Biomedical Science courses have six letters of prefix “BioMed” and three-digit numbers of suffix. The first digits are 6 (six) and 7 (seven) that indicate MSc level courses at 1st year and 2nd year, respectively. The middle digit indicates the course type: “0” for supportive courses, “1” for compulsory courses and “2” for elective courses. The last digit is from “1-9” based on the logical order of the courses. In the last digit, odd numbers indicate 1st semester courses and even numbers indicate 2nd semester courses within each course types.
### 8.3. List of Courses

Table 2 List of courses

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course code</th>
<th>Cr.hr.</th>
<th>Course Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biology of Pathogenic Bacteria &amp; Fungi</td>
<td>BioMed-611</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>2</td>
<td>Virology</td>
<td>BioMed-612</td>
<td>1</td>
<td>Compulsory</td>
</tr>
<tr>
<td>3</td>
<td>Advanced Vector Biology &amp; Vector Pathogen Interaction</td>
<td>BioMed-613</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>4</td>
<td>Biology of Parasitic Protozoa</td>
<td>BioMed-615</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>5</td>
<td>Biology of Parasitic Helminths</td>
<td>BioMed-616</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>6</td>
<td>Advanced Immunology</td>
<td>BioMed-617</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>7</td>
<td>Methods in Molecular Biology</td>
<td>BioMed-618</td>
<td>2 (1+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>8</td>
<td>Biostatistics</td>
<td>BioMed-601</td>
<td>3 (2+1)</td>
<td>Supportive</td>
</tr>
<tr>
<td>9</td>
<td>Epidemiology</td>
<td>BioMed-602</td>
<td>3</td>
<td>Supportive</td>
</tr>
<tr>
<td>10</td>
<td>Research Methods &amp; Scientific communication</td>
<td>BioMed-604</td>
<td>2</td>
<td>Supportive</td>
</tr>
<tr>
<td>11</td>
<td>Elective</td>
<td>BioMed-62X</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>12</td>
<td>MSc Seminar in Biomedical Science</td>
<td>BioMed-711</td>
<td>1</td>
<td>Compulsory</td>
</tr>
<tr>
<td>13</td>
<td>MSc Thesis</td>
<td>BioMed-719</td>
<td>6</td>
<td>Compulsory</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bioinformatics for Infectious Diseases</td>
<td>BioMed-622</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>2</td>
<td>Vector sampling, Identification &amp; Incrimination</td>
<td>BioMed-624</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>3</td>
<td>Medical Physiology</td>
<td>BioMed-626</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>4</td>
<td>Laboratory Animal Science</td>
<td>BioMed-628</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>5</td>
<td>Emerging &amp; re-emerging zoonoses</td>
<td>BioMed-620</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>6</td>
<td>Medical Malacology</td>
<td>BioMed-621</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>7</td>
<td>Proteomics</td>
<td>BioMed-623</td>
<td>2</td>
<td>Elective</td>
</tr>
</tbody>
</table>
Courses in Semesters

Table 3. List of courses in semester basis

Year 1- Semester I

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course Code</th>
<th>Cr.hr.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biostatistics</td>
<td>BioMed-601</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Advanced Vector Biology &amp; Vector Parasite Interaction</td>
<td>BioMed-613</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Biology of Pathogenic Bacteria &amp; Fungi</td>
<td>BioMed-611</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Biology of Parasitic Protozoa</td>
<td>BioMed-615</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Advanced Immunology</td>
<td>BioMed-617</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>15</strong></td>
<td></td>
</tr>
</tbody>
</table>

Year 1- Semester II

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course Code</th>
<th>Cr.hr.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Epidemiology</td>
<td>BioMed-602</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Research Methods &amp; Scientific communication</td>
<td>BioMed-604</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Virology</td>
<td>BioMed-612</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Biology of Parasitic Helminths</td>
<td>BioMed-616</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Methods in Molecular Biology</td>
<td>BioMed-618</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Elective</td>
<td>BioMed-62X</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>13</strong></td>
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</tr>
</tbody>
</table>

Year 2- Semester I

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course Code</th>
<th>Cr.hr.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MSc. Seminar</td>
<td>BioMed-711</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MSc. Thesis</td>
<td>BioMed-719</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>7</strong></td>
<td></td>
</tr>
</tbody>
</table>

Year 2- Semester II

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course Code</th>
<th>Cr.hr.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MSc. Thesis</td>
<td>BioMed-719</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>6</strong></td>
<td></td>
</tr>
</tbody>
</table>
8.3.1. Biology of Pathogenic Bacteria & Fungi (BioMed-611)

Course title: Biology of Pathogenic Bacteria & Fungi

Course Code: BioMed 611

Credit hour: 3 Cr. hr. (2+1)

Pre-requisite: None

Academic year:

Semester: I

Course description

The course will provide a concise overview and analysis of Biology of Pathogenic bacteria and fungi. It will highlight overview of pathogenic microbes and their detection, host-pathogen interaction and pathogenesis; and antimicrobial agents: mechanisms of action and resistance. Special attention will be given to major bacterial and fungal pathogens; and the disease they cause in humans.

Course objectives

At the end of the course, students will be able to:

- Recognize the pathogenic bacteria and fungi, source and rout of infection and mechanism of detection;
- Describe host-pathogen interaction and pathogenesis of pathogenic bacteria and fungi;
- Explain antimicrobial agents: mechanisms of action and microbial drug resistance, and;
- Describe the biology of major bacterial and fungal pathogens; and the disease they cause in humans.
- Prevention and control of human diseases caused by bacterial and fungal pathogens.

Course outline
1. **Overview: Basic Concepts (2hrs)**

   1.1. Microorganisms
   
   1.2. Human Microbiota
   
   1.3. Pathogens
   
   1.4. Sources and Routes of Infection
   
   1.5. Detection of Pathogen

2. **Mechanism of Pathogenesis (4hrs)**

   2.1. Host-Pathogen Interaction
   
   2.2. Virulence Factors

3. **Antimicrobial Agents (4hrs)**

   4.1 Sources of Antimicrobial Agents
   
   4.2 Kinds of Antimicrobial Agents
   
   4.3 Mechanisms (mode) of Action
   
   4.4 Microbial Drug Resistance

4. **Pathogenic Bacteria (6hrs)**

   4.1. Bacteria-basic concepts
   
   4.2. Mechanism of bacterial pathogenesis
   
   4.3. Diagnosis of bacterial infection
   
   4.4. Role of bacteria in disease
   
   4.5. Antibacterial agents and resistance
5. Major Bacterial Pathogens

5.1. Infections of the Respiratory System

5.2. Infections of the Gastrointestinal Tract

5.3. Infections of the Urinary Tract

5.4. Infection of the

5.5. Infection of the

6. Pathogenic Fungi (4hrs)

6.1. Fungi-basic concepts

6.2. Mechanisms of fungal pathogenesis

6.3. Diagnosis of fungal infection

6.4. Role of bacteria in disease

6.5. Antifungal agents and resistance

7. Major Fungal Pathogens

7.1. Dermatophytes

7.2. Subcutaneous Fungi

7.3. Opportunistic Fungi

7.4. Systemic Fungal Pathogens

8. Prevention and Control

8.1. Bacterial infection

8.2. Fungal infection

Practical Content

Practical 1: Methods for Isolation and identification of pathogenic bacteria and fungi from college premises
Practical 2: Isolation and identification of pathogenic bacteria and fungi from college premises

Practical 2: Processing of clinical samples for isolation and identification of bacteria and fungi

Mode of delivery

➢ The course will encompass lecture presentations combined with a variety of interactive learning activities including: structured group work, Lab activity, group and individual reflection, self-study and writing and plenary discussions.

Mode of evaluation:

▪ Class activity/attendance ................................................................. 5%
▪ Assignments (Article presentation) .................................................. 15%
▪ Laboratory Report .......................................................... 15%
▪ Mid exam .......................................................... 25%
▪ Final examinations .......................................................... 40%

References:

8.3.2.  Virology (BioMed-612)

Course Code: BioMed-612

Credit Hour: 1

Pre-requisite: Basic Molecular Biology and/or Genetic, and Microbiology courses

Academic Year: 1st year

Semester: 1st semester

Course Description:

This course will explore concepts in the field of virology with emphasis on the discovery and classification of viruses, virus structure, virus life cycle, virus transmission and epidemiology, methods used for viral diagnostics, DNA viruses, RNA viruses, reverse transcription viruses, virus vectors, subviral agents and prions, new emerging viruses, common viral diseases, vaccines and antiviral therapy.

Course Objectives:

The objective of this virology course is to enable students:

✓ To know about how the viruses had been discovered
✓ To understand the classification of viruses and the basic structure of viruses
✓ To explain the life cycle of viruses from its host cell attachment to exit, and the way it disseminates to next host
✓ To understand the basic principles and methods in diagnosis and detection of viruses
✓ To describe typical members of DNA viruses, RNA viruses and RT viruses
✓ To explain different types of virus vectors and their application
✓ To familiarize themselves with new emerging viruses and common viral diseases
✓ To familiarize themselves with the existing antiviral vaccines and antiviral therapy
Course Outline:

1. Discovery and Classification of Viruses
   1.1. Discovery of Virus
   1.2. Classification of Viruses
2. Virus Structure
3. Virus Life Cycle
   3.1. Steps in Virus Life Cycle
   3.2. Viral Entry
   3.3. Viral Gene Expression and Genome Replication
   3.4. Exit
   3.5. Types of Virus Infection
4. Virus Transmission and Epidemiology
   4.1. Portals of Virus Entry
   4.2. Dissemination within a Host
   4.3. Portals of Virus Exist
   4.4. Patterns of Infection
   4.5. Epidemiology
5. Diagnosis and Methods
   5.1. Virus Diagnosis
   5.2. Cultivation of Viruses
   5.3. Quantification of Viruses
   5.4. Purification of Viruses
   5.5. Genetic Manipulation of Viruses
   5.6. Laboratory Safety
6. DNA viruses
   6.1. Polyomaviruses
   6.2. Papillomaviruses
   6.3. Adenoviruses
   6.4. Herpesviruses
   6.5. Other DNA viruses
7. RNA viruses
7.1. Positive-Strand RNA Viruses
7.2. Negative-Strand RNA Viruses
8. Reverse Transcription (RT) Viruses
  8.1. Retroviruses
  8.2. Hepadnaviruses
9. Virus Vectors
  9.1. Gene Expression Vectors
  9.2. Recombinant Virus Vectors
  9.3. Gene Therapy Vectors
10. Subviral Agents and Prions
11. New Emerging Viruses
12. Viruses and Disease
  12.1. Influenza Viruses
  12.2. HIV and AIDS
  12.3. Hepatitis Viruses
  12.4. Tumor Viruses
13. Vaccines
14. Antiviral Therapy

Mode of Delivery:
✓ Lecture/discussions, video for visualization on certain topics, reading and writing assignments, and presentations

Mode of Evaluation:
✓ Mid-exam (40%), Assignment and presentation (20%) and Final exam (40%).

References:
Virology. 4th ed. USA: American Society for Microbiology.


8.3.3. Advanced Vector Biology & Vector Parasite Interaction (BioMed-613)

Course Code: BioMed-613

Credit Hours: 3 (2 +1)

Pre-requisite: General Entomology

Academic Year: 1st year

Semester: 1st semester

Course description

This course presents the major vectors of disease to man and animals. Students will learn to identify and understand the life cycles, morphology, and behavior of disease vectors. The interaction between the disease-causing pathogen and the arthropod vector will be covered, including biological and mechanical transmission of pathogens. Collecting and preserving medically important insects is also discussed.

Course objectives

By the end of this module, students should be able to:

- Demonstrate knowledge and understanding of key aspects of vector behaviour, vector ecology and vector-parasite interactions
- Demonstrate an understanding of how these features impact on the epidemiology and control of vector-borne diseases
- Apply a range of practical entomological techniques and tools used in research on vector competence and ecology
- Demonstrate the ability to critically evaluate the relevant scientific literature
- Demonstrate some of the skills required to design a research project related to vector biology or competence

Overall aim of the course
To provide students with a broad understanding of the key aspects of insect vector behaviour, vector ecology and vector-parasite interactions relevant to the epidemiology and control of vector-borne diseases.

The course is expected to include sessions addressing the following topics:

1. Major Vectors of human and animal diseases
   1.1. Anopheline mosquitoes
   1.2. Culicine mosquitoes
   1.3. Black-flies(Simuliidae)
   1.4. Phlebotomine sand-flies (Phlebotominae)
   1.5. Tsetse-flies (Glossinidae)
   1.6. Fleas (Siphonaptera)
   1.7. Lice (Anoplura)
   1.8. Ticks and Mites

2. Chemical ecology and Vector Behaviour
   2.1. Feeding and resting behaviours
   2.2. Dispersal and Learning
   2.3. Diapauses
   2.4. Application of Behavioural Approaches to Vector Control

3. Sexual behaviour and pheromones

4. Circadian activity rhythms and the gonotrophic cycle

5. Genetic and physiological determinants of vector competence and vector-parasite specificity

6. Effects of parasites on vector behaviour, survival and parasite transmission

7. Host-parasite interactions
   7.1. mosquitoes, *Plasmodium*,
   7.2. lymphatic filariae and wobachia;
   7.3. sandflies and *Leishmania*;
   7.4. blackflies and onchocerca;
   7.5. ticks and viral pathogens
**Teaching and learning methods**

Teaching will include formal lectures by specialists in each field, many with associated laboratory practicals; small group work for developing research proposals on selected topics related to the course. Visits will be made to research institutions working on vector behaviour and ecology and host-parasite interactions and control.

**Mode of assessment**

Mid examination (30%), final examination (40%), practical examination (10%) and term paper writing and presentation (15%).

**References**


8.3.4. Biology of Parasitic Protozoa (BioMed-615)

Course title: Biology of Parasitic Protozoa

Course Code: BioMed 615

Credit hour: 3 (2+1)

Pre-requisite: Principles of Parasitology

Academic year: 1st Year

Semester: 1st Semester

Course description:

This course is intend to equip students with advanced knowledge on biology of protozoa, host-parasite interactions and diseases caused by protozoa in humans and animals in different parts of the world. The course further enables students to review current articles on parasitic protozoa.

Course Objectives:

Upon successful completion of the course, the student will be able to:

♦ Identify taxonomically various medically important protozoa
♦ Apply knowledge on life cycles of common disease-causing protozoan to their control;
♦ Analyze mechanisms of host-parasite interactions
♦ Assess factors that affect geographical distribution of protozoan diseases;
♦ Evaluate the economic and public health importance of parasites;
♦ Suggest preventive and management measures of diseases
♦ Diagnose protozoan infections;
♦ Apply principles learnt to research on protozoan infections;

Course outline:

1. Introduction to parasitlogy
1.1. Definition and scope
1.2. Parasitology and Human welfare
1.3. Parasites of Domestic and wild Animals

2. Basic Principles and Concepts in Parasitology
   2.1. Systematics and taxonomy
   2.2. Evolution
   2.3. Immunology
   2.4. Pathology

3. Introduction to Parasitic Protozoa
   3.1. Forms and Functions
   3.2. Classification of Protozoan phyla

4. Kinetoplastida: Trypanosomes and Their kin
   4.1. Forms of Trypanosomatidae
   4.2. Genus Trypanosoma
   4.3. Genus Leishmania
   4.4. Other Trypanosomatid parasites

5. Other Flagellated Protozoa
   5.1. Retortamonada
   5.2. Diplomonada
   5.3. Trichomonada
   5.4. oplinida (slopalinida)

6. The Amoebas
   6.1. Amoebas infecting mouth and intestine
   6.2. Amoebas infecting brain and eyes

7. Apicomplexa
   7.1. Haemosporida: malaria parasites
   7.2. Piroplasmida
   7.3. Gregarinasina
   7.4. Coccidiasina

8. Ciliophora
   8.1. Spirotrichea
8.2. Litostomatea
8.3. Oligohymenophorea

9. **Microsporidia and Myxozoa: Parasites with Polar Filament**
   9.1. Microsporidia
   9.2. Myxozoa

**Practical Content:**

**Practical 1:** Introduction, Safety Rules and Calibration of laboratory equipment

**Practical 2:** Techniques of Specimens Collection and Examination

**Practical 3:** Faecal sample collection and macroscopic examination, microscopic examination of wet mounts: Identification of amoeba, Giardia, Isospora and other intestinal protozoa

**Practical 4:** Faecal sample collection and examination, concentration techniques (sedimentation and floatation) and Permanent staining techniques

**Practical 5:** Direct examination of urethral and vaginal smears

**Practical 6:** Collection and examination of blood specimens: microscopy and rapid diagnostic tests (RDT)

**Practical 7:** Identification of Plasmodia, Trypanosoma and other blood protozoa

**Practical 8:** Collection and examination of skin specimen: Identification of Leishmania

**Mode of delivery:**

- Interactive lectures
- Discussions

**Mode of evaluation:**

Article and Abstract presentation …………….. 10%
Review Paper .............................................. 10%

Laboratory Activity ................................. 20%

Mid exam ................................................. 20%

Final Exam .................................................. 40%

References:

Mcgraw-Hill Companies, Inc. pp 701.


Animal Parasitology by J.D Smith Medical Parasitology by K.J. Ryan and C.G. Ray Eds :

Journals

Journal of Parasitology, Published by: American Society of Parasitologists Open Access
The East and Central Africa Medical Journal
Trends in Parasitology
International Journal for Parasitology - Elsevier
Parasitology - Cambridge Journals Online
Journal of Parasitology Research — An Open Access Journal
Parasitology Research - Springer
African Journal of Parasitology Research Open Access
8.3.5. Biology of Parasitic Helminths (BioMed-616)

Course title: Biology of Parasitic Helminths

Course Code: BioMed 616

Credit hour: 3 (2+1)

Pre-requisite: Principles of Parasitology

Academic year: 1st year

Semester: 2nd semester

Course description:

To equip students with advanced knowledge on biology, host-parasite interactions and diseases of helminthes, particularly, Cestodes, Trematodes and Nematodes which cause diseases in humans and animals in different parts of the world.

Course Objectives:

Upon successful completion of the course, the student will be able to:

- Identify taxonomically various medically important helminthes of the Phyla; Platyhelminthe and Nematoda.
- Apply knowledge on life cycles of helminthes to their control;
- Analyze mechanisms of host-parasite interactions of helminthes relating to the diseases;
- Assess factors that affect geographical distribution of helminthes parasites;
- Evaluate the economic and public health importance of helminthes parasites;
- Suggest preventive and management measures of diseases caused by the helminthes;
- Diagnose helminthic infections;
- Apply principles learnt to research on helminthic parasites;

Course outline:
1. Introduction to Helminths
   1.1. Definitions and scopes
   1.2. Mesozoans
2. Platyhelminthes
   2.1. Introduction and Systematics
   2.2. Turelaria
3. Trematoda
   3.1. Forms, functions and Development
   3.2. Polygenetic Considerations
4. Digenic Trematodes
   4.1. Forms and Functions
   4.2. Metabolism and Development
   4.3. Phylogeny
   4.4. Strigeiformes
      4.4.1. Strigeoidea
      4.4.2. Schistosomatidea
   4.5. Echinostomatiformes
      4.5.1. Echinostomoidea
      4.5.2. Paramphistomoidea
   4.6. Plagiorchiformes and Opisthorrhormes
4.6.1. Plagioformes

4.6.2. Opisthochiformes

5. Monogenoidea

5.1. Forms and functions

5.2. Development

5.3. Phylogeny

6. Cestoidea

6.1. Forms and functions

6.2. Metabolism and Development

6.3. Classifications

7. Tapeworms

7.1. Pseudophyllidea

7.2. Caryophyllidea

7.3. Spathebothriidea

7.4. Cyclophyllidea

7.5. Proteocephalata

7.6. Tetraphyllidea

7.7. Trypanorhyncha

8. Nematoda

8.1. Introduction
8.2. Forms and functions

8.3. Metabolism, Development and Classification

8.4. Trichinella and Dioctophymatida

8.5. Tylenchina, pioneering parasites

8.6. Strogyloidia Bursate Rhabditans

8.7. Ascaridomorpha

8.8. Oxyuridomorpha

8.9. Gnathostomatomorpha and Spiruromorpha

8.10. Filaroidea

8.11. Dracunculoidea

Practical Content:

Practical 1: Identification of intestinal helminths by wet mounts and concentration

Practical 2: Identification of Schistosoma and other intestinal parasites by Kato-katz technique

Practical 3: Urine analysis for the detection of Schistosoma haematobium (Bilharzia)

Practical 4: Identification of intestinal nematodes by coproculture methods

Practical 5: Detection of pinworms from anal swab

Practical 6: Diagnosis of filarial nematodes from blood films

Mode of delivery:

- Interactive lectures
- Discussions
Field Trip

**Mode of evaluation:**

Review Paper ............................................. 10%

Laboratory Activity ................................. 20%

Field Report and Specimen collection ........ 10%

Mid exam ................................................. 20%

Final Exam .............................................. 40%

**Text Books and References:**


**Journals**

Journal of Helminthology
Journal of Parasitology, Published by: American Society of Parasitologists Open Access
The East and Central Africa Medical Journal
Trends in Parasitology o International Journal for Parasitology - Elsevier
Parasitology Research - Springer o African Journal of Parasitology Research Open Access
8.3.6. Advanced Immunology (BioMed-616)

Course Code: BioMed-616

Credit Hour: 3 (2 + 1)

Pre-requisite: Introduction to Immunology

Academic Year: 1st year

Semester: 2nd semester

Course Description:

This course will provide advanced knowledge of immunology with respect to basic concepts of immunology, innate immunity, antigens, how antigens are recognized by immune cells, development and maturation of immune cells, adaptive immunity, the link between cellular and humoral adaptive immunity, immune response to different infectious agents, hypersensitivity, autoimmunity, immunity during transplantation, and manipulation of the immune response.

Course Objectives:

The objective of Advanced Immunology course is to enable students:

- To understand the basic concepts of immunology
- To understand the mechanisms of innate immunity
- To know about different types of antigens and their properties/characteristics
- To understand how antigens are recognized by immune cells
- To know where immune cells are originated, developed and mature
- To understand the basic mechanisms of adaptive immunity
- To be familiarized with the cellular and humoral adaptive immunity and their link
- To be familiarized with different means of immune response to different infectious agents
- To be familiarized with adverse consequences of immunity
- To be familiarized with the manipulation of immune response as treatment and vaccine

Course Outline:
1. Introduction to Immunology and Innate Immunity
   1.1. Basic concepts of Immunology
   1.2. Innate immunity
   1.3. The Induced Response of Innate Immunity
2. The Recognition of Antigens
   2.1. Antigen Recognition by B-cell and T-cell Receptors
   2.2. The Generation of Lymphocyte Antigen Receptors
   2.3. Antigen Presentation to T lymphocytes
3. The Development of Mature Lymphocyte Receptor Repertories
   3.1. Lymphocyte Receptor Signaling
   3.2. The Development of B and T Lymphocytes
4. The Adaptive Immune Response
   4.1. T-cell Mediated Immunity
   4.2. The Humoral Immune Response
   4.3. Integrated Dynamics of Innate and Adaptive Immunity
   4.4. The mucosal Immune System
5. The Immune System in Health and Disease
   5.1. Failure of Host Defense Mechanisms
   5.2. Allergy and Allergic Diseases
   5.3. Autoimmunity and Transplantation
   5.4. Manipulation of the Immune Response

Practical Content:

Practical 1: General Laboratory Procedures, Safety Considerations, Notebook handling, Basic tools in Immunology Laboratory and Practice with Micropipettes

Practical 2: Preparation of serum and plasma from whole blood samples

Practical 3: Microscopic examination of blood Cells and Cell counting

Practical 4: Dissections of mice for major lymphoid organs
Practical 6: Isolation of Ig from serum

Practical 7: Isolation of monoclonal Ig

Practical 8: Cleavage of Ig using proteolytic enzymes

Practical 9: Antigen- Antibody Interaction

Practical 10: ELISA

Practical 11: Preparation of cell suspension

Practical 12: Isolation of cells

Practical 13: Cell culture

Practical 14: ELISPOT assays

Practical 15: Bioassay for cytokines

Mode of Delivery:

✓ Lecture/discussions, video for visualization on certain topics, reading and writing assignments, presentations and practical sessions

Mode of Evaluation:

✓ Lab report writing (10%), lab performance (5%), lab notebook (neatness, way of recording practical activities) (5%), practical exam (10%), mid-exam (30%), and final exam (40%).

References:


8.3.7. Methods in Molecular Biology (BioMed-616)

Course Code: BioMed-616

Credit Hour: 2 (1 + 1)

Pre-requisite: Molecular Biology and/or Genetics

Academic Year: 1st year

Semester: 2nd semester

Course Description:

This course will make students familiarize with the basic techniques in Molecular Biology such as DNA and RNA extraction, plasmid DNA extraction, quantification of nucleic acids, restriction digestion of plasmid DNA, amplification of DNA templates using thermo-cycler, Gel-electrophoresis, Protein extraction, DNA cloning and bacterial transformation, restriction fragment length polymorphism (RFLP), southern blotting, northern blotting and western blotting techniques.

Course Objectives:

At the end of this course students will be able to understand the principles and practice of:

✓ Extraction of DNA, RNA and plasmid DNA from a cell
✓ Quantification of nucleic acids using spectrophotometer
✓ Amplification of DNA templates using thermo-cycler
✓ Running Gel-electrophoresis
✓ Protein extraction
✓ DNA Cloning and Bacterial transformation
✓ Performing southern, northern and western blotting

Course Outline:

1. General Laboratory Procedures, Safety Considerations and Notebooks
2. Basic tools in the Molecular Biology Laboratory
3. Practice with Micropipettes
4. Nucleic Acid Extraction
   4.1. DNA Extraction
   4.2. Plasmid DNA Extraction
   4.3. RNA Extraction
5. Quantification of Nucleic Acids
   5.1. DNA Quantification
   5.2. RNA Quantification
6. Restriction Digestion of Plasmid DNA
7. Polymerase Chain Reaction (PCR)
   7.1. Conventional PCR
   7.2. Real Time PCR
8. Gel Electrophoresis
   8.1. Horizontal Gel Electrophoresis
9. Protein Extraction
   9.1. Vertical Gel Electrophoresis
10. DNA Cloning and Bacterial Transformation
11. PCR for Detection of Transgenes
12. Restriction Fragment Length Polymorphism (RFLP)
13. Nucleic Acid Blotting Techniques
   13.1. Southern Blotting
   13.2. Northern Blotting
   13.3. Western Blotting

Mode of Delivery:

   Lecture/discussions, video for visualization on certain topics and performing laboratory session.

Mode of Evaluation:
Lab report writing (25%), lab performance (15%), lab notebook (neatness, way of recording practical activities) (10%), practical exam (20%) and theoretical exam (30%).

References:

8.3.8. Biostatistics (BioMed-601)

Biostatistics

Course Code: BioMed-601

Credit Hours: 3 (2 + 1)

Prerequisite: Introduction to Statistics

Course description

This course covers both descriptive and intermediate (some are advanced) level statistics for public health. The descriptive statistics deals with frequency distribution, measures of central tendency and variability; probability and probability distributions; sampling and sampling distributions; statistical estimation; hypothesis testing and sample size determination. It also covers some demographic and health services statistics. The intermediate advance course deals with statistical methods that help understand relations between two or more variables. The techniques to be covered in this course include analysis of categorical data from epidemiological studies, correlation analysis, regression analysis, analysis of variance and survival Analysis.

Course objectives

At the end of the course students will be able to:

- Discuss the role of statistics in health science and explain the main uses of statistical methods in the broader field of health care
- Describe methods of collection, recording, coding and handling data;
- Calculate measures of central tendency and dispersion and present data in the form of tables, graphs etc.
- Identify and make use of data from existing health records;
- Apply different techniques of sampling;
- Explain and apply statistical estimation and statistical significance
- Get basic application skill of SPSS

**Course Content**

1. **Descriptive Statistics**
   
   1.1. Methods of data Collection
   
   1.2. Types of Scales of Measurement
   
   1.3. Frequency distributions (absolute, relative, cumulative): exercise in Excel
   
   1.4. Data summarization: Measures of Central tendency (Mean, Median, Mode) and Measures of Variability (Range, Inter-quartile range, Percentiles, Variance, Standard deviation, Coefficient of variation)
   
   1.5. Diagrammatic Representations: Bar graph, Histogram, Pie chart, Box and Whisker plot, Line graph and Scatter diagram: exercise in SPSS

2. **Probability and Probability Distributions:**
   
   2.1. Independent events, Mutually exclusive events
   
   2.2. Classical definition of probability, Conditional probability
   
   2.3. Probability Distributions (Discrete & Continuous): the Binomial distribution, the Normal distribution, the Poisson distribution.

3. **Sampling and Sampling Distributions:**
   
   3.1. Sampling theory in public health;
   
   3.2. Random numbers and their uses;
   
   3.3. Types of sampling (probability (simple random, systematic, stratified random, cluster, multi-stage sampling) and non-probability sampling); Sampling distribution of the mean.
4. Statistical Estimation:

4.1. Biased and Unbiased estimates;

4.2. Point and interval estimates;

4.3. C.I. for a single population mean,

4.4. C.I. for the difference between two Independent population means;

4.5. Paired Samples C.I. for the difference between two population means,

4.6. C.I. for a single population proportion,

4.7. C.I. for the difference between two population proportions.

5. Hypothesis Testing: Hypothesis (Null and Alternative);

5.1. Steps involved in testing a hypothesis;

5.2. Type I and Type II errors;

5.3. Critical region;

5.4. One- tailed vs. Two-tailed tests;

5.5. Test of hypothesis about a single population mean,

5.6. Test of hypothesis about the difference between two independent population means;

5.7. Test of hypothesis about paired difference of two population means,

5.8. Test of hypothesis about a single population proportion

5.9. Test of hypothesis about the difference between two population proportions.

6. Sample Size Determination (for different study designs)- (with exercise in Epi-Info), Applications of selected statistical tests (with exercise in SPSS)
6.1. Chi-square test

6.2. ‘95% CI for OR’

6.3. T-test

6.4. One-way ANOVA

6.5. Bivariate correlation

6.6. Linear regression

6.7. Binary logistic regression

6.8. Survival analysis

6.9. Cox-regression

6.10. Kaplan-Meier curve

6.11. Non-parametric tests

6.12. Sign test

6.13. Mann-Whitney

6.14. Wilcoxon

7. Demographic and health service statistics (reading assignment- documents will be provided)

7.1. Questionnaire design

7.2. Reporting output of statistical analysis

8. Design & Analysis of Operational Studies

**Teaching and learning methods**: Lecture/discussion, assignment, class work, uses of computer (Statistical packages, SPSS)
Evaluation: Assignments (20%), quiz (10%), mid examination (30%) and final examination (40%).

References


8.3.9. Epidemiology (BioMed-602)

Course Code: BioMed-602

Credit Hour: 3

Pre-requisite: Biostatistics

Academic Year: 1st year

Semester: 2nd semester

Course description

This course provides a foundation of topics in epidemiology through examining infectious disease, chronic diseases, and general health. Students will learn from real world health problems and demonstrate how epidemiology is used to better understand, prevent, and treat these “health states” among the population.

Course objectives

At the end of the course, students will be able to:

- Define epidemiology and explain the importance of this field in improving the overall health of the global population.
- Apply to understanding distribution and determinants of infectious and chronic diseases.
- Critically evaluate epidemiology topics in the media and the science behind these studies to better understand your “risk” in developing infectious disease or preventing a negative health outcome.
- Understand the contribution of social, economic, genetic, environmental and cultural factors associated with disease development, treatment and prevention.

Course outline:

1. Introduction
   1.1. Definition and purpose
   1.2. Relation to other disciplines
1.3. Milestones in epidemiological research
1.4. Types of epidemiological studies
1.5. Methodological limits

2. **Basic Concepts in Epidemiology**
   2.1. Causation and causal inference
   2.2. Measures of disease frequency
   2.3. Measures of effect
   2.4. Confounding
   2.5. Selection and information bias

3. **Rates, Risks, Measures of Association and Impact**
   3.1. Incidence and hazard rates
   3.2. Measures of disease risk
   3.3. Measures of association
   3.4. Measures of impact

4. **Epidemiological Studies**
   4.1. Descriptive studies
   4.2. Cohort studies
   4.3. Case-control studies
   4.4. Intervention trials

5. **Modern Epidemiologic Study Designs**
   5.1. Case-cohort studies
   5.2. Nested case-control studies
   5.3. Case-crossover studies
   5.4. Case-time-control studies
   5.5. Case-specular studies

6. **Confounding and Interaction**
   6.1. Confounding
   6.2. Interaction
   6.3. Detecting interactions

7. **Epidemiological Field Work in Population-Based Studies**
   7.1. Asking for information
7.2. Field study measures and questions
7.3. Administration of field instruments
7.4. Reliability and validity of field measure
7.5. Field work language and culture

8. Exposure Assessment
8.1. Definition of exposure
8.2. Exposure data
8.3. Process of exposure assessment
8.4. Measurement errors

9. Design and Planning of Epidemiological Studies
9.1. Early planning
9.2. Design
9.3. Measures of disease outcome and exposure
9.4. Confounding and statistical analysis
9.5. Practical issues

10. Quality Control and Good Epidemiological Practice
10.1. Data scope
10.2. Quality in the planning phase
10.3. Quality during study conduct
10.4. Quality after data collection

11. Statistical Methods in Epidemiology
12. Applications of Epidemiology

Mode of delivery

➢ The course will encompass lecture presentations combined with a variety of interactive learning activities including: structured group work, group and individual reflection, self-study and writing and plenary discussions. It also be accomplished by classes based discussions and written analysis of current primary literature in the field of epidemiology and current topics.

Mode of evaluation
▪ Class activity/attendance ................................................................. 5%
▪ Assignments 1 ...................................................................................... 15%
▪ Assignments 2 ...................................................................................... 15%
▪ Mid exam ............................................................................................. 25%
▪ Final examinations .................................................................................. 40%

References

Course Code: BioMed-604

Credit Hour: 2

Pre-requisite: Biostatistics

Academic Year: 1st year

Semester: 2nd semester

Course Description:

This course will familiarize students about the need of research, types of research, writing of research proposal, ethics in research, formats of scientific research reports, basic rules of scientific paper writing, concerns of plagiarism in scientific writing, how to write seminar paper, how to evaluate published articles, how to prepare PowerPoint and poster for oral and poster scientific presentation, publication process and its ethics, and finally deals about on how to communicate science for non-scientific communities/audiences.

Course Objectives:

The objective of this course is to enable students:

➢ To understand some basic concepts of research and its methodologies
➢ To describe the scientific writing process and its key stages
➢ To organize and compose a scientific paper in accordance with the IMRAD (Introduction, Methods, Results and Discussion)
➢ To analyze and review scientific papers in terms of key message, consistency and justification
➢ To reflect on the benefits of working in teams in scientific writing and describe the rules of co-authorship
➢ To write scientific review paper, thesis manuscript, research paper
➢ To reflect on the ethics in scientific writing
➢ To prepare scientific research presentation material for oral and poster presentations in a seminar or scientific conferences

Course Outline:

1. Concepts of Research
   1.1. The Need of Research
   1.2. Types of Research
   1.3. Writing of Research Proposal
   1.4. References in the Text and the List
   1.5. Ethics in Research
   1.6. Steps in Conducting Research
2. Typical Types of Research Reports and their Format
   2.1. Thesis
   2.2. Manuscript
3. Basic Rules of Writing in each Elements of the Thesis and Manuscript
4. Plagiarism
5. Seminar writing
6. PowerPoint Preparation and Oral Presentation
7. Scientific Poster Preparation and Presentation
8. Publication Process in a Journal
   8.1. How to Select a Journal for Submission of a Manuscript
   8.2. Rearrange the Manuscript according to a Journal Guideline
   8.3. Submission of the Manuscript
   8.4. Editorial and Peer Review Process, and their Decision
   8.5. What to do if Accepted with Modification/Revision?
   8.6. Proofreading for Publication
   8.7. What to do if Rejected?
   8.8. Common Errors in Scientific Manuscripts
   8.9. Common Reasons Why Manuscripts are Rejected
   8.10. Ethics in Scientific Publication
9. Communicating Science to Non-scientific Audience
Mode of Delivery:

✓ Lecture/discussions, Articles evaluation, Proposal writing, Seminar writing, Poster preparation, PowerPoint preparation, and presentations.

Mode of Evaluation:

✓ Reference listing of different types of sources (10%), Mini-research proposal writing (20%), Mini-seminar writing (20%), Proposal presentation (10%), Seminar presentation (10%), Article evaluation (15%), and Poster presentation (15%).

References:

8.3.11. Bioinformatics to Infectious Diseases (BioMed-622)

Course Code: BioMed-622

Credit Hour: 2

Pre-requisite: Basics in Molecular Biology and/or Genetics

Academic Year: 1st year

Semester: 2nd semester

Course Description:

This course will explain about bioinformatics and its biological foundations including nucleic acids (DNA and RNA) and proteins, and their genetic information and structures. Deals about different types of biological databases. Discusses the comparison mechanisms to use available biological databases with the assistance of software and decoding of genomes. Describes the structure of proteins and structural based rational design of drugs. Lastly, discusses about functional and comparative genome analysis.

Course Objectives:

The objective of this course will be to enable students:

✓ To understand the basic concepts and applications of bioinformatics
✓ To familiarize themselves with the available biological databases
✓ To differentiate and utilize available biological databases for proteins, RNAs and DNAs
✓ To be skillful on utilization of bioinformatic software
✓ To understand on how to design drugs rationally
✓ To understand the functional and comparative genome analysis

Course Outline:

1. Introduction to Bioinformatics
2. Biological Foundations of Bioinformatics
2.1. Nucleic Acids and Proteins
2.2. Structure of the Nucleic Acids DNA and RNA
2.3. The Storage of Genetic Information
2.4. The Structure of Proteins
3. Biological Databases
   3.1. Biological Knowledge in Stored in Global Databases
   3.2. Primary Databases
   3.3. Secondary Databases
   3.4. Genotype-Phenotype Databases
   3.5. Molecular Structure Databases
4. Sequence Comparisons and Sequence Based Database Searches
   4.1. Pairwise and Multiple Sequence Comparisons
   4.2. Database Searches with Nucleotide and Protein Sequences
   4.3. Software for Sequence Analysis
5. Decoding of Eukaryotic Genome
   5.1. The Sequencing of Complete Genome
   5.2. Characterization of Genomes using STS and EST Sequences
   5.3. EST Project Implementation
   5.4. Identification of Unknown Genes
   5.5. The Discovery of Splice Variants
   5.6. Genetic Causes for Individual Differences
6. Protein Structure and Structure Based Rational Drug Design
   6.1. Protein Structure
   6.2. Signal Peptides
   6.3. Transmembrane Proteins
   6.4. Analyses of Protein Structures
   6.5. Structure based Rational Drug Design
7. Functional Analysis of Genomes
   7.1. The Identification of the Cellular Functions of Gene Products
   7.2. Systems Biology
8. Comparative Genome Analysis
8.1. The Era of Genome Sequencing
8.2. Drug Research on the Target Protein
8.3. Comparative Genome Analysis Provide Information about the Biology of Organisms
8.4. Comparative Metabolic Analyses
8.5. Groups of Orthologous Proteins

Mode of Delivery:

✓ Lecture/discussion, practical session using computer to access databases, assignments, and groupwork.

Mode of Evaluation:

✓ Mid-exam (20%), Assignment and Practical exam (40%), and Final exam (40%).

References:

8.3.12. Vector Sampling, Identification & Incrimination (BioMed-624)

Course Code: BioMed-622

Credit Hour: 2

Pre-requisite: Advanced Vector Biology & Vector Parasite Interaction

Academic Year: 1st year

Semester: 2nd semester

Course Description:

The course is expected to include sessions addressing the following topics: Introduction to both traditional and modern techniques, including morphological keys, cytotaxonomy, PCR, Species complexes in relation to biology and control. It also includes sampling and identification of mosquitoes, phlebotomine sand-flies, tsetse flies, and snails. Techniques in vector incrimination will also be addressed in this course.

By the end of this module, students should be able to:

- Appreciate the importance of accurate identification of the major groups of arthropods and snails in relation to disease transmission and control
- Select appropriate sampling methods for the major groups of vectors
- Apply a range of techniques for the identification of vectors in areas where the use of conventional methods may be problematic, i.e. species complex identification.
- Understand the principles and the methods of vector incrimination

1. Major vector groups

   1.1. Mosquitoes (anopheline and culicine)
   1.2. Blackflies
   1.3. Phlebotomine sandflies
   1.4. Tsetse flies
   1.5. Fleas
1.6. Louse
1.7. Ticks and Mites

2. Intermediate hosts

2.1. Snails

3. Sampling techniques

3.1. Trapping (CDC light traps, sticky traps, tsetse traps)

3.2. Population estimates (mosquitoes)

4. Identification techniques

4.1. Keys (traditional & computer)

4.2. Crossing experiments

4.3. Polytene chromosome analysis

4.5. Molecular techniques (PCR)

5. Incrimination techniques

5.1. Dissection (bugs, snails, mosquitoes)

5.2. ELISA (mosquitoes)

Teaching and learning methods

This course is predominately laboratory-based. The practical sessions are an important point for extensive interaction in terms of practical skills as well as to support the theoretical content of the lectures. Students will gain hands-on experience in preparing specimens for identification, use of identification keys, dissection, ELISA, blood meal analysis and the use of qPCR. Sampling of major vectors will be done in different collection sites.

Assessment details
The tasks will be a practical exam with questions relating to material covered during practical sessions and a short answer theory exam.
8.3.13. Medical Physiology (BioMed-626)

Course title: Medical Physiology

Course Code: BioMed 626

Credit hour: 2

Pre-requisite: Introductory course on physiology

Academic year: 1st year

Semester: 2nd semester

Course description:

The course focuses on a few themes that provide a full view of what the human body is capable of and of the exciting processes going on inside of it. The themes are: Structure and function of the body, and the connection between the two; Homeostasis, the body’s natural tendency to maintain a stable internal environment; Levels of Organization, the major levels of organization in the human organism from the chemical and cellular levels to the tissues, organs and organ systems; Integration of Systems, concerning which systems are subsets of larger systems, and how they function together in harmony and conflict.

Course Objectives:

Upon completion of this course, students will be able to:

- Understand how the human body works under normal and disease conditions
- Explain the levels of organization and their coordination systems
- Acquire advanced knowledge of body function and its medical implication
- Describe each organ system and the medical implication

Course outline:
1. Unit One: GENERAL PHYSIOLOGY
   1.1. The Internal Environment
   1.2. Control of Cell Function
   1.3. Membrane Transport
2. Unit Two: CARDIOVASCULAR PHYSIOLOGY
   2.1. Hemodynamics
   2.2. Mechanical and Electrical Activity of the Heart and the Electrocardiogram
   2.3. Regulation of Arterial Pressure, Venous Return and Cardiac Output
   2.4. Capillary Exchange and Regulation of Regional Blood Flow
3. Unit Three: RESPIRATORY PHYSIOLOGY
   3.1. Structure and Function of the Respiratory System
   3.2. Mechanics of Breathing
   3.3. Oxygen and Carbon Dioxide Transport in the Blood
   3.4. Pulmonary Gas Exchange
   3.5. Control of Breathing
4. Unit Four: RENAL PHYSIOLOGY
   4.1. Functional Anatomy of the Kidney and Micturition
   4.2. Renal Blood Flow and Glomerular Filtration
   4.3. Mass Balance in Body Homeostasis and Renal Function
   4.4. Reabsorption and Secretion in the Proximal Tubule
   4.5. Reabsorption and Secretion in the Loop of Henle, Distal Tubule, and Collecting Duct
   4.6. Regulation of Body Fluid Osmolality
   4.7. Regulation of Sodium Balance and Extracellular Fluid Volume
   4.8. Renal Regulation of Potassium, Calcium, and Magnesium
   4.9. The Role of the Kidney in Acid-Base Balance
5. Unit Five: GASTROINTESTINAL PHYSIOLOGY
   5.1. Regulation
   5.2. Motility
   5.3. Secretion
   5.4. Digestion and Absorption
   5.5. Intestinal Electrolyte and Water Transport
6. Unit Six: ENDOCRINE PHYSIOLOGY
   6.1. Introduction to Endocrine Physiology
   6.2. Pituitary Gland
   6.3. Thyroid Gland
   6.4. Adrenal Glands
   6.5. The Pancreatic Islets
   6.6. Hormonal Regulation of Fuel Metabolism
   6.7. Hormonal Regulation of Calcium Metabolism
   6.8. Hormonal Growth Control
   6.9. Hormonal Control of Reproduction in the Male
   6.10. Hormonal Control of Reproduction in the Female: The Menstrual Cycle
   6.11. Hormonal Control of Reproduction in the Female: Pregnancy and Lactation

7. Unit Seven: CENTRAL NERVOUS SYSTEM PHYSIOLOGY
   7.1. Organization of the Nervous System.
   7.2. Sensory Receptors of the Somatosensory System.
      7.2.1. The Visual System,
      7.2.2. The Vestibular System,
      7.2.3. The Auditory System
      7.2.4. The Chemical Senses: Smell and Taste
   7.3. Lower Motor Neurons of the Spinal Cord and Brain Stem
   7.4. The Motor Cortex
   7.5. The Basal Ganglia
   7.6. The Cerebellum
   7.7. Neuronal Control of Mood, Emotion, and State of Awareness
   7.8. Learning and Memory

**Mode of delivery:**

Interactive lecture

Discussion

**Mode of evaluation:**

58
Review paper ............................................ 20%

Assignments ............................................. 10%

Mid Exam .................................................... 30%

Final Exam ................................................... 40%

References:


8.3.14. Laboratory Animal Science (BioMed-628)

Course Code: BioMed-628

Credit Hour: 2 (1 + 1)

Pre-requisite: None

Academic Year: 1st year

Semester: 2nd semester

Course Description:

Researches in the field of Biomedical Science mostly involve laboratory animals for part of their experiment which demands proper training on laboratory animals. This course will provide basic knowledge on laboratory animals and skills on how to handle and use them for experimental works with respect to Animal Welfare, and collection of informative, unbiased and reproducible data. It explains about laboratory animals and biomedical research, welfare, quality control, anatomy, physiology and husbandry of laboratory animals, principles of creating and using animal Models for studying human diseases, animal experimentation and design, organization and management of animal experiments and includes practical session on how to handle, identify and mark laboratory animals, removal of fur, transdermal, enteral and parenteral administration to lab animals, blood, feces, urine and other body fluid collection from lab animals, provision of anesthesia, performing dissection and surgery, collection of pathological samples and how to perform euthanasia.

Course Objectives:

The objective of this course will be to enable students:

✓ To understand about laboratory animals and their link with biomedical research
✓ To know about animal welfare, quality control, anatomy, physiology and husbandry of laboratory animals
✓ To understand the principles of creating and using animal models for studying human diseases
✓ To familiarize with animal experimentation and design, organization and management of animal experiments
✓ To be skillful on handling, identification, removal of fur, administration of fluids, collection of bloods, urines, feces, other fluids, anesthesia administration, surgical operations and euthanasia.

Course Outline:

1. Laboratory Animals and Biomedical Research
   1.1. Introduction of Laboratory Animal Sciences
   1.2. History and Application of Laboratory Animals
   1.3. Use of Laboratory Animals Currently
   1.4. Management of Laboratory Animals

2. Welfare of Laboratory Animals
   2.1. The Concepts of Animal Welfare
   2.2. Stress, Pain, and Distress
   2.3. Animal Ethics
   2.4. Principles of the 3Rs (Reduction, Replacement, and Refinement)
   2.5. Humane End Points of Animal Experiments

3. Quality Control on Laboratory Animals
   3.1. Genetic Standardization of Laboratory Animals
   3.2. Microbiological Standardization of Laboratory Animals
   3.3. Environment and Facilities of Laboratory Animals
   3.4. Nutrition and Animal Experimentation

4. Anatomy, Physiology and Husbandry of Laboratory Animals
   4.1. Mice
   4.2. Rats
   4.3. Guinea Pig
   4.4. Rabbits
   4.5. Sheep
4.6. Amphibians

   5.1. Why We Need Animal Models?
   5.2. The Classification of Animal Models
   5.3. The Selection of Animal Models
   5.4. Creating Animal Models
   5.5. GM Animal Models
   5.6. Humanized Animal Model

6. Animal Experimentation Design
   6.1. Variation Control
   6.2. Procedures of Animal Experimental Design
   6.3. Final Steps in Animal Experimental Design

7. Organization and Management of Animal Experiments
   7.1. Observational Study and Experimental Study
   7.2. Deduction from Animal Experiments
   7.3. Animal Experiment Process
   7.4. Organization and Management of Animal Experiments
   7.5. Standardization of Animal Experimentation
   7.6. Animal Experiments in Translational Medicine
   7.7. The Key of Translational Medicine is Animal Experiments

Practical Content:

Practical 1: General Laboratory Procedures, Safety Considerations and Notebook handling,

Practical 2: Handling and Restraining of Animals

Practical 3: Animal Identification and Marking

Practical 4: Fur Removal

Practical 5: Administration to Animals (Transdermal and Enteral)

Practical 6: Administration to Animals (Parenteral)
Practical 7: Animal Fluid Collection (Blood)

Practical 8: Animal Fluid Collection (Urine and Faces)

Practical 9: Animal Fluid Collection (Cerebrospinal Fluid, Bile, Lymph Fluid, Ascitic Fluid)

Practical 10: Anesthetization of Laboratory Animals (General)

Practical 11: Anesthetization of Laboratory Animals (Local)

Practical 12: Animal Surgical Operations (Ectomy)

Practical 13: Animal Surgical Operations (Fistulas)

Practical 14: Animal Surgical Operations (Transplantation)

Practical 15: Euthanasia

Practical 16: Pathological Anatomy and Sample Collection

Mode of Delivery:

✓ Lecture/discussion, practical session, assignments, and video for visualization

Mode of Evaluation:

✓ Mid-exam (30%), Lab Report and Practical exam (30%), and Final exam (40%).

References:


Course Code: BioMed-620

Credit Hour: 2

Pre-requisite: 

Academic Year: 1st year

Semester: 2nd semester

Course description

Emerging and re-emerging zoonosis influence the health of human populations in less developed countries and are expected to have similar effects worldwide. Rising incidence of "new" diseases underscores the need for knowledge of infection mechanisms and their outcomes. In this course we will examine and discuss current concepts and trends in emerging re-emerging zoonosis and their impacts. The students will come to understand that zoonoses are multidisciplinary and involves veterinarians and human health professionals. The course focuses on the causal agents, the nature of disease, mechanism of transmission, biochemical, genetic, cellular and immunological events of emerging and re-emerging zoonotic pathogens.

Course objectives

After completing this section students should be able to:

➢ Develop comprehensive understanding of biology of emerging and re-emerging zoonosis;

➢ Describe the major determinates of emergence and reemergence of zoonotic pathogens;

➢ Explain the biology of major newly emerging and reemerging zoonotic microbial pathogens;

➢ Describe the challenges and prospects of emerging and re-emerging microbial pathogens.
Course contents

1. Overview and Basic concepts
   1.1. Definition and concept
   1.2. Concept of zoonosis
   1.3. Types of emerging diseases
   1.4. Source and origin
   1.5. The global burden

2. Determinants of Emergence of Microbial Disease
   2.1. The microbial factors
   2.2. The host factors
   2.3. The environmental factors

3. Newly Emerging Microbial Diseases
   1.6. Basic concepts
   1.7. SARS corona virus
   1.8. Influenza A (H5N1)
   1.9. Zika virus
   1.10. Ebola virus

2. Re-Emerging Microbial Diseases
   2.1. Basic concepts
   2.2. Multidrug-resistant tuberculosis
2.3. Drug-resistant malaria

2.4. *Bacillus anthracis*

2.5. Dengue virus

2.6. West Nile virus

3. **Deliberately Emerging Microbial Diseases**

   3.1. Basic concept

   3.2. Anthrax bioterrorism

4. **Challenges and Prospects of Emerging Microbial Disease**

   4.1. Challenges

   4.2. Prospects

**Teaching Methods:**

➢ The course will encompass specific facilitator inputs (e.g. Lecture presentations), combined with a variety of interactive learning activities, including: structured group work, group and individual reflection, self-study and writing, and plenary discussions.

**Mode of Evaluation or Assessment:**

- Class activity ........................................................................................................... 5%
- Assignment-1: home take exam................................................................. 10%
- Assignment-2: seminar................................................................. 20%
- Mid examination .............................................................................. 25%
- Final examinations ................................................................. 40%

**References**

Course title: Medical Malacology

Course Code: BioMed 621

Credit hour: 2

Pre-requisite: None

Academic year:

Semester: II

Course description:

This course is intended to equip students with important knowledge about medically important snails. The course also enables the student to review ecology, development, factors influencing the development and control of snails.

Course Objectives:

Upon completion of the course, students will be able to

• Acquire basic knowledge about medically important snails

• Gain useful information about the parasite-host relationship among trematodes and snails

• Understand the physical and chemical conditions that influence the development and distribution of snail fauna

• Acquire basic information about the control of snails of medically important

Course outline:

1. Introduction
   1.1. Identification keys,

2. Chemical and physical factors
3. Life cycles and populations
4. Prosobranchs
   4.1. Neritidae
   4.2. Hydrocenidae
   4.3. Viviparidae
   4.4. Ampullariidae (Pilidae)
   4.5. Valvatidae
   4.6. Littorinidae
   4.7. Hydrobiidae: Hydrobiinae Cochliopeidae
   4.8. Pomatiopsidae
   4.9. Bithyniidae
   4.10. Assimineidae
   4.11. Thiaridae
   4.12. Melanopsidae
5. Pulmonates
   5.1. Ellobiidae
   5.2. Acroloxidae
   5.3. Lymnaeidae
   5.4. Ancylidae
   5.5. Planorbidae:
      5.6. Planorbinae
      5.7. Bulininae
   5.8. Physidae
6. Snails and schistosomes
7. Snails and other snail-transmitted parasites
8. Snail control

**Mode of delivery:**

Interactive lecture

Discussion
Field Trip

**Mode of evaluation:**

Field report .......................... 15%
Presentation .......................... 10%
Mid exam .............................. 30%
Final exam ............................ 45%

**References:**

Taylor and Francis Ltd, 4 John St, London, UK, pp 673
8.3.17. Proteomics (BioMed-623)

Course Code: BioMed-623

Credit Hour: 2

Pre-requisite: None

Academic Year: 1st year

Semester: 2nd semester

Course Description:

The proteomics course is to determine how all the genes in the genome act and how their products interact to produce a functional organism. Proteomics seeks to identify and to characterize all the proteins synthesized in a cell or a tissue. Based on this information, one can then try to understand how individual proteins or protein collectives’ function within an organism. The course focuses on the current methodology used to analyze and identify proteins such as protein electrophoresis, chromatography, mass spectrometry and protein database analysis.

Course Objectives:

The objective of this course will be to enable students:

✓ To understand what proteomics means
✓ To understand about amino acids, proteins and protein folding and misfolding
✓ To know the methods of sample preparation, protein extraction and quantification
✓ To familiarize with gel electrophoresis for sample protein fractionation
✓ To familiarize with chromatography, mass spectrophotometry and sample preparation
✓ To familiarize with techniques for quantitative proteomics
✓ To understand how to analyze and interpret proteomics data
✓ To familiarize with protein databases
✓ To update themselves with advanced proteomics
Course Outline:

1. Basics of Proteins and Proteomics
   1.1. Amino Acids
   1.2. Proteins
   1.3. Protein Folding and Misfolding
   1.4. Proteomics
2. Gel Based Proteomics
   2.1. Sample Preparation and Pre-analytical Factors
   2.2. Sample Preparation: Protein Extraction and Quantification
3. One-Dimensional Electrophoresis
4. Two-Dimensional Gel Electrophoresis (2-DE)
   4.1. Second dimension, staining and Destining
   4.2. Gel Analysis
   4.3. Gel Applications and Challenges
5. Difference in Gel Electrophoresis (DIGE)
   5.1. 2D-DIGE: Basics
   5.2. 2D-DIGE: Data analysis
   5.3. 2D-DIGE: Applications
6. Basics of Mass Spectrometry
   6.1. Fundamentals of Mass Spectrometry
   6.2. Chromatography Technologies
   6.3. Liquid Chromatography
   6.4. Mass Spectrometry: Ionization Sources
   6.5. Mass Spectrometry: Mass Analyzers
7. Basics of Mass Spectrometry and Sample Preparation
   7.1. MALDI Sample Preparation and Analysis
   7.2. Hybrid Mass Spectrometry Configurations
   7.3. In-gel and In solution Preparation
8. Quantitative Proteomics
   8.1. Stable Isotope Labeling by/with Amino acids in Cell culture (SILAC): In vivo Labeling
   8.2. Isobaric Tags for Relative and Absolute Quantitation (iTRAQ): In vivo Labeling
8.3. Tandem Mass Tag (TMT): In vivo Labeling

8.4. Data Analysis

9. Advancement in Proteomics
   9.1. Proteomics Applications
   9.2. Challenges in Proteomics
   9.3. OMICS and Translational Research

Mode of Delivery:

✓ Lecture/discussion, practical session using computer to access databases, assignments, and groupwork.

Mode of Evaluation:

✓ Mid-exam (20%), Assignment and Practical exam (40%), and Final exam (40%).

References:

8.3.18. MSc Seminar in Biomedical Sciences (BioMed-711)

Course Code: BioMed-711

Credit Hour: 1

Prerequisite: Research Methods & Scientific Communications

Academic Year: 2nd year

Semester: 1st semester

Course Description

The course is mainly intended to enable students acquire skills in extracting, organizing and synthesizing scientific information and presenting it to an attending audience. This course encourages and reinforces in-depth literature review by students. The students critically analyse the current topics in the field of biomedical sciences. The seminar topics include immunology, infectious and non-infectious disease, with ranges from molecules to the whole organism. The interaction of pathogen-host and the response of either parties to each other and the dynamic nature of the pathogens will be stressed.

At the end of the course, the students will be able to

- Understand how the research in laboratory and clinical settings has advanced the knowledge and technology in biomedical sciences
- Develop creative and critical thinking-skills through active discussion during the seminar

Teaching Strategy

Encourage and reinforce in-depth literature review by students, supervision and guidance in literature search and consultation in identifying topic for review, guidance on how to write a review paper, guidance on how to present and defend a review paper.

Assessment criteria

Quality and competence of both written (70%) and oral presentation (30%) of the review paper.
8.3.19. MSc Thesis (BioMed-719)

Dr. Fekadu
9. **Teaching Learning Approach**

- Detail teaching and learning approach specific to the courses are described under the course description and course outline.

- Generally, all the courses have theoretical and practical sessions.

- Majority of the courses are covered by staff of Biology Department.

- In addition to the staffs of Biology Department, consortium teaching approach which involves the participation of experts from other faculties, and relevant national and international institutions, will be perused based on assessment of demand by DGC.

- Graduate students are expected to deliver a seminar on current and specific topic which is related to their MSc thesis research project.

- Graduate students are expected to carryout original research on specific topic which have at least three specific objectives.

10. **Mode of Assessments**

10.3. **Grading System**

The grading system in the Biomedical Science program applies the AMU legislation (Article 129) as indicated below.

Table 5: Grading system- mark conversion into letters and points

<table>
<thead>
<tr>
<th>Raw Mark [100 %]</th>
<th>Letter Grade</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>[95,100]</td>
<td>A+</td>
<td>4.00</td>
</tr>
<tr>
<td>[85, 95)</td>
<td>A</td>
<td>4.00</td>
</tr>
<tr>
<td>[80, 85)</td>
<td>A−</td>
<td>3.75</td>
</tr>
<tr>
<td>[75, 80)</td>
<td>B+</td>
<td>3.50</td>
</tr>
<tr>
<td>[70, 75)</td>
<td>B</td>
<td>3.00</td>
</tr>
<tr>
<td>[65, 70)</td>
<td>B−</td>
<td>2.75</td>
</tr>
<tr>
<td>[58, 65)</td>
<td>C+</td>
<td>2.50</td>
</tr>
<tr>
<td>[50, 58)</td>
<td>C</td>
<td>2.00</td>
</tr>
<tr>
<td>---------</td>
<td>----</td>
<td>------</td>
</tr>
<tr>
<td>[40-50)</td>
<td>D</td>
<td>1.00</td>
</tr>
<tr>
<td>&lt;40</td>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

10.4. MSc Thesis Assessment

The graduate students are expected to complete their MSc thesis research project within specified time and compile in a monograph form to be submitted to the Department. Students are expected to present and defend their work orally in public and in front of a Board of Examiners that includes an external examiner as mentioned in AMU Senate Legislation Guideline (Article 134).
11. Resource profiles

11.3. Staff Profiles

<table>
<thead>
<tr>
<th>No.</th>
<th>Specialization</th>
<th>Academic qualification</th>
<th>Academic rank</th>
<th>Number of staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biomedical Sciences</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Tropical &amp; Infectious Diseases</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Medical Entomology</td>
<td>PhD</td>
<td>Assoc. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Applied Microbiology</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Biomedical Sciences</td>
<td>MSc.</td>
<td>Ass. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Biomedical Sciences</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Medical Entomology and Vector Control</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Medical Microbiology</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Biomedical Sciences (PhD Candidate)</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

11.4. Laboratory Resources

Parasitology Laboratory, Bacteriology Laboratory, Biotechnology Laboratory, Entomology Laboratory, Advanced Research Laboratory and Animal houses equipped with basic facilities. They are currently utilized by undergraduate and graduate programs in the Department and they are expected to serve the coming programs too.
References

Curriculum for Master of Science in Medical Entomology and Vector Control Program. (2013).
Department of Biology, Arba Minch University, Arba Minch, Ethiopia.

FMoE. (2013). Modular Harmonized Curriculum for BSc Degree Program in Biology Ethiopia.
Addis Ababa, Ethiopia.

MSc Program in ‘Tropical and Infectious Diseases’ Modular Curriculum. (2009). Aklilu Lamma
Institute of Pathobiology, Addis Ababa University, Addis Ababa, Ethiopia.

Assessment Survey for M.Sc. Training in Environmental Health Science in Swaziland.

Senate Legislation of Arba Minch University. (2016). Arba Minch University, Arba Minch,
Ethiopia.
Appendix 1. Institutes and organizations which will be participated in need assessment

<table>
<thead>
<tr>
<th>No.</th>
<th>Institutes/organizations involved</th>
<th>Units</th>
</tr>
</thead>
</table>
| 1.  | Professional societies (3)      | 1. Biological Societies of Ethiopia  
2. Society of Tropical and Infectious Diseases in Ethiopia  
3. Ethiopian Public Health Association |
| 2.  | Federal Ministry of Health (3)   | 1. HIV Control Program  
2. Tuberculosis, Leprosy Prevention  
3. Malaria Prevention and Control Programs |
| 3.  | Ethiopian Public Health Institute (EPHI) (1) | 1. Bacterial, parasitic and zoonotic diseases |
| 4.  | Armauer Hansen Research Institute (AHRI) (2) | 1. Mycobacterial Disease  
2. Leishmania, malaria and neglected tropical disease |
| 5.  | Regional Health Bureau (3)       | 1. Health Research Regional Laboratories (Addis Ababa)  
2. Health Research Regional Laboratories (Hawassa) |
• Biology Dpt  
• Health Science Dpt  
2. Dilla University  
• Biology Dpt  
• Health Science Dpt  
3. Hawasa University  
• Biology Dpt  
• Health Science Dpt  
4. Addis Ababa University  
• Biology Dpt  
• Health Science Dpt  
5. Wachamo University  
• Biology Dpt  
• Health Science Dpt  
6. Worabe University  
• Biology Dpt  
• Health Science Dpt |
| 7.  | Biomedical company (2)           | 1. Ethiopian Pharmaceuticals Manufacturing  
2. Medtech Ethiopia |
| 8.  | National Animal Diagnostic Center (Sebeta) (1) | 1. Diagnostic center |
| 9.  | NGOs/Professional Associations (2) | 2. Africa CDC  
3. The Carter Center |
Appendix 2: Need Assessment Questionnaire

Basic Need Assessment Questionnaire on proposed “MSc. Biomedical Sciences Program”

Introduction:

Biomedical Sciences is an application of Biology for medical use. The field is an advanced internationally recognized and accepted field, which involves health oriented basic and applied research. Ethiopia is a country with high burden of infectious diseases and also before it able to tackle such diseases, the non-infectious diseases (non-communicable diseases) are on the way to overlap and complicate the situation. These situations will continue and become a serious threat to health and socioeconomic development of the country unless more work is done on health problem solving researches. The dynamics of such diseases are very complex. The control, prevention, diagnosis, and treatment of such diseases require understanding of the biology of parasites, hosts and their environment. These require well designed Biomedical Sciences education with specialized focus on research.

List of proposed courses for the program:

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Name</th>
<th>Course code</th>
<th>Cr.hr.</th>
<th>Course Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biology of Pathogenic Bacteria &amp; Fungi</td>
<td>BioMed-611</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>2</td>
<td>Virology</td>
<td>BioMed-612</td>
<td>1</td>
<td>Compulsory</td>
</tr>
<tr>
<td>3</td>
<td>Advanced Vector Biology &amp; Vector Pathogen Interaction</td>
<td>BioMed-613</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>4</td>
<td>Biology of Parasitic Protozoa</td>
<td>BioMed-615</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>5</td>
<td>Biology of Parasitic Helminths</td>
<td>BioMed-616</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>6</td>
<td>Advanced Immunology</td>
<td>BioMed-617</td>
<td>3 (2+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>7</td>
<td>Methods in Molecular Biology</td>
<td>BioMed-618</td>
<td>2 (1+1)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>8</td>
<td>Biostatistics</td>
<td>BioMed-601</td>
<td>3 (2+1)</td>
<td>Supportive</td>
</tr>
<tr>
<td>9</td>
<td>Epidemiology</td>
<td>BioMed-602</td>
<td>3</td>
<td>Supportive</td>
</tr>
<tr>
<td>10</td>
<td>Research Methods &amp; Scientific communication</td>
<td>BioMed-604</td>
<td>2</td>
<td>Supportive</td>
</tr>
<tr>
<td>11</td>
<td>Elective</td>
<td>BioMed-62X</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>12</td>
<td>MSc Seminar in Biomedical Science</td>
<td>BioMed-711</td>
<td>1</td>
<td>Compulsory</td>
</tr>
<tr>
<td>13</td>
<td>MSc Thesis</td>
<td>BioMed-719</td>
<td>6</td>
<td>Compulsory</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>35</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bioinformatics for Infectious Diseases</td>
<td>BioMed-622</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>2</td>
<td>Vector sampling, Identification &amp; Incrimination</td>
<td>BioMed-624</td>
<td>2</td>
<td>Elective</td>
</tr>
<tr>
<td>No.</td>
<td>Specialization</td>
<td>Academic qualification</td>
<td>Academic rank</td>
<td>Number of staff</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>------------------------</td>
<td>-----------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1</td>
<td>Biomedical Sciences</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Tropical &amp; Infectious Diseases</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Medical Entomology</td>
<td>PhD</td>
<td>Assoc. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Applied Microbiology</td>
<td>PhD</td>
<td>Ass. Prof.</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Biomedical Sciences</td>
<td>MSc.</td>
<td>Ass. Prof.</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Biomedical Sciences</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Medical Entomology and Vector Control</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Medical Microbiology</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Biomedical Sciences (PhD Candidate)</td>
<td>MSc.</td>
<td>Lecturer</td>
<td>2</td>
</tr>
</tbody>
</table>

*There are numbers of graduate assistants and lab technicians.

**Laboratories in the Department:**

Parasitology Laboratory, Bacteriology Laboratory, Biotechnology Laboratory, Entomology Laboratory, Advanced Research Laboratory and Animal houses equipped with basic facilities.

The need assessment is a process for determining and addressing the gaps it exists in the current situation of the country with respect to Biomedical Scientists. It helps to acquire information on training needs, gaps, and program courses. These are necessary data for decision making to open the program or not.
Participants in the need assessment:

You are selected to participate in this need assessment study since we think you have basic information related to the field “Biomedical Sciences” and your organization may be one of the destinations for such professionals. We, as University, are responsible to produce professionals who able to contribute in the development of their country with regard to their professions. Considering the mentioned and unmentioned reasons, we kindly request you to provide honest and genuine response for these need assessment questions.

1. Respondent’s
   a. Name: __________________________
   b. Sex: __________
   c. Age: __________
   d. Qualification: _________________
   e. Total year of experience: ________
   f. Year of experience after recent specialization: __________
   g. Position in the Organization/Institute: ______________________
   h. Organization/Institute name: _______________________________

2. Please rate the following questions based on your personal judgment from 5 to 1 & NA. Five (5) for the one that you give highest score and one (1) for the one that you give least score. Response (5= Excellent, 4 = very high, 3 = moderately high, 2 = fairly low, 1 = very low, NA= If the question is not appropriate to you to respond).

And please respond to open ended questions too.

<table>
<thead>
<tr>
<th>No.</th>
<th>Questions</th>
<th>Response (Tick on the appropriate column)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need of Biomedical Sciences specialty at Masters level in the country</td>
<td>5  4  3  2  1  N/A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Need of MSc Biomedical Sciences qualification in your institute/organization</td>
<td>5  4  3  2  1  N/A</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Appropriateness of the program for control of disease of public health importance in the country</td>
<td>5  4  3  2  1  N/A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Appropriateness of the program for utilization and evaluation of diagnostic tools</td>
<td>5  4  3  2  1  N/A</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Appropriateness of the program for evaluation of</td>
<td>5  4  3  2  1  N/A</td>
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<tr>
<td></td>
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<tr>
<td>6</td>
<td>Appropriateness of the program to consult health policy makers</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>Appropriateness of the site for the program [*Arba Minch University located at Arba Minch town in the Rift valley with hot temperature and number of infectious agents]</td>
<td></td>
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<tr>
<td>8</td>
<td>Relevance of the human resource to run the program in the Department</td>
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<tr>
<td>9</td>
<td>Relevance of available labs in the Department for the program</td>
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<tr>
<td>10</td>
<td>Interest of your organization or professionals to participate in research collaboration with the program</td>
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<tr>
<td>11</td>
<td>Interest of your organization to send candidates for specialty in the program</td>
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<tr>
<td>12</td>
<td>Interest of your organization to forward research questions for the program</td>
<td></td>
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<tr>
<td>13</td>
<td>Interest of your organization to work with the program on Biomedical consultancy services</td>
<td></td>
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<tr>
<td>14</td>
<td>Willingness of your organization to share lab facilities in your organization for the program development</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>Willingness of your organization to share human resources when the program in need of expertise</td>
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<tr>
<td>16</td>
<td>Do you think the proposed graduate courses are appropriate</td>
<td></td>
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</tr>
<tr>
<td>17</td>
<td>Interest to join the program</td>
<td></td>
<td></td>
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<tr>
<td>18</td>
<td>If you have any additional course(s) to be added in the program, please list</td>
<td></td>
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<tr>
<td>19</td>
<td>If you have any comment on the program, please write down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Please recommend problem areas/challenges that need to be addressed through MSc Biomedical Sciences program:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>