



FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI (FUTO)



26/10/17

Department Of
BIOTECHNOLOGY
AND **BIOLOGY,**
SCHOOL OF SCIENCE

HANDBOOK OF ACADEMIC PROGRAMMES AND GUIDELINES





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TECHNOLOGY OWERRI
(FUTO)**



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PREFACE

The Department of Biotechnology and Biology is one of the three Departments carved out of the former Department of Biological Sciences in FUTO. The others include Biochemistry and Microbiology. The creation was a decision of the Senate of the University and was subsequently approved by the National Universities Commission (NUC). The Department of Biotechnology and Biology admitted its first set of students in 2002/2003 academic session.

Programmes offered by the Department are highly multidisciplinary covering most aspects of life science and related technologies involving the practical application of organisms and their cellular and tissue components to manufacturing and service of industries and environmental and healthcare management. For example, the Biotechnology programme draws upon a wide array of relevant fields such as microbiology, biochemistry, molecular biology, cell biology, immunology, protein and genetic engineering, enzymology, classified breeding techniques and the full range of bioprocess technologies etc. Likewise, the Biology programme offers detailed scope of training in Parasitology, Entomology, Hydrobiology, and Plant Science.

Based on existing staff strength the Department emphasizes environmental, agricultural as well as medical biotechnology, Parasitology and Applied Entomology, among numerous areas of specialization. Postgraduate programmes leading to the award of M.Sc and Ph.D degrees in Biotechnology and Environmental Health Biology are also offered in the Department.

This Department Handbook is intended to introduce Students, Staffs and other interested persons to the Sciences of Biotechnology and Biology and possible employment opportunities available to the graduates.

Dr(Mrs) H. C. Nwigwe
Ag. Head of Department.

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Principal Officers of the University

Professor Celestine O. E. Onwuliri, KSJ, JP
Vice Chancellor

Professor Ebong T. Eshett
Deputy Vice Chancellor (Academic)

Professor Martin I. Nwufo, KSM
Deputy Vice Chancellor (Administration)

Mr. Charles O. Omeire
Registrar

Mr. Robinson U. Akujobi
Bursar

Chief John E. Nwogu
University Librarian

Deans of Schools

Professor C.C. Asiabaka

School of Agriculture and Agricultural
Technology
(SAAT).

Engr. Professor O.O. Onyemaobi

School of Engineering and Engineering
Technology.
(SEET).

Professor G.E Nworuh

School of Management Technology
(SMAT).

Dr C. Abanobi

School of Health Technology
(SOHT).

Professor G.I. Nwankwor

School of Sciences
(SOSC).

Professor C.I. Anunuso

School of Post Graduate Studies. (SPGS).

Directors of Academic Units

Names	Designation
Professor M.O.E. Iwuala	Director of Academic Planning.
Professor F.O.U. Osuala	Director FUTO CCE
Professor C.E. Akujor	Director ICT
Professor J.C. Obiefuna	Director CAR
Professor N.N. Onu	Director IES
Engr. Professor P.B. U Achi	Director CIS
Dr S.O.E. Ogbogu	Ag. Director UCC
Dr (Mrs) C.O. Chukwuezi	Ag. Director Gen. Studies.

Nature and Scope of Biotechnology and Biology Programmes.

Biotechnology is an applied science aimed at harnessing the natural biological capabilities of living units. e.g. microbial, plant and animal cells and tissues for the benefit of man. The Science also addresses the use of biological and technological methods in seeking solutions to the day-to-day problems of man and the environment.

The Science of Biology focuses on the study of living things, their structure, complex organisation and the almost inexhaustible stock of mysteries pertaining to their ecology and sustainance. Indeed, the study of living things can take up most of the productive years of people's lives involving fields and laboratory studies etc.

Biotechnology employs both scientific and engineering principles with gainful considerations in developing and improving products and processes made from or for living systems. These include for example fermentation processes (e.g. brewing, bakery industry, and enzyme engineering (as per securing vitamins, antibiotics and various biochemicals); cell and tissue technology (e.g. for increasing an organism's Physiological efficiency); medical and veterinary biotechnology (e.g. production of monoclonal antibodies, DNA probes for disease diagnosis, prevention and control); plant biotechnology (e.g. plant propagation, and achieving new plant products); animal breeding and production. (e.g. embryo transfer, in-vitro fertilization and immunogenetics to improve livestock); renewable resources technology (e.g. generation of new sources of chemical raw materials and energy); environmental

biotechnology and waste management technology(e.g. efficient treatment of waste, recovery of valuable substances, land reclamation and rehabilitation plus energy production).

The training in Biology will expose students to the knowledge of Ecology, Taxonomy, Genetics, and the Morphology and Physiology of Plants and Animals generally. It will also stress such applied and relevant aspects as Parasitology, Entomology, Hydrobiology, Aquaculture and essential Principles of Plant Science.

Graduates from the Department of Biotechnology and Biology will be capable of operating in an inter-disciplinary environment with appropriate expertise in the areas of Biotechnology and Biology, and adequate knowledge of biochemistry, Bio-Physics and Bio-Engineering. The emphasis of the programme will be on developing the skills and knowledge necessary for application to a wide range of Biotechnology and Biological challenges and production processes. There will also be adequate opportunities for research training in such areas as the following:

1. Applied Biology
2. Environmental Biotechnology.
3. Medical and Public Health Biotechnology.
4. Agricultural/Food Biotechnology.
5. Marine/Aquatic Biotechnology/ Hydrobiology.
6. Plant Biotechnology/ General plant science.
7. Parasitology/ Molecular Biology.
8. Entomology/ Pest Management.
9. Pharmaceutical Biotechnology.
10. Genetic engineering and breeding technology.
11. Bioassay technology and biochemical analysis.

Aims and Objectives

The Department of Biotechnology and Biology will provide training in General Biology for students at foundation (100//200) levels plus in-depth training intended to expose students at (300-500) levels to specific/applied aspects of Biotechnology and Biology. This is with a view to equipping the students for possible self-employment on graduation. The students will also be adequately prepared for inter-disciplinary research work in biological sciences, involving gainful application of the principles of Biotechnology, Biostatistics, Genetics, Physiology, Embryology and Immunology etc. It is also the goal of the Department to produce students who can relate to the needs of the Nigerian society and beyond through their knowledge of the many facets of Biology – especially General and Applied Ecology, Entomology, Parasitology, Plant Science and Hydrobiology etc. Students will be required to take ancillary courses in Chemistry, Biochemistry, Microbiology, Mathematics, Computer Sciences and General Studies. The students, as expected, will power our industries in producing goods and services needed to improve our levels of industrial development. Above all, it is the aim of the Department to train and develop the minds of our students such that they can be well educated people capable of logical reasoning.

Degree Programmes

The Department of Biotechnology and Biology will train students for Bachelor of Technology (B. Tech) Degree Programmes in respective fields of Biotechnology and Biology. The first three years of the respective courses will involve a series of carefully co-ordinated Lectures, Laboratory Practicals and Tutorials. In the 4th and 5th years, the students are given the

opportunity of more specialized training through field and laboratory practice and an extended practical Research Project, plus a literary seminar based on Library Research. A supervised Industrial Attachment exposure shall also constitute an important component of the degree programme. This Industrial Training Scheme usually lasts for nine (9) months, 3 months at the end of second year (200 level) and a total of six (6) months in the second semester of the fourth year(400 level). This programme will provide essential practical experience and on-the- job training (through industrial/professional exposure) to enrich the knowledge gained from the class room and laboratory teaching.

Academic Content and Curricula:

The Academic content and detailed curricula for the degree programmes in Biotechnology and Biology are as spelt out in the attached schedule covering the year-by-year course titles, codes, credit units, and specified semester-by-semester work loads (Lectures/Tutorials/Practicals) and clear-cut provisions for Electives etc.

Expected Duration of the Degree Programmes

The normal duration of the B.Tech degree programme is five years for (UME) students admitted to the 100 – level and four years for (DE) students admitted into 200 level.

Change of Degree Programme:

A student who has been admitted to a degree programme on satisfying minimum requirements for entering into the Department shall not be permitted to change to another

Department until completion of the first academic year in the Department. Application for change should however be made by the student through the Head of his/her present Department, who in turn recommends such to the School Board on a prescribed form obtainable from the Registrar. Duly completed form (Change of Programme Form) should be forwarded through the Dean to the Registrar for certification and finally forwarded to the Vice chancellor for approval. Intra school transfer can be approved by the School Board and Committee of Deans, and the Vice Chancellor informed later. To qualify for consideration to transfer to Programmes in Engineering and Management Sciences, a student must be required to obtain a CGPA of 4.0 or above at the time of application.

Grading Systems:

<u>Marks/Scores(in%)</u>	<u>Notations in alphabets</u>	<u>Grading</u>
70 and above	A	5.0
60-69	B	4.0
50-59	C	3.0
45-49	D	2.0
40-44	E	1.0
0-39	F	0.0

Students are advised to sit for examinations in all registered courses. Failure to sit for a course in examination without satisfactory reason earns the grade of 'F'. Grades obtained in all approved courses shall be used to compute the GPA.

Method used in GPA and CGPA calculation

<u>Courses</u>	<u>G</u>	<u>CU(LTP)</u>	<u>GP</u>	<u>QP/C</u>	<u>GPA</u>	<u>CGPA</u>
MTH 101	A	4 (310)	5	20	TQP/C/TCU	GPA1
PHY 101	B	4 (211)	4	16	= 74/19	+
CHM 101	B	4 (211)	4	16	=3.9	GPA2
BIO101/103	C	2 (101)	3	06		/2
ENG 101	D	1 (001)	2	02		
ENG 103	E	1 (001)	1	01		
GST 101	A	2 (110)	5	10		
GST 103	C	1 (100)	3	03		
Total		19		74		

Legend:

G	-	Grades;
CU	-	Credit unit;
LTP	-	Lecture, Tutorials,Practicals.
GP	-	Grade points;
QP/C	-	Quality pointsper course(CU x GP made in a course);
TQP	-	Total Quality Point;
TCU	-	Total Credit Unit;
GPA	-	Grade point average = (TQP/C divided by TCU);
GPA1	-	Grade Point Average for first semester;
GPA2	-	Grade Point Average for second semester;
CGPA	-	Cummulative Grade Point Average = (GPA1 + GPA2 divided by 2).

With the above method, a student should be able to calculate his/her GPA per semester as well as his/her cumulative grade point average(CGPA) at the end of every session or academic year. And to continue in the programme, a student is required to have at least CGPA of 1.00 at the end of

every academic year. However, a student whose CGPA is below 1.00 at the end of a particular session will not be allowed to register for more than 18 units per semester. This is to make the student concentrate and improve his/her performance and such student should be cautioned by the Department.

A Students who fail his/her course(s), must retake the failed course(s) at the next available opportunity, provided the total number of credit units during each semester does not exceed the total number of units meant for that semester and the GPA obtained counts towards the standard GPA. A student whose CGPA per session is below 1.00 and who continues to fail courses, shall be required to withdraw from the programme.

Classification of Degrees.

<u>Class of Degree</u>	<u>CGPA</u>
1st Class Honours	4.50 - 5.00
2nd Class Honours (Upper division)	3.50 - 4.49
2nd Class Honours (Lower division)	2.40 - 3.49
3rd Class Honours	1.50 - 2.39
Pass	1.00 - 1.49

Departmental Regulations.

Lectures, Practicals, Tests/ Examination.

Lectures and practicals are compulsory. Students are advised to attend and be punctual at all lectures and practical classes for the courses they have registered. Attendance is usually taken during lectures and practicals, and this usually carries 10% of the total score meant for each course.

Tests and assignments are part of the course Assessment which constitutes the continuous assessment. This usually

accounts for 20% of scores whereas examination scores account for 70% of the total score. No unregistered student would be allowed into the classroom for lectures, practicals and examination.

During test/examination, students should be in the examination hall at least 30 minutes before the start of each examination. A student who is 30 minutes late may be admitted but would not be given any extra time; but a student who arrives later than 30 minutes shall not be allowed to write the examination. A student may be allowed to leave the examination hall temporarily after the first one hour from the starting time due to possibly, an emergency such as ill health, but he/she must be accompanied by a staff and/or University security officer assigned to the Department for the particular examination. In such situations, the student will not be allowed to leave with his/her answer scripts. Once the question papers and scripts are shared in the test/examination hall, no student will be allowed to leave, or walk about in the hall. Students must write their names and registration numbers and as well sign the attendance register during each test/examination.

Students should neither keep any handbag, brief case, notebook, paper or telephone handset, nor give or accept assistance directly or indirectly during test or examination. Such assistance include lending/borrowing of materials such as pencils, ruler, eraser, calculator, question papers, answer script, etc.

Students are not allowed to leave the test/examination hall with any answer scripts, and any student who disrupts a test or examination will have his/her test/examination cancelled and will have to re register for the course. However, involvement in malpractice during examination can result in

deregistration, and other punishments as defined in the University Statement of Academic Policies which can be consulted in the office of the Head of Department.

Behaviour/ Conduct of Student.

Any student involved in falsification of his/her credentials or results; or proved to belong to a secret cult will be de-registered from the Department.

Dress Code.

Student of the Department of Biotechnology and Biology must be decently dressed to school especially to lectures. Seductive dressing such as indecent exposure of body attracts serious consequences. However, any genuine and proven cases of sexual harrasement on a student by fellow student or lecturer, should be reported in writing to the Head of the Department.

All students are expected to obtain laboratory coats which "MUST" be used during practicals. They should also obtain any other safety wears recommended by the department for practicals and field trips.

Employment Opportunity

Graduates from the department of Biotechnology/ Biology will be suitably equipped to take on gainful employments in the following areas:

Career	Description	Employment
Research Scientist	As part of a larger research team, conduct experiments in the laboratory or in the field. Design experiments involving a range of scientific disciplines. Liaise with other research staff to interpret the results, communicate your findings within and outside of your research team, and keep up with the latest developments in biotechnology and biological sciences generally.	Industry, Universities, hospitals, various other government agencies, research institutions etc.
Medical Laboratory Scientist	Analyse clinical samples from patients for diagnosis of disease and monitoring of people's health. Interpret the test results with other medical and scientific staff.	Hospitals, medical research institutions, Private pathology companies etc.
Forensic Scientist	Examine DNA and other scientific evidence relating to civil or criminal investigations. Present your evidence in criminal and civil law courts.	Government and Private forensic laboratories.
Environmental Scientist	Assess and monitor the environmental effects of soil, water and air pollution. Help develop and implement Bio-remediation programmes to clean up the environment.	Industry, Government Departments, research institutions and other Environmental Management Agencies.
Quality analyst	Ensure that high industrial production standards are met, particularly in the food and pharmaceutical industries. apply biotechnological, microbiological and biochemical standards for quality control. Make decisions about how to	Various industries, especially food processing and pharmaceutical companies, Breweries and Canning Factories.

improve the quality of manufactured products.

Science Teacher	With appropriate additional training, teach the next generation of scientists in high schools. Transfer your enthusiasm about biotechnology and science to children and young adults. Teach people to think critically and clearly on scientific subjects.	Public and Private Schools, including high schools, Colleges, Polytechnics and Universities.
Scientific Patent Adviser	Examine and advise on the value of biotechnology and other science based patent applications. Assess the novelty of scientific inventions. Further training in law may be undertaken.	Legal firms
Scientific Journalist/ Media Presenter	Keep up-to-date with the latest innovations in science and technology by interviewing research scientists and searching the literature. Write articles and help prepare broadcast programs, to communicate the importance of scientific developments to the world. Further training in journalism may be undertaken.	Newspaper, TV and radio companies, scientific publishing companies
Sales Representatives/ marketing professional	Sell and provide advice about special scientific products to clients in research and diagnostic laboratories. Help solve specific problems related to equipment applications and experimental procedures.	Scientific instrument and chemical supply companies.

Investment Analyst	Assess the commercial potential of research programs in biotechnology and other scientific disciplines. Examine the investment prospects associated with venture capital applications.	Investment banks and Finance companies.
Scientific Adviser on Regulatory Affairs.	Advise the government on appropriate regulations for the conduct of scientific research and on the scientific issues of national importance.	Government Departments

Specific Employment Opportunities and Avenues

Graduates from the department of Biotechnology and Biology apart from the possibility of being self employed, can also gain employment in several other areas such as: Teaching of Biology and Natural Science in Schools; serving gainfully in Medical clinics and Diagnostic Laboratories, Pathology, Radiology and Immunology Departments, plus such other areas as Public Health and Environmental Sanitation Departments and in Departments concerned with Drug trials against microbial and parasitic infections.

Other opportunities exist in Pest Management Agencies and Insect Vector Control Departments; and in Agencies concerned with the control of Agricultural, Industrial and Domestic Pests, plus the Control/Eradication of Pests of stored produce. This is in addition to Agencies concerned with the manufacture, screening/Bioassay and Practical Applications of various forms of Pesticides and Biological Control Agents; and the various uses of Biophysical, Biochemical and cultural Strategies for suppression and regulation of Insect Populations and other Arthropod Pests. Furthermore, the graduates may serve in Management Agencies for Lakes, Riverine Settlements and Agricultural Basins; Fish Cultivation Projects, Fisheries and Hydrobiology Departments, Canning and Processing Industries; Environmental Quality Control Agencies, and various Bio-resources Integrated Management Projects etc.

Admission Requirements:

Candidates to be admitted into any of the 5-year Bachelor of Technology Programmes must possess the following qualifications:

i) University Matriculation Entry (UME) Requirement:

An acceptable level of pass in the JAMB (UME) Examination, with the following UME subject combinations: English Language, Biology, Chemistry and Physics.

In addition, each candidate must possess:

(a) Credit level passes in at least five subjects in the Senior Secondary School Certificate Examination SSCE (or the WASC/NECO/GCE Ordinary Level) inclusive of the following, English Language, Mathematics, Biology, Chemistry, and Physics. In exceptional cases, Pass in English may be accepted.

(ii) Direct Entry (DE) Requirements:

Acceptable levels of pass in at least two subjects at the West African Higher School Certificate (HSC) or the GCE - Advanced Level. The subjects must include Biology (Botany or Zoology) plus Chemistry (or Physics) in addition to four GCE Ordinary Level Credit Passes, inclusive of Mathematics and Agricultural Science at not more than two sittings. Alternatively, the candidates will be required to attain HSC/ GCE Advanced level passes in three relevant subject, plus at least three O-level Credit passes in Mathematics and to other subjects at not more than two sittings.

In addition, holders of (OND) Ordinary National Diploma or National Diploma (ND) certificates with a minimum of upper Credit Pass will be eligible for Admission into Year two (200-level) of the Degree programme, provided that each of such candidates must possess at least five GCE O- Level Credit pass in relevant subjects, including Biology, Mathematics, Chemistry and Physics at not more than two sittings.

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
DEPARTMENT OF BIOTECHNOLOGY AND BIOLOGY
ACADEMIC PROGRAMME

YEAR 1 (100 LEVEL) COMMON FOUNDATION YEAR COURSE
HARMATTAN SEMESTER

COURSE NO	TITLE	L.T.P	UNITS
MTH 101	Elementary Mathematics 1	3,1,0	4
PHY 101	General Physics I	2,1,1	4
CHM 101	General Chemistry 1	2,1,1,	4
BIO 103	Biology for Agric. & Bio Sci. 1	2,0,1	3
ENG 101	Workshop Practice 1	0,0,1	1
ENG 103	Engineering Drawing 1	0,0,1	1
ENG 101	Use of English 1	1,1,0	2
GST 103	Humanities	1,0,0	1

Total

20units

RAIN SEMESTER

COURSE NO.	TITLE	L.T.I	UNITS
MTH 102	Elementary Mathematics 11	3,1,0	4
PHY 102	General Physics 11	2,1,1,	4
CHM 102	General Chemistry	2,1,1,	4
BIO 104	Biology for Agric. & Bio Sci. 11	1,0,1	2
ENG 102	Workshop Practice 11	0,0,1	1
ENG 104	Engineering Drawing 11	0,0,1	
GST 102	Use of English 11	1,1,0	2
GST 108	Social Science 1	1,0,0	1

GST 110 Science Technology Society 1,0,0

1

Total

20 units

B.TECH. (HONS) BIOTECHNOLOGY/ BIOLOGY

YEAR II (200 LEVEL)

HARMATTAN SEMESTER

COURSE CODE	TITLE	L.T.P	UNITS
IMB 201	General Microbiology I	2,0,1	3
BCH 201	General Biochemistry I	2,0,1	3
CHM 201	Physical Chemistry I	2,0,1	3
MTH 201	Statistics	2,1,0	3
CSC 201	Computer Application	2,1,1	4
MTH 203	Mathematics Methods I	2,1,0	3
GST 201	Nigerian and African Culture	1,0,0	1
Total			<u>20 units</u>

RAIN SEMESTER

COURSE CODE	TITLE	L.T.P	UNITS
IMB 202	General Microbiology II	2,0,1	3
BCH 202	General Biochemistry II	2,0,1	3
CHM 202	Inorganic Chemistry	2,0,1	3
CHM 204	Organic Chemistry	2,0,1	3
BIO 202	Biological Techniques	1,0,1	2
MTH 202	Introduction to Numerical Analysis	2,1,0	3
ECN 204	Introduction to Industrial		

	Economics	2,0,0	2
SIW	Students Industrial Work Experience	0,0,2	2
Total			<u>21 units</u>

B.TECH. (HONS) BIOTECHNOLOGY

YEAR III (300LEVEL)

HARMATTAN SEMESTER

COURSE CODE	TITLE	L.T.P.	UNITS
MLB 301	Genetics	2,1,0	3
MLB 303	Molecular Biology	2,0,1	3
BCH 301	Enzymology	2,0,1	3
BCH 303	Biochemical Techniques	2,0,1	3
STA 301	Biostatistics	1,0,0	1
BTC 303	Cell Biology	1,0,1	2
BTC 305	Introductory Biotechnology	2,1,0	3
	Elective	- - -	3
Total			<u>21 units</u>

Electives

CHM 303	Inorganic Chemistry II	2,0,1	3
CHM 305	Organic Chemistry II	2,0,1	3

RAIN SEMESTER

BTC 302	Microbial Growth and Growth Kinetics	2,0,1	3
IMB 302	Pharmaceutical Microbiology	2,0,0,	2

BCH	302	Metabolic Pathways I	2,1,0,	3
BCH	304	Biophysics	2,1,0,	3
BCH	306	Membrane Biochemistry	2,0,0,	2
BCH	304	Genetic Engineering	2,0,1,	3
BTC	306	Introductory Biotechnology II	2,1,0	3
		Electives	- - -	2

Total

21 units

Elective

BTC	308	General Ecology	2,1,0	3
BCH	308	Bioinorganic Chemistry	2,1,0,	3
MLB	302	Embryology	2,0,0,	2
EVT	306	Environmental Impact		
		Assessment I	2,0,0	2
BTC	310	Genetic Biotechnology I	2,0,0,	2

B.TECH (HONS) BIOLOGY

(Options: Parasitology, Entomology, Hydrobiology and Plant Science).

Year III (300 LEVELS)

HARMATTIAN SEMESTER

COURSE CODE	TITLE	L T P	UNITS
BIO/MLB 301	General Genetics	2 1 0	3
BIO 303	General Invertebrate		
	Zoology	2 0 1	3
BIO 305	Seedless Plants	2 0 1	3
BIO 307	Biosystematics	2 0 1	3
BIO 309	Cytology and Histology	1 0 1	2
BTC 303	Cell Biology	2 0 1	3
STA 301	Bio Statistics	1 0 0	1
BCH 303	Biochemical Techniques	2 0 1	3
	Total		<u>21 units</u>

ELECTIVES

BCH 301	Enzymology	2 0 1	3
BTC 305	Introduction Biotechnology I	2 1 0	3

RAIN SEMESTER

COURSE CODE	TITLE	L T P	UNITS
BIO 302	General Vertebrate Zoology	2 0 1	3
BIO 304	Seed Plants	2 0 1	3
BIO 306	General Physiology	2 0 1	3
BIO 308	Introduction to Fisheries & Wildlife Management	2 0 1	3
BIO 310	Soil Science	1 0 1	2
BIO 312	Cytogenetics & Population Genetics	2 0 1	3
BTC 306	General Ecology	2 0 1	3
Total			<u>20 Units</u>

ELECTIVES

EVT 306	Environmental Impact Assessment I	2 0 0	2
BTC 302	Microbial Growth & Growth Kinetics	2 0 1	3
IMB 302	Pharmaceutical Microbiology	2 0 0	2

B.TECH (HON.) BIOTECHNOLOGY**YEAR IV (400-LEVEL)****HARMATTAN SEMESTER**

COURSE CODE	TITLE	L.T.P	UNITS
IMB 409	Microbial Genetics and Molecular Biology	2,0,1	3
BCH 308	Pharmacology of Natural Products	2,0,0	2

IMB	401	Analytical Microbiology and Quality Control	2,0,1	3
IMB	405	Microbial Physiology and Metabolism	2,0,1	3
BTC	403	Cell and Tissue Culture	2,0,1	3
BTC	405	Agricultural Biotechnology	2,0,1	3
BTC	407	Bioassays and Chemical Screening	2,0,1	3
Total				<u>20 units</u>

RAIN SEMESTER

SIW	Student Industrial Work Experience Scheme	0,0,4	4units
Students will be attached to some industrial Organization for six months.			

B. TECH. (HONS) BIOLOGY

Parasitology Option

YEAR IV(400 LEVEL)

HARMATTAN SEMESTER

COURSE CODE	TITLE	L T P	UNITS
BIO 401	Animal Physiology	2 0 1	3
BIO 403	Introductory Parasitology	2 0 1	3
BIO 405	Basic Entomology	2 0 1	3
BIO 407	Parasitological and Entomological Techniques	2 0 1	3
BTC 403	Cell and Tissue Culture	2 0 1	3
BIO 409	Fish Ecology	1 0 1	2
BIO 411	Pathogenic Mycology	1 0 1	2
BIO 425	Biosystematics	1 0 1	2
Total			
			<u>21units</u>

RAIN SEMESTER

SIW 400	Students Industrial Work Experience Scheme		
	Students will be attached to some Industrial Organizations for six months		

YEAR IV(400 LEVEL) BIOLOGY**Entomology Option****HARMATTAN SEMESTER**

BIO 401	Animal Physiology	2 0 1	3
BIO 405	Basic Entomology	2 0 1	3
BIO 407	Parasitological & Entomological Techniques	2 0 1	3
BTC 403	Cell & Tissue Culture	2 0 1	3
BIO 403	Introductory Parasitology	2 0 1	3
BIO 411	Pathogenic Mycology	1 0 1	2
BIO 413	Insects	1 0 1	2
BIO 425	Biosystematics	1 0 1	2
Total			<u>21units</u>

RAIN SEMESTER

SIW 400	Students Industrial Work Experience Scheme. Students will be attached to some Industrial Organizations for six months.		
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YEAR IV (400 LEVEL) BIOLOGY**Plant Science Option****HARMATTAN SEMESTER**

BIO 415	Plant Ecology	2 0 1	3
BIO 417	Plant Anatomy/ Morphology	2 0 1	3
BIO 403	Introductory Parasitology	2 0 1	3
BTC 403	Cell and Tissue Culture	2 0 1	3
BIO 411	Pathogenic Mycology	1 0 1	2
BIO 419	Plant Physiology	2 0 1	3
BIO 421	Principles of Plant Taxonomy	1 0 1	2

Total**19 units**

RAIN SEMESTER

SIW 400

Students Industrial Work Experience

Scheme. Students will be attached to some Industrial Organizations for six months

YEAR IV (400 LEVEL) BIOLOGY**Option: Hydrobiology****HARMATTAN SEMESTER**

BIO 401	Animal Physiology	2 0 1	3
BIO 403	Introductory Parasitology	2 0 1	3
BIO 411	Pathogenic Mycology	1 0 1	2
BIO 427	Fish Biology	2 0 1	3
BIO 423	Limnology	2 0 1	3
BIO 409	Fish Ecology	1 0 1	2
BTC 403	Cell and Tissue Culture	2 0 1	3
BIO 425	Biosystematics	1 0 1	2
Total			<u>21 units</u>

B.TECH. (HON.) BIOTECHNOLOGY.**YEAR V (500-LEVEL)****HARMATTAN SEMESTER.**

COURSE CODE	TITLE	L.T.P.	UNITS
BTC 501	Biochemical Engineer I	2,0,1,	3
BTC 503	Environmental Bioscience	2,0,1,	3
IMB 503	Immunology and Immunochemistry	2,0,1	3
IMB 501	Industrial Microbiology and Biotechnology I	2,0,1	3
BTC 505	Seminar topics in Biotechnology	0,1,0	1
BTC 509	Diagnosis of Parasitic infection	2,0,1,	3
BTC 511	Advanced methods in Biotechnology	2,0,1,	3
	Electives	- - -	2
Total			<u>21 units</u>

ELECTIVES.

BCH	501	Phyto Biochemistry	2,1,0	3
BCH	503	Advanced Biochemical and Microbiological Methods	1,0,2	3
EVT	511	Environmental Impact Assessment II	2,0,0	2

RAIN SEMESTER

BTC	502	Biochemical Engineer 11	2,0,1	3
BTC	504	Pest Management and Control Technology	2,0,1	3
IMB	502	Industrial Microbiology and Biotechnology 11	2,0,1	3
BTC	508	Research Project in Biotechnology	0,0,6	6
IMB	504	Microbial Ecology	2,0,0	2
		Electives	- - -	3
Total				<u>20 units</u>

ELECTIVES

BCH	504	Advanced Enzymology	2,0,1	3
IMB	506	Soil Microbiology	2,0,1	3
FST	504	Food Laws and Standards	2,0,0	2
BTC	506	Principles of Taxonomy	2,0,0	2
BTC	510	Industrial Pollution and Waste Management Technology	2,1,0	3

B. TECH (HONS) BIOLOGY**Year V (500 LEVEL) Parasitology Option****HARMATTAN SEMESTER**

COURSE CODE	TITLE	LTP	UNIT
BIO 501	Parasitology I (Protozoology)	2,0,1	3
BIO 503	Plant Nematology	2,0,1	3
BIO 505	Animal Ecology	2,0,1	3
BIO 507	Parasite Epidemiology and Public Health	2,0,1	3
BIO 509	Arthropods and Arthropod-borne Diseases	2,0,1	3
IMB 503	Immunology and Immunochemistry	2,0,1	3
BIO 511	Seminar Topics in Biology	0,1,0	1
BIO 513	Research Projects in Biology	0,0,2	2
Total			<u>21units</u>

RAIN SEMESTER

BIO 502	Parasitology II (Helminthology)	2,0,1	3
BIO 504	Zoogeography	1,0,1	2
BIO 506	Development and Conservation of Natural Resources	2,0,0	2
BIO 508	Fish Parasites and Diseases	2,0,1	3
BTC 509	Diagnosis of Parasitic Infections	2,0,1	3
BTC 504	Pest Management & Control Technology	2,0,1	3
BIO 514	Research Projects in Biology Electives	0,0,4	4
Total			<u>21units</u>

ELECTIVES

EVT 511	Environmental Impact Assessment II	200	2
BTC 510	Industrial Pollution and Waste Management Tech.	210	3

YEAR V (500 LEVEL)**Option: Entomology****HARMATTAN SEMESTER**

COURSE CODE	TITLE	LTP	UNITS
BIO 501	Parasitology I (Protozoology)	201	3
BIO 505	Animal Ecology	201	3
BIO 507	Parasite Epidemiology and Public Health	201	3
BIO 509	Arthropods and Arthropod-borne Diseases	201	3
BIO 511	Seminar Topics in Biology	010	1
BIO 513	Research Projects in Biology	002	2
BIO 515	Population Ecology	110	2
IMB 503	Immunology and Immuno- chemistry	201	3
Total			<u>20 units</u>

RAIN SEMESTER

BIO 502	Parasitology II (Helminthology)	201	3
BIO 504	Zoogeography	101	2
BIO 506	Development and Conservation of Natural Resources	200	2
BIO 510	Chemistry and Toxicology of Pesticides	201	3
BTC 504	Pest Management & Control Technology	201	3
BIO 514	Research Projects in Biology	004	4
BIO 516	Applied Entomology	201	3
Total			<u>20 units</u>

ELECTIVES

EVT 511	Environmental Impact Assessment II	200	2
BTC 510	Industrial Pollution and Waste Management Technology	2,1,0	3
BTC 509	Diagnosis of Parasitic Infections	2,0,1	3

YEAR V (500 LEVEL) BIOLOGY**Option: Hydrobiology****HARMATTAN SEMESTER**

CODE	TITLE	LTP	UNITS
BIO 511	Seminar Topics in Biology	0,1,0	1
BIO 513	Research Projects in Biology	0,0,2	2
BIO 523	Fish genetics and breeding	2,0,1	3
BIO 525	Marine Biology	2,0,1	3
BIO 527	Principles of Aquatic Resources Assessment	2,0,1	3
BIO 529	Fisheries Management and Population dynamics	2,0,1	3
BIO 531	Applied Chemical Techniques In Aquatic environment	1,0,1	2
BIO 533	Aquatic Flora and Fauna	1,0,1	2
BIO 535	Fish Adaptation & Physiology	1,0,1	2
Total			<u>21units</u>

RAIN SEMESTER

BIO 504	Zoogeography	1,0,1	2
BIO 506	Development and Conservation Of Natural Resources	2,0,0	2
BIO 508	Fish parasites and Diseases	2,0,1	3
BIO 510	Chemistry and Toxicology of Pesticides	2,0,1	3
BIO 512	Water quality management and Pollution Control	1,0,1	2
BIO 514	Research Projects in Biology	0,0,4	4
BIO 518	Shellfish Biology	1,0,1	2
BIO 520	Fisheries Policy and legislation	2,0,0	2
Total			<u>20 units</u>

ELECTIVES

BTC 504	Pest Management and Control Technology	2,0,1	3
EVT 511	Environmental Impact Assessment II	2,0,0	2
BTC 510	Industrial Pollution & Waste Management Technology.	2,1,0	3

YEAR VI (500 LEVEL) BIOLOGY**Option: Plant Science****HARMATTAN SEMESTER**

COURSE CODE	TITLE	LTP	UNIT
BIO 503	Plant Nematology	2,0,1	3
BIO 511	Seminar Topics in Biology	0,1,0	1
BIO 513	Research Projects in Biology	0,0,2	2
BIO 515	Population Ecology	2,0,1	3
BIO 517	Mycology	2,0,1	3
BIO 519	Economic Botany	2,0,1	3
BIO 521	Nigerian Vegetation	1,0,1	2
BCH501	Phytobiochemistry	2,0,1	3
Total			<u>19 units</u>

RAIN SEMESTER

BIO 506	Development and Conservation of Natural Resources	2,0,0	2
BIO 514	Research Projects in Biology	0,0,4	4
BIO 522	Plant Pathology	2,0,1	3
BIO 524	Plant Virology	2,0,1	3
BIO 526	Plant Breeding & Plant Cytogenetics	2,0,0	2
BIO 528	Phycology	2,0,1	3
BIO 530	Palynology	2,0,1	3
Total			<u>20 units</u>

ELECTIVES

EVT 511	Environmental Impact Assessment II	2,0,0	2
ETC 510	Industrial Pollution & Waste Management Technology	2,1,0	3
ETC 509	Diagnosis of Parasitic Infections	2,0,1	3

**B. TECH BIOTECHNOLOGY AND BIOLOGY
PROGRAMME(S)
COURSE DESCRIPTION**

**BIO 103: BIOLOGY FOR AGRIC. AND BIO. SCIENCES I
(2,0,1)**

Cell structures and organization; plant and animal cells. Functions of cellular organelles; diversity, characteristics of living things. General reproduction; mitosis and meiosis, abnormalities associated with gene crossing, heredity and evolution. Concept of ecology and types of habitats diversity of plant and animals, food chains and food webs; interrelationship of organisms. Elementary Biochemistry of carbohydrates, proteins and lipids with emphasis and their structure and chemical characteristics.

**BIO 104: BIOLOGY FOR AGRIC. AND BIO. SCIENCES
II (1,0,1)**

Ecology; Ecosystem biotic and abiotic factors. Interrelationships between plants and animals. Adaptations of plants and animals to their environment using local examples if possible, types of population; Dynamic, static, climax community; types and factors affecting them, adaptive factors; rainfall, wind, relative humidity, light intensity etc. Modification of the natural ecosystem by Man.

IME 201: GENERAL MICROBIOLOGY I (2,0,1)

History and scope of microbiology. General characteristics of micro-organisms, classification of bacteria; scientific of classification. International code of

bacterial nomenclature and classification of convenience, Micro-organism-growth and reproduction, sterilization and disinfections. Economic importance of microbes. Effect of the environment and microbial growth. Microbial techniques-culturing, isolation and identification. (Pre-requisites BIO 1 -/102).

BCH 201: GENERAL BIOCHEMISTRY I (2,0,1)

Protein and amino-acids; structure and chemical properties, biological importance, pH, pKa values and their effects on cellular activities. Methods of isolation of proteins. Buffers; amino acids and other examples. Role of buffers in biological systems. Carbohydrates, lipids and nucleic acids; structures, properties and biological significance. Introduction to the metabolism of carbohydrates, proteins and lipids.

IME 202: GENERAL MICROBIOLOGY II (2,0,1)

Systematic classification of bacteria, fungi, algae, protozoa and viruses. Microbial variation and heredity; biochemical reactions associated with DNA/RNA, hybridization cycles of elements in nature-carbon cycle, Nitrogen cycle. The general nutritional requirement and nutritional categories in micro-organism e.g. Chemosynthetic, autotrophic, saprophytic etc. (Pre-requisite: BIO 103/104).

BCH 202: GENERAL BIOCHEMISTRY II. (2,0,1)

Primary, secondary tertiary and quaternary structures of proteins. Determination and biochemical applications of the structures. Nomenclature of

nucleosides and nucleotides. Acid and alkalis hydrolysis of nucleosides, nucleotides and nucleic acids. Structures and functions of major cell components; prokaryotic versus eukaryotic organisms.

BIO 202: BIOLOGICAL TECHNIQUES. (0,1,1,).

Microscope: Preparation of microscope slides, photometry, colorimetry, chromatography, conductometry, experimental design. Electrophoresis.

STAT 301/BTC 307: BIOSTATISTICS. (1,0,0).

Introduction to Biostatistics, Numerical Statistics, Arithmetic Average, Mean, Mode, Median and Standard Deviation, Standard Error, Graphs, Pit Charts, bar Charts/ Histograms. Inferential Statistic, T-test, Chi Square, Probability, Bernolli, Principles Regression, Correction, Use of computer.

BTC 302: MICROBIAL GROWTH AND GROWTH KINETICS.(2,0,1)

Cell and population growth, continuous and synchronous culture. Measurement of microbial mass, total and viable counts of microbial populations. Growth curve of micro-organisms and conditions for growth. Principles of microbial cultivation in aqueous system. Mathematics of population growth rates in batch, feed batch continous cultures. Derivation of equations for log time, mean, generation time and specific growth rate. Comparison of methods for measuring growth limitation of growth in batch culture, substrate utilization and measurement of growth yields. Death phase of bacterial

growth curve and methods of preventing growth and killing cells. **(Pre-requisite: MTH 101/102,IMB 201/202).**

BTC 303: CELL BIOLOGY. (2,0,1).

Living matter (protoplasm), its nature and characteristics. Origin of cell; Molecular basis of cell structure and composition; Nature features. The cell membrane, Cytoplasm and cell nucleus. Cell organelles, Endoplasmic Reticulum, Golgi apparatus, Mitochondria, Lysosomes, Ribosomes, Vacuoles, Microtubules, Microfilaments, Nucleolus. Membrane Interactions. Cell Physiology and Metabolism, Cell Growth, Multiplication and cell Division/Reproduction. **(Pre-requisites BIO 101/102).**

BTC 304: GENETIC ENGINEERING. (2,0,1).

Replication transcription and translation-a brief review. The genetic code and its relationship to cellular functions. DNA replication in cell-free system. Genetic transformation, transduction and conjugation. Gene mutation, mutagenic agents and their applicators to gene transfer. Gene mapping. Structure of eucaryotic genome. Recombinant DNA and its application. **(Pre-requisite: IMB 201/202, BCH 201/202).**

BIO 305: SEEDLESS PLANTS (2,0,1)

The fundamental structure and functions of cryptogams morphology, taxonomy, physiology, ecology and reproduction of representative groups. The environmental historical background and model works. Basic

terminologies, chemical nature of the gene, gene interactions. Heritable and non-heritable characteristics. Aspects of human genetics and Features, agricultural and industrial importance, evolutionary sequence of members of the Thallophyta (bacteria fungi and algae), Bryophyta (liverworts, hornworts and mosses).

Pre-requisites: BIO 101/104.

BIO 304: SEED PLANTS (2,0,1)

General characteristics and classification (taxonomy), morphoheat study of stems, roots, leaves, flowers and fruits of angisperms and gymnosperms including their modifications.

Pre-requisites: BIO 101/104

BIO 301: GENERAL GENETICS (2,1,0)

Historical background and model works. Basic terminologies, chemical nature of the gene and gene interactions. Heritable and non-heritable characteristics. Aspects of human genetics and common genetic diseases, pedigree analysis; population genetics, Hardy-Weinberg Principle, sex determination, sex linkage, multiple allele, mutations, molecular basis of inheritance (DNA, RNA and protein synthesis, composition, structure and replication of DNA).

Pre-requisites: BIO 103/104

BIO 302: GENERAL VERTEBRATE ZOOLOGY (2,0,1)

General characteristics, organization, comparative morphology and anatomy, classification, range of forms, origin, evolution and phylogenetic relationships.

distribution and general biology of protochordata, Pisces, Amphibia, Reptilia, Aves and Mammalia illustrated with examples

Pre-requisites: BIO 103/104. BIO 303.

BIO 303: GENERAL INVERTEBRATE ZOOLOGY(2,0,1)

General characteristics, organization, classification, interrelationships, life history, mode of life adaptations, economic importance of the invertebrate phyla with selected examples from protozoa to anthropoda, Echinodermation.

Pre-requisites: BIO 103/104.

BCH 301: ENZYMOLOGY(2,0,1)

General properties of enzymes. Enzymes as proteins. Enzyme classification and nomenclature. Enzyme codes and numbering of enzymes. The active site enzyme specificity, measurement of enzyme activity. General enzyme assays. Methods of monitoring enzyme assays. Spectrophotometric methods. P^H stat. Radiometric assay. Oxygen electrode. Coupled assays. Enzyme time product relationship. Effect of substrate concentration P^H and temperature on enzyme assays. Enzyme kinetics Michaelis-Menten equation. Graphical determination of kinetic parameters. Irreversible and reversible inhibition of enzyme analysis. Co-enzyme, co-factors and prosthetic groups. Vitamins, Allosteric enzymes. Isolation and purification of enzymes.

BCH 303: BIOCHEMICAL TECHNIQUES (2,0,1)

Principles of instrumentation P^{II} Electrophoresis-principles and application. Types of chromatography – thin layer, gel filtration, ion exchange and affinity chromatography etc HPLC Gas chromatography. Spectroscopy and spectrophotometry. Liquid scintillation counters. Enzyme – linked immunoassay (ELISA). Microanalysis in Biochemistry .Centrifugation. Practical Lab. Exercises in areas of interest of academic staff to cut across wide spectrum of general biochemistry.

BTC 305: INTRODUCTION TO BIOTECHNOLOGY I (2,1,0.)

Introduction to Biotechnology.; Types and Sources of Microorganisms used in Biotechnology; Advantages of using microbes over chemical production systems; Introduction to Recombinant DNA Technology with special emphasis on gene function, identification, isolation and cutting of genes; Gene cloning; Preparation of DNA library and identification of desired genes; Transformation and recombinant selection; Gene mapping; Genetic code and its relation to protein synthesis. Microbial genetics; Introduction to Microbial physiology and ecology; Dogma in Molecular biology; Other biological techniques and tool used in biotechnology to include DNA labelling, Nick Translation of DNA, Nucleic acid hybridization, Biprobe (DNA probe), Gene gun technique, nucleotide synthesis, monoclonal antibodies, Gene libraries, etc.

BTC 306: INTRODUCTORY BIOTECHNOLOGY II:

(2,1,0)

Application of Biotechnology to Agriculture: this include application to crop improvement/ product yield improvement, to germplasm collection and improvement, to cell and tissue culture in agriculture, to diagnosis. of plant diseases, to animal science eg, artificial insemination, embryo transfer, etc. Application of Biotechnology to Medicine and Helath, including to diagnostics, production of vaccines, monoclonal antibodiesFoetal diagnosis, production of insulin,interferon, to genetic finger printing. Application of Biotechnology to Pharmaceuticals/Chemical Industry including enzyme Technology and application of Immobilized enzymes, etc. Application of Biotechnology in Food and Beverage industry including production of Single cell proteins (SCP), Microbial enzymes, fermented foods, etc. Application in Recovery of metals - biolcaching of metals eg iron, gold and silver, copper, bismuth and molybdenum oresantimony ores, alminium, selenium, etc., recovery of metals in natural water and industrial waste. Application of Biotechnology in the environment- Biotech and super-bug concept of oil spill control, waste management, bodegradation, bioremedation, etc. Future prospects and constraints of biotechnology. Role of biotechnologist in developed and developing economy. Biotechnology policy in Nigeria. Bioethics in Biotechnology.

Application of Biotechnology to Agriculture: this include application to crop improvement/ product yield improvement, to germplasm collection and improvement, to cell and tissue culture in agriculture, diagnosis of Biotechnology.

BIO 306: GENERAL PHYSIOLOGY(2,0,1)

Structure, properties and organization of matter. Thermodynamics and energy of reactions physiological importance of inorganic and organic molecules, movement of substances in and out of cell, movement in plants and animals. Simple and chemical tests for food etc.

Pre-requisites: BIO 101/104, BIO 202.

BIO 307: INTRODUCTORY BIOSYSTEMATICS (2,0,1)

Historical background of development of science of classification. Biosystematic approach to the classification, nomenclature of organisms, principles of collection, preservation, identification and classification of plants and animals. Engler's and Hutchinson's systems of classification of angiosperms compared.

Pre-requisites: BIO 101/104.

BTC 308: GENERAL ECOLOGY:(2,1,0)

Science of Ecology, Nature of our environment, the ecosphere, ecosystems, physical and chemical factors in the environment, Environmental and Biogeophysical cycles, Population of organisms and population ecology and dynamics. Relationships and interdependence of organisms, Trophic relations, Food chains and webs. Energy flow through the biosphere, Biotic communities and ecological succession. Biodiversity and conservation. Pre-requisites: BIO 103/104.

BIO 308: INTRODUCTION TO FISHERIES AND WILD LIFE MANAGEMENT (2,0,1)

External morphology of fish; differences between bony and cartilaginous fishes; identification; distribution and of selected fishes in relation to salinity, classification of adequate habitats in relation to depth, factors affecting distribution and survival of fish, definition of fisheries management, dynamics of fish population, management procedures, restrictive laws, artificial propagation, introduction and habitat improvement; management of endangered species; organization of wild life, habitat requirements, factors affecting distribution and abundance, adaptation, movement behaviour, life cycles and reproduction, management of wild life.

Pre-requisites: BIO 101/BIO 104.

BIO 309: GENERAL CYTOLOGY AND HISTOLOGY (2,0,1)

Review of light, phase-contrast, dark-field and electron microscopy; cell cycle; introductory cytogenetics. Detailed structure and functions of the Cell and its organelles tissues and organs of vertebrates and angiosperms. Histological techniques and drawing. Chromosome, variation number, morphology and mutation.

Pre-requisites: BIO 202.

BIO 310: SOIL SCIENCE (1,0,1)

Physical and chemical nature of soil, soil profile and soil classification, soil origin and formation, plant-soil water relationships, soil organisms, cycling of nutrients, nutrient pools, mineral nutrition of plants, pollution/contamination of soil, strategies for soil improvement. Introduction to fertilizer.

BIO 401: ANIMAL PHYSIOLOGY (2,0,1)

Principles of physiology as illustrated by cells, tissues, organs, and organ systems in vertebrates. Metabolic processes such as respiration, excretion, digestion, etc coordination and control of metabolism, growth, reproduction and contraception. See Zoo 311 for Physiology practicals.

Pre-requisites: BIO 306.

BTC 401: PHARMACOLOGY OF NATURAL PRODUCTS (2,0,1)

The living plant cell, Cell differentiation, ergastic cell contents, Biological and geographical source of drugs. Factors involved in the production of drugs. The pharmacological action of plant drugs. Phytochemistry. Basic metabolic pathways and the origin of secondary metabolites, Microbiological conversions. Aberrant synthesis in higher plants. Drugs of biological origin. commerce and quality control of drugs. (**Pre- requisites: IMB 302**)

BIO 403: INTRODUCTORY PARASITOLOGY (2,0,1)

Features of Parasitism. Basic terminologies, types of parasites, the ecology of animal parasites, life histories, mode of transmission and epidemiology. A review of important viral rickettsial and spirochaetal infections of man, animals – pathogenicity, prevention and control. Economic importance of parasites with special reference to public health and agriculture in Nigeria and West Africa.

Pre-requisites: BIO 303, BIO 101/104.

BTC 403: CELL AND TISSUE CULTURE (2,0,1)

Review of basic principles of microscopy, cytology and histology. The history and development of tissue culture technique. Working facilities, glass wares and instruments, types of culture media used in cell and tissue culture- their composition and uses. Types of aseptic cultures. Aseptic culture procedures to include Preparation of culture media and sterilization techniques. Techniques used in cultivation of various cells and tissues. maintenance of culture; organ, tissue, embryo cell and protoplast cultures. Isolation and identification of cells and tissues. Incubation and preservation of cell and tissue cultures. Physical, Chemical and Biological Standardization methods. Immunological and serological methods. Roles of Antimicrobial agents in cell and tissue cultures. The significant of tissue culture in biological research (both plant and animal research) at basic and applied levels. Significant difference in agriculture and crop improvement. Plant and animal cells for production of natural products.

BIO 405: BASIC ENTOMOLOGY (2,0,1)

Introduction to the Phylum Arthropoda and its classes, general characteristics of arthropoda and their relative importance in the animal kingdom, the classes insecta, myriapoda and arachnida and their relationship to human health, agriculture and commerce, general biology of insects - holometabolous and hemimetamorphosis, growth and moulting, external features and internal anatomy of insects, using specific insect groups, principles and methods of control of arthropod pests.

Pre-requisites: BIO 303, BIO 101/104.

BTC 405: AGRICULTURAL AND ENVIRONMENTAL BIOTECHNOLOGY (2,0,1)

Definition and historical development of plant and animal breeding, its significance and scope, genetic basis of breeding, review of Mendelian principles of inheritance, linkage, heritability. Sources of variation/mutation including genetic and chromosomal. Plant breeding, selection and hybridization- clonal propagation, somatic hybridization, germplasm conservation, somaclonal variation in vitro production of plant secondary metabolites, modern techniques in plant biotechnology- RFLP, PCR, RAPD, ELISA. Animal breeding - artificial insemination, embryo splitting, in vitro fertilization and embryo transfer. Production of Transgenic plants and animals. Fermentation and food processing. Quality control and preservation methods for agricultural produce. Biomass production; Single Cell Protein production, bio-energy production Biological nitrogen fixation and formulation and application of Biofertilizers. Genetic engineering methods for pest and pesticides resistance and for breed selection, disease resistance and virus tolerance. Antibody and vaccine production techniques as applicable to livestock rearing and animal production generally.

BTC 407: BIOASSAYS AND CHEMICAL SCREENING (2,0,1)

Nature and characteristics of chemical Pesticides, Methods of synthesis (including composition) and classification of chemicals (e.g. Insecticides, Molluscicides,

Rodenticides, Fungicides, Herbicides etc.) employ in Agriculture, Public Health, Environmental Protection, and Industry generally. Essence of Bioassays for the detection, measurements and monitoring of chemical substances in plants, Animals, Soil, Water and Air, and the environment generally. Chemical screening techniques employed in the handling of Drugs, Pesticides, Trace Metals, and Pollution factors generally.

BIO 407: PARASITOLOGICAL AND ENTOMOLOGICAL TECHNIQUES (2,0,1)

Introduction to the techniques of handling parasitological and entomological materials. Collection and rearing of insects including maintenance of laboratory cultures of insects. Examination of human and animal bodies for ecto-parasites, examination of faecal, blood and lymph (body fluid) samples for parasites, temporary and permanent preparation/preservation of insects, parasites, dissection of different systems of the insect. Collection and preparation/preservation of parasitological materials, sputum, excreta, blood etc; various standard methods of fixation etc, use of different reagents (fixatives stains) and solutions. Entomological and parasitological drawings.

Pre-requisites: BIO 202, BIO 303.

BIO 411: PATHOGENIC MYCOLOGY (1,0,1)

Structure, reproduction and classification of pathogenic fungi. Laboratory methods of study. Pathogenic and immunology of superficial/cutaneous mycoses, sub-cutaneous mycoses.

BIO 413: MORPHOLOGY AND PHYSIOLOGY OF INSECTS (1,0,1)

Origin and phylogeny of insects, classification of insects and mites. External features, modification of external organs to suit habits and habits – antennae, mouth parts, leg etc. Anatomy and physiology of insects:- digestive, muscular, nervous, respiratory, circulatory, excretory and reproductive systems of insects, insect cuticle and the physiology of moulting, sense organs, embryonic and post embryonic development, life histories of principal groups of insects, modes of production in insects.

Pre-requisites: BIO 303, BIO 306.

BIO 415: PLANT ECOLOGY (2,0,1)

Study of various plant communities and their ecological framework. Nigerian vegetation, desert and semi-arid plant productivity. Modern concepts in ecology.

Pre-requisite. BTC 306.

BIO 501: PARASITOLOGY I (PROTOZOOLOGY) (2,0,1).

Classification, morphology, parasitic adaption, geographical distribution, epidermiology, life cycles, physiology, metabolism, pathogenicity, symptomatology, diagnosis, treatment prevention, control, immunity, host specificity and susceptibility of parasitic protozoans including bacteria, spirochaetes, amocbas, sporozoans, haemoflagellates, host-parasite relationships, protozoan parasites of live-stock, food contamination and spoilage, zoonosis.

live-stock, food contamination and spoilage, zoonosis.

BIO 502: PARASITOLOGY II (HELMINTHOLOGY) (2,0,1)

General biology, socio-economic importance and control of parasitic helminthes. Classification, morphology, parasitic adaption and epidemiology, life cycle, physiology, Pathogenicity and pathology, diagnosis, treatment, prevention and control, immunity, hosts specificity and susceptibility of parasitic helminthes in Nigeria, global, public health and socio-economic importance of parasitic helminth infections.

BIO 503: PLANT NEMATOLOGY (2,0,1)

Characteristics, morphology, anatomy, life cycle and local distribution of plant parasitic nematodes, structural modifications and feeding mechanisms in plant nematodes in relation to endo - and ecto-parasitism. Pathogenesis - host/parasite relationships and disease complexes involving nematodes and other pathogens (fungi, bacteria and viruses). Symptoms and economic importance of the major groups of plant nematodes, nematode sampling and extraction techniques.

BIO 505: ANIMAL ECOLOGY(2,0,1)

In depth strides on the relationship of animals on their environment, especially as they affect their distribution and abundance, population structures, community metabolism, zoogeography, evolutionary and genetic ecology, biological control, environmental threats to man and animals game reserves and game cropping.

Pre-requisites: RTC 306

BTC 501 BIOCHEMICAL ENGINEERING I (2,0,1)

A brief review of the kinetics of enzymes catalyzed reactions and applied enzyme catalysis. Metabolic, stoichiometry and Energetic. A brief review of molecular genetics and control systems. Kinetics of substrate utilization, product formation, and biomass production in cell cultures. Transport phenomena in Bioprocess systems. (Pre-requisites: **IMB 409, BCH 302/304, BTC 302**).

BTC 502: BIOCHEMICAL ENGINEERING II (2,0,1)

Design and Analysis of Biological Reactors. Ideal bioreactors, reactors dynamics. Sterilization of reactors, multiphase bioreactors, fermentation technology and animal and plant cell reactor technology. Instrumentation and control. Product recovery operations. Basic theory will be illustrated with specific examples of current biotechnological processes. **Pre-requisites: IMB 409, BCH 302/304, BTC 302**).

BTC 503 ENVIRONMENTAL BIOSCIENCE (2,0,1)

Micro-organism and other organisms important in aquatic systems and disposals. Ecology of micro-organisms in fresh water. Pollution and self-purification of water, water purification. Brief studies of marine microbiology, disease transmission by water. Microbiological examination of water. Microbiology of waste disposal. Biological oxygen demand and chemical oxygen demand tests for swage and water; pest control. Winkler's method of determining available oxygen in water sample. (**Pre-requisites: IMB 201/202**).

BTC 504: PEST MANAGEMENT AND CONTROL TECHNOLOGY (2,0,1)

Principles of pest management. Methods and techniques available for management of various types of pests. (e.g Agricultural, Industrial and Public Health pests as well as Stored Produce pests; domestic, urban, rural and cosmopolitan pests etc), Technological aspect of pest control including the use of Chemical, Biological, Biophysical (e.g. Irradiation) and Bio-Chemical (e.g Sterilisation) techniques, plus such contemporary approaches as use of Microbial Pesticides, and Insect Growth Regulators etc. for the control of sundry Pests in various habitats. Focus on Strategies and Equipments for Pest Management and Control.

BTC 505: SEMINAR IN BIOTECHNOLOGY (0,1,0)

BTC 506: PRINCIPLES OF TAXONOMY (2,0,0)

Definition and Terms - Identification, Nomenclature, Classification. Hierarchical Classification - Ranks and Categories. Systems of Classification - Natural and Artificial. Keys - Numerical and Dichotomous- (Bracketed and Indented). History of Taxonomy. Herbarium and Museum Techniques. Systematics of some major Families.

BTC 508: RESEARCH PROJECT IN BIOTECHNOLOGY II (0,0,6)

BIO 506: APPLIED ENTOMOLOGY (2,0,1)

Basic classification and main groups of insects, mites and ticks. Patterns of life history, Bionomics of suitable species. Economy importance with emphasis in the fields of agriculture and public health. - Nature of damage and

losses caused by insects and mites on stores products, detection of infestation in stores products, management and control of stores products pests. General principles and methods of arthropod pest control, control of major pests of cocoa, cotton, oil and coconut palms, cowpea, cassava, yam, maize, sugar cane, sorghum, selected vegetables. Medical and veterinary importance of arthropods as vectors and intermediate hosts of human and animal diseases. Three areas of the above are on (i) stored products entomology (ii) plant Entomology and (iii) medical and veterinary entomology.

Pre-requisite: BIO 405

BIO 508: FISH PARASITES AND DISEASES (2,0,1)

Study of morphology, taxonomy and life history of organisms causing fish diseases including bacteria, fungi, protozoa and viruses; skin parasites and infections, Helminth and crustacean parasites of fish, respiratory diseases of fish, Tumors and other fish diseases, deficiency and environmental diseases. Prevention epidermology of fish pathogens in water bodies treatment and control of fish diseases other enemies of fish including harmful insects and amphibians, reptiles, other fishes, birds and mammals.

BIO 509: PARASITIC ARTHROPODS AND ARTHROPOD BORNE DISEASES (2,0,1).

Study of disease - causing arthropods, their classification habits, life cycles transmission, epidemiology, pathogenesis and control. Arthropods as intermediate hosts and vectors of parasitic diseases, poisonous, venomous and allergic arthropods including their biology, habits and control.

BTC 509: DIAGNOSIS OF PARASITIC INFECTIONS (2,0,1)

Review of methods available for diagnosis of various Parasitic Infections; especially Protozoal Infections caused by Parasitic Arthropods (e.g. Myiasis-producing maggots, fleas, mites etc). Detailed Laboratory techniques as process including wet and permanent preparations, staining techniques and concentration methods (for parasite cysts, eggs and larvae) etc. Study of Sero-Diagnostic and various other Immuno-diagnostic Techniques.

BTC 510 INDUSTRIAL POLLUTION AND WASTE MANAGEMENT TECHNOLOGY (2,1,0)

General introduction. Definition of Pollution. Pollutants and Types of Pollution. Types of Industrial Pollution, Water, Air, Noise, Thermal, Radioactive, etc. Waste Management. Pollution Monitoring. Pollution Control Policy and Legislation.

BTC 511 ADVANCED METHODS IN BIOTECHNOLOGY (2,0,1)

Chromosomal DNA and general features of chromosome. Plasmid DNA - their isolation and analysis. Method of cutting and joining of DNA. Routine cytological methods using root tips, cytogenetic methods using pollen cells and other plant parts, in situ hybridization of DNA probes on chromosomes. Variations and types of biological data; computerized management of biological data, Extrapolation of models and patterns from biological data; DNA sequencing; forecasting of biological properties using appropriate computer softwares and programme; computer programmes and programming. Biosafety; Regulations on

genetically modified organisms (GMOs); Intellectual Property Rights (IPR).

BIO 512: WATER QUALITY MANAGEMENT AND POLLUTION CONTROL (1,0,1)

Physical composition of water bodies; water chemistry and nutrient cycles; sampling methods; chemical, Mechanical and biological methods for maintaining and improving water quality; characteristics of polluted water, effect of pollution on aquatic flora and fauna and water quality.

BCH 501: PHYTOBIOCHEMISTRY (2,1,0)

Techniques of Plant biochemistry such as cell fractions. Structure and functions of plant organization physiology and biochemistry of plant organization and its relationships. Respiration in storage tissues, fruit development. Studies on increasing photosynthesis in crop plants. Regulation of crop growth and productivity. Biochemistry and genetic control of photorespiration. Respiratory patterns in plant breeding. Influence of herbicides in plant respiration and photosynthesis. Anaerobic respiration flood and drought tolerance in plants. Salt resistance and ion toxicity in higher plants. Solar energy conversion and photosynthesis. Alkaloids, flavonoids and other phytochemicals. Plant hormones and their metabolism. Synthetic growth regulators. Lignin biosynthesis.

BIO 515: POPULATION ECOLOGY (2,0,1)

Evolution. Properties of population and biotic communities. Behaviour. Conservation. Laboratory and field studies illustrating principles of population ecology, natural selection. Measurement of ecological variables and illustrations of their effect on plant and animal communities.

Pre-requisites: BTC 306.

BIO 530: PALYNOLOGY (2,0,1)

Definition of terms, (palynology) pollen characters, ontogeny of pollen, gametophytes, sporophytes and gametogenesis differences between microspores and megaspores, structure and functions. Tectum, exine of pollen and intine, distinction between pollen structure and sculptures. Pollen faces, polarity of tetrads, exine stratification bacula and spines. Acetolysis technique. Application of palynology. Evolution of plant vegetation and climate forensic and taxonomy in relation to pollen identity.

BIO 528: PHYCOLOGY (2,0,1)

Definition of basic terminologies, characteristics types of algae, algal nutrition, ecology. And pigments, Taxonomy various divisions/classes of algae, chlorophytic, cyanophyta, Phaeophyta, Rhodophyta, Xanthophyta (crysohyta), Bacillariophyta – diatoms, Euglenophyta-Euglenoids. Structure and reproduction of algae – unicellular algae, motile or flagellate, non-motile or protocoidal forms. Multicellular forms, colonial forms, filamentous, branched filamentous forms, siphonaceous, parenchymatous forms, and aggregate forms.

Reproductive structures and life cycles. Mode of reproduction; systematics of representatives of various divisions.

BIO 517: MYCOLOGY (2,0,1)

Further study on general morphology, physiology and reproduction of fungi with emphasis on local flora. An introduction to the construction of dichotomous keys. Role of fungi in nature and economic importance to man. Structure life cycles and classification of representative general of the sub-divisions.

BIO 510:CHEMISTRY AND TOXICOLOGY OF PESTICIDES (2, 0, 1)

Major groups of pesticides – insecticides, acaricides herbicides, nematocides, avicides, fungicides and antibiotics with special reference to their chemical structure, physical, chemical and biological properties, selectivity, metabolism and persistence. Mode of action of pesticides, extraction and bioassay of residues and other metabolites pesticides in the environment and health hazards associated with their use. Resistance to pesticides and safety requirements, movement of pesticides in plants and soil. Pesticides formulation, emulsifying agents and other additives, product registration, application methods, dosage calculation, types of equipment, maintenance and calibration.

BIO 507: PARASITE EPIDEMIOLOGY AND PUBLIC HEALTH (2,0,1)

An introduction to the concept of epidemiology including incidence, prevalence, strategies and methods of control of parasitic infections, methods of epidemiological data collection and analysis study of epidemiology of importance endemic parasite diseases in Nigeria including malaria, Amebiasis trypanosomiasis, schistosomiasis, onchocerciasis hookworm, etc other important non-communicable diseases, and vector-borne diseases.

BIO 506: DEVELOPMENT AND CONSERVATION OF NATURAL RESOURCES (2,0,0)

Development of conservation movement, definition of basic terminologies/concepts scope of conservation, identification or characterization of natural resources. Methods/techniques of conservation, man, nature and resources, principles of conservation and resource use, pollution, environmental limits of man's economic growth.

BIO 504: ZOOGEOGRAPHY (1,0,1)

Subdivision of the earth into zoogeographic regions, characteristic features of each region; transition zones. The distribution of animals and the continental drift. Animal distribution and discontinuous distribution. Effect of man on the distribution of animals. Origin of domesticated animals. The zoogeography of *Homo sapiens* and other selected animals species.

BIO 511: SEMINAR IN BIOLOGY (0,1,0)

Literature research/review on a selected biology (parasitological, Entomological, hydrobiological and plant science) etc topic under staff guidance, written up and presented in class and finally submitted in bound form.

BIO 513 RESEARCH PROJECT (0,0,2)

This is designed to give students an opportunity to carry out a small independent research project involving an investigation of a selected biological problem, approved by the Department Board and under the supervision of one or more members of the staff. The project is written up in the form of a scientific report in a format approved by the Department.

BIO 518: SHELLFISH BIOLOGY (1,0,1)

Taxonomy, biology and ecology of freshwater, estuarine and coastal/marine shellfish particularly of Nigeria and West African coastline. Use of identification keys and associated techniques.

BIO 519: ECONOMIC BOTANY (2,0,1)

Origin and evaluation of cultivated plants with special reference to those in Nigeria. Productivity and the economic aspects of the utilization of food resources. Aspects of land use in crops production. Classification and botanical characteristics of plant used in food, as source of fibres, as source of oil, as source of latex as source of timber; as source of drugs, paper etc.

BIO 520: FISHERIES, POLICIES AND LEGISLATION (1,0,1)

Fisheries institution. Conservation strategies; fish policy and laws of Nigeria; International laws of the sea.

BIO 521: NIGERIAN VEGETATION (1,0,1)

Nigerian Vegetation types: mangrove swamp forest, fresh water swamp forest, tropical rain forest and savannah – their environment, structure and management. The impact of human activities on the Nigerian vegetation sampling and analysis.

BIO 522: PLANT PATHOLOGY (2,0,1)

Principles and concepts of plant diseases development, parasitic diseases and non parasitic diseases, methods of studying nematode diseases of plants, fungi and bacteria diseases of plants, especially Nigerian plants. Plant disease control.

BIO 523: FISH GENETICS AND BREEDING (2,0,1)

Principles of fish genetic and hybridization, determination of heritable characteristics, basic principle of mendelian inheritance; genetic manipulation of cultivable fish species, natural and artificial selection of desirable traits; breeding and cultivation of common types of fish.

BIO 524: PLANT VIROLOGY (2,0,1)

Survey of plant viruses with special reference to structure, physical and chemical properties; serological relationships, transmission, variability infection, replication, movement, quantitative essays purification and electron microscopy.

Acquired immunity and environmental influence, studies of selected virus diseases and general principles of control.

BIO 525: OCEANOGRAPHY (2,0,1)

Study of temperature and chemistry of sea water; biological activities and their distribution; salinity, chlorinity, currents, tides, waves, sound and radiation in the sea, conductivity, diffusion, viscosity and dynamics of sea water, distribution.

BIO 526: PLANT CYTOGENETICS & BREEDING (2,0,0)

Chromosome structure and number, crossing over, pedigree analysis, mutogenesis, population genetics-Hardy-Weinberg law. Gene recombination, Elementary probability and testing genetic ratios. Modern applications of genetics. The objectives and origin of plant breeding. Self-pollinated and cross pollinated crops. Breeding methods: pure line breeding and mass selection. Pedigree method bulk population breeding, back-cross breeding. Recurrent selection heterosis, chromosome manipulation. Plant propagation techniques-macro and micro and behaviour of plankton and fauna; brackish water conditions, interrelationships and physiological adaptation of marine organisms.

Pre-requisites: BIO 425, BIO 423.

BIO 527: PRINCIPLES OF AQUATIC RESOURCE MANAGEMENT(2,0,1)

Theory and methods of conducting resource assessment surveys, including survey planning, survey execution and data acquisition, analysis, interpretation and presentation. **Pre-requisites:** BIO 409; BTC 307.

BIO 529: FISHERIES MANAGEMENT AND POPULATION DYNAMICS (2,0,1)

Definition, dynamics of fish population; stock assessment; catch and effort statistics, concept of maximum sustainable yield, gear selectivity, management procedures, restrictive laws, artificial propagation, introduction and habitat improvement, natural and artificial selection and management of endangered species. **Pre-requisites: BIO 409.**

BIO 531: APPLIED CHEMICAL TECHNIQUES IN AQUATIC ENVIRONMENT (1,0,1)

Procedure for obtaining representative samples for chemical analysis of biological materials in the food chains; procedures for initial treatment and wet chemical or instrumental analysis in pollution related problems; comparative methods of analysis of different sample types; sample collection in the field; analysis of biological materials and water.

BIO 533: AQUATIC FLORA AND FAUNA (1,0,1)

General concept, definition and importance; differences between aquatic and terrestrial flora and fauna; identification of characteristic flora and fauna of importance in freshwater and coastal water in the tropics; the ecology, utilization and management of aquatic flora and fauna.

BIO 535: FISH ADAPTATION AND PHYSIOLOGY (1,0,1)

The different shapes and adaptive features in fish in relation to the environment, natural environmental adaptation of fish as regards migration, reproduction, feeding habitats, salinity, temperature, pressure, light, electrical field, noise.

FEDERAL UNIVERSITY OF TECHNOLOGY
SCHOOL OF SCIENCE
DEPARTMENT OF BIOTECHNOLOGY AND BIOLOGY

CURRENT STAFF LIST

S/N	ACADEMIC STAFF	RANK
1.	Prof. M. O. E. Iwuala	Professor
2.	Prof. C.E.O. Onwuliri	Professor
3.	Prof. P. T. E. Ozoh	Professor
4.	*Prof. G. S. C. Okpokwasili	Professor
5.	*Prof. B. E. B. Nwoke	Professor
6.	Prof. A. J. Njoku	Professor
7.	Prof. F. O. U. Osuala	Professor
8.	Dr. (Mrs) H. C. Nwigwe	Reader
9.	Dr. D. I. O. Osuigwe	Snr. Lecturer
10.	Dr. F. N. Opara	Snr. Lecturer
11.	Dr. A.N. Amadi	Snr. Lecturer
12.	Dr. N. E. Onyedineke	Snr. Lecturer
13.	Dr(Mrs.) G. C. Okoli	Snr. Lecturer
14.	Dr. S. O. Obiekezie	Snr Lecturer
15.	Dr. I. A. Okwujiako	Snr Lecturer
16.	Dr. N. C. D. Ukwandu	Snr. Lecturer
17.	Rev. Sr.(Dr) Oparaocha	Snr. Lecturer
18.	Mr T. I. N. Ezejiofor	Lecturer I
19.	Mr. B.C. Anuforo	Lecturer I
20.	Mrs R. I. Okechukwu	Lecturer I
21.	Dr. O.C. Ogueri	Lecturer II
22.	Miss P. U. Okere	Lecturer II
23.	Mr C.N. Ugochukwu	Lecturer II
24.	Mrs T. E. Ogbulie	Asst. Lecturer
25.	Mr C. M. Duru	Asst. Lecturer

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|-------------------------|----------------|
| 26. Rev. M. C. Nnoli | Asst. Lecturer |
| 27. Miss I. C. Mgbemere | Asst. Lecturer |
| 28. Mr K. O. Obasi | Asst. Lecturer |
| 29. Mr J. N. Okereke | Asst. Lecturer |
| 30. Mr E. U. Ezeji | Asst. Lecturer |
| 31. Mrs. A. C. Udebuani | Asst. Lecturer |

TECHNICAL STAFF:

- | | |
|------------------------|------------------------|
| 32. Mr S. E. Nwanganga | Chief Technologist |
| 33. Mrs R. N. Anunobi | Principal Technologist |
| 34. Mrs P. N. Anozie | Technologist I |
| 35. Mr U. Igbe | Chief Lab. Supervisor |
| 36. Mr E. O. Obasi | Asst Chief Lab. Sup. |
| 37. Mrs B. J. O. Ibe | Snr. Lab. Supervisor |
| 38. Miss J. Amadi | Lab Assistant. |

ADMINISTRATIVE STAFF:

- | | |
|------------------------|------------------------|
| 39. Mr O. Okoreaffia | Asst. Registrar |
| 40. Mrs F. Iheanacho | Chief Cl. Supervorsor |
| 41. Miss N. E. Akudolu | Asst. Chief Typist |
| 42. Mrs P. Ekeledo | Asst. Chief Typist |
| 43. Miss C. Enwerem | Trainee Comp. Operator |
| 44. Miss E. Oguoma | Caretaker. |

*** Adjunct staff**



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