



FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
AFRICA CENTRE OF EXCELLENCE
FOR MYCOTOXIN AND FOOD SAFETY



safer foods, secured living

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PROGRAMME NAME: MASTERS OF TECHNOLOGY (MTech) and DOCTORAL DEGREE (PhD) in TOXICOLOGY

STUDENTS' HANDBOOK

BACKGROUND

Food safety and insecurity, malnutrition and poverty are severe interdependent development challenges in Africa. Almost half of Africa's population is living below the poverty line (48.5%), suffers from chronic hunger (75%) and malnourishment (226.7 million-20.5%) and these figures are highest in Central and West African regions. Food production increases resulting from agricultural initiatives that are compromised by food borne diseases; and to this effect, much effort is already deployed to address the threat from mycotoxins that are the major biotic constraints to food security, causing losses in crop yield, human productivity (40%) and in export, and lowered performance of animal husbandry in addition to the direct human health impacts of cancers, growth stunting in children, reduced life expectancy and death. Other threats, such as salmonellosis, entero-haemorrhagic, hepatitis A, acute and chronic aflatoxicosis, cholera, heavy metal poisoning, and the threat of antibiotic resistance arising from improper use of veterinary drugs, and chronic pesticide and industrial chemical residue exposure need urgent attention. These pervasive problems, which affect children at a disproportionately high rate, require transformative science, engineering and policy solutions brought about by a knowledgeable workforce. Thus, the MTech and PhD programmes in Toxicology will help to create learning opportunities that would come up with research results to address Africa's shortage of expertise and applicable solutions to ensure a safe, controlled and sufficient food supply that will support economic growth and public health.

The programme will balance the molecular biology, engineering, computing and modeling necessary for career in Toxicology and food security. The emphasis will be placed on mechanisms of actions of many toxins, underlying disease mechanisms, mapping and diagnosis of diseases such as salmonellosis, entero-haemorrhagic, hepatitis A, acute and chronic aflatoxicosis, cholera and heavy metal poisoning. The threat of antibiotic resistance arising from improper use of veterinary drugs, chronic pesticide and industrial chemical residue exposure will also be studied. The Centre will also focus on training in innovation process, entrepreneurship and commercialization of biotechnology products. The knowledge and skills gain from this programme will open doors to employment in many sectors in industry, academia and agencies concerned with patent and legal issues, education or research fundings.

Toxicology is a scientific discipline, overlapping with biology, chemistry, pharmacology and medicine, and involves the study of the adverse effects of chemical substances on living organisms

and the practice of diagnosing and treating exposures to toxins and toxicants. The chemical toxicants include inorganic substances such as lead, mercury, cadmium, hydrofluoric acid, chlorine gas and organic compounds such as methyl alcohol, most medications and poisons from living things. The Africa Centre of Excellence for Mycotoxin and Food Safety intends to train toxicologist in the areas of analytical toxicology, applied toxicology, clinical toxicology, veterinary toxicology, forensic toxicology, environmental toxicology, and industrial toxicology. These toxicologists will have expertise to investigate, interpret, and communicate the nature and the adverse effects of the toxicants, thereby providing the necessary basis for protection measures. In doing these, toxic genomics that involves applying molecular profiling approaches to the study of toxicology would be employed. The toxicology course would help in the development of new effective and safe chemical, monitor the effect of chemicals on environment, ensures that food and water are free from chemical and microbial contamination and safe for consumption. It will also assist in the diagnosis and treatment of chemical poisoning in humans and animals, provides specialized expert opinion in legal cases where medicines, food borne pathogens/poisons, drugs of abuse may be implicated, provide guidance for the safe use of chemicals in farms/farm produce and the ecosystems.

GENERAL PHILOSOPHY, VISION AND MISSION

The Africa Centre of Excellence for Mycotoxin and Food Safety came into existence in 2019 through NUC/World bank support and it is one of the ten (10) different projects in various strategic areas of Science and Technology aimed at creating World Class Research Centers in the country. The ACEMFS was established at the Federal University of Technology Minna to leverage the research infrastructure available in the National Centre for Genetic Engineering and Biotechnology (CGEB) and its strategic plan to train a skilled and innovative work-force that would transform Africa's natural resources into goods and services, driven by entrepreneurship and information and communication technology (ICT), to positively affect the economy and thus the quality of life of her people.

PHILOSOPHY

The ignorance of African farmers and extension workers, the public and policy makers on the existence and health impact of food borne toxicants, coupled with the deficits in funds, qualified personnel and laboratory infrastructure of national food control systems to generate occurrence data, formulate and effectively enforce standards; account for the deplorable food safety situation of the Continent. Postgraduate study (MTech and PhD) in Toxicology are full time programmes designed by ACEMFS for the purpose of encouraging cross-border collaboration to provide relevant human and material resources for the effective training of high-level independent minded, self-reliant and competent researchers that are capable of providing critical skills in effective food system. The programmes in Toxicology will provide the skills that will adequately address the research and training needs to conduct regional survey of food borne pathogens and toxic chemical residues, assess their health and economic impacts and consequently set appropriate national and regional standards for effective prevention and control.

VISION

To produce skilled manpower with quality education and training in the use of modern functional equipment and innovative research for assessing impacts of food borne pathogens and toxic chemical residues on the health and economy of West and Central Africa Sub-region and

consequently set appropriate national and regional standards for effective prevention and control of food poison that can guide policy formulation across the African region.

MISSION

To provide expert information to health care providers, food vendors, food regulators and policy makers based on practical evidence of the understanding of disease etiology, and plausible association between disease development and the exposure to hazard agents.

AIM To produce Toxicology graduates that have broad knowledge of harmful actions of chemical substances by studying their mechanisms of actions and to estimate their possible risks to humans on the basis of experimental work on the biological test organisms.

OBJECTIVES

The programme will impart the knowledge required to create an interdisciplinary, experimental education model that will prepare graduates on the rapidly emerging need for innovations at the nexus of food security, food safety, agricultural productivity and economics from local to global scales. These would be achieved by;

- (a) Acquire knowledge required to create an interdisciplinary and experience based educational model that will prepare students on the rapidly emerging need for innovations at the nexus of food security, food safety, agricultural productivity and economics from local to global scales.
- (b) Acquire skilled and innovative ideas that would transform Africa's natural resources into goods and services, driven by entrepreneurship and Information and Communication Technology (ICT), to positively affect the economy and thus the quality of life of her people.
- (c) Be able to foster impactful interdisciplinary research and implement solutions that will improve the quality of life of Africans through fit-for-purpose interventions fostering economic growth and access to sufficient safe food for all.
- (d) Be able to address Africa's shortage of expertise and applicable solutions to ensure a safe, controlled and sufficient food supply that will support economic growth and public health.

Specific objectives of Toxicology are as follows:

- i. to transmit the inter-disciplinary knowledge of toxicology viz-a-viz food, environmental, forensic and clinical toxicity.
- ii. to expose students to broad knowledge of classes of toxicants with the view to understanding advance toxicological activities
- iii. to describe various toxic actions and explain how they affect organs and systems
- iv. to expose students to instrumentation techniques and analytical procedure in toxicology
- v. to transmit knowledge on risk assessment, prevention and control of toxins
- vi. to expose the students to toxicological techniques for food, industrial and environmental applications.

ADMISSION REQUIREMENTS

Candidate for admission to the MTech programme in Toxicology in Africa Centre of Excellence for Mycotoxin and Food Safety shall have the following requirements:

- (a) minimum of five 'O' level credit passes in NECO/WAEC/NABTEB or its equivalent for international students which must include English/French, Mathematics and relevant science subjects (Chemistry, Biology and Physics) at no more than two sittings.
- (b) National Youth Service Corps (NYSC) certificate or NYSC exemption certificate (Nigerians only)
- (c) must ensure their academic transcripts are received on time to allow for consideration of the application.
- (d) must have at least a second class lower honour degree or its equivalent for foreign candidate.
- (e) recognized PGD with a minimum of lower credit (CGPA of 2.50) in relevant fields with, at least one year post-qualification experience may be considered.
- (e) must provide three referees, one of whom must be his/her academic supervisor
- (f) a qualifying examination may be necessary.

Note:

1. First degree graduates from the following areas: Food Safety, Food Toxicology, Biochemistry, Molecular Biology and Bioinformatics, Biotechnology, Microbiology, Veterinary Medicine, Bachelor of Medicine & Surgery, Pharmacy, Chemistry, Food Science, Animal Science, Crop Science, Plant Pathology are qualified to apply for the MTech programme in Toxicology.
2. Candidates from non-English speaking countries (Francophone Countries) are to undergo proficiency training in English Language (maximum of six months). The waiting period for the training is not counted as part of candidate's academic programme duration.

Admission into the PhD programme is TWICE a year (at the beginning of new academic session and commencement of second semester of every academic session).

Candidate for admission to the PhD programme in Toxicology of the Africa Centre of Excellence for Mycotoxin and Food Safety shall have the following requirements:

- (g) minimum of five 'O' level credit passes in NECO/WAEC/NABTEB or its equivalent for international students which must include English/French, Mathematics and three relevant science subjects (Chemistry, Biology and Physics) at no more than two sittings.
- (h) Nigerian applicants must have National Youth Service Corps (NYSC) certificate or NYSC exemption certificate.
- (i) ensure their academic transcripts are received on time to allow for consideration of the application.
- (j) shall be Master Degree graduates and must have attained an average performance of 'B' grade or weighted average of 60% or a minimum CGPA of 3.50

- (k) ensure that their research proposals are received on time for consideration of the application.
- (l) must provide three referees, one of whom must be his/her supervisor or an academic referee.
- 3. Graduates with Master degree from the following specialization/areas: Food Safety, Food Toxicology, Biochemistry, Molecular Biology and Bioinformatics, Biotechnology, Microbiology, Veterinary Medicine, Medicine & Surgery, Pharmacy, Chemistry, Food Science, Animal Science, Crop Science, Plant Pathology are qualified to apply for the PhD programme in Toxicology.

All PhD candidates will be required to audit core courses from the Masters programme on assessment of their academic transcripts by Academic Board of the Centre. The courses to be audited are peculiar to each students and are on the students' portal.

- 4. Candidates from non-English speaking countries (Francophone Countries) are to undergo proficiency training in English Language (maximum of six months). The waiting period for the training is not counted as part of candidate's academic programme duration.

GRADUATION REQUIREMENTS

Master Programme

To be awarded a master degree in Toxicology, a candidate is expected to satisfy the following conditions before graduation;

- (a) Pass all courses, including research project
- (b) A minimum of three (3) semesters and maximum of six (6) semesters are required to be spent by the candidates while on the program. This includes the period spent on the course work and internship. To successfully complete the course, students are expected to register and **PASS all the credit units registered for.**

Total number of credits required for graduation is 43 credits for Toxicology:

Core credit units: **31**

Elective credit units: **4**

Internship: **2**

Thesis: **6**

- (c) Publication of at least one paper in high Impact Factor Journal and a conference paper presentation is a prerequisite for graduation.
- (d) Attain an overall minimum CGPA of 2.50 at the end of course work.

Registration and Duration

MTech candidates will be required to register as full time at the beginning of any session.

Minimum Time – 3 Semesters- 18 months

Maximum Time – 6 Semesters- 36 months

Doctoral Programme

To be awarded a PhD degree in Toxicology, a candidate is expected to satisfy the following conditions before graduation;

- (a) a group of supervisors shall be nominated by the Centre, presented to, and approved by the postgraduate board for each candidate.
- (b) must have presented and passed four seminar series comprising of oral proposal, two progress reports and exit seminar before the final viva..
- (c) at least TWO paper publications from the thesis in high impact factor journals and TWO conference paper presentations before final examination can take place.
- (d) final oral examination of the graduant in the presence of an external examiner invited from any sister Universty, an internal examiner from the department, the representative of the Postgraduate School and other academic members of the the University.
- (e) the final corrected version of the PhD thesis must be re-submitted within three months from the date of final oral defense.

Registration and Duration

PhD candidates will be required to register as full time at the beginning of the session.

Minimum 6 Semesters or 36 months
Maximum 10 Semesters or 60 months

METHODS OF INSTRUCTION

Generally, pedagogical approaches will be adopted. These will include lectures, demonstration, tutorials, group presentation; Laboratory practical will include wet and dry practical, field trips, report presentation at the end of internship, teleconferencing and mid-term papers. All instructions shall be in English language.

METHODS OF EVALUATION

Procedure for formative assessment (FA) including assignments and mid-term test: 40%

Procedure for summative assessment (SA): 60%

Internship/Industrial experience: 3 months

Practical- based classes shall be assessed thus:

Class experiments: 40 %

Advanced technique term paper: 10 %

Examination: 50 %

CAREER/JOB OPPORTUNITIES

Graduates of Africa Centre of Excellence for Mycotoxin and Food Safety specializing in Toxicology, shall be opportune to work as laboratory analysts, surveillance/senior inspectors, molecular toxicologists, forensic and clinical toxicologists, food and safety officer/food safety

regulators in various companies and industries. They would also be relevant as biosafety officers, toxicological risk assessors, food toxicologists, and instructor/lead instructors/trainers/lecturers. In addition, their expertise will be needed in agriculture, food industries and regulatory organizations ; Standards bureau/organizations, National Drug Administration and Food Control, Quarantine services, Veterinary Centre, Hospitals, Food and Chemical Industries, Drug Discovery scientist, Molecular Mycologist, Data Scientist, Computational Scientist, Modeling expert, Food Nanotechnologist, Food borne infection control expert, Food industry, Animal feed Quarantine Institution, Universities, and Research Institutes.

EXAMINATION MALPRACTICE AND PENALTIES

1. Except where specifically stated, materials relevant to the examination should not be brought into the examination Hall.
2. The Senate shall impose penalties for any examination malpractices after thorough investigation.
3. Proven cases of cheating shall be punished with dismissal from the University. Other cases will be treated on their individual merits.
4. Suspected examination malpractices shall be investigated by the School panel and its report and recommendations submitted to the Students' Disciplinary Committee through the Registrar for determination subject to approval by the Vice-Chancellor.
5. Graded punishments include the following:

S/N	OFFENCES	PENALTIES
1.	Writing Before an Exam was officially started	First offender: Warning. Second offender: Suspension for one semester
2.	Writing beyond the official termination of examination	Letter of warning and deduction of 5 marks. To be done at the spot by the invigilator.
3.	Talking to another candidate during examination	First offender; Warning. Second offender: Suspension
4.	Writing on question paper	Letter of warning and deduction of 5 marks.
5.	Being caught with extraneous material not relevant to the examination	Cancellation of paper of the affected student.

6.	Anyone caught using foreign materials inside the examination hall that are relevant to the Examination/course.	Expulsion
7.	Anyone who brought relevant materials into the hall but was not caught using it.	Suspension for two semesters
8.	Unruly behaviour e.g. changing position without permission	Suspension for one semester
9.	Smuggling in/out of the examination hall, Blank answer booklet or continuation Sheet.	First offender: Minimum of 2 Years suspension. Those with previous records, expulsion.
10.	Anyone who brought into the examination hall already written answer script or continuation sheet.	Expulsion
11.	Aiding and abetting 'grafting'	Suspension for one semester
12.	Giving false evidence	Suspension
13.	Refusal to give evidence on request	Suspension
14.	Previous involvement in two examination misconduct with penalties less severe than rustication	Expulsion
15.	Assaulting/Fighting an invigilator or any officer of the University	Expulsion
16.	Being in possession of dangerous weapon in and around the examination hall.	Expulsion
17.	Involvement in examination leakage	Expulsion
18.	Impersonation (both the impersonator and collaborator)	Expulsion

19.	Those who fail to submit answer scripts at the end of examination	Suspension for one session
20.	Students who failed to sign out after Examination	First offender: Warning, Second offender: Suspension for one semester
21.	Refusal to surrender incriminating evidence, chewing or destruction of materials.	Expulsion
22.	Refusal to write statement	Expulsion
23.	Forging any document relevant to the Examination	Expulsion
24.	Anyone who refused to be identified and/or searched at the entrance of an examination hall.	Suspension from the examination for that particular paper, through Examination Officer and Dean.
25.	Staff harassment or intimidation for leakage of examination questions	Expulsion
26.	Writing on question paper	Letter of warning and deduction of 5 marks.
27.	Anyone who takes GSM handset into the Examination hall.	Suspension for one semester
28.	Refusal to appear before the Students Disciplinary Committee within a session following examination misconduct.	Expulsion
29.	Those who exchange or transfer calculator in the examination hall.	Expulsion.
30.	Exchange of answer booklets	Expulsion
31.	Writing on any part of the body and clothes	Expulsion
32.	Discussion in the course of writing an examination.	Letter of warning
33.	Making some writings relevant to the course at the back of	Expulsion

	calculators including placing relevant material inside Mathematical-set.	
34.	Exchanging answer script or question papers or any relevant writing materials during Examination.	Expulsion. <u>Note.</u> Relevant material: Suspension for one semester.

DRESS CODE

Students' dressing should reflect a high sense of morality and decency and show respect for the sensibilities of other members of the community. Therefore, the following types of dressing and physical appearances be prohibited on the University campus:

1. Short and skimpy dresses e.g. Body hugs, Show-me-your chest/back/stomach; Spaghetti wears and dresses exposing sensitive parts.
2. Tight shorts and skirts that are above the knees (except for sporting purposes).
3. Tattered jeans with holes and/or patches.
4. Transparent and see-through dresses.
5. Tight fittings e.g. Jeans, Shirts, Hip Star, Patra, Lactra, Cross-No Gutter, Mini-micro and others that reveal the contour of the body.
6. Under clothing, such as singlets worn publicly.
7. Unkempt and haggard appearance, including bushy hair and rough beards.
8. Dresses that make it impossible to wear laboratory coat during practical's or participate actively in practical.
9. Long and tight skirts, with long slits that reveal sensitive parts.
10. Wearing of T-shirts with offensive captions.
11. Shirts without buttons or not properly buttoned leaving the wearer hare chested.
12. Wearing of earrings by male students.
13. Plaiting or weaving of hair by male students.

14. Wearing of coloured eye glasses, except on medical grounds in the classrooms/lecture halls/library/offices.
15. Wearing bathroom slippers to class/library/offices (except on medical grounds).

DISCIPLINARY MEASURES

1. Cultism: any students guilty of participating in any occultism shall be expelled from the university after proven guilty by the Students' Disciplinary Committee (SDC).
2. Stealing: any act of stealing shall attract maximum penalty of expulsion from the university.
3. Drug abuse: any drug- related anti-social behaviours shall attract necessary disciplinary measures ranging from suspension to expulsion.
4. Any students' case involving police shall also be tried by the university Students' Disciplinary Committee (SDC).
5. In any case of co-habitation by the student(s), centre shall make available form of intent to be completed by the student(s) concerned, failure to do this shall attract penalty ranging from suspension to suspension as determined by the Students' Disciplinary Committee (SDC).
6. Any student that disobeys laboratory code of conducts shall be suspended from the lab for a period to be determined by the Students' Disciplinary Committee.
7. Physical assault shall attract punishment ranging from suspension to expulsion to be determined by the Students' Disciplinary Committee (SDC)

SEXUAL HARASSMENT

Federal University of Technology Minna will provide enabling conditions for the guarantee of academic freedom and fundamental human rights of staff, students, service providers, and all persons; regardless of gender, thereby supporting an environment that is free of sexual harassment in any form.

Vision of the Policy

To raise FUTMINNA to the status of an ideal, safe, and secure institution, where the dignity of everyone is ensured and guaranteed.

Mission of the Policy

- Provide information to staff, students, and other stakeholders on what constitutes sexual harassment
- Enlighten staff and students on their rights to seek redress in cases of sexual harassment and the consequences of such acts.
- Put in place machinery for investigating allegations and incidents of sexual harassment and /or attempted sexual harassment.

- Ensure that victims of sexual harassment do not suffer any setbacks/victimization/stigmatization/discrimination and are integrated back into University life as quickly as possible.
- Sensitize staff and students on the need to comply with decent dress code and appropriate behavior; and discourage inappropriate relationships between staff and students that may engender conflict of interest.

The Scope of the Policy

The Sexual Harassment Policy shall apply to:

- All academic and non-academic staff of the University
- All students
- All contractors of the University and other service providers
- All visitors to the University
- Other groups of persons in the University, including but not limited to children, wards, and other dependents of staff resident on both campuses

Objectives of the Policy

The objectives of the policy are to:

- Create for staff, students and service providers a safe and secured work and learning environment that is free from sexual harassment/assault.
- Guarantee respect for both sexes, and provide a transparent operating system in the university that is devoid of demands for sexual gratification.
- Eliminate all manners of gender-based violence.
- Ensure that no member of the university community or its customers suffer any form of service failure due to gender bias.
- Forbid discrimination on the basis of sex in all the University's service windows.
- Ensure firm commitment to transparency on the issues of sexual harassment and sexual violence
- Enforce the dress code as enshrined in the University's code of conduct for staff and students.
- Train students/staff to be alert to the possibility of sexual misconduct, to identify warning signs and to learn strategies for getting out of those kinds of situations before it reaches a crisis level.

WHAT IS SEXUAL HARASSMENT?

Sexual harassment is defined as unwelcome sexual advances, request for sexual favors and other verbal or physical conduct of a sexual nature when either:

- i. The conduct is made as a term or condition of an individual's employment, education, living environment or participation in a University community.
- ii. The acceptance or refusal of such conduct is used as a basis or factor in decisions affecting an individual's employment, education, living environment, or participating in a University community.
- iii. The conduct unreasonably impacts an individual's employment or academic performance or creates an intimidating, hostile or offensive environment for that individual's employment, education, living environment, or participation in a University community.

The following behaviors shall be considered by the University as sexual harassment:

- Unwanted sexually motivated conduct, crude jokes, comments, unwanted touching and expressions capable of prejudicing or undermining a person's freedom, rights and privileges. Such acts could include but are not limited to outright demands for sex, ogling, indecent comments and unnecessary bodily contact which could lead to psychological or physical unsolicited sexual relationships;
- Unwanted suggestive looks, phone calls or use of any other electronic medium with the intent to lure a person into a sexual relationship.
- Spousal abuse where one or both partners are members of the university community
- Sexual harassment may be from a superior to a subordinate or vice versa or among peers.
- Sexual harassment can be direct or indirect (including procuring or attempting to offer a person to another for sexual activity); and may involve persons of the same or opposite sex.
- Sexual harassment may take place over a period of time, may be a single incident and may or may not involve elements of overt coercion.

BEHAVIOURS THAT ARE CONSIDERED 'CONDUCT OF A SEXUAL NATURE'

- I. Unwanted sexual statement: Sexual or 'dirty' jokes, comment on physical attributes, spreading rumors about or rating others as to sexual activity or performance, talking about one's sexual activity in front of others and displaying or distributing sexually explicit drawings, pictures and/or written material. Unwanted sexual statement can be made in person, in writing, electronically (e-mail, instant messaging, blogs, web pages etc) and otherwise.

- II. Unwanted personal attention: Letters, telephone calls, visits, pressure for sexual favors, pressure for unnecessary personal interaction and pressure for dates where a sexual/romantic intent appears evident but remains unwanted.
- III. Unwanted physical or sexual advances: Touching, hugging, kissing, fondling, touching oneself sexually for others to view, sexual assault, intercourse or other sexual activity.

WHAT IS SEXUAL ASSAULT?

Sexual assault/ sexual violence is any sexual act, attempt to obtain a sexual act, or other act directed against a person's sexuality using coercion, by any person regardless of their relationship to the victim, in any setting. It includes rape, defined as the physically forced or otherwise coerced penetration of the vulva or anus with a penis, other body part, or object (WHO, 2011).

FORMS OF SEXUAL HARASSMENT

Based on the definition provided above, sexual harassment in Federal University of Technology, Minna shall include but not limited to:

Verbal Conduct

- Unfriendly remarks with sexual connotations
- Forcing of females or males by staff or students to have sexual interaction.
- Demanding for sexual favors in exchange for employment, promotion, admission, grades, or any other benefits in the course of performing official duties.
- Victimizing an individual through denial of his or her entitlement for refusal to succumb to sexual advances.
- Sexually motivated jests, comments and defamation of a person(s).
- Making sexually motivated comments about a person's clothing, body or shape.
- Turning academic and occupational discussions into sexual discussions without precluding or restricting appropriate teaching methods and research.
- Compelling persons to narrate sexual fantasies, preferences or history.
- Unsolicited, sexually explicit or suggestive electronic and mobile messages.
- Directly or indirectly procuring or attempting to offer a person to another for sexual activity

Visual and Audio Conduct

- Recording and sending unwholesome pictures (videos, CDs, camera phones etc) for the purpose of blackmail or any other purpose.
- Forcing or inducing to watch pornography or X-rated movies

- Seductive postures and indecent dressing and exposure by males or females that offend public morality. Any form of dressing that exposes vital parts of the human body constitutes indecent dressing. The University shall encourage a ‘dress sense’ culture among males and females.
- Indecent and inappropriate public display of sexual intimacy

Physical Conduct

- Physical sexual assault and battering
- Repeated, unwelcomed and unwarranted brushing against a person’s body.
- Unwelcomed caressing or fondling

WHO IS THE VICTIM OF SEXUAL HARASSMENT/ASSAULT?

In the University community, the following may be victims:

- i. Students (males and females)
- ii. Staff (males and females)
- iii. Staff children/wards
- iv. Students’ children/wards

Sexual harassment by University staff/student outside the University community.

The victim could seek support from University services and duty bearers within the community the University operates in like the security, health services and SERVICOM.

Redress Mechanism for Complainants

All complaints on violation or infringement of the sexual harassment policy shall be made at the Gender Mainstreaming Office (GMO) or SERVICOM unit of the University. If the complainant is not satisfied, he/she can complain to the Vice Chancellor. All complaints shall be treated with confidentiality and the victim shall be properly secured while reporting the incidence and afterwards.

Complaints of violation or infringement of the policy may be formal or informal. ACEMFS has a guidance counselor desk officer whom the victim reports to as soon as it happens.

- Informal complaints (i.e. oral complaints) shall be treated administratively. The receiving officer shall however document such complaint and treat with dispatch.
- Formal complaint must be in writing, signed and submitted at the GMO or SERVICOM unit.

A report or complaint can be made by the victim (or anyone who advocates on his or her behalf), or a witness. However, the decision to make such complaint formal or informal lies with the victim (or anyone who advocates on his or her behalf) or a witness.

PENALTIES

Any person found culpable of perpetrating sexual harassment, falsely accusing any person or instigating the occurrence of false accusation shall be subject to penalty as stipulated in the Conditions of Service of the University. These may include, but will not be limited to any of the following:

- Counseling and/or therapy
- Oral admonition
- Written warning or oral reprimand
- Referral to Staff/Student Disciplinary Committee (SDC) as the case may be or
- Any other disciplinary action which the University may deem fit (including suspension, expulsion or dismissal from service with photograph pasted around the campus).

In cases of sexual harassment outside the University, there will be a need for the involvement of security agencies and hence the court. The University shall follow the case to the latter while the student/victim is fully protected.

MTECH TOXICOLOGY (COURSE OUTLINE)

FIRST SEMESTER

S/NO	Course Code	Course Title	Credit Unit	Course Status
1	TOX 811	Principles of Toxicology	2	Core
2	TOX 812	Advanced Toxicology	3	Core
3	TOX 813	Toxic Actions	2	Core
4	TOX 814	Organ Toxicity	3	Core
5	TOX 815	Analytical Toxicology	2	Core
6	TOX 816	Seminar	1	Core
7	TOX 817	Prevention of Toxicity	1	Core
8	MFT 811	Introduction to Nanoscience and Nanotechnology	2	Core
		Sub-total	16	

9	MBB 815	Bioinformatics I	3	Elective
10	BFS 813	Chemical Food Safety	2	Elective

SECOND SEMESTER

S/NO	Course Code	Course Title	Credit Unit	Course Status
1	TOX 821	System Toxicity	2	Core
2	TOX 822	Toxicological Risk Assessment and risk characterization	2	Core
3	TOX 823	Food Toxicology	2	Core
4	TOX 824	Environmental Toxicology	2	Core
5	TOX 825	Forensic and Clinical Toxicology	2	Core
6	TOX 826	Toxicological Methods	2	Core
7	MFT 821	Research Methods, Biostatistics and Ethics	3	Core
		Sub-total	15	

8	TOX 827	Plant and Animal Biotechnology	3	Elective
9	BFS 822	Veterinary Chemical and Drug Residues	2	Elective

THIRD SEMESTER

S/NO	Course Code	Course Title	Credit Unit	Course Status
1	MFT 830	Internship	2	Core
2	TOX 830	Research Project	6	Core

NOTE:

A minimum of forty three (43) credit units must be taken by students in the three semesters.

*Internship program for a minimum of three months will be in an accredited industry or research institute approved by the Department/Centre/AAU/World Bank.

COURSE CONTENTS

TOX 811 PRINCIPLES OF TOXICOLOGY

2 CREDITS

Introduction to Toxicology

Definition and scope, relationship to other sciences and a brief, history of Toxicology. Dose–response relationships, sources of toxic compounds and movement of toxicants in the environment.

Introduction to Biochemical and Molecular Methods in Toxicology

Cell culture techniques, including suspension of cell culture, monolayer cell culture, indicators of toxicity in cultured cells, use of stem cells and cell culture models as “alternative” toxicity tests.

Molecular Techniques on molecular cloning, DNA and Genomic Libraries, Northern and Southern Blot analysis, PCR and evaluation of Gene expression, regulation, and function.

Immunochemical Techniques including proteomics, metabolomics and bioinformatics.

Exposure Classes, Toxicants in Air, Water, Soil, Domestic and Occupational Location.

Air pollutants; types, sources and examples of air pollutants. Types and examples of water and soil pollutants. Routes of exposure and regulation of occupational pollutants and examples of industrial toxicants.

Classes of Toxicants

History of common toxic metals, mechanisms and sites of action with reference to lead, mercury, cadmium, chromium, and arsenic. Treatment of metal poisoning.

Introduction to agricultural chemicals (pesticides). Definitions and terms, organochlorine insecticides, organophosphorus (OP), insecticides (carbamate insecticides, botanical insecticides, pyrethroid insecticides). New classes of insecticide: herbicides, fungicides, rodenticides, and fumigants. Food additives and contaminants. Toxins of microbial origin, mycotoxins, algal toxins, plant and animal toxins and chemical toxins. Therapeutic and drugs of abuse. Combustion products and cosmetics

TOX 812 ADVANCED TOXICOLOGY 3 CREDITS

Metabolism of Toxicants

Phase I Reactions, The endoplasmic reticulum, microsomes, and monooxygenations. The CYP-dependent monooxygenase system. The FMO, nonmicrosomal oxidations, co-oxidation by cyclooxygenase (COX), reduction reactions, hydrolysis, epoxide hydration and DDT dehydrochlorinase. **Phase II Reactions**: Glucuronide conjugation, glucoside conjugation, Sulfate conjugation, methyltransferases, GSTs and mercapturic acid formation, cysteine conjugate β -lyase, acylation and phosphate conjugation.

Absorption and Distribution of Toxicant

Structure of cell membranes, mechanisms of transport of toxicants across membranes: passive diffusion, carrier-mediated membrane transport, physicochemical properties relevant to diffusion namely ionization and partition coefficients. Routes of absorption; extent of absorption, gastrointestinal absorption, dermal absorption, respiratory penetration, toxicant distribution, physicochemical properties and protein binding toxicokinetics.

Reactive Metabolites

Activation of enzymes. Nature and stability of reactive metabolites, fate of reactive metabolites, binding to cellular macromolecules and lipid peroxidation. Trapping and removal role of glutathione. Trapping and removal role of epoxide hydration, factors affecting toxicity of reactive metabolites (Levels of activating enzymes, levels of conjugating enzymes and levels of cofactors or conjugating chemicals). Reactive oxygen species in activation reactions (piperonyl butoxide, chlorpyrifos, vinyl chloride, methanol, aflatoxin B1, carbon tetrachloride (tetrachloromethane), acetylaminofluorene, benzo(a)pyrene, acetaminophen and cycasin

Chemical and Physiological Factors Affecting Xenobiotic Metabolism

Nutritional effects (protein, carbohydrates, lipids, micronutrients, starvation, dehydration and nutritional requirements in xenobiotic metabolism. Physiological effects (development, gender differences, hormones, pregnancy, disease and diurnal rhythms. Comparative and genetic effects (variations among taxonomic groups, selectivity and genetic differences). Chemical effects and

inhibition. Induction and biphasic Effects. Inhibition and induction. Environmental effects (temperature, ionizing radiation, light, moisture, altitude and other stress factors).

Elimination of Toxicants

Introduction on factors involved in elimination of toxicants; size, surface area to body mass ratio, compartmentalization, lipid content and barriers to the environment. Transport and renal elimination (size, water solubility, hepatic elimination, entero-hepatic circulation and active transporters of the bile canaliculus. Respiratory elimination.

TOX 813 TOXIC ACTIONS 2 CREDITS

Acute and chronic Toxicity

Introduction to acute exposure and effect, dose–response relationships and nonconventional dose–response relationships. Alternative methods including Up-Down method, fixed-dose method, and *In vitro* methods. Mechanisms of acute toxicity involving necrosis, acetylcholinesterase inhibition, ion channel modulators and inhibitors of cellular respiration.

Chemical Carcinogenesis and Mutagenesis

DNA damage and mutagenesis. General aspects of cancer. Human cancer; causes, incidence, and mortality rates. Known human carcinogens, classification of human carcinogens, usefulness and limitations of mutagenicity assays for the identification of carcinogens. Classes of agents that are associated with carcinogenesis; DNA damaging and epigenetic agents. General aspects of chemical carcinogenesis; initiation-promotion model and metabolic activation of chemical carcinogens and DNA adduct formation. Oncogenes; Ras Oncogene, tumor suppressor genes.

Teratogenesis

Overview of embryonic development; fertilization, cleavage stages, determination, gastrulation, differentiation, organogenesis and fetal period. Principles of teratogenesis; Wilson’s principles and critical period, mechanisms of teratogenesis; genetic factors and teratogens.

TOX 814 ORGAN TOXICITY 3 CREDITS

Hepatotoxicity

Liver structure, function and susceptibility of the liver. Types of liver injury (fatty liver, Cholestasis, Fibrosis and Cirrhosis, Necrosis, Apoptosis, Hepatitis, Carcinogenesis. Mechanisms hepatotoxicity; examples of hepatotoxicants, carbon tetrachloride, ethanol, bromobenzene, acetaminophen and troglitazone. Metabolic activation of hepatotoxicants.

Nephrotoxicity

Structural organization of the kidney, function of the renal system and factors contributing to nephrotoxicity. Examples of nephrotoxicants will include metals, antimicrobial agents, agents that precipitate in renal tubules, halogenated hydrocarbon and analgesics.

Endocrine Toxicology

Introduction to endocrine system: Nuclear receptors and membrane-bound steroid hormone receptors. Endocrine disruption: hormone receptor agonists, hormone receptor antagonists and organizational versus activation effects of endocrine toxicants, inhibitors of hormone synthesis, inducers of hormone clearance and hormone displacement from binding proteins. Incidence of endocrine toxicity, including organizational toxicity, Activation toxicity and hypothyroidism.

Respiratory Toxicology

The anatomy and function of the respiratory tract, upper and lower respiratory tracts as sites of toxicity. Airways of the lower respiratory tract, parenchyma of the lower respiratory tract, circulatory, lymphatic, and nervous system of the lung. Toxicant-induced lung injury, remodeling, repair and oxidative stress and lung injury, antioxidant mechanisms in the lungs. Respiratory tract injury from inhaled particles and fibers, particle and fiber deposition. Clearance and respiratory tract injury from gases and vapors. Occupational and environmental lung diseases: Pulmonary fibrosis, asthma, hypersensitivity, pneumonitis (HP), COPD 383 and lung cancer.

TOX 815 ANALYTICAL TOXICOLOGY 2 CREDITS

Measurement of Toxicants: biological techniques; bioassay procedures using vertebrates, invertebrates, algae and animal toxicity test, and cell cultures. Physical and chemical methods: Chromatography (paper, thin layer, adsorption chromatographic techniques, gas chromatography, High Performance Liquid Chromatography). Spectroscopic techniques (UV/Visible Spectrophotometry, IF Spectrophotometry, Atomic Absorption Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Mass Spectroscopy) and Binding Assay.

Toxicity Testing: Experimental administration of toxicants, routes of administration, chemical and physical properties, exposure and environmental fate. *In vivo* tests; acute toxicity, sub chronic tests, chronic tests, special Tests. *In vitro* and other short-term tests, prokaryote mutagenicity, eukaryote mutagenicity, DNA damage and repair, chromosome aberrations, mammalian cell transformation and general considerations and testing sequences. Ecological effects. Laboratory tests, simulated field tests. Risk analysis and the future of toxicity testing.

TOX 816 SEMINAR 1 CREDIT

New approaches in Toxicology: perspectives on informatics in toxicology, molecular and biochemical toxicology and development of selective toxicants and other emerging trends in toxicology of the various food contaminants.

TOX 817 PREVENTION OF TOXICITY 1 CREDIT

Overview of preventive methods. Legislation and regulation by Federal Government, State Governments, Legislation and regulation in other countries and international organizations. Prevention in different environments; home, workplace, pollution of air, water, and land.

**MFT 811 INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY
2 CREDITS**

Emergence of Nanotechnology- Definition of nanotechnology, nano-system, nanomaterials and property-size dependent properties - Mechanical, Physical and Chemical properties. **Nano Ethics and Environment-** Environment related case studies on nanomaterials; Screening of nanomaterials for understanding potential effects to human health and the environment.

Environmental Pollution by Nanoparticles- Health impact, safety and toxicological effects transport of nanomaterials in soil/sediments. Study of physical and chemical properties of nanomaterials influencing their behavior in the environment and in biological systems.

Application of Nanotechnology- Nanoporous polymers and their applications in water purification, nanotoxicology, use of nanoparticles for environmental remediation and water treatment. case studies and regulatory needs.

Nanotechnology in Food Production- Food and new ways of food production - efficient fractionation of crops - efficient product structuring -optimizing nutritional values - applications of nanotechnology in foods : sensing, packaging, encapsulation, nano-feed binder, engineering food ingredients to improve bioavailability - nanocrystalline food ingredients - nano- emulsions - nano-engineered protein fibrils as ingredient building blocks - preparation of food matrices - concerns about using nanotechnology in food production. crop improvement - reasons to package food products - physical properties of packaging materials - strength - barrier properties light absorption – structuring of interior surfaces - antimicrobial functionality - visual indicators – quality assessment - food safety indication - product properties - information and communication technology - sensors - radiofrequency identification technology - risks - consumer and societal acceptance.

Nanoparticles in Agricultural and Food Diagnostics- Enzyme Biosensors and Diagnostics - DNA-Based Biosensors and Diagnostics - Radiofrequency Identification- Integrated Nanosensor Networks: Detection and Response- Lateral Flow (Immuno) assay - Nucleic Acid Lateral Flow (Immuno) assay - Flow-Through (Immuno)assays - Antibody Microarrays -Surface Plasmon Resonance Spectroscopy.

Toxicology of Nanomaterials in Food- Characterization of Engineered Nanomaterials: Unique Issues for Characterization of Engineered Nanomaterials for Food Applications - Safety Assessment of Oral- Exposure Engineered Nanomaterials for Food Application - Experimental

Design Considerations for Toxicology Studies - Toxicokinetics – ADME - Toxicodynamics - In Vivo Toxicity - In Vitro Toxicity - Study Reliability.

MBB 815 BIOINFORMATICS 1 3 CREDITS

Unit I: Introduction to Bioinformatics concepts, principles and applications: Biological databases, exploration, Data retrieval, homology searches and interpretation (BLAST algorithm and result interpretation: coverage, percentage similarity, e-value). Sequence alignments: types tools and practical applications.; DNA Sequences: Alignments and Analysis; Proteins: Alignment, Analysis and Structure; Sequence assembly methods for multiple sequence alignment; Multiple sequence alignment tools and applications (Use of Clustal Omega and Molecular Evolution and Genomic analysis (MEGA) software package for model and approach-based phylogeny construction, Overview of Primers and Primer Designing; Primer Designing; Primer specificity, Primer validation, n-Silico restriction digest in SMC and webcutter. In-Silico PCR in UCSC and virtual PCR

Unit II Exploration of DNA, and proteomic tools in Expasy: Pattern analysis in sequences Motif representation: consensus, regular expressions; PSSMs; Markov models; Regulatory sequence identification using Meme; Gene finding: composition based finding, sequence motif-based finding.

Units III : Structure-related problems representation of molecular structures (DNA, mRNA, protein), secondary structures, domains and motifs; structure classification (SCOP, CATH); Visualization software (Pymol, Rasmol etc.); Experimental determination of structures (X-ray crystallography, NMR); Structure databases; secondary structure prediction; RNA structure prediction; Mfold; Protein structure prediction by comparative modelling approaches(homology modelling, threading); Ab initio structure prediction: force fields, backbone conformer generation by Monte Carlo approaches, side-chain packing; Energy minimization; Molecular dynamics; Rosetta; structure comparison (DALI, VAST etc.); CASP; Protein-ligand docking; Computer-aided drug design (pharmacophore identification); QSAR; Protein-Protein interactions and Bioinformatic tools (e.g. STRING) ;

Unit IV::System-wide analyses: Transcriptomics: Microarray technology, expression profiles, data analysis; SAGE; Proteomics: 2D gel electrophoresis; Mass Spectrometry; Protein arrays; Metabolomics: 13C NMR based metabolic flux analysis; Exploring and Analysing microbial and eukaryotic genomic dataset ; analysing and exploring metagenomics data; Bioinformatics for transcriptomics; Bioinformatics for Systems Biology. Diversity studies: Case study in Fungi diversity

BFS 813 CHEMICAL FOOD SAFETY

2 CREDITS

Absorption, transport, metabolism and excretion; Toxicokinetics and dynamics; irritation and sensitization. *In vivo* toxicological investigations; genotoxicity, carcinogenicity and teratogenicity; plant and algal toxins; packaging materials and migration. Food- a matter of life and death.

TOX 821 SYSTEM TOXICITY 2 CREDITS

Introduction to immune system. The immune system, immune Suppression, classification of immune-mediated injury (Hypersensitivity) and effects of chemicals on allergic disease (ACD). Respiratory allergens, adjuvants, systemic hypersensitivity and other issues: autoimmunity and the developing immune system.

Toxicity of the Nervous System

Introduction to the nervous system; the neuron, neurotransmitters and their receptors, Glial cells. The blood-brain barrier and the energy-dependent nervous system. Toxicant effects on the nervous system. Structural effects of toxicants on neurons and toxicant-mediated alterations in synaptic function. Neurotoxicity testing; *in vivo* tests of animal exposure, *in vivo* tests of human exposure and *in vitro* neurochemical and histopathological end points and skin toxicity.

Toxicity of the Reproductive System

Definition of reproductive toxicity, definition of endocrine disruption, the hypothalamic-pituitary-gonadal axis, male reproductive physiology, disruption of male reproduction by toxicants (pesticides, metals, plastics). Female reproductive physiology and the ovulatory cycle. Disruption of female reproduction by toxicants such as cigarette smoke, diethylstilbestrol (DES), pesticides, plastics, phytoestrogens and others.

TOX 822 TOXICOLOGICAL RISK ASSESSMENT AND RISK CHARACTERIZATION 2 CREDIT UNITS

Introduction to risk assessment methods; hazard identification, exposure assessment and dose response and risk characterization. Non-cancer risk assessment: default uncertainty and modifying factors, derivation of developmental toxicant RfD, determination of RfD and RfC of naphthalene using the NOAEL approach, benchmark dose approach, determination of BMD and BMDL for ETU and risk for Non-carcinogenic effects, hazard quotient and chemical mixtures. Cancer risk assessment and PBPK Modeling.

Emerging Risk Assessment methods: hazard and exposure assessment using toxicogenomics, proteomics, metabolomics, systems biology approach to risk assessment, endocrine disruptors, genetically and modified plants (GMPs). Risk management. Risk communication. *In vivo* toxicity. Molecular and biochemical toxicology and development of selective toxicants.

TOX 823 FOOD TOXICOLOGY 2 CREDITS

Physiological functions and requirement of dietary constituents. General principles for use, safety assessment and types of **food additives** (food colours, sweeteners, acidulants and sequestrants, flavouring agents and antimicrobial agents. Types, occurrence, metabolism and toxicity of **toxicants resulting from food processing** (PAHs, premelanoidins, food irradiation, nitrates and nitrites) and effect of packaging materials. Classes, occurrence and effects of **Toxicants and antinutrients in plant foods** (proteinase, amylase and lipase inhibitors, phytates, tannins, cyanogenic glycosides, toxic amines and fatty acids, saponins, oxalates, alkaloids, phytoestrogens, antivitamin, phychoactive substances, etc.). Classification, occurrence, metabolism and toxicity of **fungal toxins**. Pathogenicity and toxicity of **Food Borne organisms and toxins**. Source of exposure and toxicity of toxic metals and radionuclides. Classification and mechanisms of toxicity of **pesticides, industrial contaminants (PCBs) and veterinary drug residues**. Prevention and controls of food borne toxicants (Nanotechnology, etc)

TOX 824 ENVIRONMENTAL TOXICOLOGY 2 CREDITS

Environmental sample collection, analytical techniques; quantification approaches.

Basics of Environmental Toxicology: Environmental persistence: abiotic degradation, biotic degradation, and nondegradative elimination processes. Bioaccumulation; factors that influence bioaccumulation. Toxicity: acute toxicity, mechanisms of acute toxicity, chronic toxicity, species-specific chronic toxicity, abiotic and biotic interactions.

Transport and fate of toxicants in the environment; Sources of toxicants to the environment. transport processes: diffusion, equilibrium partitioning, air–water partitioning, octanol–water partitioning, lipid–water partitioning, particle–water partitioning, transformation processes: reversible reactions, irreversible reactions. Environmental fate models. **Environmental Risk Assessment:** Formulating the problem. Selecting assessment end points, developing conceptual models and selecting measures. Analyzing exposure and effects information. Characterizing exposure and ecological effects. Characterizing and estimating risk. Describing and Managing risk.

TOX 825 FORENSIC AND CLINICAL TOXICOLOGY 2 CREDITS

Introduction to forensic toxicology; overview, evidentiary requirements, sample type and chemical classes analyzed in Forensic Toxicology. Clinical toxicology; overview, clinical toxicology and health care, training and certification, clinical management of toxicant exposure and analytical methods in Forensic and Clinical Toxicology.

MFT 821 RESEARCH METHODS, BIOSTATISTICS AND ETHICS 2 CREDITS

An in-depth study in preparation for seminar and conference presentations using visual aids. Writing of research and review papers for publication, thesis preparation, writing award winning research proposals, bibliographic citations, use of citation/referencing tools such as One Note, analysis and processing of raw quantitative data, literature search, abstracting etc. The use of

appropriate tool in analyzing data, sample collecting and preparation according to the needs of each research. Any relevant information that may be applicable to research.

TOX 826 TOXICOLOGICAL METHODS 2 CREDITS

Theory and practical familiarity with equipment used for investigations in toxicology.

BFS 822 VETERINARY CHEMICAL AND DRUG RESIDUES 2 CREDITS

Types of drugs; causes of drug residues in animal products; potential effect of veterinary drug residues on public health: developing of drug resistance, drug hypersensitivity reaction, carcinogenic effect, Mutagenic effect, teratogenic effect, disruption of normal flora; risk factors for development of residues in food producing animal; Permissible levels of residue; Detection methods of drug residues: microbiological method, immunological (rapid test kits), Immunoassay (ELISA), chemical method (Chromatography); safety evaluation of veterinary drug residues: acceptable daily intake (ADI), Maximum residue limit (MRL), calculating withdrawal time; residues avoidance program; control and prevention measure of veterinary drug residues.

TOX 827 PLANT AND ANIMAL BIOTECHNOLOGY 3 CREDITS

Unit I: Plant Biotechnology: Introduction: History, aim and scope of Plant Biotechnology, Biotechnology Scenario in India. Meristem culture, virus free plants. Large scale micropropagation, hardening and its application. Another culture for haploid plant production, Doubled haploids, application of haploids in plant breeding and crop improvement. Somaclonal variations and their use in crop improvement.

Liquid culture: Suspension cultures, Batch cultures, continuous cultures. Bioreactors, immobilized bioreactors; Improving and enhancing yield of secondary plant products using bioreactors, Hairy root cultures for production of secondary metabolites.

Unit II: Transgenic Plants: Vectors for plant transformation - Binary vectors and integration vectors; their characteristic features in detail. Construction of expression vectors, Use of selectable markers. Marker free technology for production of transgenics. Methods for gene transfer: Gene gun and *Agrobacterium* methods. Details of *Agrobacterium*, Ti and T-DNA, mechanism of DNA transfer and integration Transgenic tissue regeneration and screening-of transgenics for gene integration using PCR and western or dot blotting techniques. Organelle Engineering: Targeting of genetically engineered DNA clones into chloroplasts of higher plants. **Disease Resistance:** Disease resistance to fungi by engineering chitinase (β -1, 3-glucanase gene) and osmotin. Disease resistance to bacteria by Lysozyme gene. Resistance to pests- Bt-toxin gene, protease inhibitor genes. Generation of herbicide tolerant plants, Development of transgenics to virus resistance, using of antisense and RNA interference technologies. Transgenic plants: Plantibodies, vaccines, Biopolymers and vitamins. Transgenics for delayed fruit ripening and increased shelf life-Tomato. Increase in the shelf life of cut flowers - (Carnation flowers).

Unit III: Improvement of food crops: Increase in essential amino acids in cereal seed proteins (phaseolin protein and albumin gene (for increase in methionine content). Increase in lysine by

using *E. coli* dihydropicolinate synthase (DHPS gene). Increase and change in the quality oils in Brassica species (increase in medium chain fatty acids and converting unsaturated fatty acid to saturated fatty acids). Increase in sweetness and flavor in fruits and vegetables (tomato). Increase in starch content (potato).

Unit IV: Animal Biotechnology: Methods and protocols used for tissue and cell cultures. Maintenance of cell cultures. Animal tissue culture: skin cultures, Neuronal cell cultures, muscle cell cultures, cartilage culture, blastocysts cell culture, whole embryo culture and tissue engineering, Large scale production: Large scale animal cell culture for commercial production of the IGs, interferons, vaccines, Mabs, hybridoma cells and other downstream process and problems. Methods to induce stem cells to differentiate into specific tissues. **Animal cell Transformation and immortalization:** Methods employed for animal cell transformation, viral and oncogene methods. Characteristic features of transformed cells. **Transgenic animals:** Protocols used for developing transgenic animals; use of fertilized egg cells, use of blastocyst cells; success and failures, problems. Transgenic sheep, transgenic goat, transgenic fishes, transgenic cattle, transgenic mice, transgenic pigs for the production of recombinant proteins. Animal cloning: Techniques used in animal cloning- transfer of whole 2n nuclei to enucleated Cells (ex. Xenopus), cultured cell application and ethics.

MFT 830 INTERNSHIP 2 CREDITS

This is the period of the Student’s Industrial Work Experience Scheme (SIWES) programme which is normally undertaken for four months during the second year of study. The SIWES programme is basically devoted to practical training in the industries that are relevant to the programme. Students are expected to put into practical use the knowledge they have learned in the classroom and laboratories

TOX 830 RESEARCH PROJECT 6 CREDITS

Independent research in selected areas of Toxicology under the guidance of academic supervisors. Students will be required to carry out literature survey on the topic, perform experiments in the laboratory and produce theses. The research outcome shall be defended before a panel of internal and external examiners.

SESSIONAL PROGRESS REPORTS FOR PhD TOXICOLOGY (NOT TO SCORED)

COURSE CODE	COURSE TITLE	
TOX 901	Seminar I	Core
TOX 902	Seminar II	Core
TOX 903	Seminar III	Core
TOX 900	Exit Seminar	Core

The ACEMFS will also provide a platform to bring together experts with tremendous wealth of experience in the diverse areas of health, agricultural and environmental research which are major development challenges confronting Africa. The following tables indicate different roles and responsibilities of officers.

TABLE 1: ADMINISTRATIVE OFFICERS

S/No	Name of Officer	Qualification	Designation
1	Prof. Hussaini Anthony Makun	BSc, MTech, PhD	Centre Leader
2	Dr. Hadiza Lami Muhammad	BSc, MTech, PhD	Deputy Centre Leader
3	Prof. Abdulkareem Ambali Saka	BSc, MTech, PhD	Sectoral Liason Officer
4	Dr. Helen Shnada Auta	BSc, MTech, PhD	Monitoring and Evaluation Officer
5	Mrs. Funmilayo Okoinemen Imoleayo	BSc, ACA	Project Accountant
6	Mr Ado Malik	BSc, MBA, ACA	Assistant Project Accountant
7	Mal Yusuf Yandalu	BSc, CNA	Finance Officer
8	Mr. Silas Habila Bijim	ND, BSc	Environmental Safeguard Officer

9	Mr. Abubakar Haruna	BTech, Dip CPT	Procurement Officer
10	Mr. Shafiu Ozovehe Sule	BSc, CNA	Auditor/Internal Auditor
11	Mrs. Dorothy Elaigu	BSc	Communication Officer
12	Mrs Ruth Lamai-Odepidan	BTech	Centre Secretary
13	Babawanchiko Mohammed	BTech, MTech	ACTO (APU)
14	Mrs Rahab Mamman	Cert Dip	Chief Clerical Officer

TABLE 2: ACADEMIC ADMINISTRATORS

S/No	Name of Officer	Designation
1	Professor Emmanuel Olofo Ogbadoyi	Applied Research Coordinator
2	Dr Oluwatosin Kudirat Shittu	Molecular Biology and Bioinformatics Research Theme Leader
3	Dr Alexander Ikechukwu Ajai	Heavy Metals and Pesticides Residues Research Theme Leader
4	Dr John Yisa Adama	Veterinary Drug Residues Research Theme Leader
5	Dr Tijani Jimoh Oladejo	Nanotechnology Research Theme Leader
6	Professor Chiemela Enyinnaya Chinma	Academic Program Coordinator
7	Dr. Hadiza Lami Muhammad	Food Safety and Toxicology Research Theme Leader

TABLE 3: INTERNATIONAL SCIENTIFIC ADVISORY BOARD

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TABLE 4: SECTORAL ADVISORY BOARD

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17	Mr. Mohamed Fofana	Sierra Leone Standards Bureau	morikeh@gmail.com

ACADEMIC FACULTY FOR PhD TOXICOLOGY

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ACADEMIC FACULTY FOR MTECH TOXICOLOGY

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