

University of Science & Technology Meghalaya

Department of Applied Biology

MSc Microbiology

POs , PSOs, COs

SCHOOL OF BIOLOGICAL SCIENCES



ACADEMIC YEAR: 2018-2019

About the Department:

The Department of Applied Biology, established as the Department of Biotechnology, came into existence in the year 2011 as the pioneering Department of the University of Science & Technology, Meghalaya. The Department was started with seven students in the M. Sc. Biotechnology programme and now has more than 400 hundred students across Bachelor and Masters programmes offered by the Department. This Department meets the national and Regional needs for interdisciplinary teaching and research through its B. Sc., M. Sc. and Ph. D. programmes in Biotechnology, Microbiology and Food Science & Technology.

The Choice Based Credit System (CBCS) was adopted both in the B. Sc. and M. Sc. programmes covering core courses as well as advanced courses mainly focusing on creating employability and developing skill among the students. The main goal of the Department is to impart quality education in frontier and cutting-edge areas where innovation, invention and entrepreneurship remain the cardinal focus and thrust.

About the Programme:

Microbiology is one of the core subjects which focus on the study of the microscopic organisms and incorporates sub-disciplines like virology, mycology, parasitology and bacteriology. Master of Science in Microbiology is a postgraduate programme which focuses on basic level aspects in the field of Microbiology. It is a two-year programme, divided into four semesters which deals with the combined study of the chemistry and biology to investigate living systems and their basic relationship with the environment.

M. Sc. Microbiology programme gives adequate exposure in the areas such as microbial diversity, terrestrial and aquatic microbiology, Food and industrial microbiology, agricultural microbiology, microbial genetics, nano microbiology etc. through both the theoretical and practical knowledge so in future they can help in developing and designing innovative techniques and methods for microbiology industry.

The curriculum covers the study of microorganisms and the effect that they have on biosphere including human society. During the duration of this programme, students get extensive insight into the various characteristics application and management of Microbes and their roles in the field of agriculture, industry and environment. This programme includes core microbiology and interdisciplinary subjects together along with laboratory programs and a research project leading to a dissertation.

Programme Details:

Programme Name	Duration
Master of Science (M. Sc.) in Microbiology	2 Years (Four Semesters)

Programme Structure:

The M.Sc. Microbiology programme is a two years course, divided into four semesters. The programme is of 88 credits and for the award of the degree students require to complete the credits as per the University norms.

Years	Odd Semester	Even Semester
First Year	Semester I	Semester II
Second Year	Semester III	Semester IV

Programme Objectives (PO):

1. M. Sc. Microbiology programme includes core microbiology and interdisciplinary subjects along with laboratory programs to impart appropriate skills among students so that they will be able to perform duties as microbiologists in diverse fields.
2. It is an interdisciplinary programme where the students have to take inputs from other areas of expertise that enable them to analyze the problems related to microbiology and come up with most suitable solutions.
3. The students are trained to pick up leads and see the possibility of converting these into products through entrepreneurship.

4. They are made aware of the requirements of developing a Microbiology enterprise by having knowledge of patents, copyrights and various regulatory processes to make their efforts a success. Besides attaining the attributes related to the profession of Microbiology, students in this discipline are able to develop ethical awareness which is mandatory for practicing a scientific discipline including ethics of working in a laboratory and ethics followed for scientific publishing of their research work in future.

Programme Specific Outcomes (PSOs) of M. Sc. Microbiology

PSO1. The objective of the Master's Programme in Microbiology is to equip the students to apply knowledge of prokaryotic and eukaryotic cellular processes, classification, interaction of microorganisms among themselves, with physical and chemical agents and higher order organisms.

PSO2. The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed.

PSO3. Basics and current molecular updates in the areas of Industrial Microbiology, Fermentation Technology, Agriculture and Environmental Microbiology are included to train the students and also sensitize them to scope for research.

PSO4. The Masters in Microbiology Programme will address the increasing need for skilled scientific manpower with an understanding of research ethics involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of microbiology and molecular biology globally.

PSO5. The study of Master of Microbiology will impart in-depth understanding of basic aspects of microbiological science pertaining to industrial applications that will make the students ready to contribute to better awareness of the major issues at the forefront of the discipline, an in-depth understanding of the area of Microbiology chosen for research emphasis, awareness of ethical issues in Microbiology research and careers options and inclination towards own professional goals over a wide range of carrier options expanding from R & D, industrial or Govt. Sector or as an Entrepreneur.

SEMESTER-I

General Microbiology and Bacteriology

MMB 101

Credit: 4

After successful completion, this course enables students

CO1. To explore the fascinating world of microorganism and their role (both beneficial and harmful) in day to day life. It also imparts knowledge on the various phases and contribution of different Scientists how Microbiology established itself as a separate branch of Science.

CO2. To understand the different categories of microbes and sub-microbial groups with their position in the tree of life (classification), their characteristic features and importance.

CO3. To become familiarize with the different technical aspects [isolation, cultivation, observation (microscopy), and identification] of studying microbes.

CO4. To get an insight on the existence of microbes in different spheres of the environment and how the microbes are affected/induced in these environments or *vice versa*.

CO5. To familiarize with the characteristic and structural features of bacteria as a representative type of prokaryotic cellular organism. It also gives an insight into the various required factors (nutritional/physical) for the laboratory cultivation of bacteria.

Microbial Physiology and Biochemistry

MMB 102

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into the various biochemical principles governing the physiology of microorganisms.

CO2. To familiarize with the characteristic, types and structural features of important bio-molecules (carbohydrate, protein, lipid, amino acids) that form the building block of cellular organisms.

CO3. To develop the concept on the type, nature and other features of enzyme molecules that controls the different physiological processes of microbes and other cellular organisms.

CO4. To understand the principles of various metabolic/biochemical processes (sugar degradation, electron transport, fermentation etc.) occurring in or carried out by different microbial/ cellular systems.

CO5. To get an insight into the principles and mechanism of photosynthetic pathway carried out by various groups of bacteria and cyanobacteria.

Bioinstrumentation

MMB 103

Credit: 4

After successful completion, this course enables students

CO1. To develop concept on the important techniques necessary for the study and prediction of different processes occurring in microbes and other cellular organisms.

CO2. To familiarize with the importance, principle and types of chromatography and centrifugation techniques and their role in the study of biological system.

CO3. To familiarize with the importance, principle and types of electrophoretic techniques and their role in the study of biological system.

CO4. To get an insight into the concept of radioactivity and its application in biochemical and immunological processes.

CO5. To familiarize with advanced techniques like Protein Crystallization, MALDI-TOF, Mass Spectrometry, Enzyme and Cell Immobilization which are extensively used in Industrial and R & D sectors.

Cell Biology and Genetics

MMB 104

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into the concept of prokaryotic and eukaryotic cells, and different cell organelles and functional role in cellular life.

CO2. To learn the basis of cell to cell communication in cellular life and the mechanism of cellular signaling maintained by them.

CO3. To familiarize with concept germinal cells and the events occurring during the developmental stages both in plant and animal life.

CO4. To understand the concept of gene (basic unit of genetic character) and the basic principle of genetics (inheritance of characters) as well as the concept of how mutation in gene can alter characters in an individual.

CO5. To familiarize with concept of inheritance of characters from parental line to the offspring following both Mendelian and non-Mendelian pattern. It also gives an insight in to the different genetic diseases/disorders in man and their pattern of inheritance.

Practical on Microbiology, Biochemistry and Cell Biology

MMB 105

Credit: 4

This course enhances the practical application of the concept on Microbiology, Biochemistry and Cell Biology. After successful completion, this course enables students

CO1. To understand the different phases of cell-cycle during mitotic and meiotic cell division.

CO2. To learn the principle and process for quantitative estimation (spectrophotometry) of DNA using (Diphenylamine method), RNA (Orcinol method) and protein analysis (vertical slab gel electrophoresis).

CO3. To get an insight into the laboratory techniques for the isolation and enumeration of microorganisms from different environmental spheres like soil, water and air with special reference to antibiotic producing microbes from soil and the effect of physical factors (temperature and pH) on growth.

CO4. To learn the principle and the process concerned with the study of bacteria including isolating bacteria in pure cultures by streaking method, determination of growth-phases in bacteria with the help of growth curve, identification of unknown bacteria with the help of specific biochemical activity and staining techniques (Gram's, capsule and flagella staining) and determination of sensitivity/resistance in bacteria against different antibiotic substances.

CO5. To get an insight into the biochemical methods for the estimation of carbohydrates, proteins and amino acids both quantitatively and qualitatively. It also helps students to develop the idea of separation of plant pigments and amino acids using chromatographic methods of TLC/ Paper chromatography.

SEMESTER II

Molecular Biology

MMB 201

Credit: 4

After successful completion, this course enables students

CO1. To understand the molecular basis of biological activity between biomolecules in the various systems of a cell.

CO2. To familiarize with the basics of DNA, RNA, and proteins structure and their interactions within the cell to promote growth, division and development.

CO3. To have the concept on the responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

CO4. To get an insight in to the wide range of mechanisms required for gene regulation in different organisms.

CO5. To understand the molecular basis of cancer and other diseases and the pattern of interaction of animal cells with microorganisms and viruses. It also deals with the application of recombinant DNA techniques to problems in basic science and biotechnology.

Microbial Genomics

MMB 202

Credit: 4

After successful completion, this course enables students

CO1. To understand the genome concept in the study of general characteristic of bacterial population focusing on the whole-genome sequencing and metagenomics for investigating microbial communities.

CO2. To get an insight in to the various tools used for studying DNA/Genes including the vectors involved in molecular cloning for genome analysis along with the concept of DNA libraries, Fluorescent in situ hybridization and Denaturing gradient gel electrophoresis.

CO3. To analyze the concept of microbial genomes, using various mapping technique such as physical and linkage mapping.

CO4. To get an insight in to the various tools involved in DNA finger printing such as RFLP, RAPD, AFLP, SSCP and SNP which finally help in studying the microbial diversity and the interrelationship between them.

CO5. To have the concept on functional genomics which helps to understand the function of genes or proteins, eventually all components of a genome of an organism which could potentially provide a more complete picture of how the genome specifies function compared to studies of single genes.

Phycology and Mycology

MMB203

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into the kingdom of Fungi; their taxonomic position, habitat, morphology, cellular, nutritional and reproductive features and how these features vary among different groups of fungi.

CO2. To familiarize with the specialized cellular and reproductive mechanisms like Heterothallism; Para-sexuality; Clamp-connection found within the Kingdom Fungi.

CO3. To familiarize with the important beneficial symbiotic association of fungi and their specific role in different sectors.

CO4. To understand the concept of diseases caused by fungi, different terminology associated with fungal disease and at the same time some of the important fungal diseases in plants (phyto-pathogenesis) and men (dermatophytoses/dermatomycoses).

It also gives an insight into the specific mechanism adopted by fungi for disease development (mycotoxins) and at the same it also gives an insight to the various means/approaches to combat such diseases.

CO5. To get an insight into the taxonomic position, habitat, morphology, cellular, nutritional and reproductive features of different groups of algae. It also familiarizes students with the beneficial aspects of different algal groups.

Soil and Environmental Microbiology

MMB 204

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into the different sphere of the environment (soil, water and air) as microbial habitat and how the microbes are affected/induced in these environments or *vice versa*.

CO2. To understand the different types of microbial association developed in soil and how these associations affecting other cellular life in/on soil.

CO3. To develop knowledge on the application of microbes or their processes/products for developing beneficial and eco-friendly byproducts like biofertilizers, biopesticides, biopolymers, bioplastics etc.

CO4. To get an insight into how microbes affecting aquatic health and what are the different approaches for monitoring and maintaining potability of water.

CO5. To familiarize with the important environmental roles played by microbes specifically in the light of sewage treatment, litter decomposition, maintenance of soil health and at the same time in metal recovery process (bioleaching).

Practical on Molecular Biology, Microbial Genomics, Mycology and Soil and Environmental Microbiology

MMB-204

Credit: 4

This practical course enhances the applicability of the concept on. After successful completion, this course enables students

CO1. To learn the principle and process for the isolation DNA from bacterial, plant and animal sources and their quantification using agarose gel electrophoresis.

CO2. To learn the principle and process of restriction digestion analysis by agarose and polyacrylamide gel electrophoresis (over-expression of proteins by SDS-PAGE).

CO3. To learn the principle and process for the isolation and cloning of plasmid DNA and their amplification by PCR (RAPD analysis).

CO4. To understand vegetative and reproductive structures of different algal (*Nostoc*, *Anabaena*, *Oscillatoria* and *Microcystis*) and fungal (*Aspergillus*, *Penicillium*, *Fusarium* and *Alternaria*) genera through temporary and permanent slides preparation.

CO5. To learn the principle and process concerned with soil and environment including:
-isolation of root nodule bacteria (*Rhizobium*) using Yeast Extract Agar (YEMA) Medium.
-study of anatogonism of micro-organism by dual culture inoculation method (Bacterium Vs Bacterium; Bacterium Vs fungus; Fungus Vs Fungus).
-determination of dissolved oxygen (DO), BOD and COD of water (Raw/Treated/Sewage).

SEMESTER III

Industrial Microbiology and Fermentation Technology

MMB 301

Credit: 4

After successful completion, this course enables students

CO1. To develop idea on the sources, isolation, preservation and maintenance of industrially important microbial strains as well as their specific features.

CO2. To get an insight into the principle, types and components of a typical industrial fermentor; the basic requirement, process, measurement and control of fermentation parameters.

CO3. To understand the industrial production of alcoholic beverages, antibiotics, solvents, vitamins and industrial enzymes using microbial fermentation process with special reference to micro-organisms involved, media, fermentation conditions, downstream processing and their uses.

CO4. To have an idea on one of the important industrial process of enzyme immobilization describing the methods of immobilization and large scale applications of immobilized enzymes.

CO5. To get the basic concept of recombinant DNA technology for the genetic modification of industrially important microorganisms. It also gives an insight in to the application of recombinant DNA technology for the production of human therapeutic agents (insulin, HGH, recombinant vaccines) and transgenic crops.

Virology

MMB302

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into one of the most important acellular entity lying at the borderline of living and dead called virus and its allied groups including viroids, virusoids and prions.

CO2. To understand the general features morphology, ultra-structure, composition and arrangements of structural components in virus.

It also deals with the nomenclature, classification of viruses and other aspects related to virus and its allied groups.

CO3. To familiarize with the concept and important aspects (types, structural organization, multiplication cycle and therapeutic application) of bacteriophages or the virus of bacteria.

CO4. To get an insight into the cultivational, diagnostic and serological (haemagglutination, immuno-fluorescence ELISA) methods concerned with the characterization and identification of virus.

CO5. To get an insight into concept of plant viruses (TMV, CMV and potato virus X) and the diseases caused by them with special reference to their pathogenicity, diagnostic techniques and curative measures, animal viruses (Picornaviruses, Orthomyxoviruses, Paramyxoviruses, Rhabdoviruses, Rotaviruses, HIV, Herpes viruses and Adenoviruses) and the diseases caused by them with special reference to their pathogenicity, diagnosis and prevention.

Clinical Microbiology and Diagnostics

MMB 303

Credit: 4

After successful completion, this course enables students

CO1. To get an insight into the concept of association of microbes with a particular disease; various phases of host-pathogen interaction during disease development and laboratory diagnosis, management and control of microbial infections.

CO2. To understand the various stages of laboratory diagnosis of microbial infections including collection and processing of clinical specimen.

CO3. To familiarize with the different phases of microscopic and biochemical examination for the characterization and identification of clinical specimens.

CO4. To have an idea on the clinical syndromes and laboratory diagnosis of respiratory tract infections (Pharyngitis and Pneumonia); skin and soft tissue infections (Impetigo, Folliculitis, Furuncle and Carbuncle), infection of central nervous system (Meningitis and Encephalitis); gastrointestinal and urinary tract infections.

CO5. To get an insight into the safety measures in the diagnostic laboratories with special reference to epidemiology, surveillance and management and control of community and hospital infections.

Immunology

MMB 304:

Credit: 4

After successful completion, this course enables students

CO1. To familiarize with the concept of non-specific (innate) and specific (acquired) resistance mechanism developed in man against pathogens and other non-self-factors which is the basis of this course.

CO2. To get an insight into the formation, types, organization and functional specificity of different cellular and organ level components conferring resistance in man.

CO3. To understand the nature, types and function of antigens that induce immunological response in man and how the product of this response (antibody, B and T cells) help in neutralizing them (agglutination and precipitation reactions).

CO4. To have the concept of different mediators/cell signaling molecules (complement, cytokines: interferons, Interleukins, hematopoietins and chemokines) associated with immunological responses as well as their biological consequences.

CO5. To deal with the different diagnostic and serological approaches for the study of interaction between an antigen and its specific antibody including Widal Test, immunodiffusion, Immuno-electrophoresis, ELISA and RIA. It also gives an idea on immune-disorders (hypersensitivity, autoimmune disorders, oncogenesis etc.) and induced immunity (vaccination) to overcome such abnormalities.

Practical on Industrial Microbiology & Fermentation Technology, Clinical Microbiology & Diagnostics and Immunology

MMB 305
Credit: 4

This practical course enhances the laboratory skill concerned with industry and diagnostic sector. After successful completion, this course enables students

CO1. To learn the microbial process for the industrial production of citric acid using *Aspergillus niger*, rifamycin using *Nocardia* strain, glutamic acid, enzyme lipase, ethanol using various Organic wastes and biofertilizers [Nitrogen fixer/Phosphate Solubilizers/ siderophore producers].

CO2. To learn the design of a batch and continuous fermenter and perform solvent extraction and metabolite analysis using a bacterial culture.

CO3. To understand the principle and process of

-blood group determination following slide agglutination test,

-blood cell count and identification following blood film preparation and

-immuno-diagnostic methods like Radial immunoassay and ELISA

It also deals with the principle and process of the immunodiffusion techniques like ODD, SRID, Immuno-electrophoresis and counter-current electrophoresis.

CO4. To isolate bacterial flora of skin by swab method and their identification on the basis of cultural, morphological and biochemical characteristics.

CO5. To understand the principle and process of antibiotic sensitivity (Kirby-Bauer method) in bacteria using minimal inhibitory concentration (MIC) of an antibiotic.

SEMESTER IV

Research Methodology, Biostatistics and Bioinformatics

MMB 401
Credit: 4

After successful completion, this course enables students

CO1. To understand the concept, types and criteria of research, addressing the identification of a research problem, objectives, designs and methodology to carry out a research work.

CO2. To get the basic knowledge on qualitative research techniques and on the collection and analysis quantitative data.

CO3. To get an insight in development of hypothesis, data analysis for hypothesis-testing as well as formulation of research synopsis and report.

CO4. To familiarize with the Biostatistical tools and techniques for analyzing research outcomes thereby enabling them in justifying their findings.

CO5. To understand the basic concept of Bioinformatics; different tools and techniques associated with analysis of phylogeny and predicting the structure of different bio-elements.

Optional Paper

MMB402

Credit: 4

MMB 402 A. Microbial Diversity

After successful completion, this course enables students

CO1. To get an insight into the diverse groups of organisms within the microbial world and the advanced strategies to classify such diverse types based on phylogeny.

CO2. To understand the different culture dependant and culture independent molecular methods for the study of microbial diversity as well as their identification.

CO3. To get an insight into the variation in metabolic pathway among different groups of microbes.

CO4. To have an idea on the various metabolic groups of microbes based on the nature of the environment and how the environmental adaptation leading to changes in their metabolic processes.

CO5. To familiarize with the concept of ecosystem in terms of microorganisms as well as the various factors affecting microbial distribution in different ecosystem and how microorganisms interact with different biotic and abiotic factors for their survival.

MMB 402 B. Agriculture Microbiology

After successful completion, this course enables students

CO1. To have a concept on the microorganisms in agro-ecosystems and their significance in maintaining soil fertility by their biological activity (N₂ fixation, solubilization and mobilization of nutrients etc.).

CO2. To understand the chemical transformation carried out by microbes during organic matter decomposition wherein mineralization and immobilization of important nutrient occurs resulting in enhancement of soil nutrient profile.

CO3. To learn about one of the most important category of soil microbe known as PGPR (plant growth promoting rhizobacteria) and their significance in agro-ecosystems.

CO4. To get an insight into the environmental significance of microorganisms in terms of biodegradation of metal and other pollutants, bioremediation of contaminated sites and environmental monitoring (biosensors).

CO5. To familiarize with the role of microbes in the cycling (mineralization and mobilization) of nutrient elements like carbon, nitrogen, phosphorus, sulphur and iron required for a proper soil health.

It also deals with the concept of microbes as a source of bio-fuels, an alternative to non-renewable fossil fuels.

MMB 402 C. Food Microbiology and Fermentation Technology

After successful completion, this course enables students

CO1. To have an idea on the association of microbe with different food product and various strategies for preserving food from microbial spoilage.

CO2. To get an insight into the physico-chemical alteration occurring in food items due to microbial contamination that bring about spoilage of them.

CO3. To deal with food-borne infections and intoxications resulting from microbial contamination of food, the laboratory diagnosis of such food-borne infections and their preventive measures.

CO4. To have the concept on microbial fermentation and different fermented food products obtained through microbial process.

It is also concerned with pharmaco-nutritional assessment of fermented food products.

CO5. To familiarize with the industrial exploitation of different microbes for the production of single cell protein, fermented beverages, industrial enzymes and genetically modified (GM) foods.

MMB 402 D. Medical Microbiology

After successful completion, this course enables students

CO1. To get an idea about the microorganisms associated with human body (skin, respiratory tract, digestive tract, urino-genital system); their source, path of entry and the infection resulted from such association.

CO2. To get an insight into the host-pathogen relationships (disease cycle), transmission of pathogens and medical diagnosis (detection of infection).

It also familiarizes with the different antimicrobial and chemotherapeutic agents, antibiotics and antiseptics with mechanism of action against targeted pathogens.

CO3. To deal with the classification, characterization, pathogenicity, symptomology, laboratory diagnosis and quarantine administration of pathogens responsible for communicable and non-communicable diseases.

CO4. To familiarize with the concept of pathogenicity, symptomology, laboratory diagnosis and quarantine administration of diseases caused by sub-bacterial agents like *Rickettsiae*, *Chlamydia* and *Mycoplasma*.

CO5. To have the concept of medical parasitology *i.e.* pathogenesis, transmission, disease cycle, laboratory diagnosis and treatment of diseases caused by Protozoa.

Practical on Optional Paper

MMB 403

Credit: 4

This practical course is based on the Optional Papers including Microbial Diversity, Agricultural Microbiology, Food Microbiology & fermentation Technology and Medical Microbiology. After successful completion, this course enables students

CO1. To understand the specificity of microorganisms present in different environmental conditions and how these factors are affecting their phenotypic and genotypic characters.

CO2. To get an insight into the different types of microbes present in crop fields and how these microbes can be utilized in increasing crop productivity or other such aspects.

CO3. To understand the features of microbes that can be used for obtaining various industrial products and the production process of solvents, antibiotics or fermented food products using such microbes.

CO4. To familiarize with the different types of pathogenic microbes, their path of entry in human body and the various techniques to study them.

CO5. To have the concept of various laboratory methods to study the health effects of different pathogenic microbes and the use of various pharmaceutical product to inhibit them.

Dissertation Work and lab Visit Report

MMBT 404:

Credit: 8

- I. **Project work evaluation:** The project work will be evaluated by both external and internal examiner based on experiment designed and thesis writing.
- II. **Project work seminar:** Every student has to present their work under following subheadings viz. objective, methodology, results and conclusion.
- III. **Project viva voce:** Viva voce will be conducted on the basis of project work and presentation.
- IV. **Submission of Lab. Visit Report.**

Course Title: Human Values and Professional Ethics

Course Code: HVP-740

[Non-Credit Compulsory Course]

Course Description: The purpose of this course is to comprehend the various ethical issues that may arise in one's professional life. The course will provide understanding of the expected professional ethics and behavior in diverse professional settings. It will also facilitate the students to develop detail insight on the different human values

transmitted by diverse sources as constitution, culture, religion, family and society. On successful completion of the course the students will learn to acclimatize to the expectations of an ideal professional and a responsible member of the society.

Course Objectives:

- 1) To critically understand ethical issues as they pertain to professional and personal identity.
- 2) To learn to consider oneself and the world around from these basic ethical positions.
- 3) To develop sharpened analytical capabilities in order to develop and maintain a good interpersonal relationship in both professional and social space.