



**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 FOOD SAFETY**

**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; to this effect, much effort is already deployed to address the threat from mycotoxins, major biotic constraints to food security causing losses in crop yield, human productivity (40%) and in export. This also lowers performance of animal husbandry in addition to the direct human health impacts of increased incidence of cancers, growth stunting in children, reduced life expectancy and death. Other threats, such as salmonellosis, enterohaemorrhagic, 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 Food Safety will help to create learning opportunities and come up with research results that will 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.

Likewise, this programme will balance the molecular biology, toxicology, engineering, computing and modeling necessary for career in food safety and security. It connects research with application and integrates molecular genetics that explains the information in the gene expression that give rise to abnormality traits in an organism. The Centre will 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 of industries, academia and agencies concerned with patent and legal issues, education and research fundings.

Food Safety is a scientific discipline, overlapping with agriculture, 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 food pathogens, toxins and toxicants. The toxicants are both organic and inorganic substances such as *Salmonella typhi*, toxic metals, hydrofluoric acid, chlorine gas and organic compounds. The

Centre will train food safety experts in the areas of chemical food safety, risk analysis, food borne disease epidemiology, food fraud, food and feed fortification, food processing and packaging. The graduates will have expertise to investigate, interpret, and communicate the nature and the adverse effects of the research outcome, thereby providing the necessary basis for protection measures. In doing these, toxic genomics that involves applying molecular profiling approaches to the study of food safety would be employed. The taught courses would help in the development of new effective and safe foods, monitor the effect of chemicals on environment and in food, ensures that food and water are free from chemical and microbial contamination and safe for consumption.

## **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 ACE was established at the Federal University of Technology Minna to leverage the research infrastructure available in the National Centre for Genetic Engineering and Biotechnology (GEBEX) and its strategic plan is 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 Food safety are full time programmes designed by the Africa Centre of Excellence for Mycotoxin and Food Safety 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 food safety 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 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 the people.

**AIM** To train personnel in Food Safety that will impart better food and feed safety culture, and ensure safer foods for healthy living across Africa.

## **OBJECTIVES**

- (a) Acquire knowledge required to create an interdisciplinary and experience based educational 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.
- (b) 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.
- (c) 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 Food Safety are as follows:**

- i. to gain better understanding of effective food safety principles
- ii. to differentiate between traditional food safety management system versus a science-based food safety approach.
- iii. to understand the international food safety regulation and its subsidiary bodies
- iv. to improve the effectiveness of training, education and communication efforts in creating smarter food safety goals
- v. to acquire practical food safety knowledge and real-world applications that will help graduates become more effective in their roles and better equipped as food safety experts
- vi. to acquire knowledge on how to handle and prevent food-borne disease outbreaks
- vii. to understand the process of food production from farm to table.

## **ADMISSION REQUIREMENTS**

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

- (a) must have 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.
- (b) National Youth Service Corps (NYSC) certificate or NYSC exemption certificate (Nigerians only)
- (c) 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.
- (f) must provide three referees, one of whom must be his/her academic supervisor
- (g) a qualifying examination may be necessary.

**Note:**

1. First degree graduates from the following areas: Food Safety, Food Toxicology, Biochemistry, Molecular Biology and Bioinformatics, Microbiology, Veterinary Medicine, Bachelor of Medicine & Surgery, Pharmacy, Chemistry, Food Science, Animal Science, Crop Science, Plant Pathology are qualified to apply for the M.Tech programme in Food Safety.
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 (beginning of new academic session and commencement of second semester of every academic session).

Applicants for the PhD programme in Food Safety shall have, in addition to MTech requirements:

- i. shall be Master's Degree graduates and must have attained an average performance of 'B' grade or weighted average of 60% or a minimum CGPA of 3.50
- ii. graduates with master degree from the following specialization/areas: Food Safety, Food Toxicology, Biochemistry, Molecular Biology and Bioinformatics, Microbiology, Biotechnology, Veterinary Medicine, Medicine & Surgery, Pharmacy, Chemistry, Food Science, Animal Science, Crop Science, and Plant Pathology.
- iii. 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.

## **GRADUATION REQUIREMENTS**

### **Master Programme**

To be awarded a master degree in Food safety, 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 of 18 months and maximum of six (6) semesters of 36 months 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 required to register and **PASS** 47 credits units.  
Core credit units: **35**  
Elective credit units: **4**  
Internship: **2**  
Thesis: **6**
- (c) Publication of at least one paper in high Impact Factor Journal and conference presentation
- (d) Attain an overall minimum CGPA of 2.50 at the end of course work.

### **Doctoral Programme**

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

- (a) a group of supervisors shall be nominated by the Centre, presented and approved by the postgraduate board for the candidates.
- (b) must have presented four seminar series comprising of oral proposal, two progress reports in the course of research and an exit seminar before the viva.
- (b) at least TWO paper publications from the thesis in high impact factor journals and TWO conference presentations before final examination can take place.
- (c) final oral examination to be conducted in the presence of the external examiner approved by the PG School.
- (d) 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 session on first registration.

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 ACMFS specializing in Food Safety shall be opportune to work as laboratory analysts, surveillance/senior inspectors, 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 Biochemistry experts, Animal feed Quarantine Institution, University and Research Institute workers.

## **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:

<b>S/N</b>	<b>OFFENCES</b>	<b>PENALTIES</b>
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 calculators including placing relevant material inside Mathematical-set.	Expulsion
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 are 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 bare 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.

## **M.TECH FOOD SAFETY (COURSE OUTLINE)**

### **FIRST SEMESTER**

<b>S/N</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Unit</b>	<b>Core/Elective</b>
1	TOX 811	Principles of Toxicology	2	Core
2	TOX 812	Advanced Toxicology	3	Core

3	BFS 811	Introduction to Food Safety	2	Core
5	BFS 812	Chemical Food Safety 1	3	Core
4	BFS 813	Risk Analysis	2	Core
5	BFS 814	Plant Pathology	2	Core
6	BFS 815	Detection and Management of Mycotoxin for Food and Feed Safety	3	Core
7	MFT 811	Introduction to Nanoscience and Nanotechnology	2	Core
		<b>Sub Total</b>	19	
		<b>Electives</b>		
8	MBB 812	Molecular Biology 1	2	Elective
5	MBB 815	Bioinformatics 1	3	Elective
	Total	<b>Maximum to be registered</b>	<b>22</b>	

## SECOND SEMESTER

S/N	Course Code	Course Title	Credit Unit	Core/Elective
1	BFS 821	Pesticide and Toxic Metals	2	Core
2	BFS 822	Veterinary Chemical and Drug Residues	2	Core
3	BFS 823	Chemical Food Safety II	2	Core
4	BFS 824	Food Borne Diseases Epidemiology	3	Core
5	BFS 825	Food and Feed Additives and Fortification	2	Core
6	BFS 826	Food Processing and Packaging	2	Core
7	BFS 827	Food Laws, Standards and Regulations	2	Core
8	BFS 828	Seminar 1	1	Core
		<b>Sub Total</b>	<b>16</b>	
		<b>Electives</b>		
9	TOX 824	Environmental Toxicology	2	Elective
10	TOX 825	Forensic and Clinical Toxicology	2	Elective
		<b>Maximum to be registered</b>	<b>18</b>	



### THIRD SEMESTER

S/No	Course Code	Course Title	Credit Unit	Core/Elective
1	MFT 830	Internship/Industrial work experience	2	Core
2	BFS 830	Thesis	6	Core
		<b>Total</b>	<b>8</b>	

### COURSE CONTENT

#### TOX 811: PRINCIPLES OF TOXICOLOGY:

2 CREDIT UNITS

**Introduction to Toxicology:** Definitions and Scope, Relationship to Other Sciences. 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 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, cDNA 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 and introduction. **Metals:** History, Common Toxic Mechanisms and Sites of Action with reference to Lead, Mercury, Cadmium, Chromium, and Arsenic. Treatment of Metal Poisoning. **Agricultural Chemicals (Pesticides);** Introduction, Definitions and Terms, Organochlorine Insecticides, Organophosphorus (OP), Insecticides (Carbamate Insecticides, Botanical Insecticides, Pyrethroid Insecticides. New Insecticide Classes. Herbicides; Fungicides, Rodenticides, Fumigants. **Food Additives and Contaminants:** Toxins; History, Microbial Toxins, Mycotoxins, Algal Toxins, Plant Toxins and Animal Toxins, **Solvents, Therapeutic Drugs, Drugs of Abuse. Combustion Products and Cosmetics**

#### TOX 812: ADVANCED TOXICOLOGY

3 CREDIT UNITS

**Absorption and Distribution of Toxicant:** Introduction. 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. **Metabolism of Toxicants: Phase 1 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  $\beta$ -Lyase, Acylation and Phosphate Conjugation. **Reactive Metabolites:** Introduction. Activation 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. Examples of Activating Reactions (PiperonylButoxide, Chlorpyrifos, Vinyl Chloride, Methanol, Aflatoxin B1, Carbon Tetrachloride (Tetrachloromethane), Acetylaminofluorene, Benzo(a)pyrene, Acetaminophen and Cycasin. **Chemical and Physiological Factors Affecting Xenobiotics Metabolism:** Nutritional Effects (Protein, Carbohydrates, Lipids, Micronutrients, Starvation and 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. Renal Elimination (Size, Water Solubility, Hepatic Elimination, Entero-Hepatic Circulation and Active Transporters of the Bile Canaliculus. Respiratory Elimination.

**BFS 811      INTRODUCTION TO FOOD SAFETY      2 CREDIT UNITS**

**Basic definition:** Food, Dietary constituents-water, carbohydrates, proteins and amino acids, dietary fats and fatty acids, minerals, vitamins, factors affecting nutrient requirement, and dietary deficiencies and excess consumption of nutrients-, feed, water quality. **Food wholesome and safety-** introduction to various types of food contaminants (food additives, antinutrients in plant foods, mycotoxins, food borne pathogens, toxic metals, pesticides and industrial contaminants and drug residues) keeping quality, Bio-terrorism in food safety. **Food** – a matter of life and death.

**BFS 812      CHEMICAL FOOD SAFETY I      3 CREDIT UNITS**

**Toxico-kinetics and dynamics; Organ Toxicity:** Manifestation of toxicity to liver, kidney, and nervous, reproductive, endocrine, respiratory and immune systems. **Irritation and sensibilisation:** definitions and prevalence of hypersensitivity reactions, mechanisms, reactions in the skin, reactions in the airways, other reactions, test for hypersensitivity reactions, prediction

of allergy risk, development of tolerance and treatment of hypersensitivity, summary. **Genotoxicity, carcinogenicity and teratogenicity;** DNA Damage and mutagenesis. General aspects of cancer. human cancer; causes, incidence, and mortality rates of human cancer, 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 agents 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, p53 **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. ***In vivo* toxicological investigations;** acute, subchronic, chronic and special test. ***In vitro* toxicological investigations** Prokaryote mutagenicity, eukaryote mutagenicity, DNA Damage and repair, chromosome aberrations, mammalian cell transformation, general considerations and testing sequences. Ecological effects; Laboratory Tests, Simulated Field Tests and field Tests.

### **BFS 813 RISK ANALYSIS**

**2 CREDIT UNITS**

**Introduction:** Components of risks analysis; Conducting risk analysis; Risk management; Risk assessment; Risk Assessment Methods; Hazard Identification, Exposure Assessment and Dose Response and Risk Characterization. Monitoring and surveillance, epidemiological and clinical studies for human data, animal and in vitro and structure-activity relationship. 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 Quantifying 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. *In Vitro* Toxicity. Molecular and Biochemical Toxicology and Development of Selective Toxicants **Risk communication; Principles and application of HACCP/preventive control (allergens) in food safety.**

### **BFS 814 PLANT PATHOLOGY**

**2 CREDIT UNITS**

What is plant pathology; Definition of disease, Abiotic, biotic and decline diseases, Signs, symptoms and patterns; Mechanisms of disease action; The disease triangle, square and tetrahedron; Classification of organisms; Organisms causing biological diseases; Pathogen/insect

relationships. Allergen, susceptible crops and control strategies; Good Agricultural Practices (GAPs)

**BFS 815 DETECTION AND MANAGEMENT OF MYCOTOXIN FOR FOOD AND FEED SAFETY 3 CREDIT UNITS**

Fungi and mycotoxin in food; significance of fungi and mycotoxins in foods; Factors affecting growth of fungi in foods; Prevention and control of fungal growth in foods and food processing environments; Methods for detecting, enumerating, and identifying fungi; Airborne fungi – with introduction to antifungal preservatives; Role of fungi in food processing. **General introduction** to mycotoxins-chemical and toxicological characteristics, occurrence in foods and regulation of major and emerging mycotoxins, **Introduction to mycotoxin analysis**; - the chemical properties of mycotoxins, explore detection methods like;; Chromatographic techniques (HPLC, LC-MS),Immunoanalytical techniques (ELISA, LFD) and Multi-toxin Analysis by LC-MS- **Identification of mycotoxigenic fungi**- conventional and molecular based techniques-, **epidemiology of mycotoxicosis**; Prevention and control of mycotoxins; Physical factors associated with mycotoxin prevention; **Application of predictive modelling in mycotoxin control**;Mycotoxins in grain in selected countries. **Africa mycotoxin challenges: valid options and opportunities**. This would be based on current literatures and interventions across Africa. It will appreciate the roles mycotoxin play in health in Africa, including reported incidences with mycotoxins and also review the challenges Africa faces in addressing mycotoxin problems, student would produce papers on the approaches needed to mitigate mycotoxin problems. Discovery of opportunities of regional networking will be an output of this course.

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

**Emergence of Nanotechnology**-Definition of nanotechnology, nano-system, nanomaterials and properties-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 812**

## **MOLECULAR BIOLOGY I**

## **2 CREDIT UNITS**

**Unit I: DNA: Chemical composition of DNA:** DNA structure-single stranded DNA, detailed account of double stranded DNA-BDNA, Z.DNA, and other structural forms, triple stranded DNA and quadruplex DNAs, curved DNA, rod shaped DNA, and their importance. Super coiled DNA: Changes from one form to the other, and the enzymes involved, concept of Linking numbers. Importance of super helical DNA and their structural forms. Types of Topoisomerases and their function in adding or removing super helical structures. Characteristic features of highly repetitive DNA; Tandemly repetitive DNA and Mini and microsatellite DNA and Insertional elements and their role and importance

**Unit II:** C value paradox- Genome size and content over members of different orders and of the same family; cDNA value paradox. Resolving the paradox by DNA-DNA and DNA-RNA hybridization kinetics. Kinetics of DNA-DNA hybridization, DNA-RNA hybridization, Cot curves, Rot curves, kinetic complexity, chemical complexity, Results of kinetics – determining the portion of genomic DNA which has highly repetitive DNA, moderately repetitive DNA and Non repetitive DNA. Rot curve analysis to find the number and the kind of gene expressed in general and tissue specific manner, the copy numbers of each species of mRNAs, by subtractive method, additive method and micro array method.

**Unit III: DNA replication: Prokaryotic DNA replication;** replication origin and site and structure and DNA Ter regions and structure. DNA polymerases, composition and features, replication factors and the mechanism of replication, leading strand and lagging strand synthesis, processivity and fidelity and regulation of replication. Replication of single stranded DNA, M13 viral DNA-use of themas cloning vectors. **Eukaryotic-replication** origins, replication initiation complexes and their assembly, licensing factors, DNA polymerases and their composition, telomerase and mode of action, replication factors, disassembly of chromatin components and reassembly during replication. Organelle genome and composition, replication origins, Enzymes and factors involved in the Replication of mitochondrial DNA and Chloroplast DNA and the mechanism involved.

**Unit IV: DNA damage:** types and there repair – Factors involved DNA damage: types and their repair mechanisms-mechanism of DNA repair and the regulation of it; direct repair-excision-repair transcriptional excision repair, glycosylase pathway, miss-match repair, UVr A, B & C mechanism, broken end repair, recombination repair and SOS repair system. **RNAs: types** rRNAs; Structural features of rRNAs- prokaryotic and eukaryotic. tRNAs: structural features, their anticodon feature. mRNAs- prokaryotic and eukaryotic mRNAs, structural features, Genomics RNAs, Replication of Picorna and Rabies Viral RNA and mechanism; Structure of retroviruses, classification, Replication of HIV viral RNA; Sn-RNAs, Sno RNAs, RNAi

**MBB 815**

**BIOINFORMATICS 1**

**3 CREDIT UNITS**

**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);



**BFS 823 CHEMICAL FOOD SAFETY II****2 CREDIT UNITS**

Occurrence, toxicity, prevention and control of other chemical hazards in food and feed **Dioxins and dl-PCBs; Non-dioxin-like PCBs; Concept of Anti-microbial resistant both in animal and plant; Plant and algal toxins**; inhibitors of proteinase, amylases lipases, lectins, phytate, tannins, cyanogens, saponins, glycosides in flaxseed, alkaloids; swainsonine in Ipomoea carnea gossypol, oxalates etc. **Seafood toxins and poisoning**, Toxic marine organisms, Types, mode of toxicity, symptoms and treatment of phycotoxins, **Mushroom toxins**, Types of poisonous mushrooms and their toxic effects, Symptoms and mechanisms of action of various mushroom poisons;

**BFS 824 FOOD BORNE DISEASES EPIDEMIOLOGY****3 CREDIT UNITS**

**Food Borne Pathogen**-Food as a substrate; Environmental factors; Storage and processing factors; Major pathogens: bacteria, fungi, viral, parasitic and prion; Food pathogens management strategies; and Emergency management: natural, accidental, or intentional introduction; Emerging and re-emerging zoonotic food pathogens; Detection methods for food pathogen; Food pathogen prevention and Management techniques. Food hygiene

**Food Borne Diseases Epidemiology**-Introduction to the principles of Epidemiology; Food borne Disease outbreak investigation: Introduction to outbreak investigation, Food production chain, Size and extent of food borne outbreak, Team players in food borne outbreak response, Detecting a possible outbreak, Defining and finding cases, Generating hypothesis about likely sources, Testing Hypothesis; Finding the point of contamination and sources of food; Controlling and outbreak; Closure; Management; Preventing future outbreak; Application of predictive modelling in control of food borne diseases.

**BFS 825 FOOD AND FEED ADDITIVES & FORTIFICATION 2 CREDIT UNITS**

Introduction; General principle of use; Food Additives intake assessments; Types, Risks and benefits of food additives; Sweeteners; flavouring; colourants; Emulsifiers; anti-caking; Antimicrobial Agents; Food fortificants; anti-nutritional factors; Enzyme safety Evaluations; National/regional and international needs and Benefits Assessment; Food Vehicles, Safety & Toxicity, and Regulation.

**BFS 826 FOOD PROCESSING AND PACKAGING****2 CREDIT UNITS**

Part I. The course will start with a case study on an existing food product, studying all elements of the food label (ingredients, nutritional value, rules and regulations, etc.) and finding out the production process of this product. To obtain a good understanding of these production processes, theories on chemical, microbial, physical and process engineering aspects will be explained in the lectures. Exercises will be worked out to illustrate the theory. Processes that will be discussed



are beer brewing, production of chocolate, dairy production, sugar refinery, production of ingredients, etc.

Part II. Definition of Packaging, Historical Development; Functions of Packaging: Containment, Protection, Convenience; Communication; Attributes of Packaging: Commercially Efficient, Minimal Environmental Impacts, Not Contaminate Food; Environments of Packaging: Physical, Atmospheric, Human, Functions/Environments Grid, Types of Packaging Materials and safety issues, Packaging requirements for fresh and processed foods, Structural qualities and performance of packaging materials, Innovations in food packaging, Labelling. **Packaging materials and migration**; types, sources of contamination, migration and assessment of dietary exposure of packaging materials; Need to highlight more developing country issues e.g. lantadine etc.)

### **BFS 827 FOOD LAWS, STANDARDS AND REGULATIONS 2 CREDIT UNITS**

The food safety policies, regulation of food safety; Food additives; Genetic modified foods; Civil and criminal liability for defective products; Inspections; Labeling; and Current issues of concern; Food Recalls and Destruction; WTO/SPS (Sanitary and Phytosanitary Rules); Codes of practices, International Standards Setting Bodies (ISSBs): Codex Alimentarius Commission (Codex); World Organisation for Animal Health (OIE - Office International des Épizooties), International Plant Protection Convention (IPPC) and International Standards Organisation (ISO); Private Standards; Types and Import of Self Regulations. Quality assurance, certification (ISO9001:2015; ISO17025) and accreditation by NiNAS and SON, Import Licensing, GMP Certification and Marketing Authorisation by NAFDAC

### **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. **BIOMETRY:** Introduction, terms and concept, scale of measurement, population and sample, sampling technique, descriptive statistics, probability, discrete probability, normal distribution introduction to hypothesis, hypothesis test; Z-distribution, chi square, student t-test, ANOVA single factor analysis of variance, Post-Hoch analysis with Duncan multiple range, Pearson (simple) Linear correlation, partial and multiple correlation, regression, the regression equation, multiple regression, binary logistic regression, non-parametric methods rationale and methods, comparison with parametric methods, fisher's Exact test, Wilcoxon rank-sum test, Wilcoxon signed rank test, spearman rank order, correlation coefficient

**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.

**BFS 821 SEMINAR I 2 CREDIT UNITS**

Each candidate shall be required to deliver a Proposal Seminar on his/her research project.

**Recommended Topics for seminar but not limited to the following:**

1. Food Safety Research Methods
2. Preventive Control for Human Food
3. Current Issues in Food Safety
4. Food Safety Control strategies
5. Food Fraud and Mitigation
6. Food Quality Management
7. Food Safety Economics
8. Food authenticity and traceability
9. Food Supply Chain and Food Safety
10. Data Analysis for Food Safety



**TABLE 1: ADMINISTRATIVE OFFICERS**

<b>S/No</b>	<b>Name of Officer</b>	<b>Qualification</b>	<b>Designation</b>
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 and Social Safeguard Officer
9	Mr. Abubakar Haruna	BTech, Dip CPT	Procurement Officer
10	Mr. Shafiu Ozovehe Sule	BSc, CAN	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	Dr. Ezenwadiugwu Eucharia Uchechukwu	B.Ed, M.Ed, PhD	Guidance Counsellor
15	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 MEMBERS**

NAME	UNIVERSITY/INSTITUTION	E-MAIL
Dr Habiba Hassan Wassef	National Research Centre, Egypt	bio_egypt@hotmail.com
Dr Charles Wilson	World Food Preservation Centre, USA	<a href="mailto:worldfoodpreservationcenter@frontier.com">worldfoodpreservationcenter@frontier.com</a>
Dr Amare Ayalew	Partnership for Aflatoxin Control in Africa	<a href="mailto:amarea@african-union.org">amarea@african-union.org</a>
Professor Sarah De Saeger	Ghent University, Belgium	<a href="mailto:Sarah.DeSaeger@ugent.be">Sarah.DeSaeger@ugent.be</a>
Dr Janie Dubois	International Food Safety Training Laboratory, University of Maryland	<a href="mailto:jdubois@umd.edu">jdubois@umd.edu</a>
Dr Gbemenou Joselin Benoit Gnonlonfin	Economic Community of West African State	bgnonlonfin74@gmail.com
Professor Odemari Mbuya	Florida Agricultural and Mechanical University	<a href="mailto:odemari.mbuya@famu.edu">odemari.mbuya@famu.edu</a>
Dr. N. C. Patel	ANAND Agricultural University, India	<a href="mailto:ncpatel@aau.in">ncpatel@aau.in</a>
Prof. Patrick Njobeh	University of Johannesburg, South Africa	<a href="mailto:pjobeh@uj.ac.za">pjobeh@uj.ac.za</a>

Regional Coordinator of FAO/WHO Coordinating Committee for Africa	FAO/WHO Coordinating Committee for Africa (CCAFRICA)	<a href="mailto:kimutaimaritim@yahoo.co.uk">kimutaimaritim@yahoo.co.uk</a>
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**TABLE 4: SECTORAL ADVISORY BOARD MEMBERS**

S/No	NAME	INDUSTRY/ORGANIZATION	E-MAIL
1	Alfa Abubakar	Market Bridge	<a href="mailto:info@marketbridge.biz">info@marketbridge.biz</a>
2	Dr Maimuna Habib	Federal Ministry of Agriculture	<a href="mailto:maimunahabib@gmail.com">maimunahabib@gmail.com</a>
3	Dr Bosede Oluwabamiwo	National Agency for Food and Drug Administration Control	<a href="mailto:oluwabamiwo.b@nafdac.gov.ng">oluwabamiwo.b@nafdac.gov.ng</a>
4	Dr Omolara Okunlola	Standards Organisation of Nigeria	<a href="mailto:omolara.okunlola@son.gov.ng">omolara.okunlola@son.gov.ng</a>
5	Professor Eustace A Iyayi	Nigerian Institute of Animal Science	<a href="mailto:nias.nigeria2013@gmail.com">nias.nigeria2013@gmail.com</a>
6	Prof. Martins Emeje	National Institute for Pharmaceutical Research and Development, Abuja, Nigeria	<a href="mailto:memeje2011@hotmail.com">memeje2011@hotmail.com</a>
7	Dr Engr. Olasupo Olayode	NASENI, Abuja, Nigeria	<a href="mailto:solayode@gmail.com">solayode@gmail.com</a>
8	Dr Gerd Schatzmayr	BIOMIN Holding GmbH, Austria	<a href="mailto:gerd.schatzmayr@biomin.net">gerd.schatzmayr@biomin.net</a>
9	Dr Gbemenou Joselin Benoit Gnonlonfin	Economic Community of West African State	<a href="mailto:bgnonlonfin74@gmail.com">bgnonlonfin74@gmail.com</a>
10	Dr Chindo Bissala Ibrahim	Ministry of Health, Minna, Niger State	<a href="mailto:chindoibro@gmail.com">chindoibro@gmail.com</a>
11	Prof. Ardjouma DEMBELE	Ministere De L'agriculture Et Du Developpement Rural, Republique De Cote D'ivoire	<a href="mailto:ianada@avisoci.ci">ianada@avisoci.ci</a>
12	Professor Pane Bernadette Sourabie Quattara	National Public Health Laboratory, Ministry of Health, Quagadougou, Burkina Faso	<a href="mailto:b_sourabie@yahoo.com">b_sourabie@yahoo.com</a>
13	Prof. Kabre Elie	National Public Health Laboratory, Ministry of Health, Quagadougou, Burkina Faso	<a href="mailto:kabre@gmail.com">kabre@gmail.com</a>
14	Dr Abakar Mahamat	Ministry of Livestock and Animal	<a href="mailto:bennourmallaye@yahoo.fr">bennourmallaye@yahoo.fr</a>

	Nour Mallaye	Production, Chad	<u>r</u>
15	Prof. Van Emery Tshiombe Mulamba	General Atomic Energy Commission, Kinshasa, Congo	<u>tshiombevan@gmx.fr</u>
16	Dr Eve Gadzikwa	Standards Association of Zimbabwe	<u>info@saz.org.zw</u>
17	Mr. Mohamed Fofana	Sierra Leone Standards Bureau	<u>morikeh@gmail.com</u>

#### ACADEMIC FACULTY FOR PhD FOOD SAFETY

S/No	NAME	UNIVERSITY/ORGANIZATION	STATUS	EMAIL
1	Prof. Makun H.A	Federal University of Technology, Minna	Full time	<a href="mailto:hussaini.makun@futminna.edu.ng">hussaini.makun@futminna.edu.ng</a>
2	Prof. Akanya H.O	Federal University of Technology, Minna	Full time	<a href="mailto:funmiakanya@yahoo.com">funmiakanya@yahoo.com</a>
3	Prof. Ogbadoyi E.O	Federal University of Technology, Minna	Full time	<a href="mailto:eogbadoyi@futminna.edu.ng">eogbadoyi@futminna.edu.ng</a>
4	Prof. Egwim E.C	Federal University of Technology, Minna	Full time	<a href="mailto:e.egwim@futminna.edu.ng">e.egwim@futminna.edu.ng</a>
5	Prof. Chinma C.E	Federal University of Technology Minna	Full Time	chinmachiemel@futminna.edu.ng
6	Prof. Saidu A.N	Federal University of Technology Minna	Full Time	Abubakar.saidu@futminna.edu.ng
7	Prof Kabiru A.Y	Federal University of Technology, Minna	Full time	
8	Prof Olayemi I.O.	Federal University of Technology, Minna	Full time	Isreal.olayemi@futminna.edu.ng
9	Prof Abdulkareem A.S	Federal University of Technology Minna	Full Time	<a href="mailto:kasaka2003@futminna.edu.ng">kasaka2003@futminna.edu.ng</a>
10	Prof Kovo A.S	Federal University of Technology Minna	Full Time	<a href="mailto:kovo@futminna.edu.ng">kovo@futminna.edu.ng</a>
11	Prof Anjorin T.I	University of Abuja, Nigeria	Visiting	<a href="mailto:oba.anjorin@uniabuja.edu.ng">oba.anjorin@uniabuja.edu.ng</a>
12	Prof Mwanza M	North-East University of Mafikeng, South Africa	Visiting	<a href="mailto:ndagiumar2@gmail.com">ndagiumar2@gmail.com</a>
13	Prof Sheila O.	University of Nairobi, Kenya	Visiting	<a href="mailto:dorisokothe@yahoo.com">dorisokothe@yahoo.com</a>
14	Prof Mbuya O.S	Florida State University of	Visiting	<a href="mailto:odemari.mbuya@famuedu">odemari.mbuya@famuedu</a>

		Agriculture, USA		
15	Prof Andrew G	Federal University of Technology, Minna	Full time	<a href="mailto:andrew.gana@futminna.edu.ng">andrew.gana@futminna.edu.ng</a>
16	Prof De Saeger S	Gent University, Belgium	Visiting	<a href="mailto:sarah.DeSaeger@ugent.be">sarah.DeSaeger@ugent.be</a>
17	Prof Njobeh P.B	University of Johannesburg, South Africa	Visiting	<a href="mailto:pjobeh@uj.ac.za">pnjobeh@uj.ac.za</a>
18	Prof Emeje M.	National Institute for Pharmaceutical Research and Development Abuja, Nigeria	Visiting	<a href="mailto:memeje2011@hotmail.com">memeje2011@hotmail.com</a>
19	Prof Adebo O.A		Visiting	
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