DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
Obafemi Awolowo University, Ile-Ife.

DEPARTMENTAL HANDBOOK

Members of Academic Staff

S/No	Name	Qualifications	Rank	Area of Specialization	Room No.
1	A.V. Ikujenlola	B.Sc., M.Sc., Ph.D. (Ife)	Senior Lecturer/ Ag. Head	Nutrition	FST204B
2	Mrs. S. H. Abiose	B.Sc. (Ibadan), M.Sc. (Readings) Ph.D. (Strathclyde)	Professor	Food Microbiology/ Biotechnology	FST201
3	C.T.Akanbi	B.Sc. (Ife) M.Sc.(Readings), Ph.D.(Leeds)	Professor	Food Process Engineering	FST103
3	T.O. Omobuwajo	B.Sc.(Ife), M.Sc.(Ife), Ph.D. (Ife)	Professor	Food Engineering	FST101
4	Mrs. K.A. Taiwo	B.Sc., M.Sc., Ph.D. (Ife)	Professor	Food Engineering	FST 105
5	H.A. Adeniran	B.Sc., (Ilorin) M.Tech. (Akure), PhD (Ife)	Professor	Food Microbiology/ Quality Control	FST205
7	S.O.Gbadamosi	B.Sc., M.Sc., PhD (Ife)	Reader	Food Chemistry	FST107
8	T.A. Morakinyo	B.Sc. (Ilorin, M.Sc., Ph.D. (Ibadan)	Lecturer I	Food Engineering	FST 104
9	L.O.Lalude	B.Sc, M.Sc., M.Phil. (Ife)	Lecturer	Nutrition	FST007B
10	A.A. Adepoju	B.Sc., M.Sc., PhD (Ife)	Lecturer I	Food Microbiology	FST204B
11	W.A. Adebayo	B.Sc., M.Sc., PhD (Ife)	Lecturer II	Food Process Engineering	FST 106

2(a) Brief History of the University

The history of university education in modern Nigeria dates from 1948, when the University College, Ibadan was established. For more than a decade that College remained the only University in Nigeria. Although the Eastern Nigeria Government had enacted a Law establishing the University of Nigeria, Nsukka in 1955, it was not until 1961 that the University came into existence.

In April 1959, the Federal Government appointed a commission under the chairmanship of Sir Eric Ashby, Master of Clare College, Cambridge, to survey the needs of post-secondary and higher education in Nigeria over the following twenty years. The Commission submitted its report to the Federal Government in September 1960. One of the most lasting results of the Commission was the establishment of three Universities in Nigeria between 1961 and 1962. One of these Universities was the University of Ife, now Obafemi Awolowo University, Ile-Ife.

The Government of Western Nigeria first announced in 1960 its intention to establish, as soon as possible, a University in Western Nigeria that would be of the highest standard. Its policy would be to open its doors to students from all parts of the Federation and of the world.

The planning of the Obafemi Awolowo University was entrusted to two committees. The first was the University Planning Committee, comprising persons qualified to advise on the planning of a new University, and which in effect undertook the preparatory work involved in the establishment of the University pending the setting up of a Provisional Council. The other was a University Parliamentary Committee, which was advisory to the Minister of Education. On June 8, 1961 the Law providing for the establishment of the Provisional Council of the University was enacted, and the Council was formally inaugurated under the Chairmanship of Chief Rotimi Williams.

On June 11, 1970, the Government of the Western State, to replace the Provisional Council Law of June 8, 1961, promulgated the University of Ife Edict, 1970. This Edict was later amended by the Obafemi Awolowo University, Ile-Ife (Amended) Edict No. 11 of 1975 (Transitional Provisions). This new Edict effected a takeover of the Obafemi Awolowo University by the Federal Military Government and established a Provisional Council as an interim governing body of the University which, subject to the general direction of the Head of the Federal Government, was to control the policies and finances of the University and manage its affairs. A Governing Council has since replaced this Provisional Council.

The site selected for the University was at Ile-Ife, a town about 80 kilometres northeast of Ibadan, in the Osun State, with a population of about, 130,000. Ife is famous as the centre of an ancient civilization and home of the Museum, which contains the renowned Ife heads. It was intended that temporary buildings should be put up on the site to enable teaching to commence in October, 1962, while the permanent buildings were being planned and erected. However, when the Federal Government transferred the Ibadan Branch of the Nigerian College of Arts, science and Technology to the University, it was decided that it would not be necessary to put up temporary buildings at Ile-Ife and University was temporarily located on the site of the Ibadan branch of the College.

Teaching began in October 1962 with an initial enrolment of 244 students. At that time, the teaching, administrative and technical staff, who had either transferred from the Nigerian College or were newly recruited from abroad, numbered about eighty.

The University started with five Faculties – Agriculture, Arts, Economics and Social Studies (now Social Sciences), Law and Science. New faculties have since been added, namely the Faculty of Education, established on October 1, 1967, the Faculty of Pharmacy established on October 1, 1969, the Faculty of Technology, established in 1970, and the Faculty of Administration which replaced the former Institute of Administration with effect from October 1, 1979. The Faculty of Health Sciences (now College of Health Sciences) was established on October 1, 1970 and the Faculty of Environmental Design and Management was established on April 6, 1982.

In 1992, the University established a Collegiate System with five Colleges. The system did not function effectively and was abandoned after two years. However, the Postgraduate College and the College of Health Sciences were retained. The College of Health Science now comprises of the Faculties of Basic Medical Sciences, Clinical Sciences and Dentistry.

The Adeyemi College of Education located in Ondo and the Institute of Agricultural Research and Training in Ibadan were initially integral parts of the University. Although, the Adeyemi College was separated from the University in 1995, however, there is still a close relationship between the two institutions. The College offers the degree programmes of the University under a system that is closely monitored by the University Senate.

The Institute of Agricultural Research and Training, Ibadan, with a branch at Akure in Ondo State, used to be fully superintended by the Obafemi Awolowo University until its disarticulation from the University ion 1991. However, the Akure branch and the College of Animal Science of the Institute continued to report to the Federal Government through the Director of the Institute. In terms of funding, the Institute of Agricultural Research and Training now relates to the Federal Ministry of Agriculture while the University still has administrative responsibility for the Research and Administrative staff of the Institution. The Director and the Secretary of the Institute are responsible to the University through the Vice-Chancellor and the Registrar respectively. The Vice-Chancellor is the Chairman of the Institute's Governing Board.

The following other institute and major units exist in the University:

The Natural History Museum
The Institute of Ecology and Environmental Studies
The Centre for Gender and Social Policy Studies
The Centre for Industrial Research and Development
The Institute of Public Health
The Institute of Cultural Studies
The Technology Planning and Development Unit
The Computer Centre
The Drug Research and Production Unit
The Equipment Maintenance and Development Centre
The Central Technological Laboratory Workshop
The Central Science Laboratory
The Distance Learning Centre

Finally, some other agencies over which the University has no direct, or, in some cases, limited control, have premises within the University:

The Regional Centre for Training in Aerospace Surveys
The National Centre for Technology Management
The Centre for Energy Research and Development
The African Regional Centre for Space Science and Education in English

(b) BRIEF HISTORY OF FACULTY OF TECHNOLOGY

The University of Wisconsin supported in full, the establishment of a strong Faculty of Agriculture in the then University of Ife; the University of Ife having being founded in 1962 as a land grant University under some special auspices and affiliation to the University of Wisconsin. Thus activities in the study of Food Science and related subjects were based in the Faculty of Agriculture. In the late 1960's, the University of Ife decided to establish a Faculty of Technology.
The establishment of the Faculty of Technology coincided with the founding of the Department of Food Science and Technology in 1971. The first Dean of the newly established Faculty of Technology was Professor G. R. Howat, who was also the Head, Department of Food Science and Technology. The Faculty houses the following teaching departments and Units:

- Agricultural Environment & Engineering
- Chemical Engineering
- Computer Science & Engineering
- Civil Engineering
- Electronic & Electrical Engineering
- Food Science & Technology
- Metallurgical and Materials Science & Engineering
- Mechanical Engineering
- African Institute for Science Policy & Innovation (AISPI - formerly called Technology Planning & Development Unit)

(c) BRIEF HISTORY OF THE DEPARTMENT

The Department of Food Science and Technology was established formally in 1971, having been created in the Faculty of Agriculture. Although formal instruction leading to the award of a degree in Food Science and Technology is a relatively new field of coordinated study, some parts of it have been studied for many generations. For example, fish and meat preservation and the dairy industry have been worked on for many years, while food canning and edible oil processing at the factory level go back for only one hundred and fifty years.
The Department was planned to cater for Nigerian needs in the fields of preservation, storage, quality control, production and processing of agricultural products. As a contribution to national development, the Department was poised to train potential managers to head the growing food industry and to encourage indigenous food processors. Thirty years after the establishment of the Department, one of the products of that training headed Cadbury Nigeria PLC and another headed the marketing division of Nigeria's largest and most successful enterprise, Nigerian Breweries PLC. There are hundreds of small scales to intermediate levels of food enterprises established by graduates

from the Department. Furthermore, some members of academic staff in the Department are alumni. Thus, the original dreams of the planners have been fulfilled

The Department started with a five-year program leading to the award of the degree of B.Sc. (Honors) in Food Science and Technology. The development of the Department was a gradual one, characterized by certain important steps, the first of which was the establishment of a postgraduate program leading to the degrees of Master of Science (M.Sc.), Master of Philosophy (M.Phil.) and Doctor of Philosophy (Ph.D). The postgraduate program was first established in 1987 and reviewed in 1992 and 1988. A new program to award the degree of B.Sc. (Honors) in Food Engineering has been approved by Senate and it is now fully accredited by NUC. The Council of Registered Engineers of Nigeria (COREN) has given the program accreditation.

Right from the inception of the Department, facilities exist to cover teaching and research in the areas of Food Microbiology, Food Chemistry, Food Processing and Engineering, quality Control and assessment, Nutrition and Baking Technology.

PRINCIPAL OFFICERS OF THE UNIVERSITY

Visitor:
His Excellency, Alhaji Mohammad Buhari GCFR
President and Commander-in-Chief of the Armed Forces,
Federal Republic of Nigeria

Chancellor:
His Royal Highness Alhaji (Dr.) Yahaya Abubakar
(The ETSU Nupe)

Pro-Chancellor:
Dr. 'Yemi Ogunbıyı
B.A(Ib.), M.Sc., Ph.D

Vice – Chancellor:
Professor Eyitope Ogungbenro Ogunbodede
B.Sc., B.Ch.D., MPH., Ph.D

Deputy Vice-Chancellor [Academic]:
Professor A. S. Bamire
B. Agric., M.Phil., Ph.D (IFE)

Deputy Vice-Chancellor [Administration]:
Professor Chris O. Ajila
B. Sc., M.Sc., Ph.D

Registrar:
Mrs. M.I. Omosule
B. A., (IFE) M.Sc.(IFE)

University Librarian:
Dr. F.Z. Oguntuase
B.Sc., M.Sc., Ph.D.

Bursar:
Mr. S.O. Ayansina FCA

4(a) MISSION OF THE UNIVERSITY

To create a teaching and learning community for imparting appropriate skills and knowledge, behaviour and attitude; advance frontiers of knowledge that are relevant to national and global development; engender a sense of selfless public services; and promote and nurture the African culture and tradition.

(b) VISION OF THE UNIVERSITY

The vision is of a top rated University in Africa, ranked among the best in the world, whose products occupy leadership positions in the public and private sectors of the Nigerian and global economy, that has harnessed modern technology, social, economic and financial strategies, built strong partnerships and linkages within and outside Nigeria and whose research contributes a substantial proportion of innovations to the Nigerian economy.

(c) STRATEGIC OBJECTIVES OF THE UNIVERSITY

1. To produce graduates of international standard, with appropriate knowledge and skills in their field of study; who will be highly employable and able to employ themselves.

2. To provide high quality research and development activities that will promote the development of the Nation and enhance the image of the University and the researchers.

3. To harness modern technology especially ICT and modern social, economic and financial strategies to run a cost of efficient and effectives academic programme and institutional management.

4. To provide services that have relevance to and impact on the local community and the Nation.

5. To provide conditions of study, work and living in the University Community that are of appropriate standard.

6. To expand access to tertiary education in the face of unmet demand.

7. To operate as an equal opportunity educational institution, sensitive to the principle of gender equity and non-discriminatory on the basis of race, ethnicity, religion or physical disability.

OBJECTIVES OF THE DEPARTMENT

The need for manpower required for the preservation of many agricultural crops and development of products or processes that will provide nutritious and balanced diet to the people has been the concern of all involved in national development. The main objectives of the Department are to provide the course of instructions that will train the type of engineers, scientists and technologist

capable of working effectively at the senior level in the food industry, food commodity research institutes and government or private establishments related to food.

The teaching and research activities of the Department will in particular emphasize the following areas:

(1) Evaluation of the physico-chemical properties of conventional and non-conventional sources of foods.
(2) Use or adaptation of appropriate technology for the preservation of foods.
(3) Study of the nutritional and health implications of local and imported foods.
(4) Provision of technical and managerial skills to industry through extension services.

The first two years of the course provide a sound knowledge of the basic scientific subjects on which the successful study of food science and technology depends. The knowledge acquired in the first two years is applied to the understanding of the nature, composition and properties of food materials and to their behaviour during processing and subsequent storage. The course makes provision for students with biological background aptitude who are interested in food chemistry, microbiology and nutrition as well as those who are oriented in the technological matters of food processing.

(5) INFORMATION ON FACILITIES

(a) LIBRARY (Hezekiah Oluwasanmi Library)

PLAN OF THE UNIVERSITY LIBRARY

The Library consists of the North and South wings, which are connected by walkways on two levels.

MEMBERSHIP

Membership of the Library is available, on completion of a registration card, to all students, members of the senior staff of the University and such other persons as may be determined by the Library Committee or the University Librarian on behalf of it.

Students are required to renew their registration at the beginning of each academic year. Library Cards and Borrower's Tickets are not transferable; books issued on them remain the responsibility of the person whose name appears on them.

A Lost Library Card or Borrower's Ticket may be replaced on submission of a written application.

THE LIBRARY COLLECTION

Hezekiah Oluwasanmi Library now contains over 380,000 volumes. It consists of two main areas:

(i) The Undergraduate Areas and
(ii) The Research Areas.

1. **Series Collection**

The Serials Collection consists of:

(i) Current journals, the most current issues of which are shelved in the display Section of the Serials Room.

a. Latest backfile i.e. the latest 10 years of journals which are on open access to registered senior staff and postgraduate students.

b. Older backfiles i.e. journals older than ten years are on closed access to all categories of readers who must obtain and complete request form the serials hatch.

2. **Africana Special Collection**

The Africana Special Collection is a collection of rare and other books of primary interest to people whose fields of interest are in African Studies. Staff publications and these submitted for higher degrees of the University as well as of other Universities are also housed there. The Collection is closed access.

3. **Documents Collection**

The Documents Collection includes official publications of the Federal Government of Nigeria, the old regional governments, the present state Governments and the Federal Territory. It also includes publications of other African governments and international organizations.

4 **Reference Collection**

Dictionaries, encyclopedia, handbooks, directives, atlases, University Calendars, etc. are shelved in the Reference Room. Bibliographies, indexes and abstracts are available in the Bibliography Room. Reference books do not ordinarily circulate.

A newspaper clippings file (post-October, 1985) and a vertical file of reprints and Other pamphlet type material is kept in the Reference Room.

5. **Reserve Collection**

(i) Day Reserve Collection

Multiple copies of textbooks, particularly some of those recommended for specific courses, are shelved in the Reserve Books Room on Floor 3 North Wing East.

(ii) Two Hour Reserve

Some other materials, periodical articles in particular, are placed on 2-hour reserve. These may be obtained on request (signature and seat number

required) and retained for a period of two hours at a time, subject to renewal, provided other readers have not demanded the materials.

6. **Recent Accessions**

A selection of books added to the Library stock is normally displayed for several days before being put in the main collection. The books may not be borrowed while on display but may be reserved at the Loans Desk.

CATALOGUES

A library catalogue is a finding list of books and other materials available in the Library. The following catalogues can be found in the Catalogue Hall:

(i) The Author/Title Catalogue
(ii) The Subject Catalogue
(iii) The Shelf List
(iv) The Serials Catalogue
(v) The Documents Catalogue.

HOW TO BORROW A BOOK

When you have found the book you want to borrow, you will be required to sign your name and address on the book card provided in duplicate. You must surrender a Borrower's Ticket for each book borrowed.

When you return a book, you must ensure that you receive your Borrower's Ticket back immediately.

RESERVATION

A book can be reserved by filling a reservation slip; in which case, it will not be renewed for the present borrower when returned, and, if it is already overdue, it will be recalled at once.

INTER-LIBRARY LOAN

If the book you require is not in stock, it is often possible to borrow it from another library. This service is dependent on goodwill and co-operation between libraries, and readers who benefit from it are required to observe the regulations applying to each loan.

PHOTOCOPYING SERVICES

Within the limitations imposed by copyright, the library is able to supply readers with photocopies of periodical articles and parts of books at moderate charges.

PENALTIES FOR OVERDUE OR LOST BOOKS

Penalties for overdue books will be imposed as follows:

(a) N5.00 per day for the first 30 days; thereafter all loan privileges will stop.

(b) Books specially recalled by the University Librarian will attract a fine of N10.00 per day after the third day from the date of recall.

(c) Books lost or damaged will attract a fine five times the current cost of the books.

(c) No student will be allowed to attend the Graduation Ceremony or receive his/her certificate without a clearance certificate from the University Library to the effect that no book or fine is outstanding against him or her.

(b) DIVISION OF STUDENTS AFFAIRS

Guidance and Counseling Unit

The Division of Student Affairs has Professional Counselors who are committed to helping students grow in self-understanding in the process of integrating their personal and academic experiences. The services are free to students and are confidential (i.e. not used as part of his/her other University records). The services include personal counseling, group counseling, study skills improvement, tests anxiety reduction, personal crisis intervention, psychological testing, career and occupational counseling and settlement of grievances between students. Where necessary, consultations are made with campus organizations, specialist and academic Departments, to ensure that students' problems are resolved satisfactorily.

The Counselors can be contacted in Rooms 9 & 10 Division of Student Affairs between 10.00 a.m. and 2.00 p.m. Monday to Friday.

SCHOLARSHIP AND FINANCIAL ASSISTANCE

The Division of Students' Affairs serves as a link between students and sponsoring authorities, both within and outside Nigeria. Students are advised to check the Notice Boards in their respective faculties as well as those at the Division of Student Affairs Building for advertisements and other relevant information.

Liaison is also maintained between students and governments at various levels for scholarship and bursaries.

6 UNIVERSITY EXAMINATION REGULATIONS

PART I: REGISTRATION FOR UNIVERSITY EXAMINATIONS

(a) A candidate for a University examination must have registered for the courses in the prescribed format not later than the closing date prescribed for registration for such courses. Any candidate who fails to register for courses at the appropriate time as prescribed by Senate will not be allowed to take any examination in such courses. Any examination taken without course registration shall be null and void.

(b) Students who register for courses are committed to the number of units registered for and are expected to take examinations in such courses. If a student failed to take an examination he would be scored 'OF' for the number of units he had registered for and in which he had failed to take the prescribed examination.

(c) Any student who does not have any course or courses to offer in a particular semester should apply for leave of absence.

(d) A candidate who has less than 15 units in a particular semester to graduate should apply to his/her Faculty Board for permission to register for less than 15 units. Failure to do so constitutes a breach of regulation which may result in the non-processing of the candidate's results.

(e) A candidate who cannot register for courses during the prescribed period for registration because of an illness, must ensure that medical report on his illness is forwarded by him or his parents/sponsors to reach the Dean of his Faculty not later than four weeks after the end of the normal registration period as scheduled in the University Calendar. Such a medical report should be forwarded for authentication by the Director of Medical and Health Services for it to be considered valid. Such a candidate shall be exempted from the penalties of late registration. All applications should be routed through the Head of Department.

(f) Students must attend a minimum of 75% of course instructions including lectures, tutorials and practicals where required to qualify to sit for examination in any course.

(g) A candidate for a university examination in a particular degree program should not be a regular candidate for another degree in this or any other university concurrently. Any candidate so discovered shall forfeit his/her studentship.

PART II: **ARRANGEMENT FOR EXAMINATION**

1. EXAMINATION TIME-TABLE AND INVIGILATION ARRANGEMENTS

(a) The Harmattan and Rain Semester Teaching and Examination Time-Table shall be made available to students at the beginning of each Semester to guide them in selecting courses, particularly electives for which they can register.

(b) The Directorate of Academic Affairs shall reissue the Examination Time-table for all courses to be examined at least 4 weeks before the first day of the examination period.

(c) The final examination time-table shall be displayed on notice boards two weeks to the examination after reactions from departments and there shall be no adjustments thereafter without the express permission of the Registrar.

(d) Each Head of Department shall be requested to make arrangement for the invigilation of courses taught in his Department. In case of courses with large student enrolment, the Head of Department should make arrangements in consultation with the Dean and Cognate Departments.

(e) An invigilator shall be allocated for an average of fifty candidates provided that there shall be at all time no fewer than two invigilators in each room. One of the invigilators shall be designated senior invigilator for an examination room. Any invigilator who is absent or late without good cause shall be reported by the Head of Department to the Vice-Chancellor.

(f) The time appointed for the examination in each paper as indicated in the examination Time-table must be strictly adhered to. When it is absolutely necessary to reschedule an examination, the Head of Department will do so after consultation with the Director of Academic Affairs who will publicize it, giving affected candidates a minimum of 48 hours notice of change.

(g) The invigilator shall hold up and show to the candidates, before opening in their presence, the sealed packets of question papers at the commencement of the examination in the subject to which the packet relates.

(h) No candidate shall be allowed to enter an examination room earlier than thirty minutes before the commencement of the examination.

(i) No candidate shall be allowed to enter an examination room later, or to leave an examination room earlier than thirty minutes after the beginning of an examination session. Any candidate who seeks

entry into the examination room after the first thirty minutes may be allowed to do so by the invigilator, but such cases shall be reported in writing to the Head of Department.

(j) Candidates who arrive late shall be allowed extra time except in special circumstances in which the candidate had duly notified the examiner or invigilator in writing such as instances of unresolved clashes in the time-table.

(k) Until the time when candidates are allowed to leave the examination room, no copy of any question paper shall be removed from the examination.

(l) In case a candidate has to leave the examination room temporarily he shall be accompanied by an Invigilator.

(m) Candidates should leave their signed signature slips on their tables and must wear their identity cards throughout the period of Examination.

(n) After the first half hour has elapsed, the Invigilator shall check and sign the attendance sheets in duplicate. These signed sheets shall be considered the final list of candidates in that examination, and one copy shall be delivered by hands to the Registrar while the other is enclosed in the same envelope containing the answer books.

(o) While the examination is in progress, no persons other than the Chief Examiner/Coordinator, the Invigilators, the Registrar or his representative and Medical Officers shall be allowed to enter the examination room except that the examiner(s) in each paper shall be present during that first thirty minutes of the examination and at such other times as may be requested.

(p) The Invigilator shall maintain constant vigilance throughout the examination session at which he is in attendance. Senior Invigilators shall consider any misconduct or reason for suspecting misconduct or any irregularity that may be brought to their notice in connection with any examination offences. They shall also send a report to the Head of Department immediately on the completion of the paper in respect of which the misconduct took place. The Head of Department shall report same to the Vice-Chancellor for disciplinary action within 24 hours.

(q) At the close of an examination, candidates shall hand over their answer scripts to the Invigilator and not leave them on the desk for the Invigilator to collect. The Invigilator should move from

row collecting the scripts from candidates and on no condition should candidates be allowed to leave the room while their scripts are lying on their desks. The Invigilator shall check the candidates' answer books against the attendance lists to ensure that the scripts are complete. He shall then parcel and seal the answer books together with four copies of the relevant question paper and the copy of the signed attendance sheet and deliver them to the Head of Department.

PART III: ABSENCE FROM EXAMINATION

Candidate must present themselves at such University examinations for which they have registered. Candidates who fail to do so for reason other than illness or accident shall be bound by the following regulations.

(a) Any student who fails to register for courses during one semester without permission should be deemed to have scored "O F" in the minimum number of units required for full time student (i.e. 15 units.)

(b) Candidates who registered for courses, attended classes regularly, did all practicals and tests but did not take required Semester examinations should be given a continuous assessment grade in each of the affected courses and a grade of "O" in the examination which they should have taken, but which they did not take.

(c) Candidates who have less than 15 units to graduate but who fail to take the required examinations should be deemed to have scored "OF" in the outstanding courses only provided such candidates obtained permission to register for less than 15 units.

(d) Any candidate who on account of illness, is absent from a University examination may be permitted by the Senate on the recommendation from the appropriate Faculty Board, to present himself for such examination at the next available opportunity provided that:

(i) A full-time student in the University shall report any case of illness to the University Health Centre at all times.

(ii) When a student falls ill during examination he should first report to the Director, Medical and Health Services before attending any hospital outside the University. A report of sickness should be made to the Registrar within a week and a medical certificate for validation of his illness within three weeks.

(iii) When a student falls ill before an examination he shall be under an obligation to send a medical report countersigned by the Director, Medical and Health Services within one week of such illness. Any time outside this period, shall be considered on its own merit.

(iv) The Director of Medical and Health Services should, within 48hours, submit a medical report on a candidate who is ill during an examination and is taken to the Health Centre or referred by it to the hospital for treatment.

(v) A candidate applying for leave of absence on medical grounds must forward his application together with a medical report to the Dean of his Faculty through his Head of Department. The Medical report must be countersigned by the Director of Medical and Health Services. All applications for Leave of Absence must be taken by the appropriate Faculty Board.

PART IV: EXAMINATIONN OFFENCES AND PENALTIES

EXAMINATION OFFENCES

(a) A candidate shall not be allowed during an examination to communicate by word or otherwise with any other candidates nor shall he leave his place except with the consent of an invigilator. Should a candidate act in such a way as to disturb or inconvenience other candidates, he shall be warned and if he persists he may, at the discretion of the invigilator, be excluded from the examination room. Such an action by the invigilator must also be reported in writing through the Head of Department to the Vice-Chancellor within 24 hours.

(b) It shall be an examination offence for any student, staff or any person whatsoever to impersonate a candidate in any University examination. Any student or staff of the University found guilty under this regulation shall be subjected to disciplinary action by the appropriate authority of the University. The candidate impersonated shall also be liable of an infraction of this regulation where it is established directly from circumstantial evidence that the impersonation is with his knowledge or connivance.

(c) No candidate shall take into an examination room, or have in his possession during an examination any book or paper or printed or written documents, whether relevant to the examination or not, unless specifically authorized to do so. An invigilator has authority to confiscate such documents.

(d) Mobile phones are not allowed in examination halls.

(e) A candidate shall not remove from an examination room any papers, used or unused, except the question paper and such book and papers, if any, as he is authorized to take into the examination room.

(f) Candidates shall comply with all "direction to candidates" set out on an examination answer book or other examination materials supplied to them.
They shall also comply with direction given to them by an Invigilator.

(g) Candidates shall not write on any paper other than the examination answer books. All rough work must be done in the answer books and crossed out neatly. Supplementary answer books, even if they contain only rough work must be tied inside the main answer books.

(h) When leaving the examination room, even if temporarily, a candidate shall not leave his written work on the desk but he shall hand it over to an invigilator. Candidates are responsible for the proper return of their written work.

(i) Smoking shall not be permitted in examination room during examination sessions.

(j) Any candidate or staff who attempts in any way to unlawfully have or give pre-knowledge of an examination question or to influence the marking of scripts or the award of marks by the University examiner shall be subjected to disciplinary action by the appropriate authority of the University.

(k) If any candidate is suspected of cheating, receiving assistance or assisting other candidates or of infringing any other examination regulation, a written report of the circumstance shall be submitted by the invigilator to the Vice-Chancellor within 24 hours of the examination session. The candidate concerned shall be allowed to continue with the examination.

(l) Any candidate suspected of examination malpractice shall be required to submit to the invigilator a written report immediately after the paper. Failure to make a report shall be regarded as a breach of discipline. Such report should be forwarded along with the invigilator's report to the Vice-Chancellor.

(m) Where a Head of Department fails to forward a report on examination malpractice to the Vice-Chancellor such action would be considered as misconduct.

(n) Where the Vice-Chancellor is satisfied on the basis of the reports forwarded to him that any candidate has a case to answer, he shall refer the case to the Central Committee on Examination Malpractice.

PENALTIES FOR EXAMINATION MALPRACTICE AND OTHER OFFENCES

(a) Any examination offence would attract appropriate penalty including outright dismissal from the University.

(b) Where the Vice-Chancellor has reason to believe that the nature of any question or the content of any paper may have become known before the date and time of the examination to any persons other than the examiners of the paper, the Board of Examiners, and any official of the University authorized to handle the paper, he may order the suspension of the examination or the cancellation of the paper or setting of a new paper and shall report the matter to the Senate. The Vice-Chancellor shall also take any disciplinary measure against any student or students involved as he may deem appropriate.

(c) If in the opinion of an invigilator, circumstances arise which render the examination unfair to any candidate he must report the matter to the Vice-Chancellor within 24 hours after the examination. Where such matter is reported to the Vice-Chancellor he may take such action as he deems fit. If he directs that another examination be held, that examination shall be the examination for the purpose of this regulation.

(d) Any candidate or member of staff may complain to the Vice-Chancellor that an examination has been improperly conducted. The Vice-Chancellor shall investigate the complaint and report the result of his investigation to the Senate which shall take such action as it may deem appropriate, including with-holding a result or deprivation of the award of a degree, diploma etc as laid down in Statue 17. However where it is shown to the satisfaction of the Committee of Deans that any alteration or amendment of a University regulation involving a change in a course of study or in examination requirements has caused hardship to a candidate in any examination, the Committee of Deans shall make such provisions as it thinks fit for the relief of each hardship and report same to Senate.

PATTERN OF EXAMINATION AND ASSESSMENT UNDSER THE COURSE UNIT SYSTEM

PATTERN OF EXAMINATION

(i) Each course shall be examined at the end of the course. The examination shall be conducted as prescribed by Senate.

(ii) Each examination shall be 1-3 hours in duration. In addition there may be a practical paper and/or an oral examination.

(iii) There shall be continuous assessment of each course and this shall constitute a percentage of the final grade.

MEASUREMENT OF PERFORMANCE

Performance in a course shall be measured in terms of:

(i) the results of prescribed theory and practical examination

(ii) continuous assessment which shall constitute 40% of measured performance.

(iii) Assessment of such essay, practical exercises and reports prescribed for each course.

LEVEL OF PERFORMANCE

A candidate shall be recorded as having attained in a course a level of achievement graded as follows:

A	=	Excellent	70% - 100%
B	=	Very Good	60% - 69%
C	=	Good	50% - 59%
D	=	Satisfactory	45% - 49%
E	=	Adequate	40% - 44%
F	=	Failure	0% - 39%

CALCULATION OF GRADE POINT AVERAGE (GPA)

The overall performance of each candidate during an entire semester shall be determined by means of a weighted grade point average, obtained by awarding credit points in respect of each course multiplied by the numerical value of the grade obtained as follows:

A	=	5 credit point per unit
B	=	4 " " " "
C	=	3 " " " "
D	=	2 " " " "
E	=	1 " " " "
F	=	0 " " " "

The grade point average is the total number of credit points divided by the total number of units for all courses taken during a particular semester.

DEFINITION OF TERMS

(i) **Student Workload:**

This is defined in terms of course units. One unit represents one hour of lecture or one hour of Tutorial or 2-4 hours of practical work per week throughout a semester. Thus for example, a course in which there are 2 hours of lectures and 1 hour of Tutorial per week is a 3 unit course.

(ii) **Total Number of Units (TNU):**

This is the total number of course units carried by a student in a particular semester. It is the summation of the load Units on all Courses carried during the semester. For example, A student who is carrying 6 courses of 3 units each has a TLU of 18 for that semester. No student shall be allowed to carry (i.e. register for) or be examined in more than 24 units in any particular semester.

(iii) **Cumulative Number of Units (CNU):**

This is the summation of total number of units over all the semesters from

the beginning to date. A student who is prone to repeating courses will finish (if he does not drop out) with a higher CNU than his non-repeating colleague and will most likely require a longer time to complete requirements for the award of Degrees.

(iv) **Level of Performance Rating:**

This is the rating of grades obtained in terms of credit points per load unit. The rating used is as follows:

Levels of Performance			**Rating (credit points per unit)**
A	=	70% - 100%	5
B	=	60% - 69%	4
C	=	50-59%	3
D	=	45%-49%	2
E	=	40%-44%	1
F	=	0%-39%	0

Based on the above, a student who obtained a grade of 'A' in a 4-unit course has scored 20 Credit points, and one who obtained a grade of C in that course has scored 12 Credit points.

(v) **Total Credit Points (TCP):**

This is the sum of the products of the course units and rating in each course, for the entire semester period. For example, consider a student who took 4 courses of 5 units each. Let's say the grade obtained in the four courses were C.B.F.D. respectively. The TCP of this student is obtained as 5x3+5x4+5xO+5x2+45.

(vi) **Cumulative Credit Point (CCP):**

This is the summation of Total Credit Points over all semester from beginning to date.

(vii) **Grade Point Average (GPA):**

This is the total credit points (TCP) divided by the total units (TNU). For example, consider the student's scores referred to above. His TCP is 45, and of course, his TNU is 20 (i.e. 4 courses at 5 units each, for the semester). The highest GPA that can be earned is 5.0 and that is when a student has earned a grade of 'A' in every course during the semester. The lowest GPA obtained is 0.0 and this would happen if the student has F all round during the semester.

(viii) **Cumulative Grade Point Average (CGPA):**

This is the summation of TCPs for all semesters, divided by the summation of TNUs for the said semesters. Like the GPA, CGPA obtainable ranges from 0 to 5.

GPA AND CGPA SAMPLE COMPUTATIONS

Sample Computations:

Consider a student who has enrolled in a course program designated as FST and has just completed 2 full semesters in the University. His course program and his GPA and CGPA could be as follows:

SEMESTER I

1	2	3	4	5	6	7	
	L	T	P	Units		RESULTS	
Course Code					GRADES	Credits Points	GPA/CGPA
FST 201	1	0	0	1	78% (A)	1x5=5	GPA = 29/18=1.61
FST 203	3	0	2	4	60% (B)	4x4=16	CCP = 29+O = 29
FST 305	3	0	3	4	45% (D)	4x2 =8	CNU = 18+0 = 18
FST 307	3	1	5	6	38% (F)	6x0 =0	CGPA= 29/18= 1.61
FST 309	2	1	0	3	27% (F)	3x0= 0	
				18 (TNU)		29 (TCP)	In this case the TCP, TNU and GPA will The same for CCP, CNU and CGPA

SEMESTER II

1	2	3	4	5	6	7	
	L	T	P	Units		RESULTS	
Course Code					GRADES	Credits Points	GPA/CGPA
FST 206	1	0	0	1	78% (A)	1x5=5	GPA = 29/18=1.61
FST 304	3	0	2	4	60% (B)	4x4=16	CCP = 29+O = 29
FST 306	3	0	3	4	45% (D)	4x2 =8	CNU = 18+0 = 18
FST 300	3	1	5	6	38% (F)	6x0 =0	CGPA= 29/18= 1.61
FST 308	2	1	0	3	27% (F)	3x0= 0	
				18 (TNU)		29 (TCP)	In this case the TCP, TNU and GPA will The same for CCP, CNU and CGPA

ASSESSMENT AND AWARD OF DEGREES

(h) A student's workload is defined in terms of course units. One unit represents one hour of lecture or one hour of tutorial, or 2-4 hours of practical work per week throughout a semester. All courses shall run for one semester or a full session of two semesters.

(ii) The final award and the class of the degree shall be based on the Cumulative Grade Point Average (CGPA) obtained by each candidate in all prescribed courses approved by the University. The final cumulative grade point average shall be calculated on the basis of the total number of credit points and the total number of course units registered for during the course of the student's program. In the case of a failed course, the candidate must repeat the course at the next available opportunity. If the course is an elective, the candidate may substitute another course and shall not be required to pass the failed elective course. If the course is a restricted elective, substitution can only be made from the list of restricted electives. The failed grade would however be reflected in the transcript.

(iii) A candidate who has satisfactorily completed all requirements for the degree with an overall grade point average of not less than 1.50 shall be awarded the honors degree as indicated below:

First Class	4.50 – 5.00
Second Class (Upper Division)	3.50 – 4.49%
Second Class (Lower Division)	2.40 – 3.49%
Third Class Honors	1.50 – 2.39%
Pass	1.00 – 1.49%

(iv) Passes in 12 units of Special Electives is a requirement for graduation.

(v) A candidate who scores a cumulative grade point average (CGPA) of less than 1.00 in two consecutive semesters shall be required to withdraw from the University.

TRANSFER WITHIN THE UNIVERSITY AND LENGTH OF STAY IN THE UNIVERSITY

(a) To qualify for a degree, a candidate will normally be required to spend a Minimum of two academic years at the Obafemi Awolowo University.

(b) If a student transfers from one Faculty to another, the transfer would be treated as if he/she is just being admitted into the University since as part of the requirement for graduation the student has to take all the foundation/ compulsory courses in the new Faculty/Department. In that case his/her stay in the new Faculty/Department should be 11/2 times the number of semesters required to complete a program.

(c) Where a student transfers from a science based Faculty to another, the computation of his result in the new Faculty shall take cognizance of his previous CGPA in the new Department. The duration of the stay in the University will be what remains of the 11/2 times the number of semesters required to complete the program as approved by Senate.

(d) Where a student is transferring from a science based to a Humanities/Arts-based Faculty or vice-versa, the transfer should be treated as if the student is just being admitted into the University. The GPA of the student will not be transferred to the new Department. He/She will however be required to take all the foundation/compulsory courses in the new Department.

RELEASE OF EXAMINATION RESULTS

(i) At the end of each semester, a provisional list of successful candidates in course examination shall be published by the Chief Examiner soon after the ratification of the recommendation of the Board of Examiners by the Faculty Board.

(ii) The proceedings of Boards of Examiners are confidential and are in no circumstances to be disclosed at any time to any candidate or to any other unauthorized person.

(iii) However, without prejudice to Regulation (ii) above, a student contesting a given grade after the release of results can appeal to the Vice-Chancellor, who shall cause the Head of Department to call for the affected paper of the candidate for re-marking. This shall be done after payment of the prescribed fee.

(iv) The final results of candidates for the award of a degree shall be published by the Registrar after they have been approved by Senate.

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

B.SC. (FOOD SCIENCE & TECHNOLOGY) DEGREE PROGRAMME

OBJECTIVES

The need for manpower required for the preservation of many agricultural crops and development of products or processes that will provide nutritious and balanced diet to the people has been the concern of all involved in national development. The main objectives of the Department will be to provide the course of instructions that will train the type of scientists and technologist capable of working effectively at the senior level in the food industry, food commodity research institutes and government or private establishments related to food.

The teaching and research activities of the Department will in particular emphasise the following areas:

(1) Evaluation of the physio-chemical properties of conventional and non-conventional sources of foods.
(2) Use or adaptation of appropriate technology for the preservation of foods.
(3) Study of the nutritional and health implications of local and imported foods.
(4) Provision of technical and managerial skills to industry through extension services.

The first two years of the course provide a sound knowledge of the basic scientific subjects on which the successful study of food science and technology depends. The knowledge acquired in the first two years is applied to the understanding of the nature, composition and properties of food materials and to their behavior during processing and subsequent storage. The course makes provision for students with biological background aptitude who are interested in food chemistry, microbiology and nutrition as well as those who are oriented in the technological matters of food processing.

DEGREE OFFERED:

B.Sc. (Food Science and Technology)

ENTRY REQUIREMENT

Admission to Part I is through the Joint Matriculation Board (JME) examination or such other concessional examinations as the University system may operate. In addition, candidates are required to have credits in five subjects at the Senior Secondary school Certificate or West African School Certificate Level (or passes at the General Certificate of Education (GCE) Ordinary level) including English, Mathematics, Chemistry, Physics or Biology.

Admissions to Part II is possible for candidates who, in addition to meeting the Faculty General Admission Requirements, have good passes at Advanced Level of the GCE (or equivalent) in Physics, Chemistry and Mathematics or Chemistry, Physics and Biology (Botany or Zoology), or approved equivalent qualifications.

REQUIREMENTS FOR THE AWARD OF DEGREE:

I. U.M.E. (Total Units for graduation = 199).
II. DIRECT ENTRY (Total Units for Graduation = 165).

GRADUATION REQUIREMENTS:

(A) Foundation Program (Compulsory and Core Courses) – 36 units.
(B) Special Elective (12 Units).

DEPARTMENTAL REQUIREMENT

To be eligible for a degree of the B.Sc. (Food Science and Technology) a candidate must satisfactorily complete a minimum of 199 units including:

(i) 74 units of Food Science and Technology courses excluding Industrial Training.
(ii) 4 units of Agricultural Engineering Courses - AGE 202 and AGE 302.
(iii) 3 units of Animal Science Course - ANS 205*
(iv) 3 units of Biochemistry Course - BCH 303.
(v) 3 units of Chemical Engineering Course – CHE 201.
(vi) 5 units of Chemistry Courses – CHM 202 and CHM 206.
(vii) 2 units of Civil Engineering Course – CVE 401.
(viii) 5 units of Computer Science Courses – CSC 201 and CSC 208.
(ix) 6 units of Electronic and Electrical Engineering Courses – EEE 201, EEE 291, EEE 202 and EEE 292.
(x) 8 units of Mathematics Courses – MTH 201 and MTH 202.
(xi) 4 units of Mechanical Engineering Courses – MEE 203 and MEE 204.

(xii) 3 units of Microbiology Course – MCB 201.
(xiii) 3 units of Plant Science Course – PSC 305*
(xiv) 7 units of Technology Planning and Development Unit Courses: TPD 101, TPD 501, TPD 502 and TPD 503.
(xv) 15 units of Industrial Training Courses – FST 200, FST 300 and FST 400.

RESTRICTED ELECTIVES:

3 Courses of 3 units each = 9 units of Electives chosen from FST 501, FST 512, FST 514, FST 515, FST 519, FST 520 and FST 526, AGE 307 and CSC 524.

PART I: HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
MTH 101	Elementary Mathematics		4	1	0	5
PHY 101	General Physics I		4	0	0	4
PHY 107	Experimental Physics IA		0	0	3	1
CHM 101	Introductory Chemistry I		3	1	0	4
CHM 103	Experimental Chemistry I		0	0	3	1
BOT 101	Form and Function in Plants I		3	0	0	3
BOT 103	Experimental Botany		0	0	3	1
TPD 101	Engineers in Society		1	0	0	1
SE	Special Elective		2	0	0	2
			17	2	9	22

RAIN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
MTH 102	Elementary Mathematics II		4	1	0	5
MTH 104	Vectors		2	0	0	2
PHY 102	General Physics II		4	0	0	4
PHY 108	Experimental Physics IB		0	0	3	1
CHM 102	Introductory Chemistry II		3	1	0	4
CHM 108	Experimental Chemistry II		0	0	3	1
SE	Special Elective		2	0	0	2
SE	Special Elective		2	0	0	2
			17	2	6	21

PART II: HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units

MTH 201	Mathematical Methods I	MTH 101, 102	3	1	0	4
MEE 203	Engineering Drawing I		1	0	3	2
CSC 201	Computer Programming I		2	0	3	3
CHE 201	Introduction to Thermodynamics		2	1	0	3
MCB 201	Introduction to Microbiology		2	0	3	3
FST 311	Introductory Food Biochemistry		2	0	0	2
FST 201	Introduction to Food Science		2	0	0	2
SE	Special Elective		2	0	0	2
			16	2	9	21

RAIN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
MTH 202	Mathematical Methods II	MTH 201	3	1	0	4
MEE 204	Engineering Drawing II	MEE 203	1	0	3	2
CSC 208	Computer Technology		1	0	3	2
AGE 202	Workshop Practice		1	0	3	2
CHM 202	Basic Organic Chemistry	CHM 202	3	1	0	4
CHM 206	Basic Organic Chemistry Lab.		0	0	4	1
FST 206	Introductory Food Technology	MTH 101	2	0	0	2
SE	Special Elective		2	0	0	2
			13	2	13	19

LONG VACATION

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 200	Students Work Experience Program		0	0	9	3

PART III: HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 301	Processing of Food Commodities	FST 201	1	0	3	2
FST 303	Introduction to Food Engineering	MTH 202	2	0	0	2
FST 305	Introductory Food Microbiology	MCB 201	2	0	0	2
FST 307	Food Process Technology I	FST 201, 206	2	0	0	2
FST 397	Food Process Technology Lab. I		0	0	3	1
FST 309	Principles of Nutrition I	FST 311	2	0	0	2
BCH 303	Introductory Biochemistry	CHM 101, 102, MTH 101	2	0	4	3
EEE 201	Applied Electricity I	PHY 101, 102	2	0	0	2
EEE 291	Applied Electricity Lab. I		0	0	3	1

PSC 305/	Crop Science I/		2	1	0	3
ANS 205	General Animal Husbandry					
SE	Special Electives		2	0	0	2
			17	1	10	21

RAIN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 302	Post-Harvest Technology	FST 201	2	0	0	2
FST 304	Food Chemistry and Biochemistry	BCH 303, FST 311	2	0	3	3
FST 306	Food Microbiology I	FST 305	2	0	0	2
FST 396	Food Microbiology Lab. I		0	0	3	1
FST 308	Food Engineering I	MTH 201, FST 303	3	0	0	3
FST 312	Principles of Nutrition II	FST 309	2	0	0	2
FST 392	Principles of Nutrition Lab.		0	0	3	1
AGE 302	Statistics for Engineers		2	0	0	2
EEE 202	Applied Electricity II	EEE 201	2	0	0	2
EEE 292	Applied Electricity Lab. II		0	0	1	1
SE	Special Electives		2	0	0	2
			17	0	9	20

LONG VACATION

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 300	Students Industrial Work Experience Scheme I		0	0	9	3

PART IV: HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 401	Food Analysis	FST 311	2	0	0	2
FST 491	Food Analysis Lab.		0	0	3	1
FST 403	Food Microbiology II	FST 306	2	0	0	2
FST 493	Food Microbiology Lab. II		0	0	3	1
FST 405	Cereal Technology	FST 307, 304	2	0	0	2
FST 407	Food Engineering II	FST 308	2	0	0	2

FST 409	Food Process Technology II	MEE 204, CHE 201, FST 307	2	1	0	3
FST 499	Food Process Technology Lab. II		0	0	3	1
FST 411	Food Engineering Lab. I.	FST 308/407	0	0	6	2
CVE 401	Technical Report Writing		2	0	0	2
SE	Special Electives		2	0	0	2
			14	1	15	20

RAIN SEMESTER AND LONG VACATION

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 400	Students Industrial Work Experience Scheme II		0	0	27	9

PART V: HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 503	Pilot Scale in Food Processing	FST 407, 409	2	0	0	2
FST 593	Pilot Scale Lab.		0	0	3	1
FST 505	Food Standards and Quality Assessment	FST 312, FST 401, 403, FST 308	2	0	0	2
FST 595	Food Quality Lab.		0	0	3	1
FST 507	Assigned Project		1	0	6	3
FST 521	Fish and Meat Process Technology	FST 401, 403, FST 409	2	0	3	3
TPD 501	Industrial Economics		2	0	0	2
TPD 503	Industrial Law and Management		2	0	0	2
FST	Elective		3	0	0	3
FST	Elective		3	0	0	3
			-	-	-	-
			16	0	15	21

RAIN SEMESTER

Course Code	Course Title	Pre-requisite/	L	T	P	Units

		co-requisite				
FST 502	Food Packaging	FST 503	2	0	0	2
FST 504	Food Processing Plant Design	FST 407, 409	2	1	0	3
FST 594	Plant Design Project		0	0	3	1
FST 506	Fruits and Vegetables Processing	FST 401, 409	2	0	3	3
FST 508	Assigned Project		0	0	9	3
FST 510	Milk and Dairy	FST 306, 409	2	0	3	3
TPD 502	Technology Policy		2	0	0	2
FST	Elective		3	0	0	3
			13	1	15	20

DEPARTMENTAL ELECTIVES

Course Code	Course Title	Pre-requisite/ co-requisite	L	T	P	Units
FST 501	Unit Operations in Food Preservation	FST 407	2	0	3	3
FST 512	Processing of Miscellaneous Products	FST 308, 409, FST 411	2	0	3	3
FST 515	Food Chemistry and Analysis	FST 304, 401	2	0	3	3
FST 526	Analytical Food Microbiology	FST 403, 493	2	0	3	3
FST 520	Fermentation Technology	FST 403, 493, 409, 499	2	0	3	3
FST 514	Biotechnology	FST 306, 409	2	0	3	3
FST 519	Selected Topics in Nutrition	FST 312, 401	2	0	3	3
AGE 307	Farm Electrification	MTH 202	2	0	3	3
CSC 524	Techniques in Data Analysis		2	1	0	3

COURSE DESCRIPTIONS

FST 201: INTRODUCTION TO FOOD SCIENCE
(2 0 0 = 2 Units) (Harmattan)

Man and his food: past and present. Composition of foods: protein, starch, sugar, fat, vitamins, minerals, and food enzymes.

Food spoilage. Principles of food preservation – sun-drying, artificial drying, smoking, canning, cold storage, chemical preserves. Bread-making and confectionery. Milk and dairy products. Nutritional background to food consumption.

FST 206: INTRODUCTORY FOOD TECHNOLOGY
(2 0 0 = 2 Units) (Rain)

Units and Dimensions. Material and Energy Balance. Laws of Conservation of mass, momentum and energy. Process calculation.

Fluid flow. Heat and Mass Transport. Dimensional Analysis. Similarity Theory.

FST 301: PROCESSING OF FOOD COMMODITIES
(1 0 3 = 2 Units) (Harmattan)

Chemical composition and nutritional values, processing, preservation and storage of: fruits and vegetables, cereal, edible oils, meat, egg, fish, milk and milk products.

FST 301: PROCESSING OF FOOD COMMODITIES
(1 0 3 = 2 Units) (Harmattan)

Chemical composition and nutritional values, processing, preservation and storage of: fruits and vegetables, cereal, edible oils, meat, egg, fish, milk and milk products.

FST 302: POST-HARVEST TECHNOLOGY (2 0 0 = 2 UNITS) (Rain)

Classification of agricultural produce. Raw products maturity evaluation. Harvesting techniques and post-harvest handling practices – washing, sorting, cooling, post-harvest loss prevention method.

Waste disposal and by-product utilization.

Technical details, economic considerations and maintenance of food stores. Packaging of fresh produce. Low temperature systems.

FST 303: INTRODUCTION OF FOOD ENGINEERING
(2 0 0 = 2 UNITS) (Harmattan)

Process Flow Sheet: Examples of Food Production Processes, Logical sequential order of processes, block process representation. Process calculation:" Macro Material and Energy balance.

Theory of Food Plant: Criteria for Food Plant Location, consideration of the structure of selected food plants, distribution of equipment, electrical load distribution, safety precaution in food plant. Examples: Food canneries, bakeries, breweries.

FST 304: FOOD CHEMISTRY AND BIOCHEMISTRY
(2 1 0 = 3 UNITS) (Rain)

Surfactants, pectic substances foams and emulsions.

Naturally occurring constituents of foods. Their structure, chemical, physical properties and significance. Food additives. Rancidity of fats and oils. Food pigments. Enzymatic and non-

enzymatic browning. Chemical, physical and biochemical changes that occur in food during handling, processing and storage. Toxicants in foodstuffs and their mode of degradation in the body.

FST 305: INTRODUCTORY FOOD MICROBIOLOGY AND BASIC TECHNIQUES (2 0 0 = 2 UNITS) (Harmattan)

Microorganisms and their function in food spoilage, preservation and in food production. Classification of bacteria, fungi and yeast important in foods. Relation between structure and function of eukaryotic and prokaryotic protist. Microbial growth. Microbial metabolism. Mechanism of pathogenecity.

FST 306: FOOD MICROBIOLOGY I (2 0 0 = 2 UNITS) (Rain)

Important Microorganisms in Food Microbiology

Role of microorganisms in food industry. Production and preservation of foods by microorganisms. Microorganisms' role in food contamination.

Physiological characteristics of molds, yeast and bacteria. Factors that influence microbial activity (moisture, oxide-reduction potential, temperature).

Food Preservation

Principles and methods of food preservation (high temperature, low temperature, drying, preservatives, radiation).

FST 307: FOOD PROCESS TECHNOLOGY I (2 0 0 = 2 UNITS) (Harmattan)

Preparatory operations

Conversion Operations:
- Size reduction
- Mixing
- Emulsification

Water:
- Process water
- boiler water

FST 308: FOOD ENGINEERING I (3 0 0 =3 UNITS) (Rain)

Fundamentals of fluid mechanics including fluid statics and fluid flow.

Also heat transfer processes including conduction, convection and radiation. Head transfer during change of phase.

FST 309: PRINCIPLES OF NUTRITION I (2 0 0 = 2 UNITS) (Harmattan)

Calorie and energy requirements. Digestion, absorption and metabolic functions of individual nutrients. Protein requirements and factors affecting the requirements. Fat absorption and metabolism. Protein-calorie malnutrition.

Vitamins in physiologic process.

Nutrition and Infection. Nutrition and mental retardation.

FST 311: INTRODUCTORY FOOD BIOCHEMISTRY (2 0 0= 2 UNITS) (Harmattan)

The reactivity of proteins, carbohydrates and lipids from the standpoint to food science. Enzymes – their role in food deterioration and use in foods. Biochemistry of food fermentations. Post-harvest changes in plant tissues. Flavours.

FST 312: PRINCIPLES OF NUTRITION II (2 0 0 = 2 UNITS) (Rain)

Nutritional Status and Assessment.

Nutrition in times of disaster and emergency feeding.

Regulation of food intake.

Effect of processing on nutritional requirements.

Nutrient fortifications and enrichment programmes.

Toxicology of common food contaminants. Bioassay and its significance. Experimental nutrition and Animal diets.

FST 314: ELEMENTS OF MASS TRANSFER (2 1 0 = 3 UNITS) (Rain)

Diffusion. Mass transfer coefficients for liquid and vapour phases. Analogy between Heat and Mass Transfer. Phase equilibria. Distillation of ideal and real mixtures. McCabe-Thiele and Ponchon-Savarit methods. Absorption. Crystallization. Extraction. Washing. Mass Transfer equipment.

FST 316: PRINCIPLES OF FOOD ENGINEERING I (1 0 3 = 2 UNITS) (Rain)

The strength of food materials: tensile, compressive and shear stress measurements of food sections or tissues. The use of Young's modulus, the shear modulus, the bulk modulus, and poisson's ratio in the evaluation of food strength.

Food Emulsion: Basic emulsion types – oil in water, water in oil; emulsifying agents, hydrophilic – lyophilic balance values. Methods of preparing food emulsions.

Foams: Formation, stability.

Food Rheology: Newtonian and Non-Newtonian fluids. Viscosity. Structural viscosity: Thixotrophy, Rheopexy. Viscoelasticity. Elasticity.

Food Texture: Relationship between sensory perceptibility of textural attribute sof food and relevant engineering constants.

Physico-chemical properties of food materials: Density, specific heat, thermal conductivity, etc.

FST 392: PRINCIPLES OF NUTRITION LABORATORY
(0 0 3 = 1 UNIT) (Rain)

FST 396: FOOD MICROBIOLOGY LAB. I
(0 0 3 = 1 UNIT) (Rain)

FST 397: FOOD PROCESS TECHNOLOGY LAB. I
(0 0 3 = 1 UNIT) (Harmattan)

FST 401: FOOD ANALYSIS (2 0 0 = 2 UNITS) (Harmattan)

Detailed analysis of moisture, carbohydrates, lipids, proteins and amino acids; vitamins; food additives and contaminants.

Paper chromatography, Thin-layer chromatography. Elementary ideas of spectrophotometry.

FST 403: FOOD MICROBIOLOGY II (2 0 0 = 2 UNITS) (Harmattan)

Fermentation of Food Products

Source of fermentation energy. Detailed energy formation. Aerobic and anaerobic fermentation. Pure cultures of microorganisms and the industrial microorganisms.

Genetics of microorganisms applied to process improvements.

Detailed process of Yeast production

Alcoholic fermentation
Distillery industries brewing
Bread-making
Acetic acid fermentation.
Propionic acid fermentation.
Citric acid fermentation.
Oriental fermented foods.

Food Supplements produced by Microorganisms

Fodder yeast
Fats
Vitamins
Enzymes

Food Poisoning and Food Infection

Botulisms and staphylococcus food poisoning.
Salmonellosis and Streptococcus infection.

Food Sanitation, Control and Inspection

Sterilization, disinfection methods.
Control of food processing plants.

Food Microbiological Standards

Basis of standardization.
Application of standards in food industries.

FST 405: CEREAL TECHNOLOGY (2 0 0 = 2 UNITS) (Harmattan)

Chemistry of the principal cereals. Conventional milling processes. Use of products and by-products. Baking with composite flours. Protein-enriched cereal products. Manufacture of breakfast products and beverages. Malting and Brewing. Nutritional considerations.

FST 407: FOOD ENGINEERING II (2 1 0 = 3 UNITS)

Psychrometry and the principles of refrigeration.

Mass transfer including application in contact. Equilibrium separation processes:

- absorption;
- crystallization;
- distillation;
- extraction and washing.

FST 409: FOOD PROCESS TECHNOLOGY II (2 0 0 = 2 UNITS) (Harmattan)

Mechanical Separation Processes:

- Filtration.
- Sedimentation.
- Expression.
- Centrifugation.

Food Machinery

- Materials of construction of food equipment.
- Design features and functions of food manufacturing equipment.

Fuel Utilisation

- Types of fuels
- Calculation involving fuel combustion.
- Other sources of energy.
- Steam generation and use.
- Instrumentation and Control.

FST 411: FOOD ENGINEERING LAB (0 0 6 = 2 UNITS) (Harmattan)

Experiments will cover:
Instrumentation and measurement
Fluid flow
Heat transfer including heat penetration into containers.
Mass transfer including contact equilibrium separation processes.
Measurement of the physico-chemical properties of food materials.
Measurement of the mechanical properties of food materials.
Rheology.
Freezing.
Canning.

FST 413: THERMAL ENGINEERING (2 0 0 = 2 UNITS) (Harmattan)

Heat Transfer: Basic theory of steady state and transient conduction, convection, and radiation. Heat transfer with change of phase.

Heat exchanger: parallel, counter current and across flow heat exchange. Heat exchanger effectiveness. Food fouling. Steam generation.

Climatisation: Psychrometry at low temperatures. Low temperature applications: freezing by contact, cold air gas blast, liquid immersion, solid carbon dioxide.

Effect of freezer burn. Freeze-drying: calculations and freeze-drying system. Cold storage; cold room design calculations.

FST 415: FOOD MACHINERY (1 0 3 = 2 UNITS) (Harmattan)

Studies on the design of equipment based on models and prototypes from the knowledge of dimensional analysis, similarity theory and inter-relationships between materials of construction and

food materials. Emphasis will be laid on safety and sanitary designs. Types and application of electrical motors in food machines.

FST 491: FOOD ANALYSIS LABORATORY (0 0 3 = 1 UNIT) (Harmattan)

FST 493: FOOD MICROBIOLOGY LAB. II (0 0 3 = 1 UNIT) (Harmattan)

FST 499: FOOD PROCESS TECHNOLOGY LAB II
(0 0 3 = 1 UNIT) (Harmattan)

FST 501: UNIT OPERATIONS IN FOOD PRESERVATION
(2 0 3 = 3 UNITS) (Harmattan)

Thermobacteriology.
The thermal resistance of bacteria.
Heat penetration in food cans and packages.
Thermal process calculations and design.
Heat exchange applications in food processing.
Microwave energy, infrared and other non-conventional heating systems.
Freezing process and equipment.
Concentration processes and equipment.
Food dehydration processes and equipment including the dryer types.
Food irradiation process and equipment.
The applied aspects of contact equilibrium separation processes.

FST 502: FOOD PACKAGING (2 0 3 = 3 UNITS) (Rain)

Packaging materials. Food/Container interactions. Packaging systems. Packaging requirements for fresh and processed foods for local and export markets. Packaging and environmental pollution.

FST 503: PILOT-SCALE FOOD PROCESSING (2 0 0 = 2UNITS) (Harmattan)

Pilot-scale manufacture of a selection of the following:-

- Canned foods.
- Concentrated foods.
- Dehydrated foods.
- Frozen foods.
- Sugar and salt preserves.
- Soft drinks.
- Cocoa.
- Tea.
- Coffee.
- Fats and Oils.

FST 504: FOOD PROCESS PLANT DESIGN (2 1 0 = 3 UNITS) (Rain)

Plant lay-out in the food industry. Economics of process design and optimization techniques. Optimum design of food processing plants. Industrial visitation to food industries to help draw attention to certain aspects of food plant location, layout, design and sanitation.

FST 505: FOOD STANDARDS AND QUALITY ASSESSMENT (2 0 0 = 2 UNITS) (Harmattan)

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- Principles and methods of food quality control, sampling, recording and use of quality control charts. Quantitative measurements of quality attributes: colour, gloss, texture and flavour

Statistical methods used in evaluating organoleptic tests and methods of analysis of taste panel data.

Food sanitation and hygiene.Codex Alimentarious. Food standards and legislation of Nigeria. Toxicology and food additives. Methods of detecting adulteration and misbranding in foods.

FST 506: FRUITS AND VEGETABLES PROCESSING (2 0 3 = 3 UNITS) (Rain)

Harvesting and pre-processing operations. Use of chemicals to control enzymatic and non-enzymatic changes in processed fruits. Processing of fruits into nectars, drinks, concentrates, powder, tablets, preservation of vegetables by dehydration and freezing methods.

FST 507: ASSIGNED PROJECT (0 0 9 = 3 UNITS) (Harmattan)

FST 508: ASSIGNED PROJECT (0 0 9 = 3 UNITS) (Rain)

FST 510: MILK AND DAIRY TECHNOLOGY (2 0 3 = 3 UNITS) (Rain)

Composition of cow and goat milks. Milking methods; manually, machine milking. Technology of liquid milk processing. Milk products e.g. evaporated milk, milk powder, filled milk, ice-cream, cheese, cultured milk, butter. Vegetable 'milk', e.g. Soy milk, melon milk. Dairy waste management and processing. Dairy plant sanitation.

FST 511: PRINCIPLES OF FOOD ENGINEERING II (2 0 3 = 3 UNITS) (Harmattan)

Kinetics: Basic theory of kinetics. Rate of reaction. Order of reaction. Arrhenius equation. Temperature, concentration, and pH dependence. Application of kinetics to enzyme activity and inactivation, fermentation processes, growth rate of microorganisms, progress of spoilage reaction during food storage.

Thermal Process Evaluation and Process time calculation for conduction and convection heated food materials.

Food Dehydration: Equilibrium moisture, water activity. The drying rate curve. Moisture removal from solids during the constant rate and the falling rate periods. Driers: Batch and continuous types. Spray drying.

Concentrating by evaporating, freeze concentrating.

Food irradiation: Sterilization of food materials and equipment through irradiation. Safety precautions.

FST 512: PROCESSING OF MISCELLANEOUS PRODUCTS (2 0 3 = 2 UNITS)

Processing of cocoa seeds into cocoa butter, cake and other applications in confectioneries. Extraction and crystallization of sugar beets or roots; processing of tea and coffee and production of soft drinks.

FST 513: PROCESS CONTROL (2 0 0 = 2 UNITS) (Harmattan)

Process dynamics. Transfer functions. Frequency response analysis. Cascade control. Feed forward and feedback control. The control valve.

FST 514: BIOTECHNOLOGY (2 0 3 = 3 UNITS) (Rain)

The emergence of biotechnology and its application in basic and applied science disciplines. Genetical modification of microorganisms, plant and animal cells: gene mapping, gene transfer, recombinant DNA techniques, protoplasm fusion, etc.

Biotechnology as applied to food related problems, e.g. fermentation, post-harvest technology, unit operations and food processing, food product development.

FST 515: FOOD CHEMISTRY AND ANALYSIS (2 0 3 = 3 UNITS) (Harmattan)

Advanced aspects of the analysis of lipids, proteins, polysaccharides and toxicants.

Consideration of special techniques in food analysis with specific examples from the literature. Gas liquid chromatography, column chromatography, including gel permeation and ion exchange chromatography, electrophoresis, ultracentrifugation, polarography, refractometry, spectrophotometry (visible, ultraviolet, infrared), fluorimetry, radioisotope tracer techniques.

FST 516: FOOD ENGINEERING LABORATORY II (0 0 3 = 1 UNIT) (Rain)

Pilot scale experiments on:

- Dehydration.
- Concentrating.
- Canning.
- Food irradiation.
- Separation processes.
- Extrusion.
- Food packaging.

A variety of food commodities will be processed.

FST 517: SIMULATION AND MODELLING IN FOOD PROCESSING (2 1 0 = 3 UNITS) (Harmattan)

Review of simulation and modeling theories; use of computers packages in, simulation and modeling of food processing operations.

FST 518: SEPARATION PROCESSES (2 0 3 = 3 UNITS) (Rain)

Mechanical separations including centrifugation, filtration, and floatation. Contact equilibrium separation processes involving liquid-liquid, liquid-solid extractions, and multi component distillation. Membrane separation processes such as ultra-filtration, reverse Osmosis and electro-dialysis.

FST 519: STUDIES IN NUTRITION (2 0 3 = 3 UNITS) (Harmattan)

Two out of these FOUR Topics in each year:

I. VITAMINS

Metabolic and cellular roles of vitamins.
Existing and potential courses of vitamins.
Vitamins in fortification programmes.

II. MINERALS

Role of minerals in intermediary metabolism.

Minerals include – iron, phosphorus, calcium, sodium, chloride, fluorine, zinc, copper, molybdenum, magnesium, arsenic.

Industrial application of these minerals.

III. PROTEIN-CALORIE

Causes of malnutrition
Role of amino acids in protein synthesis degradation.
Inborn errors of metabolism.
Gluconeogenesis.
Protein deficiency and infection.
Protein deficiency and mental retardation.
Disposal of body energy.
Calorie under and over nutrition.
Work efficiency and energy requirements.

IV. FATS AND LIPIDS

Hormonal influences of lipid mobilization, lipid transport and depot. Fat in mitochondrial and non-mitochondrial systems.

Lipogenesis and Fatty acid oxidative systems.

Hepatic role in cholesterol and other lipo-proteins metabolism. Atherosclerosis and obesity.

FST 520: FERMENTATION TECHNOLOGY (2 0 3 = 3 UNITS)

The range and types of fermentation processes. Microorganisms involved in fermentation. Biochemical basis of fermentation nature and types of fermentation substrates. Microbial growth kinetics, and its application to fermentation types. Culture improvement for industrial processes. Fermentor types and design. Instrumentation and control. Product recovery and purification. Fermentation economics, selected examples of industrial fermentations.

FST 521: FISH AND MEAT PROCESS TECHNOLOGY (2 0 3 = 3 UNITS) (Harmattan)

Biology of sea and fresh water fish production; handling methods and assessment of quality, fish microbiology; preservation techniques; freezing, smoking and salting, canning, irradiation. Fish-protein concentrates and other fish products.

Abattoir practice including pre-slaughter examination of animals, inspection of carcases. Distribution of frozen carcasses. Meat quality assessment. Hygiene practices in sale of fresh meat. Manufacture of meat products.

FST 526: ANALYTICAL FOOD MICROBIOLOGY (2 0 3 = 3 UNITS) (Rain)

Aims and problem of Microbiology food analysis. Conventional and new instruments of analysis. Automation. Computerized analysis. Media and cultivation techniques. Sterilization. Sampling and sample handling. Record keeping, microbiological assay of preservatives, antibiotics and toxins. Immunological methods. DNA composition in the identification of microorganisms. RCR. Rapid method of identification – microbiological kits for laboratory and field use. Standard and specific techniques for the enumeration and identification of pathogenic and non-pathogenic organisms in foods.

FST 593: PILOT SCALE LAB. (0 0 3 = 1 UNIT) (Harmattan).

FST 594: PLANT DESIGN PROJECT (0 0 3 = 1 UNIT) (Rain).

FST 595: FOOD STANDARDS LABORATORY (0 0 4 = 1 UNIT) (Harmattan)

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

B.SC. (B.Sc. FOOD ENGINEERING) DEGREE PROGRAMME

INTRODUCTION:

The successful development of food industries in a country is a function of effective manpower training schemes in the areas of harmonization and utilization of the available raw materials. The

Department recognizes the need for the development of a training programme which will produce personnel that will be able to develop and apply appropriate technologies in the manufacture and preservation of food products. Such a training will be tailored to cope with the need of designs and development of machinery, equipment and appropriate packaging materials for use in the food industries.

PHILOSOPHY:

Following the vision of the founding fathers of the OAU, the Food Engineering programme is designed to give a broad based education that will produce well rounded educated graduates that can meet the employment requirements of the nation and world at large as well as be self employable. The goal of the Food Engineering programme is to develop areas on interface between food and engineering. The graduates will be able to apply engineering and biological principles to improve the food production process.

OBJECTIVES:

The degree programme in Food Engineering is designed to

(1) train engineers capable of developing and maintaining food machines and equipment for various food processes within available resources.
(2) train personnel who can generate data on the physico-chemical properties of food materials.
(3) give adequate solution to food packaging problems
(4) provide skilled personnel for the production and policy making sector in either an industrial food preservation establishment or in the civil service, and
(5) lay solid foundation for engineers who can work in research institutes and higher educational institutions.

ADMISSION REQUIREMENTS

The minimum requirements for admission to courses leading to B.Sc. (Food Engineering) Degree are those for entry into the Faculty of Technology.

Admission to Part I is through the University Matriculation (UME) examination or such other concessional examinations as the University system may operate. In addition, candidates are required to have credits in five subjects at the Senior Secondary School Certificate, or West Africa School Certificate Level (or passes at the General Certificate of Education (GCE) Ordinary Level) including Mathematics, Physics, Chemistry and English Language.

Admission to Part II is possible for candidates who, in addition to meeting the Faculty General admission Requirements, have good passes at Advanced Level of the G.C.E. (or equivalent) in Physics, Pure Mathematics and Applied Mathematics (or Physics, Chemistry, Pure and Applied Mathematics), or approved equivalent qualifications.

REQUIREMENTS FOR THE AWARD OF DEGREE

(i) U.M.E. (Total Units for Graduation = 202).
(ii) Direct Entry (Total Units for Graduation = 172).

GRADUATION REQUIREMENTS

(a) Foundation Program (Compulsory and Core Courses) – 30 Units.
(b) Special Electives - 12 Units.

DEPARTMENTAL REQUIREMENT

To be eligible for a degree of the B.Sc. (Food Engineering) a candidate must satisfactorily complete a minimum of 202 units including:-

(i) 12 units of Special Electives as prescribed by Senate regulations
(ii) 30 units of Part 1 Physics, Chemistry and Mathematics courses of Science Foundation Option A or exemption from those courses
(iii) 45 units of Food Engineering courses.
(iv) 16 units of Food Science and Technology courses.
(v) 19 units of Mechanical Engineering Courses, MEE203, MEE204, MEE205, MEE206, MEE303, MEE305, MEE 395, MEE306, and MEE396
(vi) 7 units of Agricultural Engineering courses: AGE202, AGE302, and AGE407.
(vii) 3 units of Animal sciences course ANS205
(viii) 4 units of Botany courses: BOT101 and BOT103
(ix) 12 units of Chemical Engineering courses: CHE201, CHE301, CHE305 and CHE306.
(x) 4 units of Chemistry course: CHM202
(xi) 5 Units of Civil Engineering courses: CVE202 and CVE401.
(xii) 5 Units of Computer Science courses: CSC201 and CSC202.
(xiii) 3 units of Crop Sciences course: CPP305
(xiv) 3 units of Electronic and Electrical Engineering courses: EEE201, EEE291
(xv) 10 units of Mathematics courses: MTH104, MTH201, and MTH202.
(xvi) 6 units of Materials Science and Engineering courses: MSE201 and MSE305.
(x) 7 Units of Technology Planning and Development Unit courses TPD101, TPD501, TPD502, and TPD503.
(xi) 15 Units of Industrial Training courses: FDE200, FDE300, and FDE400.

RESTRICTED ELECTIVES

3 Courses of 3 units, each = 9 units of Electives chosen from FDE506, FDE510, FST 514, FDE513, FDE517, FDE 518, FDE 521, FST520, AGE 307, AGE503, AGE530, CHE 411, CHE 502, and CSC 524

PART 1 HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
MTH 101	Elementary Mathematics I		4	1	0	5

PHY 101	General Physics I		4	0	0	4
PHY 107	Experimental Physics IA		0	0	3	1
CHM 101	Introductory Chemistry I		3	1	0	4
CHM 103	Experimental Chemistry IA		0	0	3	1
BOT 101	Introductory Botany		3	0	0	3
BOT 103	Experimental Botany		0	0	3	1
TPD 101	Engineers in Society		1	0	0	1
SE	Special Electives		2	0	0	2
			17	2	9	22

PART 1 RAIN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
MTH 102	Elementary Mathematics II		4	1	0	5
MTH 104	Vectors		2	0	0	2
PHY 102	General Physics II		4	0	0	4
PHY 108	Experimental Physics IB		0	0	3	1
CHM 102	Introductory Chemistry II		3	1	3	4
CHM 104	Experimental Chemistry IB		0	0	3	1
SE	Special Electives		2	0	0	2
SE	Special Electives		2	0	0	2
			17	2	6	21

PART 2 HARMATTAN SEMESTER

Course Code	Course title	Pre-requisite /Co-requisite	L	T	P	Units
MTH 201	Mathematical Methods I	MTH 101, 102	3	1	0	4

MEE 203	Engineering Drawing I		1	0	3	2
MEE 205	Engineering Mechanics I		3	0	0	3
CSC 201	Computer programming I		2	1	0	3
CHE 201	Introduction to Thermodynamics		3	0	0	3
EEE 201	Applied Electricity I	PHY 102	2	0	0	2
EEE 291	Applied Electricity Lab I		0	0	3	1
MSE 201	Engineering Materials		2	0	3	3
			15	3	9	21

PART 2 RAIN SEMESTER

Course Code	Course title	Pre-requisite /Co-requisite	L	T	P	Units
MTH 202	Mathematical Methods II	MTH 201	3	1	0	4
MEE 204	Engineering Drawing II	MEE 203	1	0	3	2
MEE 206	Engineering Mechanics II	MEE 205	2	1	0	3
CVE 202	Strength of Materials I	MEE 205	2	0	3	3
AGE 202	Workshop Practice		1	0	3	2
CHM 202	Basic Organic Chemistry	CHM 102	3	1	0	4
FDE 206	Introductory Food Science and Eng		2	0	0	2
SE	Special Electives		2	0	0	2
			16	3	9	22

LONG VACATION

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 200	Students Work Experience Programme		0	0	9	3

PART 3 HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
MEE 303	Fluid Mechanics I	MEE 205,206	3	0	0	3
MEE 305	Mechanics of Machine I	MEE 206	2	0	0	2
MEE 395	Mechanics of Machine Lab I	MEE 206	0	0	3	1
CHE 301	Chemical Engineering Thermodynamics	CHE 201	2	1	0	3
CHE 305	Engineering Analysis I	MTH 201, 202	2	1	0	3
FDE 301	Human Nutrition	FST 311	2	0	0	2
FST 305	Introductory Food Microbiology		2	0	0	2
FST 311	Introductory Food Biochemistry		2	0	0	2
ANS 205/CPP 305	General Animal Husbandry I/ Crop Science I		2	1	0	3
			17	3	3	21

PART 3 RAIN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
MEE 306	Mechanics of Machines II	MEE 305	2	0	0	2
MEE 396	Mechanics of Machines Lab II	MEE 395	0	0	3	1
AGE 302	Statistics for Engineers		2	0	0	2
CSC 202	Computer Programming II	CSC 201	1	0	3	2
CHE 306	Engineering Analysis II	CHE 305	2	1	0	3
FST 306	Food Microbiology I	FST 305	2	0	0	2
FST 396	Food Microbiology Lab I		0	0	3	1
FDE 314	Elements of Mass Transfer	MTH 202, CHE 201	2	0	0	2
FDE 302	Post Harvest Technology		2	0	0	2
FDE 316	Food Engineering I	CVE 202	2	0	0	2
SE	Special Electives		2	0	0	2
			17	1	9	21

LONG VACATION

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 300	Students Industrial Work Experience Scheme I		0	0	9	3

PART 4 HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 409	Food Process Technology	MEE 204, CHE 201	2	1	0	3
FDE 499	Food Process Technology Lab		0	0	3	1
FDE 411	Food Engineering Lab I	FDE 316	0	0	6	2
FDE 413	Thermal Engineering	CHE 301	2	0	0	2
FDE 415	Food Machinery	MEE 306, FDE 413	1	0	3	2
FST 401	Food Analysis	FST 311	2	0	0	2
FST 491	Food Analysis Lab		0	0	3	1
FDE 405	Technology of Plant Food Products I		2	0	3	3
CVE 401	Technical Report Writing		2	0	0	2
AGE 407	Design of Agricultural and Food Processing Machines I	CVE 202	2	0	3	3
			13	1	21	21

PART 4 RAIN SEMESTER AND LONG VACATION

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 400	Engineering Valuation and Students Industrial Work Experience Scheme II		0	0	27	9

PART 5 HARMATTAN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 507	Assigned Project		0	0	9	3
FDE 511	Food Engineering II	FDE 316, 413	2	0	3	3
FST 505	Food Standards and Quality Assessment	FST 306, FST401, FDE 401	2	0	0	2
FST 595	Food Quality Laboratory		0	0	3	1
FDE 521	Fish and Meat Process Technology	FDE 409	2	0	3	3
TPD501	Industrial Economics		2	0	0	2
TPD503	Industrial Law and Management		2	0	0	2
FDE	Elective		3	0	0	3
			13	0	18	19

PART 5 RAIN SEMESTER

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE 502	Food Packaging		2	0	3	3
FDE 504	Food Processing Plant Design	FDE 409	2	1	0	3
FDE 594	Plant Design Project		0	0	3	1
FDE 508	Assigned Project		0	0	9	3
FST 514	Food Biotechnology	FST 306	2	0	3	3
FDE 516	Food Engineering Lab II	FDE 411	0	0	3	1
TPD 502	Technology Policy		2	0	0	2
FDE 530	Seminar		1	0	0	1
FDE	Elective		3	0	0	3
			12	1	21	20

DEPARTMENTAL FREE ELECTIVES

Harmattan Semester

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE513	Instrumentation and Process Control		2	1	0	3
FDE517	Simulation and Modelling in Food Eng		2	1	0	3
AGE307	Farm Electrification	MTH 202	2	0	3	3
AGE 503	Design of Agric and Food Processing Machines II	AGE 407	2	0	3	3
CHE411	Chemical Engineering Analysis	CHE 306	3	1	0	4
CHE521	Environmental Engineering		2	1	0	3

Rain Semester

Course Code	Course Title	Pre-requisite /Co-requisite	L	T	P	Units
FDE506	Technology of Plant Food Products II		2	0	3	3
FDE510	Milk and Dairy Technology		2	0	3	3
FDE 518	Food Engineering III	FDE 314	2	0	3	3
FST 520	Fermentation Technology		2	0	3	3
AGE530	Energy in Agriculture		2	0	3	3
CHE502	Process Optimization	CHE 411	2	1	0	3
CSC524	Techniques in Data Analysis		2	1	0	3

COURSE DESCRIPTIONS

FDE 206: INTRODUCTION TO FOOD SCIENCE AND ENGINEERING (2 0 0 =2 UNITS)
Philosophy, definition and inter relationship of Food Science, Technology and Engineering. Interphases of agriculture, food and nutrition. Review of global food situation with emphasis on Nigeria and Africa. The role of agriculture in the nation's economic growth and development. National Food security issues. The Nigerian food industries and national development. Poverty,

employment and income generation in Food science and engineering. Process calculation: material and energy balance

FDE 301: HUMAN NUTRITION (2 0 0 = 2 UNITS)
Calorie and energy requirement. Digestion, absorption and metabolic function of individual nutrients. Protein requirements and factors affecting protein requirement. Protein-calorie malnutrition. Food fortification. Nutritional status and infection. Food intake and nutritional disorders (atheroscelerosis, anaemia, ketosis, avitaminosis, hypertension, kidney and liver malfunctions). Effect of processing on nutritional requirements.

FDE 302: POST- HARVEST TECHNOLOGY (2 0 0 = 2 UNITS)
Classification of agricultural produce. Raw products maturity evaluation. Harvesting techniques and post harvest handling practices – washing, sorting, cooling, post harvest loss prevention method. Waste disposal and by product utilization.Technical details, economic considerations and maintenance of food stores. Packaging of fresh produce. Low temperature systems.

FST 305: INTRODUCTORY FOOD MICROBIOLOGY AND BASIC TECHNIQUES (2 0 0 = 2 UNITS)
Microorganisms and their function in food spoilage, preservation and in food production. Classification of bacteria, fungi and yeast important in foods. Relation between structure and function of eukaryotic and prokaryotic protist. Microbial growth. Microbial metabolism. Mechanism of pathogenicity.
PRACTICAL: basic methods of culture techniques, sterilization, composition and construction of media. Staining methods. Enumeration of microorganisms from foods. Examination and principles of identification of microorganisms.

FST 306: FOOD MICROBIOLOGY I (2 0 0 = 2 UNITS)
Important microorganisms in food microbiology. Role of microorganisms in food industry. Production and preservation of foods by microorganisms. Microorganism's role in food contamination. Physiological characteristics of molds, yeast and bacteria. Factors that influence microbial activity (moisture, oxide reduction potential, temperature).
Food preservation: Principles and methods of food preservation (high temperature, low temperature, drying, preservatives, radiation).

FST 311: INTRODUCTORY FOOD BIOCHEMISTRY (2 0 0 = 2 UNITS)
The reactivity of proteins, carbohydrates and lipids from the standpoint to food science. Enzymes – their role in food deterioration and use in foods. Biochemistry of food fermentations. Post harvest changes in plant tissues. Flavours.

FDE 314:ELEMENTS OF MASS TRANSFER (2 0 0 = 2 UNITS)
Diffusion. Mass transfer coefficients for liquid and vapour phases. Analog between heat and mass transfer. Phase equilibria. Distillation of ideal and real mixtures. McCabe-Thiele and Ponchon-Savarit methods. Absorption. Crystallization. Extraction. Washing. Mass transfer equipment.

FDE 316: FOOD ENGINEERING I (2 0 0 = 2 UNITS)
The strength of food materials: tensile, compressive and shear stress measurements of food section or tissues. The use of Young's modulus, the shear modulus, the bulk modulus, and Poisson's ratio in the evaluation of food strength.
Food emulsion: basic emulsion types – oil in water, water in oil; emulsifying agents, hydrophilic – lyophilic balance values. Methods of preparing food emulsions. Foams : formation , stability. Food

rheology: Newtonian and non-Newtonian fluids. Viscosity. Structural viscosity: thixotropy, rheopexy. Viscoelasticity. Elasticity. Food texture: relationship between sensory perceptibility of textural attributes of food and relevant engineering constants.
Physico-chemical properties of food materials : density, specific heat, thermal conductivity, etc.

FST 396: FOOD MICROBIOLOGY LAB I (0 0 3 = 1 UNIT)

FST 401:FOOD ANALYSIS (2 0 0 = 2 UNITS)

Detailed analysis of moisture, carbohydrates, lipids, proteins and amino acids, vitamins, food additives and contaminants. Paper chromatography, thin-layer chromatography. Elementary ideas of spectrophotometry.

FDE 405:TECHNOLOGY OF PLANT FOOD PRODUCTS I (3 0 0 = 3 UNITS)

Cereal Technology: chemistry and technology of the primary cereal (maize, rice, sorghum, millet). Milling and conversion of cereals to various products. Extruded product from cereals. Manufacture of breakfast cereal. Baking technology.
Legumes: processing of cowpea into flour and other products
Fats and oils: production of oils and cake from a variety of oil seeds and nuts
Vegetable milks: production of milks from soyabean, melon and groundnut seeds
Sugar: conversion of sugar cane to sugar and syrups
Beverages: malting, production of fermented beverage from cereal and their adjunct
Waste byproduct recovery and management
Starch: starch extraction, starches as ingredient in food systems, enzyme and acid hydrolysis of starches.

FDE 409: FOOD PROCESS TECHNOLOGY (3 0 0 = 3 UNITS)

Preliminary operations e.g. cleaning, sorting, washing, peeling, deskinning, cutting, blanching, etc. Mechanical conversion (ancillary) operations e.g. size reduction. Disintegration operation: dry and wet milling, pressure homogenizing. Integration processes: mixing, agglomeration
Separation processes: filtration, sedimentation, centrifugation, and expression. Materials handling systems in food processing. Water and waste water. Fuel utilization. Steam generation

FDE 411 :FOOD ENGINEERING LAB I (0 0 6 = 2 UNITS)

Experiments will cover instrumentations and measurements. Fluid flow, heat transfer including heat penetration into containers. Mass transfer including contact equilibrium separation processes. Measurement of the physico-chemical properties of food materials. Measurement of the mechanical properties of food materials. Rheology, freezing and canning.

FDE 413:THERMAL ENGINEERING (2 0 0 = 2 UNITS)

Heat transfer – basic theory of steady state and transient conduction, convection, and radiation. Heat transfer with change of phase. Heat exchanger – parallel, counter current and cross flow heat exchange. Heat exchanger effectiveness. Food fouling. Steam generation. Climatization – psychrometry at low temperatures. Low temperature applications: freezing by contact, cold air gas blast, liquid immersion, solid carbon dioxide. Effect of freezer burn. Freeze drying: calculations and freeze drying system. Cold storage; cold room design calculations.

FDE 415: FOOD MACHINERY (1 0 3 = 2 UNITS)

Studies on the design of equipment based on models and prototypes from the knowledge of dimensional analysis, similarity theory and inter-relationships between materials of construction and food materials. Emphasis will be laid on safety and sanitary designs. Types and application of electrical motors in food machines.

FST 491 :FOOD ANALYSIS LAB (0 0 3 =1 UNIT)

FDE 499 :FOOD PROCESS TECHNOLOGY LAB II (0 0 3 = 1 UNIT)

FDE 502: FOOD PACKAGING (2 0 3 = 3 UNITS)

Packaging materials. Food/container interactions. Packaging systems. Packaging requirements for fresh and processed foods for local and export markets. Packaging and environmental pollution.

FDE 504 :FOOD PROCESS PLANT DESIGN (2 1 0 = 3 UNITS)

Plant layout in the food industry. Economics of process design and optimization techniques. Optimum design of food processing plants. Industrial visitation to food industries to help draw attention to certain aspects of food plant location, layout, design and sanitation.

FST 505 :FOOD STANDARDS AND QUALITY ASSESSMENT (2 0 0 = 2 UNITS)

Quantitative measurements of quality attributes: colour, gloss, texture and flavour. Principles and methods of food quality control, sampling recording and use of quality control charts. Statistical methods used in evaluating organoleptic tests and methods of analysis of taste panel data. Food sanitation and hygiene. Codex alimentarius. Food standards and legislation of Nigeria. Toxicology and food additives. Methods of detecting adulteration and misbranding in foods.

FDE 506: TECHNOLOGY OF PLANT FOOD PRODUCTS II (2 0 3 = 3 UNITS)

Harvesting and preprocessing operations. Use of chemicals to control enzymatic and non-enzymatic changes in processed vegetables. Processing of fruits into nectars, drinks, concentrates, powder, tablets, preservation of vegetables by dehydration and freezing methods, chemical and sugar preservatives. Roots and tubers storage and processing. Production of beverage from cocoa, coffee, etc

FDE 507 :ASSIGNED PROJECT (0 0 9 = 3 UNITS)

FDE 508 : ASSIGNED PROJECT (0 0 9 = 3 UNITS)

FDE 510 :MILK AND DAIRY TECHNOLOGY (2 0 3 = 3 UNITS)

Composition of cow and goat milks. Milking methods; manually, machine milking. Technology of liquid milk processing, milk products e.g. evaporated milk, milk powder, filled milk, ice cream, cheese, cultured milk, butter. Vegetable “milk” e.g. soy milk, melon milk. Dairy waste management and processing. Dairy plant sanitation.

FDE 511: FOOD ENGINEERING II (2 0 3 = 3 UNITS)

Kinetics: basic theory of kinetics. Rate of reaction. Order of reaction. Arrhenius equation. Temperature, concentration, and pH dependence. Application of kinetics to enzyme activity and inactivation, fermentation processes, growth rate of microorganisms, progress of spoilage reaction during food storage.

Thermal process evaluation and process time calculation for conduction and convection heated food materials.

Food dehydration: equilibrium moisture, water activity. The drying rate curve. Moisture removal from solids during the constant rate and the falling rate periods. Driers; batch and continuous types. Spray drying.

Concentration by evaporating, freezers concentrating.

Food irradiation: sterilization of food materials and equipment through irradiation. Safety precautions. Application of enzyme systems to food processing

FDE 513: INSTRUMENTATION AND PROCESS CONTROL(2 1 0 = 3 UNITS)

Elements of an instrument. Error measurement. Calibration. Case studies of a few measuring instruments.

Process dynamics. Transfer functions. Frequency response analysis. Cascade control. Feed forward and feedback control. The control valve.

FST 514: BIOTECHNOLOGY (2 0 3 = 3 UNITS)
The emergence of biotechnology and its application in basic and applied science disciplines. Genetic modification of microorganisms, plant and animal cells, gene mapping, gene transfer, recombinant DNA techniques, protoplasm fusion, etc.
Biotechnology as applied to food related problems, e.g. fermentation, post-harvest technology, unit operations and food processing, food product development.

FDE 516: FOOD ENGINEERING LAB II (0 0 3 = 1 UNIT)
Pilot scale experiments on: dehydration, concentrating, canning, food irradiation, separation processes, extrusion, food packaging. A variety of food commodities will be processed.
FDE 517: SIMULATION AND MODELING IN FOOD PROCESSING (2 1 0 = 3 UNITS)
Review of simulation and modeling theories; use of computers packages in simulation and modeling of food processing operations.
FDE 518: FOOD ENGINEERING III (2 0 3 = 3 UNITS)
Novel technologies involving advances in food processing. Use of cryogenic freezing systems. Use of on-line moisture meter. Boiling characteristics of organic liquids and applications involving boilers, cookers and cryogenic freezer. High pressure sterilization, ohmic and other novel heating systems. Membrane separation processes such as ultra-filtration, reverse osmosis and electro-dialysis. Contact equilibrium separation processes involving liquid-liquid, liquid-solid extractions, and multi component distillation. Systems analysis.

FST 520: FERMENTATION TECHNOLOGY (2 0 3 = 3 UNITS)
The range and types of fermentation processes. Microorganisms involved in fermentation. Biochemical basis of fermentation nature and types of fermentation substrates. Microbial growth kinetic, and its application to fermentation types. Culture improvement for industrial processes. Fermentor types and design. Instrumentation and control. Product recovery and purification. Fermentation economics. Selected examples of industrial fermentation.
FDE 521: FISH AND MEAT PROCESS TECHNOLOGY (2 0 3 =3 UNITS)
Biology of sea and fresh water fish production; handling methods and assessment of quality; fish microbiology; preservation techniques; freezing, smoking and salting, canning, irradiation. Abattoir practice including pre-slaughter examination of animals, inspection of carcasses. Distribution of frozen carcasses. Meat quality assessment. Hygiene practices in sale of fresh meat. Manufacture of meat products.
FDE 594 :PLANT DESIGN PROJECT (0 0 3 = 1 UNIT)
FST 595 : FOOD STANDARDS LABORATORY (0 0 3 = 1 UNIT)
FDE 530 : SEMINAR ON RECENT DEVELOPMENTS IN FOOD ENGINEERING (1 0 0 = 1 UNIT)
LIST OF COURSES TAKEN OUTSIDE THE DEPARTMENT

Course Code	Course Title	Department offering Courses
MTH 101	Elementary Mathematics I	Mathematics

MTH 102	Elementary Mathematics II	Mathematics
MTH 104	Vectors	Mathematics
MTH 201	Mathematical Methods I	Mathematics
CHM 101	Introductory Chemistry I	Chemistry
CHM 102	Introductory Chemistry II	Chemistry
CHM 103	Experimental Chemistry I	Chemistry
CHM 104	Experimental Chemistry II	Chemistry
PHY 101	General Physics I	Physics
PHY 102	General Physics II	Physics
PHY 102	General Physics II	Physics
BOT 101	Introductory Botany	Botany
BOT 103	Experimental Botany	Botany
CHM 202	Basic Organic Chemistry	Chemistry
CPP 305	Crop Science I	Plant Science
ANS 205	General Animal Husbandry	Animal science
TPD 101	Engineers in Society	Technology Planning and Development Unit
TPD 501	Industrial and Engineering Economics	Technology Planning and Development Unit
TPD 502	Technology Policy	Technology Planning and Development Unit
TPD 503	Production Operation Management & Industrial Law	Technology Planning and Development Unit
MEE 203	Engineering Drawing I	Mechanical Engineering
MEE 205	Engineering Mechanics I	Mechanical Engineering
MEE 204	Engineering Drawing II	Mechanical Engineering
MEE 206	Engineering Mechanics II	Mechanical Engineering

MEE 303	Fluid Mechanics I	Mechanical Engineering
MEE 305	Mechanics of Machine I	Mechanical Engineering
MEE 395	Mechanics of Machine Lab I	Mechanical Engineering
MEE 306	Mechanics of Machines II	Mechanical Engineering
MEE 396	Mechanics of Machines Lab II	Mechanical Engineering
CSC 201	Computer programming I	Computer Science and Engineering
CSC202	Computer Programming II	Computer Science and Engineering
CSC524	Techniques in Data Analysis	Computer Science and Engineering
CHE 201	Introduction to Thermodynamics	Chemical Engineering
CHE 301	Chemical Engineering Thermodynamics	Chemical Engineering
CHE 305	Engineering Analysis I	Chemical Engineering
CHE 306	Engineering Analysis II	Chemical Engineering
CHE411	Chemical Engineering Analysis	Chemical Engineering
CHE502	Process Optimization	Chemical Engineering
CHE521	Environmental Engineering	Chemical Engineering
EEE 201	Applied Electricity I	Electrical Engineering
EEE 291	Applied Electricity Lab I	Electrical Engineering
MSE 201	Engineering Materials	Materials Science and Engineering
CVE 202	Strength of Materials I	Civil Engineering
CVE 401	Technical Report Writing	Civil Engineering
AGE 202	Workshop Practice	Agricultural Engineering
AGE 302	Statistics for Engineers	Agricultural Engineering
AGE307	Farm Electrification	Agricultural Engineering
AGE 407	Design of Agricultural and Food Processing Machines I	Agricultural Engineering
AGE 503	Design of Agric and Food Processing Machines II	Agricultural Engineering
AGE 530	Energy in Agriculture	Agricultural Engineering

COURSE OUTLINES OF COURSES TAUGHT IN OTHER DEPARTMENTS OF THE FACULTY

Department of Agricultural Engineering

AGE 202: WORKSHOP PRACTICE (1 0 3 = 2 units)
Workshop safety measures, Introduction to Workshop hand and powered tools emphasizing safety measures to the taken during operation. Workshop materials, various gauges and measuring devices. Tolerance of products. General description of the function and capabilities of grinding machines. Practice in grinding tools and drills. Function and capabilities of drilling machines, lathe machines, milling machines and shaping machines. Jigs, Fixtures, Practice in the use of the machine.

AGE 302: STATISTICS FOR ENGINEERS (2 0 0 = 2 units)
Statistical concepts, Normal distribution, Student distribution, Hypothesis testing, Confidence Interval, Pair wise comparison, Analysis of Variance, Completely Randomised design, Completely Randomised blockdesign, Factorial experiments, Regression analysis.

AGE 307: FARM ELECTRIFICATION (2 0 3 = 3 units)
The use of electricity as a power source for lighting, comfort in living, farm production and processing. Planning the Farmstead Distribution system: Demand load for Farm Building, Central Metering and distribution, Capacity of main service selecting feeder conductors. Electric central and circuit protection. Electric motors: Motor rating and importance, stand-by generator type selection, maintenance and operation.

AGE 407: DESIGN OF AGRICULTURAL AND FOOD PROCESSING MACHINES 1 (2 0 3 = 3 units)
Philosophy of design. Components of design. Agricultural Machines: Types and functional requirements. Engineering materials. Stress and deflection analysis. Theories of failure. Design against failure. Detachable fasteners. Power Screws. Shafting design. Design project.

AGE 503: DESIGN OF AGRICULTURAL AND FOOD PROCESSING MACHINE II (2 0 3 = 3 units)
Mechanical power transmission: gear drives, belt drives, chain drives, ropes and hoists, springs. Bearings, Welding, Brakes, Clutches and Couplings: Vibrations. Design Project.

AGE530: ENERGY IN AGRICULTURE (2 1-0= 3 units)
Energy-Basic Definitions and Classification. Energy balance, management and evaluation of alternatives. Energy from solar, Biomass, Wind, Thermal and Hydraulics and their applications in Agriculture.

Department of Chemical Engineering

CHE 201: Engineering Thermodynamics (2 1 0=3 units)
Definition of terms and general concepts of system, surrounding, process, temperature heat, work and energy. First Law of Thermodynamics application to open systems. Second Law of Thermodynamics. Application to heat engines. Entropy. First and second Law combined. Perfect

Gases. Joule Thompson coefficient. Equilibrium processes. Maxwell's relations. Two-phase systems thermodynamic functions of solution. P-V-T relationship. Work from Heat energy: Refrigeration.

CHE 301: Chemical Engineering Thermodynamics (2 1 0=3 units)

1. Generalized P-V-T Relations: The P-V-T behaviours of pure substance. Equation of state for gases. The principle of corresponding state. Compressibility relations, reduced pressure, reduce volume, temperature, Pseudocritical constants. P-V-T approximations for gaseous mixture-idea gas mixture. Dalton's law of additive pressure, Amagar law of additive volume. Pseudocritical point method. Kay's rule. Gililland's method.

2. Heat Effects: Heat capacities as a function of temperature. Heat capacities of liquids and solids. Clapeyron equation. Standard heats of temperature on heat of concentration diagrams for $H_2SO_4 - H_2O$ etc. Partial enthalpies; single and multiple effects evaporators with regards to heat effects.

3. Industrial Stoichiometry: Gas analysis – Orsat method, determination of components in fuels. Calculations based on fuel analysis. Combustion of carbon, hydrogen and hydrocarbons. Correction for nitrogen and oxygen in the fuel; correction for sulphur. Net hydrocarbon ratio in the fuel and percent excess air. Air/fuel and ratios. Interrelations of fuel and fuel-gas analysis. High nitrogen Mixed fuels.

4. Thermodynamics of Flow Processes: Fundamental equations: continuity equation, equation of motion, energy equation, Bernoulli's equation. Flow in pipes, laminar and turbulent flows. Reynolds' number friction factor – Fanning equation. Flowmeters, Nozzles, Compression single stage and multistage, effects of clearance.

5. Phase Equilibria: Criteria of equilibrium. Fugacity of gas mixture. Effects of temperature and pressure on fugacity. Pressure-temperature-composition relationship. Phase behavior at low and elevated pressure. Raoult's law, Equilibrium constant: Activity coefficient. Gibbs-Duhem equation. Margules' and Van Leer equations.

6. Chemical Reaction Equilibria: Standard free energy change and equilibrium constant. Evaluation of equilibrium constants. Effects of temperature and pressure on equilibrium constants. Calculation of conversion. Gas – phase reactions, Percent conversion. Liquid-phase reactions. Heterogeneous reactions.

CHE 305: Engineering Analysis 1 (2 1 0= 3 units)

Linear Algebra Elements of matrices, determinants, in verse of matrix, theory of linear equations, eigen-values and eigen-vectors. Analytical geometry coordinates transformation – solid geometry, polar, Cylindrical and spherical coordinates. Elements of functions of several variables. Ordinary intergrals, triple integrals, line integrals, surface integrals. Derivation and integrals of vectors. The gradient of scalar quantities. Flux, divergence and curl of a vector field, Gauss, Green's and stokes' Theorems and applications. Single-valued functions. Multi-valued functions. Analytical functions. Cauchy-Riemann equations. Singularities and zeros. Contour integration including the use of Cauchy's integral theorem. Taylor and Laurent's series. The residua theorem. Bilinear transformation.

CHE 306: Engineering Analysis II (2 1 0=3 units)
Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturm-Louivile boundary value problems. Solutions of equations in two or three dimensions by separation of variables. Eigenvalue problems. Use of operations in the solution of partial differential equations and linear integral equations. Integral transforms and their inverses including. Fourier, Laplace, Mellin and Hnadel transforms. Convolution integral and Hilbert transform. Calculus of finite differences. Interpolation formulae. Finite difference equations. Runge-Kutta and other methods in the solution of ordinary and partial differential equations. Numerical methods for the solution of nonlinear equations. Numerical integration and differentiation.

CHE 411: Chemical engineering Analysis (2 1 0= 3 units)
Review of elementary theorems and operations on vectors and matrices. Theory of linear systems including rank, degeneracy, dimensions, bases and span. Properties of eigenvalues and eigenvectors Cayley – Hamilton and Sylveseis theorems. Reductions to diagonal and Jordan forms. The state transition matrix and solution of linear ordinary differential equations. Numerical methods for solving linear and nonlinear algebraic equations. Guass-Seidel and Newton-Raphson methods. Numerical procedures for solving ordinary and partial differential equations including boundary values problems. Formulation of simple and complex chemical engineering problems and their solutions. Application to chemical engineering stage processes including rectification, multicomponent distillation, staged absorbers, all types of reactors and heat exchangers.

CHE 502: Process Optimisation (2 1 0 =3 units)
Stationary Optimisation: Differential approach Numerical approach, linear and non linear programming. Trajectory Optimisation including dynamic programming, calculus of variation and Pontryagin Optimum Principle. Numerical computational techniques including first and second order methods.

Department of Computer Science and Engineering

CSC 201: Computer Programming I (3 Units)
(a) An introduction to digital computer; Historical perspective, up-to-date description. A simple typical Computer Structure applications of Digital Computers.
(b) Programming the Computer in a selected language: Declarative statements; Input and Output statements; Program compilation and execution; Control and conditional statements; Flow diagram organization; Loops and Routines; Program testing and debugging techniques.
(c) Introduction to Structured Programming

CSC 202: Computer Programming II (2 Units)
This is a programming laboratory course consisting of applications of programming, through case study problems, to the students' major subject areas. The emphasis in this course is not of derivation of theory but on applying programming to problems and thus acquiring practical experience with numeric and non-numeric techniques relevant to the student's study area.

Problems are so defined that various selected groupings are emphasizing various application areas

CSC 524: Techniques in Data Analysis (2 Units).
Data collection and coding. Data cleaning – completeness, range, consistency. Case studies using SPSS or PSTAT packages. Interpretation of results.

Department of Electronic and Electrical Engineering

EEE 201: Applied Electricity I: 2-0-0= 2 units (Harmattan)
Introduction to electrostatics Gauss's theorem and application, electrostatic potential and equipotential surface capacitances, energy of a charged conductor.

Foundation of electric circuit theory: Circuit elements, resistors, capacitors and inductors, Network theorems – Norton, Theorem and Super-position theorems, Transient response of RC, RL and RLC Circuits.

Elements discussion on Semiconductors-pn junction diode, npn and pnp transistors. Full-wave and half-wave rectification circuits and smoothing circuits. Electric lamps and illumination.

Pre-requisite: PHY 101 & PHY 102

EEE 202: Applied Electricity II: 2-0-0= 2 units (Rain)
Magnetic field of currents in space: Magnetic flux and flux density, corkscrew rule, solenoid and magnetomotive force, periodic wave forms- their average and effective values. Characteristics and use of non-linear elements in simple circuit.

Single-phase alternating current circuits – complex impedances and admittances. Series and parallel resonant circuits. Magnetic circuit, mutual inductance, transformers. Introduction to electrical generators and motors. Power factor correction. Introduction to measuring instruments: Moving coil instruments, oscilloscope, electrostatic voltmeters, A.C. and D.C. bridges.

Prerequisite: EEE 201

Department of Materials Science Engineering

MSE 201 – ELEMENTS OF ENGINEERING MATERIALS 2-0-3= 3 units (Harmattan)
Atomic and crystal structure. Crystal imperfections. Simple phase diagrams of allows. The relationship between structure and properties. Mechanical properties-engineering and true stress-strain curves, ultimate strength, ductility, impact strength, hardness and torsion. Creep and fatigue failure. Electrical properties-conductivity, semi-conductivity and super-conductivity. Optical and magnetic properties of materials. Stability of materials in the service environment, corrosive media, sub-zero and elevated temperature, irradiation. Basic criteria for the selection of materials for engineering applications. Engineering properties of wood, concrete, ceramics, polymers, ferrous and non-ferrous metals and alloys; cryogenic, corrosive media and nuclear applications.

MSE305-Mechanics of Materials (2-0-3= 3units) (Harmattan)

One, two- and three- dimenstional stress and strain. Application of Mohr's circle for the analysis of stresses and strains Tensor analysis of stresses and strains. Creep and fatigue-Theories and experimental techniques.

Department of Mechanical Engineering

MEE 203: Engineering Drawing I (1-0-3=2 units) (Harmattan)
Introduction – use of drawing instruments, paper sizes, scales and drawing layout. Lines and lettering, electric circuit diagrams. Geometrical drawings – plane geometry, conics and cycloids. Dimensioning and tolerances. Orthographic projections. Sectional views. Fastening devices-rivets and screw fasteners. Conventional practices. Isometric projections. Oblique projections. Freehand sketching. Graphic charts and diagram.

MEE 204: Engineering Drawing II (1-0-3 =2 Units) (Rain)
Auxiliary projections, True lengths, sizes and shapes. Simple developments. Interpenetration and development. Mechanical drawing of machine parts – carns, gears, couplings, bearings pipe joints and valve. Structural drawing –materials representation, dimensioning of structural details, and welds. Structure wood, concrete structural detailing, shop drawings and sketches. Simple assembly drawing. Introductory pen work; lettering and tracing of completed drawings.

MEE 205: Engineering Mechanics I (2-1-0= 3 units) (Harmattan)
Independence, dimensions and coordinates in space. Vectors and vector algebra. Forces couples and their systems: composition, resolution. Varigon's theorem, equivalence and reduction of systems, wrench. Rigid bodies and equilibrium. Centres of gravity, centroids and their application. Structures and machine. Friction, Moments of Inertia. Virtual work.

MEE 206: Engineering Mechanics I (2-1-0= 3units) (Rain
Kinematics and Kinetics of particles. Work, Energy, Power, Momentum, and Impulse.
Kinematics and Kinetics of rigid Bodies in Plane motion.
Analysis of elementary dynamic systems – dynamic system elements: mechanical electrical fluid and thermal; modeling of physical systems; Newton's laws of motion. 'Alembert's principles and Lagrange's equations. Particle dynamics in non-inertia frame of reference, and application of Lagrange's equations.

MEE305: Mechanics of Machines I (2-0-0 =2 Units) Harmattan
Fundamental concepts in kinematics and motion. Mechanisms. Instanteneous centres. Relative velocities and Acceleration in mechanisms. Rolling Contact. Cams. Gearing. Gear Trains. Introduction to Analytical methods of mechanisms Analysis.
MEE395: Mechanics of Machines I Laboratory (0-0-9= 1 unit) (Harmattan)

MEE 306: Mechanics of Machines 11 (2-0-0= 2 units) (Rain)
Static and Inertia Force analysis in Machines. Dynamically equivalent systems. Balancing of rotating and reciprocating masses. Turning moment diagrams and Flywheels. Governors. Free and Forced Vibrations. Friction in machines.

MEE396: Mechanics of Machines Laboratory (0-0-9= 1 unit) (Rain)

African Institute of Science Innovation and Policy (formerly Technology Planning and Development Unit)

TPD 501 – Industrial and Engineering Economics (2 Units)
Basic concepts, factors of production, supply and demand, price elasticity analysis, business organization. The business firm production functions, price system and competition. Basic principles of Engineering Economy, cost concepts and analysis. Interests calculations, concept of equivalence and money-time relationships. Basic methods of engineering economy and their applications in valuation. Evaluating alternatives. Depreciation, taxation and replacement studies. Capital budgeting.

TPD 502 – Technology Policy (2 Units)
The course content includes: Science, Technology and Development, Technological change and industrial development, government intervention in S & T in Nigeria and other developing countries, S & T Policy formulation and implementation. Policy statements, policy targets, policy instruments and strategies, monitoring devices and policy review. Technological capability and transfer of technology.

TPD 503: Production/Operations management and Industrial Law
Principles of management. Decision theory. Basic concepts in production and operations management. Plant location and facility layout. Capacity management, inventory control, scheduling and network analysis. Quality control, replacement problems. Functions of Law, Basic principles of Nigerian Law. Engineers and law of contract Law of business associations. Trade marks and patents.