



**NATIONAL BOARD FOR TECHNICAL EDUCATION, KADUNA
IN COLLABORATION WITH
MARITIME ACADEMY OF NIGERIA, ORON**

NATIONAL DIPLOMA (ND)

IN

OCEANOGRAPHY AND FISHERY SCIENCE (OFS)

CURRICULUM AND COURSE SPECIFICATIONS

MAY 2017

PLOT 'B' BIDA ROAD, P. M. B. 2239, KADUNA – NIGERIA.

GENERAL INFORMATION

1.0 GOAL AND OBJECTIVES

NATIONAL DIPLOMA (ND)

PROGRAMME GOAL

The National Diploma (ND) in Oceanography and Fishery Science is aimed at producing diplomates with sound knowledge and skills to assist in the effective management of the ocean and its resources such as marine scientific research, oil and gas and other activities. It is also designed to produce technicians who will be able to apply modern skills to rear fish and other aquatic animals, participate in freshwater and marine fishing, process, store and market fish on a large scale for human consumption and other purposes.

PROGRAMME OBJECTIVES

On completion of this course, the ND diplomates should be able to:

- i. Carry out data collection using oceanographic instrumentation.
- ii. Know the importance of oceanographic information to the marine-based industries and agencies.
- iii. Understand the various laws protecting the oceans and their resources.
- iv. Assist in the construction and operation of fish processing and preservation equipment.
- v. Assist in determining suitable environment, planning, layout, construction and development of fish ponds/farms.
- vi. Construct, operate and maintain fishing gear and crafts (nets, traps, lines out-board engines etc).
- vii. Employ modern techniques in fish feed preparation, storage, utilization and general fish farm management.
- viii. Acquire computer skills and entrepreneurial knowledge for the marine and fishery-related business.

2.0 MINIMUM ENTRY REQUIREMENTS

The academic requirements for admission into the ND Oceanography and Fishery Science programme are:

- i. Five (5) G.C.E. (0 level), WASSC, NECO or NABTEB subjects passed at not more than two sittings. The subjects must be passed at Credit level and should include English Language Mathematics, Geography and any two other subjects.
- ii. Five credit passes in relevant subjects obtained at final examination of an NBTE recognized preliminary ND programme offered in a college of Agriculture or similar post-secondary technical institutions. Such students must have 'O' level WASSC, SSC, or GCE passes in Biology / Agricultural Science, Geography, Chemistry, Mathematics and English Language before undertaking the course.

3.0 PROJECT

Every ND student is required to successfully complete a relevant project in either Oceanography or Fishery Science during his/her final year.

4.0 CURRICULUM

The curriculum consists of four main components. These are:

- i. General Studies courses
- ii. Foundation Courses
- iii. Professional Courses
- iv. Supervised Industrial Work Experience Scheme (SIWES)

The General Studies component shall include courses in Science and Technology related programmes, English Language, Computer/ICT, Entrepreneurship Education; Citizenship Education (the Nigerian Constitution), Sociology, and Entrepreneurship. The General Studies component shall account for not more than 10-15% of total contact hours for the programme.

Foundation courses include courses in English Language, Languages, and Basic Computer Applications. The number of hours will account for about 10-15% of the total contact hours.

Professional Courses are the core Oceanography and Fishery Science Courses which give the student the theoretical and practical skills needed to practice in the industry. These may account for between 70-80% of the contact hours.

5.0 CURRICULUM STRUCTURE OF THE ND PROGRAMME IN OCEANOGRAPHY AND FISHERY SCIENCE

The structure of the ND programme consists of four semesters of Classroom, Laboratory, boatyard and fish farm in the institution. Each semester shall be of 17 weeks duration made up as follows: 15 contact weeks of teaching (Lecture and Practical Exercises), and 2 weeks for Tests, Quizzes, and Examinations, and Registration.

6.0 ACCREDITATION

The National Diploma (ND) in Oceanography and Fishery Science shall be accredited by NBTE before the diplomates can be awarded the Diploma Certificate. Details about the process of accrediting a programme for the award of the ND are available from the Executive Secretary, National Board for Technical Education, Plot 'B', Bida Road, P.M.B. 2239, Kaduna, Nigeria or the Board's website at www.nbte.ng.org.

7.0 CONDITIONS FOR THE AWARD OF THE DIPLOMA

Institutions offering accredited programmes shall award the National Diploma (ND) to candidates who have successfully completed the programme after passing prescribed course work, examinations and diploma project. Such candidates should have completed a minimum of 72 semester credit units.

The Diplomas shall be classified as follows on a 4-point grading system:

Grading System

MARKED RANGE	LETTER GRADE	WEIGHTING
75% and above	A	4.00
70%- 74%	AB	3.50
65% - 69%	B	3.25
60% - 64%	BC	3.00
55% - 59%	C	2.75
50% - 54%	CD	2.50
45% - 49%	D	2.25
40% - 44%	E	2.00
Below 40%	F	0.00

Distinction - GPA of 3.50 and above
Upper Credit – GPA of 3.00 – 3.49
Lower Credit – GPA of 2.50 – 2.99
Pass - GPA of 2.00 – 2.49

8.0 GUIDANCE NOTES FOR TEACHERS TEACHING THE PROGRAMME

- 8.1** The new curriculum is drawn in course units. This is in keeping with the provisions of the National Policy on Education which stresses the introduction of the semester credit units, which will enable a student who so wishes to transfer the units already completed in an institution to another of similar standard.
- 8.2** In designing the units, the principle of the modular system by product has been adopted thus making each of the professional modules, when completed, to provide the student with technical operative skills, which can be used for job creation and employment purposes.
- 8.3** As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in behavioural objectives, so that the expected performance of the student who successfully completed the courses of the programme is clear to it. There is a slight departure in the presentation of the performance based curriculum which requires the conditions under which the performances are expected to be carried out and the criteria for the acceptable levels of performance to be stated. It is a deliberate attempt to get the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and to follow that with the criteria for determining an acceptable level of performance. The Academic Board of the institution may vet departmental submission on the final curriculum. The aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standards and quality of education in the programmes offered throughout the polytechnic and other specialized institution.
- 8.4** The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice.

9.0 GUIDELINES ON SIWES PROGRAMME

9.1 For the smooth operation of the SIWES the following guidelines shall apply.

- a. Institution offering the ND programme shall arrange to place the students in industry. By the end of the second semester/first year of the programme, six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE, who shall, in turn authenticate the list and forward it to the Industrial Training Fund, Jos.
- b. The Placement Officer should discuss and agree with industry on the following
 - i. A task inventory of what the student is expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field by the industry based supervisor.
 - ii. The evaluation of the student by the industry based supervisor and the institution-based supervisor.
 - iii. The final grading of the student during the period of attachment should be weighted more on the evaluation by industry-based supervisor.
- c. The Supervised Industrial Work Experience Scheme (SIWES) shall be for a minimum of three months in the relevant Industry.

9.2 Evaluation of Students during the SIWES

In the evaluation of the student, cognizance should be taken of the following items:

- i. Punctuality
- ii. Attendance
- iii. General Attitude to Work
- iv. Respect for authority
- v. Interest in the field/technical area
- vi. Technical competence as a potential technician in his field.
- vii. Team work

9.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of students work which has been agreed to by all polytechnics is adopted.

9.4 The Institution Based Supervisor

The institution-based supervisor should initial the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any problems regarding the specific assignments given to them by their industry-based supervisor.

9.5 Frequency of Visit

Institution should ensure that students placed on attachment are visited within one month of their placement. Other visits shall be arranged so that:

1. There is another visit six weeks after the first visit; and
2. Final visit in the last month of the attachment

9.6 Stipend for Students in SIWES

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training Fund and the National Board for Technical Education (NBTE).

9.7 SIWES as a Component of the Curriculum

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES he may only be allowed to repeat another four months SIWES at his/her own expense.

10.0 CAREER OPPORTUNITIES

The NDOceanography and Fishery Science course prepares students for career in several areas that include:

- Oceanographic Instrumentation
- Aquaculture

- Marine Environmental Protection in places like NIMASA
- Environmental Department of Oil and Gas Companies
- Oceanographic Institutes
- Fishing Vessels
- Fish Processing Industries
- Federal and State Ministries
- Pollution monitoring
- Coastal Tourism
- Ecosystem Restoration

11.0 QUALIFICATION OF THE IMPLEMENTERS OF THE CURRICULUM

Specialists of ND Oceanography and Fishery Science programme that are to implement the curriculum are those with qualification in the relevant subjects. Years of teaching experience in the industry as well as selected certificates will be an added advantage. Additional qualification in the field will also be an added advantage.

CURRICULUM TABLE

1ST SEMESTER

Course Code	Course Title	L	P	CU	CH
**GNS 101	Use of English	1	0	2	3
**MTH 101	General Mathematics	1	-	2	3
**STP 122	Optics and Waves	1	2	2	3
**GNS111	Citizenship Education I	2	-	2	2
**GNS 115	Introduction to Computer Science	1	2	3	3
**TSL 101	Basic Principles in Land Surveying	1	2	3	3
**STC 111	General Principles of Chemistry	2	3	3	5
**STB 111	Cell Biology	2	2	3	4
*MCM 110	Basic Safety at Sea	0	0	0	0
		11	11	20	26

** Available in NBTE Curriculum,

*Students should show evidence of taking basic safety courses before the start of the second semester.

2ND SEMESTER

Course Code	Course Title	L	P	CU	CH
**GNS 102	Communication in English I	2	-	2	2
** GNS 224	Physical Geography	1	2	2	3
**SEC 205	Basic Workshop practices	1	2	3	3
OFS 121	Physical Oceanography	1	2	2	3
OFS 122	Chemical Oceanography	1	2	2	3
**FIT 122	Biology of Fishes	1	3	3	4
**FIT 123	Basic Aquaculture	1	3	3	4
**FIT 124	Fishing gear and craft Technology	1	5	3	6
		9	19	20	28

3RD SEMESTER

COURSE CODE	COURSE TITLE	L	P	CU	CH
OFS 211	Oceanographic Instrumentation	1	2	2	3
**FIT 211	Fish Farm Engineering	1	4	3	5
OFS 212	Marine Biology	2	1	3	3
**FIT 216	Practical Fishing	-	4	2	4
**EED 126	Introduction to Entrepreneurship	1	0	2	1
**FIT 213	Elementary Navigation and Seamanship	1	4	3	5
**FIT 215	Aquatic Ecology	1	2	2	3
OFS 214	Marine Environmental Pollution and Prevention	2	1	3	3
**STA 111	Introduction to Statistics	2	-	2	2
		11	18	22	29

4TH SEMESTER

COURSE CODE	COURSE TITLE	L	P	CU	CH
**GNS 202	Communication in English II	3	-	2	3
**FIT 221	Pond Management	2	3	3	5
**FIT 212	Fish Processing and Storage Technology	1	5	3	6
**EED 216	Practice of Entrepreneurship	1	2	2	3
OFS 221	Geographic Information System and Remote Sensing	1	2	2	3
OFS 222	Introduction to Ocean Law	2	-	2	2
OFS 223	Research Project	-	-	6	
		10	12	20	22

**** Available in NBTE Curriculum**

Department /Programme: National Diploma	Course Code: STP122	Credit Hours:
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	Subject/Course:			Theoretical:1 hours/week
	Optics and Waves			
	Year:	Semester:	Pre-requisite:	Practical:2 hours /week

GOAL: This course is designed to acquaint the principles and applications of reflection and refraction at plane and curved surfaces.

General Objectives:-

On completion of this course, students should be able to:

- 1 Understand the principles and applications of reflection and refraction at plane and curved surfaces.
- 2 Understand the working principles of optical instruments.
- 3 Understand the basic concepts of photometry.
- 4 Understand the phenomenon of wave, optics and sound waves.

	Course: Optics and Waves	Course	STP122		Credit Hours:	
					Theoretical: 1 hours/week	
	Year: 1 Semester: 2	Pre-requisite:			Practical: 2 hours/week	
	Theoretical			Practical Content		
	General Objective 1.0: Understand the principles and applications of reflection and refraction at plane and curved surfaces.					
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1- 3	Reflection and Refraction at Plane Surfaces 1.1 Define refractive index in term so velocities of light in vacuum and in a medium. 1.2 List the use of spherometer. 1.3 Describe the application of total internal reflection in the construction of the following: Submarine periscope, binoculars, optical fiber and kaleidoscopes. 1.4 Determine the focal length of two thin lenses in contact using the formula: $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$ 1.5 Explain defects of lenses (spherical and chromatic aberration) and their corrections.	Explain refractive index in term so velocities of light in vacuum and in a medium. Explain the use of spherometer. Explain the application of total internal reflection in the construction of the following: Submarine periscope, binoculars, optical fiber and kaleidoscopes. Determine the focal length of two thin lenses in contact using the formula:	Classroom Resources. Sphceromete r Piece of plane glass, convex mirror. Concave mirror, liquid, retort test and. Clamp Pin, meter rule $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$	Determine the Radius of curvature of a convex mirror using a spheromete Determine the refractive index of liquid using a concave mirror.	Assist Students in performing a n experiment to determine the radius of Curvature of a Convex mirror using a spherometer. Students should perform an Experiment to determine refractive index of liquid using a concave mirror.	Define refractive index in term so velocities of light in vacuum and in a medium. Explain the use of spheromete r

4-6	<p>Identify focal length of a convex lens by the displacement method.</p> <p>Determine the focal length and position of a lens mounted in an inaccessible position inside a tube.</p> <p>Determination of (i) glass, Liquid using a travelling microscope.</p>	<p>Explain focal length of a convex lens by the displacement method.</p> <p>Explain determination of the focal length and position of a lens mounted in an inaccessible position inside a tube.</p> <p>Determination of (i) glass, Liquid using a travelling microscope</p>	<p>rule, convex Lens, stands and screen.</p> <p>Light box, screen, cardboard tube with lens inside and having window both ends.</p>	<p>Determine The focal length of a convex lens by the displacement method.</p> <p>Determine thefocallength andpositionofa lensmountedin aninaccessible positioninside atube.</p> <p>Determination of (ii)glass, (iii) L iquid using a travelling microscop e.</p>	<p>Experiment to determine the focal length of a convex lens by the displaceme nt method.</p> <p>Students should perform an experiment to determine the focal length and position of a lens mounted in an in accessible position in side a tube.</p> <p>Perform experiment to determine</p>	<p>Travelling microscope with vernier scale, glass block, tank with glass sides lycopodium m powder finesand.</p>
General Objective 2.0: Understand the working principles of optical instruments.						
Optical Instruments and Human Eye 2.1 Explain the magnifying action of lens		Explain the magnifying action of	Classroom resources			

7-8	<p>2.2 Illustrate the expression for angular magnification of a lens</p> <p>2.3 Explain the working of:</p> <ul style="list-style-type: none"> ii) Simple microscope iii) Compound microscope iv) Astronomical telescope v) Galilean telescope vi) Terrestrial telescope 	<p>2.2 Write expression for angular magnification of a lens</p> <p>2.3 Explain the working of:</p> <ul style="list-style-type: none"> ii) Simple microscope 	Microscope	Demonstrate the use of microscope	use the microscope to view minute particles.	Write short note on the following: vii) viii) S C
9-11	<p>2.4 Explain the magnifying power of optical instruments in 2.3 above.</p> <p>2.5 Calculate the magnifying power of the optical instruments in 2.3 above.</p> <p>2.6 Describe the working of a spectrometer.</p> <p>2.7 Explain the defects of the eye and their correction.</p> <p>2.8 Calculate the magnifying power, angular magnification of optical instruments.</p> <p>2.9 Calculate the focal lengths of the objective and eye lenses of a compound microscope given the magnification and other necessary parameters.</p>	<p>Solve simple numerical problems to Explain the magnifying power of optical instruments in 2.3 above.</p> <p>Calculate the magnifying power of the optical instruments in 2.3 above</p>	<p>Compound Microscope, unsilvered glass plate, two millimeter scales (mounted white paper scales are suitable).</p> <p>Spectrometer</p>	<p>Determine the magnifying power of a microscope.</p> <p>Demonstrate the use of the spectrometer</p> <p>Measure angle of deviation, minimum deviation angle of a prism using spectrometer.</p>	<p>Determine the magnifying power of a microscope</p> <p>demonstrate the use of spectrometer</p> <p>Students should measure angle of deviation, minimum deviation angle of a</p>	<p>Explain the magnifying power of optical Instruments in.</p>

	GeneralObjective3.0: Understand the basic concepts of photometry.					
12-13	Photometry 3.1 Define radiant power, radiant flux ,luminous flux 3.2 Define luminance, luminance and luminous intensity 3.3 Describe the international standard source of light. 3.4 Define solid angle 3.5 Define luminous efficiency. 3.6 State the relationship between luminance and luminous flux; luminous intensity and luminous flux. 3.7 State cosine law and inverse square law	Explain radiant power, radiant flux ,luminous flux Define luminance, luminance and luminous intensity International standard source of light. solid angle Luminous efficiency. State the relationship between luminance and luminous flux; luminous intensity and luminous flux. State cosine law and inverse	Classroom Resources Light sources Of different intensities, meter rule, photometer.	Compare light Intensities.	Compare light intensities using photometer.	Define radiant power, radiant flux ,luminous flux Define luminance, luminance and luminous intensity
	GeneralObjective4.0: Understand the phenomenon of wave, optics and sound waves.					
14	4.1 Explain sound waves in air columns and waves in Strings. 4.2 Define resonance. 4.3 List examples of resonance in other physical events. 4.4 Identify the factors that affect the velocity of sound waves in pipes. 4.5 Establish the relationship between the frequency of waves in a straight string and the length and tension: $F = \frac{1}{2L} \sqrt{\frac{T}{M}}$ Where f=Frequency T=Tension	Describe sound waves in air columns and waves in Strings. Define resonance. List examples of resonance in other physical events. Identify the factors that affect the velocity of sound waves in pipes. Establish the relationship between the frequency of waves in a straight string and the length and tension: $F = \frac{1}{2L} \sqrt{\frac{T}{M}}$	Classroom Resources Glass resonance tube about 100cm long and 3cm in diameter, candle lamp, rubber bung, set of tuning forks of frequency range	Determine Experimentally the velocity of sound in air using a resonance tube.	Perform the experiment to determine experimentally the velocity of sound in air using a resonance tube.	Define resonance. List examples of resonance in other physical events. Identify the factors
	4.6 Explain what is meant by Doppler effect 4.7 List examples of Doppler effect in sound and light. 4.8 Explain the terms:-	4.9 Explain what is meant by Doppler effect 4.10 List examples of Doppler effect in sound and light. Explain the terms	Classroom Resources Sonometer, Length of steel of	Determination Of the frequency of a tuning fork	Determine by experiment the	Explain what is meant by Doppler effect

15	<p>i) Reflection ii) Refraction iii) Superposition iv) Interference and diffraction as they relate to waves.</p> <p>4.9 State the conditions necessary for interference and to occur. 4.10 Explain the term beat. 4.11 Determine beat frequency 4.12 Explain the electromagnetic spectrum in relation to wave lengths and frequency. 4.13 Distinguish between emission and absorption of waves.</p>	<p>v) Reflection vi) Refraction vii) Superposition viii) Interference and diffraction as they relate to waves.</p> <p>State the conditions necessary for interference and to occur. Explain the term beat. Determine beat frequency Explain the electromagnetic spectrum in relation to wave lengths and frequency. Distinguish between emission and absorption of waves</p>	<p>About half millimeter , supporting hook and set of slotted five Newton weights, tuning folk, and micrometer screw gauge</p> <p>Ripple tank..</p>	<p>Using a sonometer. Demonstration of reflection, refraction, superposition, interference and diffraction using a ripple tank.</p>	<p>Frequency of a Tuning fork using a sonometer The teacher should demonstrate reflection, refraction, superposition, interference and diffraction using a ripple tank.</p>	<p>Explain the electromagnetic spectrum in relation to wave lengths and frequency. Distinguish between emission and absorption of waves.</p>
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	Department/ Programme: National Diploma	Course Code:		Credit Hours:
	Course: General Principles of Chemistry	STC 111		Theoretical: hours/week 2
	Year:	Semester:	Pre-requisite:	Practical: hours/week3

1 GOAL: This Course Is Designed to acquaint the students with the knowledge of atoms molecules, composition and structure in the periodic table

General Objectives

1. Understand atoms molecules, composition and structure
2. Understand the arrangement of elements in the periodic table
3. Understand chemical thermodynamics
4. Understand the properties and reactions of acids, bases and salts
5. Understand the fundamental concept of oxidation and reduction reactions
 6. Understand surface phenomena and colloidal systems
 7. Understand chemical equilibrium

	Course: Insurance National Diploma	CourseCode: STC111		Credit Hours:		
	General Principles of Chemistry			Theoretical:2 hours/week		
	Year:	Semester:	Pre-requisite:		Practical:3 hours/week	
	Theoretical			Practical Content		
	GeneralObjective1: Understandatoms,molecules,compositionandstructure					
Week /s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning	Teacher's activities	Evaluation

1	<p>1.1 Explain the experimental basis of atomic theory using the Bohr's theory of hydrogen atom and many electron atoms.</p> <p>1.2 Describe atomic spectra particularly the Hα emission spectrum</p>	<p>Explain the experimental basis of atomic theory using the Bohr's theory of hydrogen atom and many electron atoms. Describe atomic spectra particularly the Hα emission spectrum</p> <p>Discuss, qualitatively, the Energy States of the hydrogen atom in the Bohr model</p>	<p>Black board Chalk Molecular models Direct vision spectroscop</p>	<p>View the visible emission spectra of several metals in some of their compounds</p>	<p>Guide and supervise lab technicians and students</p>	<p>Explain the experimental basis of atomic theory using the Bohr's theory of hydrogen atom and many electron atoms</p>
2	<p>1.3 Discuss, qualitatively, the Energy States of the hydrogen atom in the Bohr model</p> <p>1.4 Relate these Energy States to the observed emission spectra</p> <p>1.5 Explain the limitations of the Bohr model</p> <p>1.6 Describe the wave-particle duality of electrons and energy</p> <p>1.7 State the different main energy levels of an atom, name lyK, L, M...</p> <p>1.8 Correlate the energies of the electron in the K, L, M, N, ... shells with the values of the principal quantum non=1,2,3,4,.....</p> <p>1.9 Relate the lines of the hydrogen emission Spectrum to electronic energy level.</p>	<p>Relate these Energy States to the observed emission spectra Explain the limitations of the Bohr model Describe the wave-particle duality of electrons and energy</p> <p>State the different main energy levels of an atom, name lyK, L, M...</p> <p>1.11 Correlate the energies of the electron in the K, L, M, N, ... shells with the values of the principal quantum non=1,2,3,4,.....</p> <p>Relate the lines of the</p>	<p>Bunsen burner, nichrome wire fixed to a cork handle, conc HCl solid chlorides of: barium, calcium, potassium, sodium and strontium beakers and watch glasses</p>	<p>Interpret the mass spectrum of representative elements such as Oxygen, Carbon, Chlorine etc.</p>		

	<p>1.11 Explain 1.10 above in relation to the concept of Orbitals including subsidiary energy levels(s,p,d,f orbitals).</p> <p>1.12 Explain the significance of the four quantum numbers</p>	<p>Explain 1.10 above in relation to the concept of Orbitals including subsidiary energy levels(s,p,d,f orbitals).</p> <p>Explain the significance</p>				
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<p>3</p> <p>4</p>	<p>1.14 Describe the determination of relative atomic and Molecular masses.</p> <p>1.15 Explain isotopes and their use Describe the use of mass spectrometer as a means of proving the existence of isotopes.</p> <p>1.16 Define the following: (i) Atomic number (ii) Mass number (iii) Atomic mass Based on ^{12}C</p> <p>1.17 Explain valency and chemical bonding.</p> <p>1.18 Explain the octet and duplet rules</p> <p>1.19 Distinguish between the following types of bonds: ionic; covalent; metallic, co-ordination bond.</p> <p>1.20 Understand energy considerations in ionic bonding and lattice energy</p> <p>1.21 Understand the formation of covalent bonds, bond length and bond energy, electronegativity and bond polarity.</p>	<p>Explain the determination of relative atomic and Molecular masses.</p> <p>Explain isotopes and their use Describe the use of mass spectrometer as a means of proving the existence of isotopes.</p> <p>Define the following: (i) Atomic number (ii) Mass number (iii) Atomic mass Based on ^{12}C</p> <p>Explain valency and chemical bonding.</p> <p>Explain the octet and duplet rules</p> <p>Distinguish between the following types of bonds: ionic; covalent; metallic, co-ordination bond</p> <p>Understand energy considerations in ionic bonding and lattice energy</p> <p>Understand the formation of covalent bonds, bond length and bond energy, electronegativity and bond polarity,</p> <p>Explain Vander Waal's forces</p>	<p>Classroom resources Workshop Resource sand representative mass spectra</p> <p>iron, Sulphur, Bunsen burner, glass ware, magnets</p>	<p>Separate a Mixture of sand and salt and relate the results to the different types of bonding in each</p> <p>Prepare iron sulphide from iron and sulphur</p>	<p>Provide Spectra and guide students through the interpretation</p>	
<p>General Objectives: 2.0 Understand the arrangement of elements in the periodic table</p>						

5	<p>2.1 Discuss the development of the periodic table</p> <p>2.2 Describe building up periods I and II</p> <p>2.3 Describe building up period III</p> <p>2.4 Describe electron configurations within groups</p> <p>2.5 Describe the first d-orbital transition series; building up period IV</p> <p>2.6 Discuss the non-metallic elements</p> <p>2.7 Discuss the Noble Gases</p> <p>2.8 Write down electronic configuration for the first</p>	<p>Explain the development of the periodic table</p> <p>Describe building up periods I and II</p> <p>building up period III</p> <p>electron configurations within groups</p> <p>Describe the first d-orbital transition series; building up period IV</p> <p>Discuss the non-metallic elements</p> <p>Discuss the Noble Gases</p> <p>Write down electronic configuration for the first</p>	<p>Classroom resources</p> <p>Mg, Ca, Sr, Ba, water, dilute hydrochloric acid test tubes etc</p>	<p>Investigate the reactivity of group 2 metals</p> <p>(i) Mg, Ca, Sr, and Ba with water</p> <p>(ii) Mg and Ca with dilute HCl</p> <p>Reactivity of transition metals-</p>	<p>Guide Students to Investigate the reactivity of group 2 metals</p> <p>Mg, Ca, Sr, and Ba</p> <p>Reactivity of transition metals-</p>	
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6	<p>Twenty elements of the periodic table.</p> <p>2.9 Relate electron configuration to the position in the periodic table.</p> <p>2.10 Describe trends in the Periodic Table such as atomic size, ionization energy, electron affinity, reactivity.</p> <p>2.11 Describe diagonal relationships</p>	<p>Twenty elements of the periodic table.</p> <p>Relate electron configuration to the position in the periodic table.</p> <p>Describe trends in the Periodic Table such as atomic size, ionization energy, electron affinity, reactivity.</p> <p>Describe diagonal relationships</p>	Copper foil, tongs, Bunsen			
General Objective3: Understand chemical Thermodynamics						
7	<p>3.1 Describe thermodynamic systems e.g. open system, closed system, isolated system.</p> <p>3.2 Explain thermodynamic functions enthalpy, entropy, free energy.</p> <p>3.3 Explain the first and second laws of thermodynamics and their significance.</p> <p>3.4 Explain thermo chemistry as heat effects that accompany chemical reactions</p>	<p>Explain thermodynamic systems e.g. open system, closed system, isolated system.</p> <p>Explain thermodynamic functions enthalpy, entropy, free energy.</p> <p>Explain the first and second laws of thermodyna</p>	Chemicals Calorimeter Glass ware etc.	Measure heat of Reaction by simple experiments e.g. heat of neutralization NaOH, HCl of acid and strong base.	Supervise and guide students in the laboratory	

General Objective 4: Understand the properties and reactions of acid, bases and salts.						
8	<p>4.1 Define an acid and a base according to Arrhenius, Bronsted–Lowry and Lewis concepts.</p> <p>4.2 Identify acids and bases in chemistry equations.</p> <p>4.3 Explain the meaning of the terms conjugates acid and conjugate base</p> <p>4.4 Distinguish between a strong and weak acid or base.</p> <p>4.5 Write the expression for the dissociation constant for an acid HA(aq)</p> <p>4.6 Give the equation for the degree of dissociation and concentration, M. (mole dm^{-3}) for a dilute solution of a weak acid.</p> <p>4.7 Explain Ostwald's Dilution law and</p>	<p>Define acid, bases and salts and teach to identify them in equations</p> <p>Explain dissociation constant and derive expression for it</p> <p>Work out simple</p>	<p>Chemicals</p> <p>Conductance meters</p> <p>pH meters</p> <p>colour charts</p> <p>indicators</p> <p>burettes</p> <p>glassware</p>	<p>Carry out acid base titration by using conductance meter</p> <p>Identify indicators and use indicators in acid base titration</p>	<p>Guide students</p>	<p>Define an acid and a base according to Arrhenius, Bronsted–Lowry and Lewis concepts.</p>

9	<p>4.10 Explain the concept of hydrogen ion concentration and pH</p> <p>4.11 Calculate the pH value of an acid or base given the hydrogen ion concentration</p> <p>4.15 Identify various types of indicators and the use in the measurement of pH.</p>	<p>Explain the concept of hydrogen ion concentration and pH</p> <p>Calculate the pH value of an acid or base given the hydrogen ion concentration</p> <p>Identify various types of indicators and the use in the measurement of pH.</p>	<p>Chemicals</p> <p>Conductance meters</p> <p>pH meters</p> <p>color charts</p> <p>indicators</p> <p>burettes</p> <p>glassware</p>	<p>Measure the pH of solutions by using color charts, indicators and pH meter</p> <p>Determine experimentally the strengths of acids and bases in relation to structure & in these</p>	<p>Measure the pH of solutions by using color charts, indicators and pH meter</p> <p>Determine experimentally the strengths of acids and bases</p>	<p>Explain the concept of hydrogen ion concentration and pH</p>
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10	<p>4.16 Define the terms ,pka and pkb</p> <p>4.17 State the Henderson Hasslebach equation</p> <p>4.18 Use the Henderson Hassleback equation</p> <p>4.19 Describe factors that affect a weak acid in a solution where the pH=of the acid, the acid is50%ionised.</p> <p>4.20 Define the terms, buffer solution and buffer capacity</p>	<p>Define the terms ,pka and pkb</p> <p>State the Henderson Hasslebach equation</p> <p>Use the Henderson Hassleback equation</p> <p>Understand that for a weak acid in a solution where the pH=of the acid, the acid is50%ionised.</p> <p>Define the terms, buffer solution and buffer capacity</p>	<p>Test tubes chemicals and burette for back titrations</p>	<p>Measure pKa of a weak acid via titration</p>	<p>Teacher supervises students in Titration of a weak acid by using a strong base. Plot the results and observe there gion of buffering and the end point.</p>	<p>Describe factors that affect a weak acid in a solution where the pH=of the acid, the acid is50%i onised. Defin e the terms</p>
11	<p>4.21 Explain the effectiveness of a buffer solution.</p> <p>4.22 Describe buffers in Biochemistry and Medicine (e.g. blood, and biochemical experiments)</p> <p>4.23 Explain the hydrolysis of salts</p> <p>4.12 Explain common ion effect.</p> <p>4,14 Explain the solubility product and its application in quantitative and volumetric analysis.</p> <p>4.24 Calculate the value of the solubility product given the solubility of sparingly soluble salt.</p>	<p>Explain the effectiveness of a buffer solution.</p> <p>Describe buffers in Biochemistry and Medicine (e.g. blood, and biochemical experiments)</p> <p>Explain the hydrolysis of salts</p> <p>Explain common ion effect.</p> <p>Explain the solubility product and its application in quantitative and volumetric analysis.</p>		<p>Titrate a weak acid by using a strong base. Plot the results and observe there gion of buffering and the end point.</p> <p>Calculate the solubility product of silver acetate in water and solutions of varying concentrations of sodium nitrate.</p>	<p>Calculate the solubility product of silver acetate in water and</p>	<p>where the pH=of the acid, the acid is50%i onised. Defin e the terms ? buffe r soluti on and buffe r conc</p>

General Objectives: 5.0 Understand the fundamental concept of oxidation and reduction reactions.						
12	<p>5.1 Explain:</p> <p>(a) Oxidation reaction</p> <p>(b) Reduction reaction</p> <p>5.2 Explain the oxidation and reduction reactions in terms of electron transfer</p> <p>5.3 List some oxidizing and reducing agents.</p> <p>5.4 State the periodicity of oxidation state of the elements.</p> <p>5.5 State half ionic equation involving in oxidation reaction.</p>	<p>Explain redox reactions and interims of electron transfer</p> <p>State half ionic equation in oxidation and</p>	<p>Titration apparatus and chemicals</p>	<p>Carry out redox titration's by using potassium permanganate</p>	<p>Supervise students in the laboratory to carry out redox titration's by using potassium</p>	<p>Explain:</p> <p>(a) O</p> <p>(b) R</p>
General Objective 6: Understand surface phenomena and colloidal systems						
13	<p>6.1 Surface Phenomena and colloidal Systems.</p> <p>6.2 Explain the following surface phenomena</p> <p>(a) Colloidal gels</p> <p>(b) surface tension</p> <p>(c) absorption, (d) emulsion (e) gels</p> <p>(f) flotation (g) chromatography</p> <p>6.3 Differentiate between adsorption and absorption.</p>	<p>Surface Phenomena and colloidal Systems.</p> <p>Explain the following surface phenomena</p> <p>(b) Colloidal gels</p> <p>(b) surface tension</p> <p>(c) absorption, (d) emulsion (e) gels</p> <p>(f) flotation (g) chromatography</p> <p>Differentiate between adsorption</p>	<p>Finely cut leaves, chromatography paper, propanone, beaker, lid, glass rod or pencil</p>	<p>Carry out redox titration's by using potassium permanganate Chromatography of leaves</p>	<p>Guide students Carry out redox titration's by using potassium permanganate Chromatography of leaves</p>	<p>Explain the following surface phenomena Colloidal gels</p>

14	6.4 Define Ion-Exchange 6.3 Distinguish between cation and anion exchange processes. 6.4 Describe the applications of ion-	Define Ion-Exchange Distinguish between cation and anion exchange processes. Describe the applications of ion-exchange.	Ion-exchange chromatography	Purify hard water using ion-exchange chromatography	Guide students in the laboratory to Purify	Distinguish between cation and anion exchange
General Objective 7.0 Understand chemical equilibrium						
15	7.1 Explain chemical equilibrium 7.2 State the factors affecting chemical equilibrium 7.3 Explain reversible reaction in relation to chemical equilibrium	Explain chemical equilibrium State the factors affecting chemical equilibrium Explain reversible reaction in relation to chemical equilibrium	Test tubes, gloves, potassium chromate,	Investigation of The effect of concentration changes on	Guide Students to Investigation of The effect of concentration changes on	State the factors affecting chemical equilibrium

	<p>7.4 Explain Le Chatellier's principle 7.5 Define equilibrium constant 7.6 Explain the law of mass action 7.7 Calculate concentrations present in equilibrium mixture at given temperature starting from any given amounts of reactants and products.</p>	<p>Explain Le Chatellier's principle Define equilibrium constant Explain the law of mass action Calculate concentrations present in equilibrium mixture at given temperature starting from any given amounts of reactants and products.</p>	<p>sulphuric acid, NaOH, potassium or ammonium thiocyanate, iron III chloride ammonium chloride, glass rod, teat pipettes</p>			
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Department/Programme: ND OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: EED 126	Contact Hours: 1 – 0 - 2
Subject/Course: Introduction to Entrepreneurship		Theory: 1 hours/week
Year: ND I Semester: 3rd	Pre-requisite:	Practical: 2 hours/week
<p>General Objectives:</p> <p>On completion of the course, the student should:</p> <ol style="list-style-type: none"> 1. Understand the meaning and scope of Enterprise and Entrepreneurship 2. Understand the history and Government Policy measures at promoting Entrepreneurship in Nigeria 3. Understand the types, characteristics and rationale of Entrepreneurship 4. Understand the role of Entrepreneurship in economic development 5. Understand Entrepreneurial characteristics and attitude 6. Understand the key competencies and determining factors for success in Entrepreneurship 7. Know the motivational pattern of Entrepreneurs 		

DEPARTMENT/PROGRAMME: ND OCEANOGRAPHY AND FISHERY SCIENCE						
COURSE: Introduction to Entrepreneurship		Course Code: EED 126		Contact Hours: 1 – 0 - 2		
GOAL: This course is designed to enable students acquire the necessary Entrepreneurship skills to be self reliant.						
Theoretical Content				Practical Content		
General Objective 1: Understand the meaning and scope of Enterprise and Entrepreneurship						
Week	Specific Learning Outcomes	Teacher’s Activities	Resources	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1-2	1.1 Define an Enterprise in its narrower and wider contexts. 1.2 Explain different forms of Enterprises 1.3 Classify the different forms of enterprises into small, medium and large enterprises. 1.4 Explain the terms: Entrepreneur, Entrepreneurship, Wage Employment, Self Employment 1.5 Explain clearly	Explain the terms: Enterprise, Entrepreneur, Entrepreneurship List the different types of enterprises and group them into small, medium and large enterprises. Compare and Contrast wage employment and self-employment. Explain clearly the business terrain in Nigeria	Instructional Manual. Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	Identify features of the types of enterprises identified. Identify the facilities and opportunities available for self employment. Identify successful entrepreneurs in Nigeria.	Guide students to research into different forms of enterprises. Guide students to research and identify criteria for successful entrepreneurship.	Successful Entrepreneur to speak on the role and importance of Entrepreneurship Use of internet and relevant video clips

	the business terrain in Nigeria			Evaluate the role of entrepreneurship in wealth creation.	Establish competitive groups. Students to make formal presentations of their findings. Students to undertake enquiry learning on selected entrepreneur and enterprise	
Theoretical Content				Practical Content		
General Objective 2: Understand the History and Government Policy measures at promoting Entrepreneurship in Nigeria						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific learning Outcomes	Teacher's Activities	Evaluation
	2.1 Trace the evolution of	Explain the historical	Text	Obtain the required	Guide students to	

3-4	entrepreneurship development	development and role of entrepreneurship in the development of enterprises in Nigeria. Compare Entrepreneurship in Nigeria with other countries of the world. Japan, India, China, Malaysia, South Korea etc.	Books Internet Journals Publications Video Film TV & VCR	information from the net.	search the web for the historical evolution of entrepreneurship in other parts of the world Research and list various Government Measures on SME's and Industrial Development from 1960 to date.	
	2.2 Compare Entrepreneurship in Nigeria with Japan, India, China, Malaysia, South Korea etc.	2.3 Explain Nigeria's values in relation to Entrepreneurship.	2.4 Describe the role of Entrepreneurship in the development of enterprises.			
Theoretical Content				Practical Content		
General Objective 3: Understand the types, characteristics and rationale of Entrepreneurship						
	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation

Week						
5-6	<p>3.1 Explain types of Entrepreneurs and their characteristics</p> <p>3.2 Compare and contrast Technological and Social Entrepreneurship.</p> <p>3.3 Identify the different types of Entrepreneurs: self employed, Opportunistic, Inventors, Pattern multipliers etc.</p> <p>3.4 Identify the role of Entrepreneurship in business, society and in self employment.</p>	<p>Explain types of Entrepreneurs.</p> <p>Explain types of Entrepreneurship</p> <p>Explain features of Entrepreneurship in business.</p> <p>Explain the rewards and efforts of Entrepreneurship in business.</p> <p>Describe the different types of Entrepreneurs.</p> <p>Describe the role of entrepreneurship in business, society employment generation and wealth creation.</p> <p>Explain the</p>	<p>Text Books, K.A.B</p> <p>Internet</p> <p>Textbooks</p> <p>Journals</p> <p>Publications</p> <p>Video Film</p> <p>TV & VCR</p>	<p>Analyze life situations people may find themselves in.</p> <p>Enumerate the benefits to be derived from the above situation.</p>	<p>Guide students to identify opportunities from the environment.</p>	

		benefits of self employment.				
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Theoretical Content				Practical Content		
General Objective 4: Understand the role of Entrepreneurship in economic development.						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
7-8	<p>4.1 Identify resources and constraints of Entrepreneurship</p> <p>4.2 Explain how Entrepreneurship leads to import substitution and utilization of local resources.</p> <p>4.3 Explain how Entrepreneurship leads to socio-economic development</p>	<p>Explain resources and constraints of an Entrepreneur.</p> <p>Relate import substitution to utilization of local resources.</p> <p>Explain equitable distribution of industries and the role of entrepreneurship.</p> <p>Explain how entrepreneurship leads to job creation.</p>	<p>Text Books</p> <p>Journals</p> <p>Publications</p> <p>Video Film</p> <p>Computer or Overhead Projector</p> <p>SME's</p>	<p>Classify the resources into economic, human, knowledge and time.</p> <p>Distinguish between economic development and economic growth</p>	<p>Show transparency of the resources needed by an entrepreneur.</p> <p>Guide students to visit selected enterprise/community projects.</p>	<p>Identify resources and constraints of Entrepreneurship</p> <p>Explain how Entrepreneurship leads to import substitution and utilization of local resources.</p>

	4.4.Explain the role of an entrepreneur in grassroots / local economic development		TV & VCR		Guide students on the use of local raw materials for value addition.	
Theoretical Content				Practical Content		
General Objective 5: Understand Entrepreneurial Characteristics and Attitudes						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation

<p style="text-align: center;">9-11</p>	<p>5.1 Explain the philosophy, values, scope, need and characteristic of Entrepreneurship.</p> <p>5.2 Explain the profiles of local Entrepreneurs.</p> <p>5.3 Demonstrate high sense of innovation, creativity and independence.</p> <p>5.4 Explain the process of acquiring high sense of information seeking and ability in operating an enterprise.</p> <p>5.5 Identify various risks and remedies involved in operating an</p>	<p>Using slide or PowerPoint explain personal characteristics and attitude of an Entrepreneur</p> <p>List Entrepreneurial traits citing relevant cases.</p> <p>Explain the aspiration, determination and efficiency of an Entrepreneur.</p> <p>Explain how to demonstrate high sense of innovation, creativity and independence. Describe how to evaluate a private project. Describe how to mobilize resources for establishing an enterprise. Describe how to</p>	<p>Text books</p> <p>Journals</p> <p>Computer</p> <p>Projector</p> <p>Guest speakers (Female/Male)</p> <p>Internet search.</p>	<p>Evaluate the opportunities identifying corresponding self employment opportunities.</p> <p>Evaluate a project considering its resources: management of time, personnel, equipment and money.</p> <p>Explain constraints and problem solving techniques.</p>	<p>Guide students to identify as many job/ employment opportunities as possible.</p> <p>Guide students to visit a successful enterprise, and evaluate its resources to identify its contribution to economy, its internal and external constraints and available problem solving techniques.</p> <p>Group students to survey and interview Entrepreneurs.</p>	<p>Explain the philosophy, values, scope, need and characteristic of Entrepreneurship.</p> <p>Evaluate a project considering its resources: management of time, personnel, equipment and money.</p>
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	<p>enterprise.</p> <p>5.6 Evaluate pilot project considering resources, time, personnel, equipment, money, materials etc.</p> <p>5.7 Demonstrate leadership and leadership skills by mobilizing resources for establishing an enterprise.</p> <p>5.8 Demonstrate high level problem solving techniques in overcoming internal and external constraints.</p>	<p>solve problems involving internal and external constraints.</p>			<p>Evaluate a sample project with the students, then give them assignment to assess one.</p>	
Theoretical Content				Practical Content		
General Objective 6: Understand the key competencies and determining factors for success in Entrepreneurship						
	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning	Teacher's Activities	Evaluation

Week				Outcomes			
12-13	6.1 Identify the key competencies required in setting up a successful small business; Knowledge, Skill and Traits.	Explain major competencies required for successful Entrepreneurship	Text Books Computer and accessories, internet and visitations.	Describe: Data collection about self, Who am I (personal efficacy) Rating of concept, Self knowledge.	Guide student to demonstrate knowledge of themselves, goals, Entrepreneurship strengths and weaknesses.	Identify the key competencies required in setting up a successful small business; Knowledge, Skill and Traits.	
	6.2 Identify key success factors in setting up a small business; Resources, Ability, Motivation and Determination, Idea and Market etc.	Explain key success factors in setting up small business.	Blocks	Play a relevant business game and observe the behavioral pattern in relation to moderate risk taking, goal setting etc.	Give practical assignment to students on personal efficacy, goal and link to Entrepreneurship strength and weaknesses.	Identify key success factors in setting up a small business; Resources, Ability, Motivation and Determination, Idea and Market etc.	
	6.3 Define individual life goal and link it to Entrepreneurship.	Explain individual life goal of an Entrepreneur.	Rings	Papers	Identify core skills, competencies, and success factors required for entrepreneurship.	Demonstrate how to play business game.	
	6.4 Identify the strengths and weaknesses in 6.3 above.	Explain relevant business games and their behavioral patterns.	Journals	Publications	Visit a small business enterprise.		
	6.5 Explain business games.		Video Film	TV & VCR			

	6.6 Explain the behavioral pattern observed in 6.5 above on: Moderate risk taking, Goal setting, Learning from feed back, Taking personal responsibility, Confidence and self reliance.					
Theoretical Content				Practical Content		
General Objective 7: Know the motivational pattern of Entrepreneurs						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	7.1 Define motivation. 7.2 List the objectives of motivation. 7.3 Identify barriers to motivation and achievement.	I Explain motivation, objectives, merit and demerit. II Explain TAT scores. III Explain how to carryout	Text Books Journals Publications Computer and internet facilities.	Analyze motive strength from TAT score using a given case.	Illustrate how to carryout analysis on motive strength from TAT scores using related case studies.	

<p>14-15</p>	<p>7.4 Explain Thematic Appreciation Test (TAT) scores.</p> <p>7.5 Explain how to analyze motive strength from TAT score.</p> <p>7.6 Explain the spirit of Achievement Motivation Test (AMT)</p>	<p>analysis on motive strength from TAT scores.</p> <p>Explain spirit of AMT</p>				
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ASSESSMENT: The continuous assessment, tests and quizzes will be awarded 40% of the total score. The end of the Semester Examination will make up for the remaining 60% of the total score.

<p>Department/Programme: ND Oceanography and Fishery Science</p>	<p>Course Code: EED 216</p>	<p>Contact Hours: 1 – 0 - 2</p>
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Subject/Course: Practice of Entrepreneurship		Theory: 1 hours/week
Year: ND II Semester: 4th	Pre-requisite:	Practical: 2 hours/week
<p>General Objectives</p> <p>On completion of the course, the student should:</p> <ol style="list-style-type: none"> 1. Know techniques for generating business ideas and the process of identifying and assessing business opportunities 2. Know how to evaluate a business idea for developing an enterprise 3. Know methods of product/service selection 4. Understand the process and procedure for starting an Enterprise 5. Know the operational techniques in managing an Enterprise 6. Understand the various existing industries and support agencies in Nigeria 7. Appreciate the role of commercial and development banks in small and medium scale industries development 8. Understand the role of personal savings and portfolio investment in National Economic Development 		

Code: EED 216

Credit Hour: 1 – 0 - 2

	Pre-requisite: Intro to Entrepreneurship	Theoretical: 1 hours/week - %
		Practical : 2 hours/week - %
oretical Content	Practical Content	

the process of identifying and assessing business opportunities

	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	1.1 Define business opportunity. 1.2 State the process of exploring opportunities. 1.3 Identify business opportunities(SWOT Analysis) 1.4 State the process of conducting a market survey in other to establish demand/supply gap. 1.5 State the process of business idea generation. Discribe process of Setting setting up a	I. Explain business opportunities and process of exploring them. Explain the process of product/service selection. Explain SWOT Analysis and how to identify business opportunities. Explain the process of conducting market survey and selecting a viable business venture. Explain the process of business idea	Text Books, Journals. Computer Text Books, Use of internet and relevant video clips. Guest speakers from successful businesses.	Identify business opportunities using SWOT Analysis. Conduct market survey and select the most viable business venture.	Guide students to identify business opportunities using SWOT Analysis Guide students to conduct market survey to enable them select the most viable business venture. Demonstrate using appropriate application package, product selection, product tracking, order tracking etc.	State the process of conducting a market survey in other to establish demand/supply gap.

<p>small business enterprise.</p> <p>Invite a successful entrepreneur to give a talk on feasible business plan.</p>	<p>generation.</p> <p>Set up student groups with the task of setting up a small business enterprise.</p> <p>Invite a successful entrepreneur to give a talk.</p> <p>Make the student/group generate his/their viable business idea which would further be subjected to feasible business plan.</p>		<p>Set up a small business enterprise</p>	<p>Set up student groups with the task of setting up a small business enterprise.</p> <p>Invite a successful entrepreneur to give a talk.</p> <p>Make the student/group generate his/their viable business idea which would further be subjected to feasible business plan.</p>	
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Theoretical Content	Practical Content
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Business Enterprise

Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
<p>2.1 Define the concept of business plan.</p> <p>2.2 Explain the process of</p>	<p>Explain business idea.</p> <p>Explain the concept of business plan</p>	<p>Textbooks.</p> <p>Journey</p> <p>Projector (mm)</p>	<p>Prepare a preliminary project proposal.</p> <p>Students groups</p>	<p>Guide students in preparing a preliminary project proposal.</p>	

<p>preparing preliminary project proposal.</p> <p>2.3 Explain the process of preparing a detailed business plan.</p> <p>2.4 Conduct a model business plan on a selected venture.</p>	<p>and project proposal. Relate business idea to business plan and project proposal.</p> <p>Describe the steps in preparing a model business plan.</p>	<p>Computer complete with accessories and D base, Internet connection.</p> <p>Textbooks.</p>	<p>to set up a small business enterprise with an initial capital of N10,000 at least.</p> <p>Conduct a modest business plan on a selected venture.</p> <p>Present the plan to a panel of successful entrepreneur for assessment.</p> <p>Explore Internet for company profile, product catalogue, product information, URL management.</p> <p>Conduct a model business plan on a selected venture.</p>	<p>Using the ongoing business project guide students to complete a business plan and present it to a panel of successful entrepreneurs, the plan should consider sale forecast, time sheet analysis, employee tracking, loan amortization etc.</p> <p>Explore Internet for company profile, product catalogue, product information, URL management.</p> <p>The written business plan should be assessed as part of continuous</p>	
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					assessment	
Theoretical Content				Practical Content		
	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>3.1 Define product /service.</p> <p>3.2 Explain the nature and characteristics of product/service.</p> <p>3.3 Explain product selection criteria.</p> <p>3.4 Identify key factors associated with product selection.</p> <ul style="list-style-type: none"> - Infrastructure - Technology - Availability of raw material. - Government Policy/Regulation -Legal aspects of business. 	<p>Explain product selection, criteria and factors associated with selection.</p> <p>Explain venture idea generation.</p> <p>Explain steps involved in preliminary screening.</p> <p>Explain steps in preparing pre-feasibility study.</p> <p>V. Explain the adequacy of infrastructural facilities, relevant technology and adequacy of raw materials for the</p>	<p>Text Books</p> <p>Journals</p> <p>Publications</p> <p>Projector (mm)</p>	<p>Analyze a given case in product selection.</p> <p>Select a product</p> <p>Prepare a feasibility report on a modern business and evaluate the viability, methodology and CBA. (Cost Benefit Analysis)</p> <p>Generate venture idea on selected exportable product obtained from the web.</p> <p>Write a report on</p>	<p>Guide students to analyze a case in product selection.</p> <p>Invite an Entrepreneur to speak on venture idea generation and product selection</p> <p>Guide students to prepare feasibility studies on a model institution based business and evaluate the viability, methodology and Cost Benefit Analysis (CBA.)</p> <p>Guide students to use web based information to</p>	

<p>3.5 Explain venture idea generation.</p> <p>3.6 Explain the steps involved in preliminary screening.</p> <p>3.9 Explain the different steps in preparing pre-feasibility study.</p> <p>3.10 Evaluate adequacy of infrastructural facilities for product selection.</p> <p>3.10 Identify the relevant technology available for the selected product.</p> <p>3.11 Evaluate sources and adequacy of raw materials for the selected product.</p> <p>3.12 Explain effects of government policy and regulations on the selected product.</p>	<p>selected product.</p> <p>VI. Explain effects of government policy and regulation as well as legal aspects of business on the selected product</p>		<p>their visit.</p>	<p>generate venture idea on an exportable product.</p> <p>Organize visit to a small business outfit to understudy infrastructural facilities, available technology, sources and adequacy of raw materials, effect of government policy and regulation and legal aspects of the business.</p>	
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	3.13 Identify legal aspects of business in product selection.					
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Theoretical Content				Practical Content		
General Objective 4: Understand the process and procedure for starting an Enterprise						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>4.1 Outline the main features of the Companies and Allied Matters Act (CAMA) 1990 and the subsequent amendments.</p> <p>4.2 Explain the functions of the Corporate Affairs Commission (CAC) under the Companies and Allied Matters Act 1990.</p> <p>4.3 Explain the legal structure of business.</p> <p>4.4 State factors to consider in naming a business.</p>	<p>Explain the main features of the CAMA with special reference to provisions relating to registration and incorporation of business.</p> <p>Explain the functions of CAC.</p> <p>Explain the different legal forms of business.</p> <p>Explain reasons for and factors in naming a business.</p> <p>Explain Memorandum and Articles of Association and the procedure for incorporation of companies in Nigeria.</p>	<p>Textbooks CAMA Articles and Memo of Association Certificate of Incorporation · Text books CAMA Internet (CAC Website)</p>	<p>Prepare Memorandum and articles of Association for a hypothetical company.</p> <p>Identify documents required for incorporation.</p> <p>Register a business name.</p>	<p>Guide students to prepare Memorandum and Articles of Association of a hypothetical company.</p> <p>Show students necessary Incorporation documents.</p> <p>Visit CAC office nearest to you to familiarize with its operation.</p> <p>Guide students to register a hypothetical business name with the nearest CAC</p>	<p>Explain the functions of CAC.</p> <p>Explain the different legal forms of business</p> <p>Explain the main features of the CAMA with special reference to provisions relating to registration and incorporation of business.</p>

	<p>4.5 Explain the procedure and requirements for registration of a business name.</p> <p>4.6 Explain the Procedure and requirements for incorporating a business.</p> <p>4.7 Explain the reasons for the existence of registered business names and companies.</p> <p>4.8 Identify various agencies responsible for issuance of licenses and permits.</p>	<p>Explain licenses and permits and their issuing Agencies. Explain the Procedure and requirements for incorporating a business.</p> <p>Explain the reasons for the existence of registered business names and companies.</p> <p>Identify various agencies responsible for issuance of licenses and permits</p>				
Theoretical Content				Practical Content		
General Objective 5: Know the various operational techniques in managing an Enterprise						

Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
8-9	<p>5.1 Define management and a manager</p> <p>5.2 Explain the functions of management and a manager</p> <p>5.3 Explain management structure for an enterprise.</p> <p>5.4 Explain the communication process in the management of an enterprise.</p> <p>5.5 Explain the techniques and skills of:</p> <ul style="list-style-type: none"> i. Planning ii. Organizing iii. Staffing iv. Leading v. Controlling <p>5.6 Explain the basic</p>	<p>Explain the functions, techniques and skills of management.</p> <p>Draw a management structure to suit the viable project selected by students</p> <p>Explain the techniques of the functional areas of management.</p> <p>Explain principles of record keeping, auditing and taxation.</p>	<p>Text Books</p> <p>Specimen of financial records.</p> <p>Cardboard</p> <p>Marker.</p> <p>Text books sample Record books</p> <p>Projector (MM) organogram</p> <p>Organogram</p>	<p>Draw appropriate organogram for a small scale enterprise.</p> <p>Identify communication process in the management of an enterprise.</p> <p>Explain the functional areas of business management, planning, organizing, etc.</p>	<p>Guide student to draw an organogram to suit the selected business venture.</p> <p>Demonstrate the techniques and skills of communication process in the management of the selected business venture, using computer networking of not less than 3 computers.</p> <p>Demonstrate, using appropriate application packages, techniques and skills of:</p> <p>Business planning</p> <p>Business positioning</p> <p>Business scheduling</p>	

	techniques of marketing, production and financial management in an enterprise. 5.7 Explain the principles of record keeping, auditing and taxation.				Staffing and staff tracking, etc explaining their importance to sustainable business venture.	
Theoretical Content				Practical Content		
General Objective 6: Know the various existing industries and support agencies in Nigeria						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	6.1 Explain various industry/support agencies. 6.2 Explain the types, and sources of materials used in both manufacturing and service Industries. 6.3 Explain the types and sources of plants and machinery used in small scale Industries. 6.4 Explain the various information and assistance for vital areas like finance,	Explain Industry, types and support agencies. Explain the nature, types and sources of materials, machineries and information in enterprises.	Textbooks, Journals, CD's/Film VCR Computer and accessories with Internet connection. Textbooks and journals.	Identify types and sources of plants and machinery used in small scale industries, nature and type of material inputs and information about market and financial assistance.	Guide students to visit websites to identify types and sources of machinery and plants, material inputs for small scale industries, information and assistance for finance market etc. Form groups and assign them out of class. Visit/experience in selected enterprise.	Explain the types, and sources of materials used in both manufacturing and service Industries.

10-11	<p>registration, project selection, training, marketing, research, quality control, raw materials, patent information etc.</p> <p>6.5 Explain environmental factors associated with Industrial and economic development in Nigeria.</p>			Prepare a report and share experience.	Groups to share experiences on the visit.	
Theoretical Content				Practical Content		
General Objective 7: Appreciate the role of commercial and development banks in small and medium scale industries development						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>7.1 Identify financial institutions involved in entrepreneurial development.</p> <p>7.2 Explain the role of Banks and financial institutions in the creation and development of enterprises.</p> <p>7.3 Explain government policy on financing</p>	<p>Explain the role of financial institutions in entrepreneurial development.</p> <p>Explain the role of commercial and development Banks in the promotion and development of SMEs.</p> <p>Examine</p>	<p>Textbooks, Journals and other publications.</p> <p>Projector (16 mm) Computer Internet.</p>	<p>Identify sources of finance to SME's and how to access their funds</p>	<p>Guide students to identify sources of finance for SME's.</p> <p>Invite a Finance Expert to give a talk.</p> <p>Guide students to develop healthy banking culture:</p> <ul style="list-style-type: none"> • Good customer relations 	

<p>12-13</p>	<p>small and medium enterprises.</p> <p>7.4 Explain the role of microfinance (Formal and Informal) in financing enterprise.</p> <p>7.5 Explain the role of capital markets in Financing enterprise.</p>	<p>government policies on financing SMEs.</p> <p>List support agencies for SMEs in Nigeria-NEPC, IDCs, BOI, and NACR DB etc.</p> <p>Explain government policy on financing SMEs.</p>			<ul style="list-style-type: none"> • Regular lodgments • Bank reconciliati on. 	
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General Objective 8: Understand the role of personal savings and portfolio investment in National Economic Development

<p>Week</p>	<p>Specific Learning Outcomes</p>	<p>Teacher’s Activities</p>	<p>Resources</p>	<p>Specific Learning Outcomes</p>	<p>Teacher’s Activities</p>	<p>Evaluation</p>
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14-15	8.1 Define the following; Income, expenditure and savings	Explain savings Explain how savings are channeled into productive ventures.	Textbooks, Journals and other publications	Calculate interest rates. Develop personal budget for one month.	Show various methods of computing interest Guide students to develop a personal budget for one month	
	8.2 Explain the role of savings in starting and sustaining businesses	Explain the benefits of interest.		Create a spreadsheet for a budget	Guide students to create a spreadsheet for a budget	
	8.3 List the benefits of interest.	Explain the role of budgeting in personal economics		Learn to save and invest in portfolio.	Invite a stock broker to give a talk.	
	8.4. Explain personal Financial Planning and management.	Describe shopping habits				
	8.5 Explain shopping habits	Analyze portfolio investment.				
	8.6 Explain portfolio investment-shares, bonds, debentures.	Explain thrift societies and how they operate.				
<i>ASSESSMENT CRITERIA</i>						
EXAMINATION	60%	CONTINUOUS ASSESSMENT	40%	Other (Examination/ project/ portfolio) %		

Department/Programme: National Diploma	Course Code:		CreditHours:
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	Subject/Course: Cell Biology	STB121		Theoretical: 2 hours/week
	Year:	Semester:	Pre-requisite:	Practical: 3 hours /week

General Objectives

1. Understand the cell as the basic unit of life
2. Know the composition of the nucleus and cytoplasm of the cell
3. Know the different types of cell division and their significance
4. Understand chemical reactions in a cell
5. Know the different types of specialized cells and their functions
6. Understand the process of photosynthesis
7. Understand the process of respiration

	Course: Insurance National Diploma	Course Code:		Credit Hours:		
	Cell Biology	STB121		Theoretical: 2 hours/week		
	Year:	Semester:	Pre-requisite:		Practical: 3 hours/week	
	Theoretical			Practical Content		
General Objective 1 Understand the cell of as the basic unit of life						
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1	1.1 Explain the cell as a unit of Life. 1.2 Describe cell inclusions and organelles. 1.3 Explain the functions of cell organelles in 1. 2 above. 1.4 Differentiate between pro karyotic and eukaryotic cells. 1.5 Differentiate between animal and plant cells.	Explain the cell as a unit of Life. Describe cell inclusions and organelles. Explain the functions of cell organelles in 1. 2 above. Differentiate between pro karyotic and eukaryotic cells. Differentiate between animal and plant cells.	Video films, monographs Microscopes Salt solutions	Examine and draw single celled animal and plants under the microscope; Amoeba, paramecium, plasmodium, chlamydomonas, chlorella, spirohyra.	Supervised microscopic examination	Differentiate between pro karyotic and eukaryotic cells
2	1.6 Describe experimentally the effects of hypertonic, hypotonic and isotonic solutions on the cell plasma	Describe experimentally the effects of hypertonic, hypotonic and isotonic solutions on the cell plasma		Laboratory examination of different cells and cell inclusions Observation of effect of hypertonic		

General Objectives 2 Know the composition of the nucleus and cytoplasm of the cell						
3	2.1 Describe the structure and functions of the Components of cell nucleus. 2.2 Draw the cytoplasm and its components as revealed by an electron micrograph. 2.3 Describe the structure and functions of DNA and RNA. 2.4 Explain the building blocks of nucleic acid (nucleotides), sugar, phosphoric acid. 2.5 Describe the biochemical components of the cytoplasm and the nucleus. 2.6 Describe the replication of the DNA molecules and significance of the replication. 2.7 Explain the role of the RNA in protein	Lecture with demonstration. Description of component of cell nucleus, structures of DNA, RNA. Explanation of building blocks of sugar and protein	Electron, Micrograph	Observe and draw samples of plant and animal cells from appropriate sources, under the microscope, cheek cells, blood cells, epidermis of Allium		
General Objective 3: Know the different types of cell division and their significance						
4	3.1 Explain cell division 3.2 Identify various types of cell divisions 3.3 Define mitosis 3.4 Describe the stages of mitotic divisions.	Use questions and Answer techniques. Give assignments	Motion Pictures charts Microscopes	Observe and draw Different stages of mitotic shown by root apart and root top of	Demonstration and lectures	
5	3.5 Define meiosis 3.6 Describe the stages of meiotic divisions 3.7 Compare and contrast mitotic and meiotic divisions Explain the significance of mitotic		Microscopes	Observe and draw Different stages of meiosis under the microscopes	Supervise microscopic examinations	
General Objective 4: Understand Chemical reactions In a Cell						
6	4.1 Explain the importance of hydrogen ions concentration (pH), buffers, crystalloids, Suspension to cell. 4.2 Explain the importance of water to normal	Explain the concentration (pH), Suspension to cell. Explain the	Charts and standard texts.	Investigate Of different pH Values on		

	functioning 4.3 List the chemical substances(organics and	functioning List the chemical		Solubility of proteins		
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	<p>In organic in the cell e.g. enzymes of biological importance.</p> <p>4.4 Explain the role of the following components in the cell: (a)carbohydrates (b) lipids (c) Proteins (d) Ribonucleic acid.</p> <p>4.5 Describe the chemical structure of carbohydrates: simple sugar, monosaccharide, disaccharides, and polysaccharides.</p> <p>4.6 Describe the basic unit of proteins its structures and function.</p>	<p>In organic in the cell e.g. enzymes of biological importance.</p> <p>Explain the role of the following components in the cell: (a)carbohydrates (b) lipids (c) Proteins (d) Ribonucleic acid.</p> <p>Describe the chemical structure of carbohydrates: simple sugar, monosaccharide, disaccharides, and polysaccharides.</p> <p>Describe the basic unit of proteins its structures and function.</p>	<p>Alcohol, peas, meat tenderizer, blender</p>	<p>Measure enzyme activity at different pH values</p>	<p>Measure enzyme activity at different pH values</p>	<p>Describe the chemical structure of carbohydrates: simple sugar, monosaccharide, disaccharides, and polysaccharides</p>
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7	<p>4.7 Explain lycerides and fatty acid, groups as the two major building blocks of FND</p> <p>4.8 Explain phospholipids.</p> <p>4.9 Explain ribonucleic acid(RNA) and deoxyribonucleic acid(DNA)</p> <p>4.10 Explain differences and significance of DNA and RNA</p>	<p>Explain the memory of phospholipids, RNA and DNA and their differences</p>	<p>Alcohol, peas, meat tenderizer, blender</p>	<p>Extract DNA from split peas or any other plant or animal source</p>		
General Objective 5: Know the different types of specialized cells and their functions						
8	<p>5.1 List various types of cells e.g. meristematic cells, parenchymations, schlerenchymations, collenchyma, bone marrows, blood and bone cells, etc.</p> <p>5.2 Define a tissue.</p> <p>5.3 Describe the structure and composition of the following tissue:- brain, bone, blood, etc and vascular bundles in plants.</p> <p>5.4 List the functions of the various tissues described above.</p>	<p>List various types of cells e.g. meristematic cells, parenchymations, schlerenchymations, collenchyma, bone marrows, blood and bone cells, etc.</p> <p>Define a tissue. Describe the structure and composition of the following tissue:-brain, bone, blood, etc and vascular bundles in plants.</p> <p>List the functions of the various tissues described above.</p>		<p>Prepare and examine slides of plants and animals tissue under the microscope</p> <p>Identify the location of the above cells in the body.</p>		

General Objective 6: Understand the process of photosynthesis						
9	<p>6.1 1.Explain with relevant equations, the process of photosynthesis</p> <p>6.2 Describe the structure of the chloroplast.</p>	<p>Explain with relevant equations, the process of photosynthesis</p> <p>Describe the structure of the chloroplast.</p>	<p>Propanonecut leaves chromatogram</p>	<p>Separate pigments using chromatographic</p>		

	<p>6.3 Explain the importance of the stoma and gramma chloroplast.</p> <p>6.4 Describe the light and dark stages of photosynthesis.</p> <p>6.5 List the products of photosynthesis.</p> <p>6.6 List and explain the factors affecting photosynthesis.</p> <p>6.7 Describe starch formation during photosynthesis.</p> <p>6.8 Explain the importance of carbondioxide in photosynthesis.</p> <p>6.9 Describe the structure and role of chlorophyll in photosynthesis.</p> <p>6.10 Explain the role of oxygen and light photosynthesis</p>	<p>Explain the importance of the stoma and gramma chloroplast.</p> <p>Describe the light and dark stages of photosynthesis.</p> <p>List the products of photosynthesis.</p> <p>List and explain the factors affecting photosynthesis.</p> <p>Describe starch formation during photosynthesis.</p> <p>Explain the importance of carbondioxide in photosynthesis.</p> <p>Describe the structure and role of chlorophyll in photosynthesis.</p> <p>Explain the role of oxygen and light photosynthesis</p>	<p>phypaper</p> <p>Belljar plants, lights candle</p>	<p>methods</p> <p>Show that plans will grow in an atmosphere that has been depleted of oxygen</p>		
General Objectives: 7 Understand the process of Respiration						

10	<p>7.1 Explain the process of respiration with relevant equation.</p> <p>7.2 List the differences between aerobic and anaerobic respiration.</p> <p>7.3 Describe the process of Glycolysis.</p> <p>7.4 Explain the net ATP produced during glycolysis.</p> <p>7.5 Explain the process of Krebscitric acid cycle</p> <p>7.6 List the net ATP produced during Krebs CYCLE</p> <p>7.7 Compare the ATP produced in Glycolysis with the produced in Krebs's cycle.</p> <p>7.8 Explain the role of the mitochondrion in respiration.</p>	<p>Explain the process of respiration with relevant equation.</p> <p>List the differences between aerobic and anaerobic respiration.</p> <p>Describe the process of Glycolysis.</p> <p>Explain the net ATP produced during glycolysis.</p> <p>Explain the process of Krebscitric acid cycle</p> <p>List the net ATP produced during Krebs CYCLE</p> <p>Compare the ATP produced in Glycolysis with the produced in Krebs's cycle.</p> <p>Explain the role of</p>	Lime water Respirometer seeds and green plants	<p>Show Experimentally that germinating seeds producing heat.</p> <p>Show experimentally that carbon dioxide is produced by green plants during respiration</p>		
General Objectives: 8 Understand the process of Transpiration						
11	<p>8.1 Define transpiration in plants.</p> <p>8.2 List the different types of transpiration in plants.</p> <p>8.3 Differentiate between transpiration</p>	<p>Define transpiration in plants.</p> <p>List the different types of transpiration in plants.</p> <p>Differentiate between transpiration and guttation</p>	Photometer Green plants	Measure rate of Transpiration in plants by using a photometer		

	List and explain the factors affecting transpiration	List and explain the factors				
General Objectives :9 Understand the process of translocation in plants						
12	<p>9.1 Explain the process of translocation in plants.</p> <p>9.2 List evidences to support translocation through the phloem.</p> <p>9.3 Draw the structure of the phloem in relation to translocation.</p> <p>9.4 Explain the mechanism of translocation in relation to the cytoplasmic streaming, pressure</p>	<p>Explain the process of translocation in plants.</p> <p>List evidences to support translocation through the phloem.</p> <p>Draw the structure of the phloem in relation to translocation.</p> <p>Explain the mechanism of translocation in relation to the cytoplasmic streaming, pressure mass flow</p>		Investigate translocation by using dyes		
General Objectives :10 Know the process of ion absorption in plants						
13	<p>10.1 List the ions that are important to plant.</p> <p>10.2 Explain the mechanism of ion absorption in plants</p> <p>10.3 List and explain the factors affecting ion absorption plants.</p>	<p>List the ions that are important to plant.</p> <p>Explain the mechanism of ion absorption in plants</p> <p>List and explain the factors affecting ion absorption plants</p>	Culture, Botanical garden, microscope	Grow plants in the presence and absence of essential ions		
General Objectives: 11 Know the process of water absorption in plants						

14	<p>11.1 Explain diagrammatically the path of water movement from the root hairs to the endodermis.</p> <p>11.2 Explain various theories to support water movement up to the leaf e.g. root pressure and transpirational pull</p>	<p>Explain diagrammatically the path of water movement from the root hairs to the endodermis.</p> <p>Explain various theories to support water movement up to the leaf e.g. root pressure and transpirational pull</p>	<p>Food, farmland, Culture, Botanical garden etc microscope</p>	<p>Collect classify and preserve selected examples of Algae (e.g. <u>Spirogyra</u>), Fungi (<u>Mucor</u> & <u>Pythium</u>), Mosses (e.g. Funaria) & Ferns (e.g. Pt</p>		
General Objectives: 12 Understand the process of growth						
14	<p>12.1 Define growth.</p> <p>12.2 Explain the growth regions and phases of growth</p>	<p>Define growth.</p> <p>Explain the growth regions and phases of growth</p>	<p>Food, farmland,</p>	<p>Continue above activity</p>		

	<p>12.3 List the parameters used to assess growth e.g. Dry weight, fresh weight, leaf area etc. List and explain the factors affecting growth.</p>	<p>List the parameters used to assess growth e.g. Dry weight, fresh weight, leaf area etc. List and explain the</p>				
<p>General Objectives13: Understand movement in plants</p>						

15	<p>13.1 Define movement.</p> <p>13.2 List the two main types of movement s in plants, locomotion and that of curvature.</p> <p>13.3 Explain the various kinds of movements e.g. Tropism, Taxism etc.</p> <p>13.4 List and explain the conditions necessary for movements in plants.</p> <p>13.5 Explain experimentally, phototropism, geotropism, hydrotropism, chemotropism, and thermotropism in plants.</p> <p>13.6 Explain auxins and the role in plant movement.</p>	<p>Define movement.</p> <p>List the two main types of movement s in plants, locomotion and that of curvature.</p> <p>Explain the various kinds of movements e.g. Tropism, Taxism etc.</p> <p>List and explain the conditions necessary for movements in plants.</p> <p>Explain experimentally, phototropism, geotropism, hydrotropism, chemotropism, and thermotropism in plants.</p> <p>Explain auxins and the role in plant movement.</p>	Biological Garden	<p>Collect, classify and Preserve selected samples of Crymnosperm s (e.g. <u>Cylasrevolute</u>), monocotyledoras (e.g. Guinea grass, maize, palms etc) and Dicotyledons(e.g.Hibiscus,crotolaria,citrus,triad,mangoes,cashewsetc).</p>	<p>Collect, classify and Preserve selected samples of Crymnosperm s (e.g. <u>Cylasrevolute</u>), monocotyledoras (e.g. Guinea grass, maize, palms etc) and Dicotyledons(e.g.Hibiscus,crotolaria,citrus,triad,mangoes,cashews etc).</p>	
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Department/Programme: ND Oceanography and Fishery Science	Course Code: GNS 111	Contact Hours: 2 – 0 - 0
Subject/Course: Citizenship Education I		Theory: 2 hours/week
Year: ND I Semester: 1st	Pre-requisite:	Practical: hours/week

General Objectives:

- 1. Understand the Constitution of Nigeria**
- 2. Understand the federal system of government in Nigeria**
- 3. Know the constitutional rights and obligations of Nigerian citizens**
- 4. Understand Citizenships**
- 5. Understand fundamental objectives and directive principles of state policy in Nigeria**

Course Code: GNS 111		Contact Hours 2HRS/WEEK		
		Practical Content: hrs		
Understand the				
Teacher Activities	Resour ces	Specific Learnin g Outcom e:	Teacher Activiti es	Eval uatio n

<p>ask the students:</p> <p>ask them that they understand by the term constitution and to distinguish the different rules of constitution known</p> <p>explain the effectiveness of International Constitution</p> <p>explain Nigerian Constitution to other laws.</p> <p>identify the main parts of the Nigerian Constitution</p> <p>Assess to the students by given the assignment to draft a</p>	<p>Instructional Manual</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	<p>▪</p>	<p>▪</p>	<p>▪</p>
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0 Understand the federal system of government in

Teachers Activities	Resour ces	Specific Learnin g Outcom e:	Teacher Activiti es	Eval uatio n
Ask the students: describe a federation and to	Instruct ional Manual ·	▪	▪	▪

differentiate between a federation and a confederation	R			
to define the functions of the federal system in Nigeria and the relationship among the three tiers of government	e			
to evaluate the revenue allocation formula operation in Nigeria	c			

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Know the constitutional rights and obligations of

Teachers Activities	Resour ces	Specific Learnin g Outcom e:	Teacher Activiti es	Eval uatio n
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<p>Ask the students to identify the responsibilities and duties of Nigerian citizenship</p> <p>Examine the significance of rights and obligations in Nigeria</p> <p>Assess government's protection of fundamental rights as contained in the Nigerian constitution</p> <p>Evaluate the responsibilities and duties of Nigerian citizenships and the benefits for performing</p>	<p>Instructional Manual</p> <p>Recommended</p>	<p>■</p>	<p>■</p>	<p>■</p>
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<p>hem</p> <p>Assess the responsibilities and duties of constituted authority to the people</p> <p>Evaluate the responsibilities and duties of government to the People</p>	<p>s</p> <p>,</p> <p>l</p> <p>e</p> <p>c</p> <p>t</p> <p>u</p> <p>r</p> <p>e</p> <p>n</p> <p>o</p> <p>t</p> <p>e</p> <p>s</p> <p>,</p> <p>W</p> <p>h</p> <p>i</p> <p>t</p> <p>e</p> <p>b</p> <p>o</p> <p>a</p> <p>r</p> <p>d</p> <p>,</p> <p>P</p> <p>o</p> <p>w</p> <p>e</p> <p>r</p> <p>P</p>			
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	a r d , f l i p c h a r t s , e t c .			
Understand Citizenships				
Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Evaluation
Ask the students: to discuss and analys	Instructional Manual	▪	▪	▪

<p>e the principles and benefits of citizenship</p>		R		
<p>to analyse the basis for the acquisition and withdrawal of Nigerian citizenship</p>		e c o m m e n d e d t e x t b o o k s , e - b o o k s , l e c		
<p>Discuss the significance of citizenship</p>				
<p>Analyse the principles and benefits of citizenship</p>				
<p>Explain the difference in the modes of acquiring citizenship</p>				

<p>Evaluate the merits and demerits of each type of citizenship</p> <p>Analyse the basis for the acquisition and withdrawal of Nigerian citizenship</p> <p>Examine the benefits derivable from Nigeria citizenship</p>	<p>t u r e n o t e s , W h i t e b o a r d , P o w e r P o i n t</p>			
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	P r o j e c t o r , S c r e e n , M a g n e t i c B o a r d , f			
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: Fundamental objectives and directive principles of

Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Evaluation
Ask the students to explain the directive principles and policy of the Nigerian	Instructional Manual R e c o	▪	▪	▪

<p>Government on cultures, the mass media, national ethnics and duties of the citizen</p>	<p>m m e n d e d</p>			
<p>State the fundament al obligation s of governme nt as provided in the constitutio n</p>	<p>t e x t b o o k s , e</p>			
<p>Explain the general provisions of the fundamental objectives and directive principles of state policy</p>	<p>- b o o k s , l</p>			
<p>Explain the political, economic, social and education policies of</p>	<p>e c t u r e</p>			

<p>Nigeria</p> <p>Explain the directive principles and policy of the Nigerian government on culture, the mass media, national ethics and duties of the citizen</p> <p>Assess the conformity observance and application of the fundamental objectives and directive principles of state policy by governments and people of Nigeria.</p> <p>Recommend improvements on the provision of conformity, observance and application of the fundamental objectives and directive</p>	<p>n o t e s , W h i t e b o a r d , P o w e r P o i n t P r o j</p>			
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principles of
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Programme: ND Oceanography and Fishery Science	Course Code: GNS 101	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: USE OF ENGLISH	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal:

GENERAL OBJECTIVES
On completion of this course the student should be able to:
1.0 Develop appropriate study skills. 2.0 Know the nature of language. 3.0 Understand the basic rules of grammar. 4.0 Know the essential qualities of paragraph. 5.0 Appreciate literacy works in English.

Programme ND Oceanography and Fishery Science**Course:** USE OF ENGLISH**Course Code:** GNS 101**CH/CU Hour:**2

Goal: This course is designed to provide the student with the necessary language skills which enable him to cope effectively with the challenges of his course, to use English Language effectively in the practice of his chosen profession as well as interact with others in the society.

General Objectives 1.0: Develop appropriate study skills.

Course Specification: THEORETICAL CONTENT

	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	Study Skills 1.1 Explain the necessity for acquiring good note taking/making techniques. 1.2 List the methods of note-	Explain the necessity for acquiring good note taking/making techniques. List the methods of	Library.			

	<p>taking/making.</p> <p>1.3 Use the dictionary correctly</p> <p>1.4 List information sources in the Library.</p> <p>1.5 Locate information in the sources listed in 1.4 above.</p> <p>1.6 Identity good reading habits.</p> <p>1.7 Explain the different methods of reading, viz, scan, skim, normal and study.</p> <p>1.8 Use the different methods of reading explained in 1.7 above.</p>	<p>note-taking/making.</p> <p>Use the dictionary correctly</p> <p>List information sources in the Library.</p> <p>Locate information in the sources listed in 1.4 above.</p> <p>Identity good reading habits.</p> <p>Explain the different methods of reading, viz, scan, skim, normal and study.</p> <p>Use the different methods of reading explained in 1.7 above.</p>				
General Objectives 2.0: Know the nature of language.						
	<p>Language</p> <p>2.1 Explain the concept of language.</p> <p>2.2 List the characteristics of language.</p> <p>2.3 Explain the four language skills, viz, speaking, listening, writing, reading</p> <p>2.4 Explain the functions of language.</p> <p>2.5 List the uses of English Language in Nigeria, e.g. as the language of research, government, commerce,</p>	<p>Explain the concept of language.</p> <p>List the characteristics of language.</p> <p>Explain the four language skills, viz, speaking, listening, writing, reading</p> <p>Explain the functions of language.</p> <p>List the uses of English Language in Nigeria, e.g. as the language of research, government, commerce, etc.</p>				

	etc.					
General Objectives 3.0: Understand the basic rules of grammar						
	Grammatical Conventions 3.1 Explain grammar 3.2 Explain parts of speech 3.3 Analyze the use of parts of speech in sentences. 3.4 Correct common errors in the use of parts of speech in sentences. 3.5 Construct sentences with correct syntactic arrangement. 3.6 List punctuation marks. 3.7 Enumerate the uses of punctuation marks. 3.8 Punctuate a given passage. 3.9 Explain idioms 3.10 Explain figures of speech. 3.11 Explain affixation. 3.12 Construct sentences to illustrate idioms, figures of speech and affixes.	Explain grammar Explain parts of speech. Analyze the use of parts of speech in sentences. Correct common errors in the use of parts of speech in sentences. Construct sentences with correct syntactic arrangement. List punctuation marks. Enumerate the uses of punctuation marks. Punctuate a given passage. Explain idioms Explain figures of speech. Explain affixation. Construct sentences to illustrate idioms, figures of speech and affixes.				
General Objectives 4.0: Know the essential qualities of paragraphs						
	Paragraphing 4.1 Define a paragraph 4.2 Name the parts of paragraph, viz., topic sentence, development, and conclusion/transition	Define a paragraph Name the parts of paragraph, viz., topic sentence, development, and conclusion/transition.				

	<p>4.3 Explain the thematic qualities of a paragraph viz, unity, coherence and emphasis.</p> <p>4.4 Explain methods of paragraph development, viz, example, definition, comparison and contrasts etc.</p> <p>4.5 Explain methods of ordering details in a paragraph viz, less complex to more complex and vice versa, less important to more important and vice versa, spatial, chronological, etc.</p> <p>4.6 Write specific paragraphs to illustrate 4.2 to 4.5 above.</p>	<p>Explain the thematic qualities of a paragraph viz, unity, coherence and emphasis.</p> <p>Explain methods of paragraph development, viz, example, definition, comparison and contrasts etc.</p> <p>Explain methods of ordering details in a paragraph viz, less complex to more complex and vice versa, less important to more important and vice versa, spatial, chronological, etc.</p> <p>Write specific paragraphs to illustrate 4.2 to 4.5 above</p>				
General Objectives 5.0: Appreciate literacy works in English						
	<p>Literature in English</p> <p>5.1 Give the meaning of Literature.</p> <p>5.2 Trace the development of literature.</p> <p>5.3 Differentiate between the literary genres.</p> <p>5.4 Explain the functions of literature.</p> <p>5.5 Explain the terminology of</p>	<p>Give the meaning of Literature.</p> <p>Trace the development of literature.</p> <p>Differentiate between the literary genres.</p> <p>Explain the functions of literature.</p> <p>Explain the terminology</p>				

	prose fiction, e.g. plot setting, characterization etc. 5.6 Answer an essay question on a given novel.	of prose fiction, e.g. plot setting, characterization etc. Answer an essay question on a given novel.				
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Programme: ND Oceanography and Fishery Science	Course Code: MTH 101	Credit Hours: 30
		Credit Unit: 3
		Total Contact Hours: 4
Course: GENERAL MATHEMATICS 1	Pre-Requisite:	Theoretical: Hours/week 4 hours
Semester: 1st Semester		Practical:

Course Main Aim/ Goal:

GENERAL OBJECTIVES
On completion of this course the student should be able to:
1.0 Understand the concept of real numbers 2.0 Understand the laws of indices and their applications in simplifying algebraic expressions 3.0 Understand the theory of logarithms and its applications in manipulating expressions 4.0 Understand the theory of surds and its application in manipulating expressions 5.0 Understand principles underlying the construction of graphs

- 6.0 Understand the concept of Equations and methods of solving different types of equations and apply same in solving related
- 7.0 Know the concept of Algebraic Functions
- 8.0 Understand the theory of Partial Fractions
- 9.0 Understand the concept of set theory
- 10.0 Understand the meaning of Permutation and Combination and their applications in solving related problems
- 11.0 Understand the properties of Arithmetic and Geometric progressions
- 12.0 Understand the Binomial Theorem and its application in the expansion of expressions and in approximations

Programme						
Course: GENERAL MATHEMATICS 1				Course Code: MTH 101		CH/CU Hour:2
Goal:						
General Objectives 1.0: Understand the concept of real numbers						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	Real Numbers 1.1 Define Real Numbers. 1.2 Define the following terms: a. Natural Number, Integers,	Define Real Numbers._ Define the following terms: c. Natural Number, Integers, d. Rational Numbers, etc with examples.	Overhead projector, text books			

	<p>b. Rational Numbers, etc with examples.</p> <p>1.3 State operations with real numbers, for example, closure law, commutative law of addition, commutative law of multiplication, Associative law of multiplication, distributive law, etc</p>	<p>State operations with real numbers, for example, closure law, commutative law of addition, commutative law of multiplication, Associative law of multiplication, distributive law, etc</p>				
General Objectives 2.0: Understand the laws of indices and their applications in simplifying algebraic expressions						
	<p>Indices</p> <p>2.1 Understand the laws of indices and their applications in simplifying algebraic expressions</p> <p>2.2 Define index</p> <p>2.3 Establish the laws of indices</p> <p>2.4 Solve simple problems using the laws of indices</p>	<p>Understand the laws of indices and their applications in simplifying algebraic expressions</p> <p>Define index</p> <p>Establish the laws of indices</p> <p>Solve simple problems using the laws of indices</p>	<p>Overhead projector, text books</p>			
General Objectives 3.0: Understand the theory of logarithms and its applications in manipulating expressions						
	<p>Logarithms</p> <p>3.1 Define Logarithms.</p> <p>3.2 Establish the basic laws of logarithms.</p> <p>3.3 Simplifying logarithms</p> <p>3.4 Define</p> <p>a. Natural Logarithms</p> <p>b. Common Logarithms</p> <p>3.5 Define</p> <p>a. characteristics</p> <p>b. Mantissa</p>	<p>Define Logarithms.</p> <p>Establish the basic laws of logarithms.</p> <p>Simplifying logarithms</p> <p>Define</p> <p>c. Natural Logarithms</p> <p>d. Common Logarithms</p> <p>Define characteristics</p> <p>Mantissa ture</p>	<p>Overhead projector, text books</p>			

	<p>3.6 Read the logarithmic table for given numbers</p> <p>3.7 Simplify numerical expressions using logarithmic tables.</p> <p>3.8 Apply logarithm in solving non linear equations.</p>					
General Objectives 4.0: Understand the theory of surds and its application in manipulating expressions.						
	<p>Surds</p> <p>4.1 Define Surds</p> <p>4.2 Establish the basic laws of surds</p> <p>4.3 Reduce surd into its simplest or basic form</p> <p>4.4 Define conjugate of a surd</p> <p>4.5 Carry out the algebra or operation of surds</p>	<p>Define Surds</p> <p>Establish the basic laws of surds</p> <p>Reduce surd into its simplest or basic form</p> <p>Define conjugate of a surd</p> <p>Carry out the algebra or operation of surds</p>	<p>Overhead projector, text books</p>			
General Objectives 5.0: Understand principles underlying the construction of graphs.						
	<p>Graphs</p> <p>5.1 Construct graphs of functions such as linear, quadratic, etc, including cases of asymptotes.</p> <p>5.2 Apply knowledge from 5.1 above in determination of laws from experimental data.</p>	<p>Construct graphs of functions such as linear, quadratic, etc, including cases of asymptotes.</p> <p>Apply knowledge from 5.1 above in determination of laws from experimental data.</p>	<p>Overhead projector, text books, Graph books.</p>			
General Objectives 6.0: Understand the concept of Equations and methods of Solving different types of equations and apply same in solving related problems.						
	Equations	Explain the concept of	Overhead			

	<p>6.1 Explain the concept of equation i.e. $A=B$, where A and B are expressions</p> <p>6.2 List different types of equations: Linear, Quadratic, Cubi, etc.</p> <p>6.3 Solve linear equations</p> <p>6.4 Solve quadratic equations by:</p> <ol style="list-style-type: none"> Factorization method Completing squares method Formula method Graphical methods <p>6.5 State examples of linear simultaneous equations with at least one quadratic equation.</p> <p>6.6 Apply algebraic and graphical methods in solving two simultaneous equations</p> <p>6.7 Define Discriminant.</p> <p>6.8 Discriminate the rootsForm equations whose roots are given in different methods</p>	<p>equation i.e. $A=B$, where A and B are expressions</p> <p>List different types of equations: Linear, Quadratic, Cubi, etc.</p> <p>Solve linear equations</p> <p>Solve quadratic equations by:</p> <ul style="list-style-type: none"> Factorization method Completing squares method Formula method Graphical methods <p>State examples of linear simultaneous equations with at least one quadratic equation.</p> <p>Apply algebraic and graphical methods in solving two simultaneous equations</p> <p>Define Discriminant.</p> <p>Discriminate the rootsForm equations whose roots are given in different methods</p>	<p>projector, text books, Graph books.</p>			
General Objectives 7.0: Know the concept of Algebraic Functions						
	<p>Algebraic</p> <p>7.1 Define Quadratic and cubic functions with examples</p> <p>7.2 State the relation between</p>	<p>Define Quadratic and cubic functions with examples</p> <p>State the relation between the roots of a quadratic equation and the coefficient</p>	<p>Overhead projector, text books, Graph books.</p>			

	<p>the roots of a quadratic equation and the coefficient</p> <p>7.3 State Remainder's theory</p> <p>7.4 Evaluate the remainder of simple polynomial.</p>	<p>State Remainder's theory</p> <p>Evaluate the remainder of simple polynomial.</p>				
General Objectives 8.0: Understand the theory of Partial Fractions						
	<p>Partial Fractions</p> <p>8.1 Meaning of partial fraction</p> <p>8.2 Mention the techniques that governed partial fraction Resolve into partial fraction one example each using the simple rules</p>	<p>Meaning of partial fraction</p> <p>Mention the techniques that governed partial fraction Resolve into partial fraction one example each using the simple rules</p>	<p>Overhead projector, text books, Graph books.</p>			
General Objectives 9.0: Understand the concept of set theory						
	<p>Set Theory</p> <p>9.1 Define sets and subsets</p> <p>9.2 Define union, Intersection, Complement of Sets, etc</p> <p>9.3 Establish the theorem that Draw Venn Diagram to demonstrate the concepts in 9.1 and 9.2 above Properties of some binary operations of sets distributive, closure, associative, commutative laws with examples, relations in a set, equivalence relation.</p> <p>9.4 Calculate the size or</p>	<p>Define sets and subsets</p> <p>Define union, Intersection, Complement of Sets, etc</p> <p>Establish the theorem that Draw Venn Diagram to demonstrate the concepts in 9.1 and 9.2 above Properties of some binary operations of sets distributive, closure, associative, commutative laws with examples, relations in a set, equivalence relation.</p> <p>Calculate the size or number of elements in a given set</p>	<p>Overhead projector, text books, Graph books.</p>			

	number of elements in a given set					
General Objectives 10.0 Understand the meaning of Permutation and Combination and their applications in solving related problems						
	Permutations and Combinations 10.1 Define Permutation. 10.2 List of examples of permutation 10.3 Solve problems on permutation 10.4 Define combination 10.5 List examples of combination 10.6 Solve problems on combination 10.7 Establish the theorem and give examples e.g. number of ways of selecting three out of nine balls is 10.8 Establish the theorem that. and give examples e.g. number of ways of collecting two out of eight balls is	10.9 Define Permutation. 10.10 List of examples of permutation 10.11 Solve problems on permutation 10.12 Define combination 10.13 List examples of combination 10.14 Solve problems on combination 10.15 Establish the theorem and give examples e.g. number of ways of selecting three out of nine balls is Establish the theorem that. and give examples e.g. number of ways of collecting two out of eight balls is	Overhead projector, text books, Graph books.			
General Objectives 11.0: Understand the properties of Arithmetic and Geometric progressions						
	Progressions 11.1 Define sequence and series with examples 11.2 Define an Arithmetic progression (AP) 11.3 Obtain the formula	Define sequence and series with examples Define an Arithmetic progression (AP) Obtain the formula for nth term and sum of the first n terms of an AP	Overhead projector, text books, Graph books.			

	<p>for nth term and sum of the first n terms of an AP</p> <p>11.4 Give examples of 11.3 above e.g. find the 25th terms of the series, 1+2+3+4+5..... Find also the sum of the first 25 terms</p> <p>11.5 Define a Geometric Progression (GP)</p> <p>11.6 Obtain the formula for the nth term and sum of the first n terms of a GP</p> <p>11.7 Evaluate examples of 11.6 above e.g given the sequence 1, 2, 4, 8, 16 Find the 20th term and hence the sum of the first 20 terms</p> <p>11.8 Define Arithmetic Mean (AM) and Geometric Mean (GM)</p> <p>11.9 State examples of 11.8 above and solve</p> <p>Define Convergence of series</p> <p>Define divergence of series</p>	<p>Give examples of 11.3 above e.g. find the 25th terms of the series, 1+2+3+4+5..... Find also the sum of the first 25 terms</p> <p>Define a Geometric Progression (GP)</p> <p>Obtain the formula for the nth term and sum of the first n terms of a GP</p> <p>Evaluate examples of 11.6 above e.g given the sequence 1, 2, 4, 8, 16 Find the 20th term and hence the sum of the first 20 terms</p> <p>Define Arithmetic Mean (AM) and Geometric Mean (GM)</p> <p>State examples of 11.8 above and solve</p> <p>Define Convergence of series</p> <p>Define divergence of series</p>				
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General Objectives 12.0: Understand the Binomial Theorem and its application in the expansion of expressions and in approximations

	<p>Binomial Theorem</p> <p>12.1 Define binomial and Binomial expansion</p> <p>12.2 State and prove the binomial theorem for a positive integral index</p> <p>12.3 Expand expressions of the forms $(x+y)^2$, $(x+y)^3$, $(x^2-1/x)^3$ applying binomial expression</p> <p>12.4 Find the coefficient of a particular term in the expansion of simple binomial expressions</p> <p>12.5 Find the middle term in the expansion of binomial expression</p> <p>12.6 State the binomial theorem for a rational index</p> <p>12.7 Expand expressions of the form: $(1+x)^{-1}$, $(1+x)^{1/2}$, $(1-x)^{-1/3}$ applying binomial theorem</p> <p>12.8 Expand and approximate expressions of the type $(1.001)^n$, $(0.998)^n$, $(1+x)^{1/2}$, $(1-x)^{1/3}$, to a stated degree of accuracy applying scalar expressions</p>	<p>Define binomial and Binomial expansion</p> <p>State and prove the binomial theorem for a positive integral index</p> <p>Expand expressions of the forms $(x+y)^2$, $(x+y)^3$, $(x^2-1/x)^3$ applying binomial expression</p> <p>Find the coefficient of a particular term in the expansion of simple binomial expressions</p> <p>Find the middle term in the expansion of binomial expression</p> <p>State the binomial theorem for a rational index</p> <p>Expand expressions of the form: $(1+x)^{-1}$, $(1+x)^{1/2}$, $(1-x)^{-1/3}$ applying binomial theorem</p> <p>Expand and approximate expressions of the type $(1.001)^n$, $(0.998)^n$, $(1+x)^{1/2}$, $(1-x)^{1/3}$, to a stated degree of accuracy applying scalar expressions</p>	<p>Overhead projector, text books, Graph books.</p>			
<p>General Objectives 13.0: Understand the basic concepts and manipulations of vectors and its application in solving related problems</p>						

	<p>Vectors</p> <p>13.1 State the definitions and representations of vectors</p> <p>13.2 Define a position vector</p> <p>13.3 Define unit vector</p> <p>Explain scalar multiple of vector</p> <p>13.4 List the characteristics of parallel vectors</p> <p>13.5 Identify quantities as vector or scalar quantity</p> <p>13.6 Compute the modulus of any given vector up to 2 and 3 dimensions</p> <p>13.7 State the parallelogram law for addition and subtraction of vectors</p> <p>13.8 Apply the parallelogram law in solving problems including addition and subtraction of vectors</p> <p>13.9 Explain the concepts of components of a vector and the meaning of orthogonal components</p> <p>13.10 Resolve a vector into its orthogonal components</p>	<p>State the definitions and representations of vectors</p> <p>Define a position vector</p> <p>Define unit vector</p> <p>Explain scalar multiple of vector</p> <p>List the characteristics of parallel vectors</p> <p>Identify quantities as vector or scalar quantity</p> <p>Compute the modulus of any given vector up to 2 and 3 dimensions</p> <p>State the parallelogram law for addition and subtraction of vectors</p> <p>Apply the parallelogram law in solving problems including addition and subtraction of vectors</p> <p>Explain the concepts of components of a vector and the meaning of orthogonal components</p> <p>Resolve a vector into its orthogonal components</p> <p>List characteristics of coplanar localized vectors</p> <p>Define the resultant or composition of coplanar vectors</p> <p>Compute the resultant of coplanar forces acting at a point using algebraic and</p>	<p>Overhead projector, text books, Graph books.</p>			
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	<p>13.11 List characteristics of coplanar localized vectors</p> <p>13.12 Define the resultant or composition of coplanar vectors</p> <p>13.13 Compute the resultant of coplanar forces acting at a point using algebraic and graphical methods</p> <p>13.14 Apply the techniques of resolution and resultant to the solution of problems involving coplanar forces</p> <p>13.15 Apply vectorial techniques</p> <p>13.16 State the scalar product of two vectors</p> <p>13.17 Compute the scalar product of given vectors</p> <p>13.18 Calculate the direction ratios of given vectors</p> <p>13.19 Define the cross product/vector product of given vectors</p> <p>13.20 Calculate the angle between two vectors using scalar product</p>	<p>graphical methods</p> <p>Apply the techniques of resolution and resultant to the solution of problems involving coplanar forces</p> <p>Apply vectorial techniques</p> <p>State the scalar product of two vectors</p> <p>Compute the scalar product of given vectors</p> <p>Calculate the direction ratios of given vectors</p> <p>Define the cross product/vector product of given vectors</p> <p>Calculate the angle between two vectors using scalar product</p>				
General Objectives 14.0: Understand the basic concepts of complex numbers and its application in solving related problems						
	Complex Numbers	Define complex Numbers	Overhead			

	<p>14.1 Define complex Numbers</p> <p>14.2 State the representation of complex Numbers including treatment of Argand Diagram</p> <p>14.3 Perform arithmetic operations of addition, subtraction, multiplication and division with complex numbers</p> <p>14.4 Define the conjugate, modulus/absolute and argument/amplitude of complex numbers</p> <p>14.5 State the polar form of complex numbers</p> <p>14.6 State De-moivre's form</p> <p>14.7 Compute roots of complex numbers</p>	<p>State the representation of complex Numbers including treatment of Argand Diagram</p> <p>Perform arithmetic operations of addition, subtraction, multiplication and division with complex numbers</p> <p>Define the conjugate, modulus/absolute and argument/amplitude of complex numbers</p> <p>State the polar form of complex numbers</p> <p>State De-moivre's form</p> <p>Compute roots of complex numbers</p>	<p>projector, text books,</p>			
General Objectives 15.0: Know the basic principles of Mathematical Induction and its application						
	<p>Mathematical Induction (MI)</p> <p>15.1 Define mathematical Induction (MI)</p> <p>15.2 Outline the steps required in proving mathematical induction</p> <p>15.3 Give examples and show the prove e.g. use the method of mathematical induction to prove that if n is a positive integes: $1+2+3+4+\dots+n = n(n+1)$</p>	<p>Define mathematical Induction (MI)</p> <p>Outline the steps required in proving mathematical induction</p> <p>Give examples and show the prove e.g. use the method of mathematical induction to prove that if n is a positive integes: $1+2+3+4+\dots+n = n(n+1)$</p>	<p>Overhead projector, text books,</p>			<p>2</p>

General Objectives 16.0: Understand the basic concepts of matrices and determinants and their applications

	<p><u>Matrices and Determinants</u></p> <p>16.1 Define Matrix</p> <p>16.2 List types of matrices and define them</p> <p>16.3 Mention the uses of matrices</p> <p>16.4 Define determinant of nth order</p> <p>16.5 Apply determinants of order 2 and 3 in solving simultaneous linear equations</p> <p>16.6 Using crammer's rule in solving simultaneous linear equations</p>	<p>Define Matrix</p> <p>List types of matrices and define them</p> <p>Mention the uses of matrices</p> <p>Define determinant of nth order</p> <p>Apply determinants of order 2 and 3 in solving simultaneous linear equations</p> <p>Using crammer's rule in solving simultaneous linear equations</p>	<p>Overhead projector, text books,</p>			
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General Objectives 17.0: Understand the basic concept of trigonometric functions and applications

	<p>17.1 Define the basic trigonometric functions; sine, cosine and tangent of an angle</p> <p>17.2 Define the reciprocal trigonometric ratios: cosecant, secant and cotangent using the basic trigonometric ratios in 17.1 above</p> <p>17.3 Derive identities involving the trigonometric ratios of the form: $\cos^2 \theta = 1 + \tan^2 \theta$, etc.</p>	<p>Define the basic trigonometric functions; sine, cosine and tangent of an angle</p> <p>Define the reciprocal trigonometric ratios: cosecant, secant and cotangent using the basic trigonometric ratios in 17.1 above</p> <p>Derive identities involving the trigonometric ratios of the form: $\cos^2 \theta = 1 + \tan^2 \theta$, etc.</p> <p>Derive the compound/multiple angle formula: $\sin (A \pm B)$, $\cos (A \pm B)$, $\tan (A \pm B)$</p> <p>Converting Degrees to Radians</p>	<p>Overhead projector, text books,</p>			
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	<p>17.4 Derive the compound/multiple angle formula: $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$</p> <p>17.5 Converting Degrees to Radians and vice versa</p>	and vice versa				
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<p>Programme: ND Oceanography and Fishery Science</p>	<p>Course Code: GNS 101</p>	<p>Credit Hours: 30</p>
		<p>Credit Unit: 2.0</p>
		<p>Total Contact Hours: 60</p>
<p>Course: COMMUNICATION IN ENGLISH I</p>	<p>Pre-Requisite:</p>	<p>Theoretical: Hours/week</p>
<p>Semester: 2nd Semester</p>		<p>Practical:</p>

Course Main Aim/ Goal: This course is designed to enable students acquire the necessary communication skills, know the techniques of correspondence and comprehend written materials.

GENERAL OBJECTIVES

On completion of this course the student should be able to:

- 1.0 Understand the concept of communication.
- 2.0 Know how to make oral presentations.
- 3.0 Know the essential elements of correspondence.
- 4.0 Know the rules of comprehension and interpretation.

Programme ND Oceanography and Fishery Science

Course: COMMUNICATION IN ENGLISH I

Course Code: GNS 101

CH/CU Hour:2

Goal: This course is designed to enable students acquire the necessary communication skills, know the techniques of correspondence and comprehend written materials.						
General Objectives 1.0: Understand the concept of communication						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-3	1.1 Define communication. 1.2 Analyze the process of communication 1.3 Analyse the purposes of communication. 1.4 Explain the relationship between communication and language. 1.5 Explain the impact of interference on communication at various levels, e.g. phonological, syntactic, etc. 1.6 Explain code-mixing, code-switching and dissonance in communication.	Define communication. Analyze the process of communication. Analyse the purposes of communication. Explain the relationship between communication and language. Explain the impact of interference on communication at various levels, e.g. phonological, syntactic, etc. Explain code-mixing, code-switching and dissonance in communication	Resource center Library			
General Objectives 2.0: 0 Know how to make oral presentations						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation

4-7	Oral Presentations 2.1 Label a diagram of the organs of speech. 2.2 Describe the functions of the organs in 2.1 above in speech production. 2.3 List the phonemes of English. 2.4 Produce correctly each of the phoneme listed in 2.3 above. 2.5 Pronounce correctly by making distinctions between the different sound contrast in the consonantal and vowel systems of English. 2.6 Explain the principles of effective speaking, viz, correct use of stress, rhythm, and intonation patterns. 2.7 Read fluently	Label a diagram of the organs of speech. Describe the functions of the organs in 2.1 above in speech production. List the phonemes of English. Produce correctly each of the phoneme listed in 2.3 above. Pronounce correctly by making distinctions between the different sound contrast in the consonantal and vowel systems of English. Explain the principles of effective speaking, viz, correct use of stress, rhythm, and intonation patterns. Read fluently.				
General Objectives 3.0” 0 Know the essential elements of correspondence						
Week	Specific Learning Outcomes	Teacher’s Activities	Resources	Specific Learning Outcomes	Teacher’s Activities	Evaluation
8-10	Correspondence 3.1 List the various type of correspondence, e.g. letter, memo, circular,	List the various type of correspondence, e.g. letter, memo, circular, etc. Explain the various				

	<p>etc.</p> <p>3.2 Explain the various parts of a letter</p> <p>3.3 Differentiate between formal and informal letter formats.</p> <p>3.4 Explain the characteristics of styles suitable for formal and informal letters..</p> <p>3.5 Explain the functions of the first, middle and last paragraph.</p> <p>3.6 Write a formal and an informal letter.</p>	<p>parts of a letter</p> <p>Differentiate between formal and informal letter formats.</p> <p>Explain the characteristics of styles suitable for formal and informal letters</p> <p>Explain the functions of the first, middle and last paragraph.</p> <p>Write a formal and an informal letter.</p>				
General Objectives 4.0: Know the rules of comprehension and interpretation						
11-15	<p>4. 1 Identify main ideas in a given passage.</p> <p>4. 2 Differentiate the main ideas from the details in a passage.</p> <p>4. 3 Use the main idea to anticipate specific details in a passage.</p> <p>4. 4 Use context clues to aid comprehension.</p> <p>4. 5 Identify relationship patterns of ideas in a passage.</p> <p>4. 6 Use context</p>	<p>Identify main ideas in a given passage.</p> <p>Differentiate the main ideas from the details in a passage.</p> <p>Use the main idea to anticipate specific details in a passage.</p> <p>Use context clues to aid comprehension</p> <p>Identify relationship patterns of ideas in a passage.</p> <p>Use context clues such as definitions, restatements and</p>				

	<p>clues such as definitions, restatements and examples to derive meaning.</p> <p>4. 7 Explain how affixes modify meanings.</p> <p>4. 8 Interpret figurative language in a passage.</p> <p>4. 9 Draw conclusions from available information</p>	<p>examples to derive meaning.</p> <p>Explain how affixes modify meanings.</p> <p>Interpret figurative language in a passage.</p> <p>Draw conclusions from available information.</p>				
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Programme: ND OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: GNS 202	Credit Hours: 30
		Credit Unit: 2.0
		Total Contact Hours: 60
Course: COMMUNICATION IN ENGLISH I Semester: 2nd Semester	Pre-Requisite: GNS 201	Theoretical: Hours/week
		Practical:

Course Main Aim/ Goal: This course is designed to equip the student with the necessary level of competence and proficiency to enable him adapt to his professional environment.

GENERAL OBJECTIVES

On completion of this course the student should be able to:

- 1.0 Understand registers
- 2.0 Understand the principle of correspondence
- 3.0 Know how to apply the principle of writing for publication.
- 4.0 Know how to write a report.

Programme ND Oceanography and Fishery Science						
Course: COMMUNICATION IN ENGLISH II				Course Code: GNS 202		CH/CU Hour:2
Goal: This course is designed to equip the student with the necessary level of competence and proficiency to enable him adapt to his professional environment.						
General Objectives 1.0: Understand registers						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-3	Registers 1.1 Explain registers 1.2 Explain factors influencing register, viz., field (profession, mode (speech or writing), tenor (relationship between the interacting parties) 1.3 List some items of register peculiar to different professions 1.4 Identify items of register in a given passage 1.5 State appropriate uses of jargon.	Registers Explain registers Explain factors influencing register, viz., field (profession, mode (speech or writing), tenor (relationship between the interacting parties) List some items of register peculiar to different professions Identify items of register in a given passage State appropriate uses of jargon.				
General Objectives 2.0: Understand the principle of correspondence						
	Correspondence	Correspondence				

	<p>2.1 Describe different types of business letters, e.g. applications, enquiries, invitations and complaints, with their replies</p> <p>2.2 Use suitable language for a specific type of letter</p> <p>2.3 Write the letters listed in 2.1 above.</p>	<p>Describe different types of business letters, e.g. applications, enquiries, invitations and complaints, with their replies</p> <p>Use suitable language for a specific type of letter</p> <p>Write the letters listed in 2.1 above.</p>				
General Objectives 3.0: Know how to apply the principle of writing Know how to apply the principle of writing						
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>Writing for Publication</p> <p>3.1 Explain techniques of writing for publication</p> <p>3.2 Write essays on topical and current issues</p> <p>3.3 Analyse published essays of literary value</p> <p>3.4 Evaluate the development of ideas in a given article</p> <p>3.5 Write good articles for publication</p>	<p>Writing for Publication</p> <p>Explain techniques of writing for publication</p> <p>Write essays on topical and current issues</p> <p>Analyse published essays of literary value</p> <p>Evaluate the development of ideas in a given article</p> <p>Write good articles for publication</p>				
General Objectives 4.0: Know how to write a report.						
	<p>Reports</p> <p>4.1 Define a report</p> <p>4.2 List the types of report</p>	<p>Reports</p> <p>Define a report</p> <p>List the types of report</p>				

	<p>4.3 Enumerate uses of reports</p> <p>4.4 List the characteristics of a good report</p> <p>4.5 Outline the stages of writing a report</p> <p>4.6 Evaluate a given report</p> <p>4.7 Write a report</p> <p>4.8 Know how to write a report.</p>	<p>Enumerate uses of reports</p> <p>List the characteristics of a good report</p> <p>Outline the stages of writing a report</p> <p>Evaluate a given report</p> <p>Write a report</p> <p>Write a report</p>				
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Programme ND Oceanography and Fishery Science						
Course: Biology of fishes				Course Code: FIT 122		CH/CU Hour:2
Goal:						
General Objectives 1.0: Understand the basic principles of fish taxonomy						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher’s Activities	Resources	Specific Learning Outcomes	Teacher’s Activities	Evaluation
1-2	<p>1.1 Identify position of the group Pisces in the general evolution of the animal kingdom.</p> <p>1.2 Classify the group Pisces into families using simple taxonomic keys.</p> <p>1.3 Describe the general characteristics of the subphylum Gnathostomata and Agnatha with Examples</p> <p>1.4 Identify the position of the group Pisces in the general evolution of the animal kingdom.</p> <p>1.5 Describe the general characteristics of the class Osteichthyes and orders</p>	<p>Identify position of the group Pisces in the general evolution of the animal kingdom.</p> <p>Classify the group Pisces into families using simple taxonomic keys.</p> <p>Describe the general characteristics of the subphylum Gnathostomata and Agnatha with Examples</p> <p>Identify the position of the group Pisces in the general evolution of the animal kingdom.</p> <p>Describe the general characteristics of the class Osteichthyes and orders</p>	<p>Fish charts for marine and fresh water Museum specimens, documentary films. Same as above Fish museum reserved specimen</p> <p>Specimens of finfish and shellfish e.g. shrimp, oysters, crayfish etc. Preserved specimen of “ancient” e.g. ploypterdae And “modern”</p>	<p>Visit fish landing site/market for further fish identifications</p> <p>Show samples from the fish types</p> <p>Lectures, questions and answer session of fish on different subclasses fish.</p> <p>Lectures, illustrations showing evolutionary trends in fisheries.</p> <p>Lectures illustrate with samples of</p>	<p>Visit fish landing site/market for further fish identifications</p> <p>Show samples from the fish types</p> <p>Lectures, questions and answer session of fish on different subclasses fish.</p> <p>Lectures, illustrations showing evolutionary</p>	<p>Classify the group Pisces into families using simple taxonomic keys. Describe the general characteristics of the subphylum Gnathostomata and Agnatha with Examples</p> <p>Identify the main groups of</p>

	<p>lodoaathemthdyonuth, teleosterichandrychthes, holostei</p> <p>1.6 Identify members of the groups of cyclostomes, chondrichives, osteichves etc.</p> <p>1.7 Identify the main groups of Nigerian Fishes (both marine and fresh water species) and their diagnostic and main characteristics.</p> <p>1.8 Differentiate between fishes and shellfishes</p> <p>1.9 A phenoptenhia and chondrichlyes and orders selchii and chondrichl hyesclashleychin fish bradyodonti.</p> <p>1.10 Describe the general characteristics of the class Osteichythes and orders Coelocanthinii Dipnoiteleotei, chondrostel, , Holosei (bonyfish)</p> <p>1.11 Identify members of the groups</p>	<p>lodoaathemthdyonuth, teleosterichandrychthes</p> <p>Identify members of the groups of cyclostomes, chondrichives, osteichves etc.</p> <p>Identify the main groups of Nigerian Fishes (both marine and fresh water species) and their diagnostic and main characteristics.</p> <p>Differentiate between fishes and shellfishes</p> <p>A phenoptenhia and chondrichlyes and orders selchii and chondrichl hyesclashleychin fish bradyodonti.</p> <p>Describe the general characteristics of the class Osteichythes and orders Coelocanthinii Dipnoiteleotei, chondrostel, , Holosei (bonyfish)</p> <p>Identify members of the groups of cyclostomes,</p>	<p>fish e.g. Polyperus, Tilapia etc.</p> <p>Fish charts for marking and fresh water lecturers.</p> <p>Museum specimens, documentary films</p> <p>Same as above</p> <p>Same as above</p> <p>Specimens of finfish and shellfish e.g. shrimp, oysters, crayfish etc.</p> <p>Preserved specimen of “ancient” e.g. ploypterdae</p> <p>And “modern” fish e.g. Polyperus, Tibpieti.</p>	<p>fish from museum, classify fish using taxonomic keys.</p> <p>Lectures</p> <p>Show samples from the fish types</p>	<p>trends in fisheries.</p> <p>Lectures illustrate with samples of fish from museum, classify fish using taxonomic keys.</p>	<p>Nigerian Fishes (both marine and fresh water species) and their diagnostic and main characteristics.</p> <p>Differentiate between fishes and shellfishes</p> <p>A phenoptenhia and chondrichlyes and orders selchii and chondrichl hyesclashleychin fish bradyodonti.</p>
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	<p>of cyclostomes, chondrichthyes, osteichtheys etc</p> <p>1.12 Identify the main groups of Nigerian Fishes (Both marine and fresh water species) and their diagnostic and main characteristics.</p> <p>1.13 Differentiate between finfishes and shellfishes</p> <p>1.14 Identify the differences between “ancient” e.g. Polypteridae, Lepidosienidea, Coelcanthinii, Mormyridea and “modern” fishes like cichlidae, Cyprinidae, Clariidae, Centropomidea etc.</p>	<p>chondrichthyes, osteichtheys etc</p> <p>. Identify the main groups of Nigerian Fishes (Both marine and fresh water species) and their diagnostic and main characteristics.</p> <p>Differentiate between finfishes and shellfishes</p> <p>Identify the differences between “ancient” e.g. Polypteridae, Lepidosienidea, Coelcanthinii, Mormyridea and “modern” fishes like cichlidae, Cyprinidae, Clariidae, Centropomidea etc.</p>				
General Objectives 2.0: Understand the external morphology of bony fish						
3-4	<p>2.1 Describe the gross morphology of a bony fish.</p> <p>2.2 Measure the morphometric or meristic</p>	<p>Describe the gross morphology of a bony fish.</p> <p>Measure the morphometric or meristic</p>	<p>Measuring board, ruler, fish specimen.</p> <p>Various fish</p>	<p>Observe a commonly available bony fish in the Laboratory.</p> <p>Carry out</p>	<p>Present a commonly available bony fish to students to</p>	<p>Describe the gross morphology of a bony fish.</p> <p>Measure the</p>

	<p>characters of fish i.e standard length, total length, tank h, head girth, head trunk and tail region of a typical fish.</p> <p>2.3 Identify and differentiate between different types of fish scales-Ctenoid, ganoid, cycloid, and placoid.</p> <p>2.4 Identify and draw the following parts of a fish:-opercular, pre-opercular, jugular, pre-orbital and snout regions, dorsal and ventral surfaces, paired and unpaired fins, lateral line, mouth shapes and positions, body forms.</p>	<p>characters of fish i.e standard length, total length, tank h, head girth, head trunk and tail region of a typical fish.</p> <p>Identify and differentiate between different types of fish scales-Ctenoid, ganoid, cycloid, and placoid.</p> <p>Identify and draw the following parts of a fish:-opercular, pre-opercular, jugular, pre-orbital and snout regions, dorsal and ventral surfaces, paired and unpaired fins, lateral line, mouth shapes and positions, body forms.</p>	<p>scales prepared slides of fish scales and microscopes.</p> <p>Drawing materials, pictures and specimens of fish (fresh and Preserved).</p>	<p>measurement of fish</p> <p>Drawing a fish</p> <p>Illustrate to show parts of fish</p>	<p>carry out Laboratory measurement of fish</p> <p>Laboratory identification and drawing of fish</p> <p>practical illustrations and demonstrates on parts of fish</p>	<p>morph metric or meristic characters of fish i.e standard length, total length, tank h, head girth, head trunk and tail region of a typical fish.</p>
General Objectives 3.0: Understand the anatomy of fish (Fish Anatomy)						
5-6	<p>3.1 Identify the alimentary canal and associated structures-mouth, teeth, pharynx, esophagus, stomach, intestine, pancreas, liver kidney, spleen, gas bladder, gills, gonads and heart of fish</p> <p>3.2 Describe the general</p>	<p>Identify the alimentary canal and associated structures-mouth, teeth, pharynx, esophagus, stomach, intestine, pancreas, liver kidney, spleen, gas bladder, gills, gonads and heart of fish</p>	<p>Dissecting kit preserved and fresh specimens of fish and ruler.</p> <p>Fish skeleton/charts</p>	<p>Dissect to showing different parts of the alimentary canal from mouth to anus.</p> <p>Practical, identify skeletal system and draw.</p>	<p>Practical show laboratory Dissection showing different parts of the alimentary canal from mouth to</p>	<p>Explain the Identify the alimentary canal and associated structures-mouth, teeth, pharynx, esophagus, stomach,</p>

	<p>functions of the above listed structure (3.1).</p> <p>3.3 Identify the skeletal system: vertebral column, caudal area, fins etc.</p> <p>3.4 Describe the general functions of items No. 3.3 above.</p> <p>3.5 Identify and draw fish skin</p> <p>3.6 Identify and draw skin derivatives of fish.</p> <p>3.7 Explain the function of fish skin.</p>	<p>Describe the general functions of the above listed structure (3.1). Identify the skeletal system: vertebral column, caudal area, fins etc.</p> <p>Describe the general functions of items No. above.</p> <p>Identify and draw fish skin</p> <p>Identify and draw skin derivatives of fish.</p> <p>Explain the function of fish skin.</p>	<p>Prepared slide of fish skin, microscope.</p> <p>Preserved fish.</p>	<p>Lecture</p> <p>Prepared slide and documentaries of fish skin</p>	<p>anus.</p> <p>Practical, identify skeletal system and draw.</p> <p>Lecture</p> <p>Prepared slide and documentaries of fish skin</p>	<p>intestine, pancreas, liver kidney, spleen, gas bladder, gills, gonads and heart of fish</p>
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General Objectives 4.0: Understand the food and feeding habits of fish

	<p>4.1 Describe the different modes of feeding in fish e.g of filter feeding, omnivorous carnivorous, detritus feeding etc.</p> <p>4.2 Explain the adaptations of fish (morphological adaptations) to different feeding methods.</p> <p>4.3 Dissect fish and draw to scale fish alimentary canal relative to body length</p> <p>4.4 Analyse stomach content of the dissected fish</p> <p>4.5 List the components of</p>	<p>Describe the different modes of feeding in fish e.g of filter feeding, omnivorous carnivorous, detritus feeding etc.</p> <p>Explain the adaptations of fish (morphological adaptations) to different feeding methods.</p> <p>Dissect fish and draw to scale fish alimentary canal relative to body length</p>	<p>Fish specimens for dissection and practical study of fish diet.</p> <p>Dissecting kit same as above.</p> <p>Charts showing energy circulation in the ecosystem experimental field.</p>	<p>Lecture, Practical showing different feeding methods of fish.</p> <p>Guide students to dissect and measure alimentary canal relative to length.</p> <p>Lectures</p> <p>Use morphological features to illustrate</p>	<p>Lecture, Practical showing different feeding methods of fish.</p> <p>Guide students to dissect and measure alimentary canal relative to length.</p>	<p>Describe the different modes of feeding in fish e.g of filter feeding, omnivorous carnivorous, detritus feeding etc.</p> <p>Explain the adaptations of fish (morphological adaptations) to different feeding</p>
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	fish food and their functions:- proteins, carbohydrates, fats, minerals and vitamins. 4.6 Explain energy circulation in the ecosystem: food chain, food web, and food pyramids	Analyse stomach content	Specimens for dissection (fresh/preserved)	adaptations Lecture and use diagrams. Dissect alimentary canal Analyse food content.	Lectures Use morphological features to illustrate	methods
General Objectives 5.0: Understand the Natural Environmental Behaviour of fish						
9-10	5.1 Describe different behavioural responses in fish e.g. aggregation schools, shoals, aestivation and hibernation. 5.2 Explain fish migration 5.3 Describe types of fish migration 5.4 Describe typical examples of migrations in fish e.g. anadromous versus catadromous, virtual and lateral 5.5 Explain different reproductive behaviour in fish 5.6 Explain different types of parental care in fish.	Describe different behavioural responses in fish e.g. aggregation schools, shoals, aestivation and hibernation. Explain fish migration Describe types of fish migration Describe typical examples of migrations in fish e.g. anadromous versus catadromous, virtual and lateral Explain different reproductive behaviour in fish Explain different types of parental care in fish.	Films and documentaries on fish behaviour. Films and documentaries on fish migrations. Films and documentaries on reproductive behaviour.	Observe the fish behaviour. Observe the fish migratory patterns, types. Monitor the reproductive behaviour cycles and parental care. Provide female and male fish for observation.	Explain the fish behaviour in a given pond Show the fish migratory patterns, types. Follow up the reproductive behaviour cycles and parental care. Provide female and male fish for observation.	Describe different behavioural responses in fish e.g. aggregation schools, shoals, aestivation and hibernation
General Objectives 6.0: Understand age and growth in fish						
11-12	6.1 Explain different methods of growth studies in fish.	Explain different methods of growth	Measuring boards, weighing	Use data to construct length	Use data to construct	Explain the use of hard

	<p>Length frequency analysis, length/weight relationships, known age methods etc.</p> <p>6.2 Explain the use of hard structures in age and growth studies in fish e.g. scales, opercular bones, Vertebral spine, otoliths, etc.</p> <p>6.3 Draw growth rings from slides using microscopes</p> <p>6.4 List the various factors that affect or regulate growth in fish, e.g. environmental factors.</p> <p>6.5 Explain the problems encountered in age and growth studies in tropical fishes</p>	<p>studies in fish. Length frequency analysis, length/weight relationships, known age methods etc.</p> <p>Explain the use of hard structures in age and growth studies in fish e.g. scales, opercular bones, Vertebral spine, otoliths, etc.</p> <p>Draw growth rings from slides using microscopes</p> <p>List the various factors that affect or regulate growth in fish, e.g. environmental factors.</p> <p>Explain the problems encountered in age and growth studies in tropical fishes</p>	<p>scales graph paper.</p> <p>Prepared slides for study, microscopes</p> <p>Films and documentaries</p> <p>Prepared slides, microscopes</p>	<p>frequency and length/weight relationship ask students to do. Same.</p> <p>observe the prepared slides of rings using microscopes</p>	<p>length frequency and length/weight relationship ask students to do. Same.</p> <p>Guide student to observe prepared slides of rings using microscopes</p>	<p>structures in age and growth studies in fish e.g. scales, opercular bones, Vertebral spine, otoliths</p>
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General Objectives 7.0: Understand respiratory, Osmoregulatory and Reproduction

13-14	<p>7.1 Explain the basic processes of respiration in fish.</p> <p>7.2 Describe non-gill respiration in e.g. using accessory breathing organs, lung skin etc.</p>	<p>Explain the basic processes of respiration in fish.</p> <p>Describe non-gill respiration in e.g. using accessory breathing organs, lung</p>	<p>Fish specimens. Dissecting kit and documentaries</p> <p>charts. Films and documentaries.</p>	<p>Observe charts to show respiratory processes and special air breathing organs. Lecturer, using diagrams to show</p>	<p>Using film and charts to show respiratory processes and special air breathing</p>	<p>Describe the basic osmo-regulatory process in fresh water, brakish and marine water fishes.</p>
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	<p>7.3 Describe the basic osmo-regulatory process in fresh water, brakish and marine water fishes.</p> <p>7.4 Explain excretion in fish.</p> <p>7.5 Describe the stages of gonad development in fish.</p> <p>7.6 Determine gonad size and weight</p> <p>7.7 Describe the life history of two named fish.</p> <p>7.8 Explain fertilization in fish.</p> <p>7.9 Explain fish fecundity and factors affecting it.</p>	<p>skin etc.</p> <p>Describe the basic osmo-regulatory process in fresh water, brakish and marine water fishes.</p> <p>Explain excretion in fish.</p> <p>Describe the stages of gonad development in fish.</p> <p>Determine gonad size and weight</p> <p>Describe the life history of two named fish.</p> <p>Explain fertilization in fish.</p> <p>Explain fish fecundity and factors affecting it.</p>	<p>Fish eggs, microscopes</p> <p>Micrometer</p> <p>screw gauges</p> <p>weighing balance.</p>	<p>osmo-regulation.</p> <p>Lecture and field trip to get information on gonad size and weight.</p>	<p>organs.</p> <p>Lecturer, using diagrams to show osmo-regulation.</p> <p>Lecture and field trip to get information on gonad size and weight.</p>	
General Objectives 8.0: Understand fish population dynamics						
15	<p>8.1 Define population density</p> <p>8.2 Explain factors affecting population density</p> <p>8.3 Describe different methods of simple population estimate in fish.</p>	<p>8.4 Define population density</p> <p>8.5 Explain factors affecting population density</p> <p>Describe different methods of simple population estimate in fish.</p>				

Programme ND Oceanography and Fishery Science		
Course: Biology of fishes	Course Code: FIT 122	CH/CU Hour:2
Goal:		
General Objectives 1.0: Understand the basic principles of fish taxonomy		
Course Specification: PRACTICAL CONTENT		

	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	<p>1.1 Classify the group Pisces into families using simple taxonomic keys.</p> <p>1.2 Draw samples of fish representing families.</p> <p>1.3 Differentiate between fishes and shellfishes</p> <p>1.4 Identify members of the groups of cyclostomes, chondrichthyes, osteichthyes etc.</p> <p>1.5 Identify the main groups of Nigerian Fishes (both marine and fresh water species) and their diagnostic and main characteristics</p>	<p>Classify the group Pisces into families using simple taxonomic keys.</p> <p>Draw samples of fish representing families.</p> <p>Differentiate between fishes and shellfishes</p> <p>Identify members of the groups of cyclostomes, chondrichthyes, osteichthyes etc.</p> <p>Identify the main groups of Nigerian Fishes (both marine and fresh water species) and their diagnostic and main characteristics</p>	<p>Fish museum preserved specimen</p> <p>Specimens of finfish and shellfish e.g. shrimp, oysters, crayfish etc.</p> <p>Preserved specimen of "ancient" e.g. pterygopterae</p> <p>And "modern" fish e.g. Polypterus, Tilapia etc.</p> <p>Specimen of fish ditto</p>	<p>Show samples from the fish types</p> <p>Laboratory identification and drawing of fish specimen.</p> <p>Visit fish landing site/market for further fish identifications</p> <p>Show samples from the fish types</p>	<p>Show samples from the fish types and Laboratory identification and drawing of fish specimen.</p> <p>Visit fish landing site/market for further fish identifications</p> <p>Show samples from the fish types</p>	<p>Draw samples of fish representing families</p>
General Objectives 2.0: Understand the external morphology of bony fish						
3-4	<p>2.1 Measure the morphometric or meristic characters of fish i.e standard length, total length, tank h, head girth, head trunk and tail region of a</p>	<p>Laboratory measurement of fish.</p> <p>Identification and drawing of fish scales.</p>	<p>Measuring board, ruler, fish specimen.</p> <p>Various fish scales prepared</p>	<p>Measure the morphometric or meristic characters of fish i.e standard length, total length, tank h, head girth, head trunk and</p>	<p>Measure the morphometric or meristic characters of fish i.e standard length, total</p>	<p>Differentiate between different types of fish scales- Ctenoid,</p>

	<p>typical fish.</p> <p>2.2 Differentiate between different types of fish scales-Ctenoid, ganoid, cycloid, and placoid.</p> <p>2.3 Identify and draw the following parts of a fish:-opercular, pre-opercular, jugular, pre-orbital and snout regions, dorsal and ventral surfaces, paired and unpaired fins, lateral line, mouth shapes and positions, body forms.</p> <p>2.4 Identify the alimentary canal and associated structures-mouth, teeth, pharynx, esophagus, stomach, intestine, pancreas, liver kidney, spleen, gas bladder, gills, gonads and heart of fish</p>	<p>Laboratory identification and drawing of fish</p> <p>laboratory dissection of fish showing different parts of the alimentary canal from mouth to anus.</p>	<p>slides of fish scales and microscopes.</p> <p>Drawing materials, pictures and specimens of fish (fresh and Preserved).</p> <p>Dissecting kit preserved and fresh specimens of fish and ruler.</p>	<p>tail region of a typical fish</p> <p>Differentiate between different types of fish scales-Ctenoid, ganoid, cycloid, and placoid</p>	<p>length, tank h, head girth, head trunk and tail region of a typical fish</p>	<p>ganoid, cycloid, and placoid.</p>
	<p>3.1 Identify the skeletal system: vertebral column, caudal area, fins etc.</p> <p>3.2 Identify and draw fish skin</p> <p>3.3 Dissect fish and draw to scale fish alimentary canal relative to body length</p>	<p>Identify the skeletal system: vertebral column, caudal area, fins etc.</p> <p>Identify and draw fish skin</p> <p>Dissect fish and draw</p>	<p>Fish skeleton/charts.</p> <p>Prepared slide of fish skin, microscope.</p>	<p>Identify skeletal system and draw.</p> <p>Prepared slide and documentaries of fish skin</p>	<p>Conduct Practical, identify skeletal system and draw.</p>	<p>Draw the skeletal system: vertebral column, caudal area, fins etc</p>

	3.4 Draw growth rings from slides using microscopes	to scale fish alimentary canal relative to body length Draw growth rings from slides using microscopes	Fresh /Preserved fish specimen Prepared slides for study, microscopes	Measure alimentary canal relative to length. Observe prepared slides of rings using microscopes	Prepared slide and documentaries of fish skin Guide students to dissect and measure alimentary canal relative to length. Guide student to observe prepared slides of rings using microscopes	
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Programme: ND Oceanography and Fishery Science	Course Code:	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60

Course: BASIC AQUACULTURE	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Goal: This course is designed to acquaint students with general principle of aquaculture particularly as it affects warm water fish species (fish and shell fishes)

GENERAL OBJECTIVES

On completion of this course the student should be able to:

Know the meaning and scope of aquaculture

Programme ND Oceanography and Fishery Science		
Course: BASIC AQUACULTURE	Course Code: FIT 123	CH/CU Hour:2
Goal: This course is designed to acquaint students with general principle of aquaculture particularly as it affects warm water fish species (fish		

and shell fishes)

General Objectives 1.0: Know the meaning and scope of aquaculture

Course Specification: THEORETICAL CONTENT

	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	<p>1.1 Define aquaculture</p> <p>1.2 Outline the history of aquaculture with particular reference to Nigeria, the present status and its prospects in future.</p> <p>1.3 Explain the potential of aquaculture in boosting fish production in Nigeria.</p> <p>1.4 Identify key species of fish cultured in Nigeria</p> <p>1.5 Identify major fish types in Nigeria, fish seed, table fish, ornamental fish, shellfish.</p> <p>1.6 Describe the growth, feeding, reproductive behaviour of common fish species in 1.4 above.</p> <p>1.7 Draw different cultureable fish species</p>	<p>Define aquaculture</p> <p>Outline the history of aquaculture with particular reference to Nigeria, the present status and its prospects in future.</p> <p>Explain the potential of aquaculture in boosting fish production in Nigeria.</p> <p>Identify key species of fish cultured in Nigeria</p> <p>Identify major fish types in Nigeria, fish seed, table fish, ornamental fish, shellfish.</p> <p>Describe the growth, feeding, reproductive behaviour of common fish species in 1.4 above.</p>	<p>Charts</p> <p>Pictures video</p> <p>Tables</p> <p>Fish museum</p> <p>Tilapia</p> <p><u>Clarias</u></p> <p><u>Heterobranchus</u></p> <p><u>Heterotis</u></p> <p><u>Mullet</u></p> <p><u>Chrysichthys</u></p> <p>Shrimps</p> <p>Macrobrachium</p> <p>Peieausp, etc</p> <p>Charts, figures</p> <p>Aquarian fishes e.g.</p> <p>Gold fish, Barbus sp. Etc</p> <p>Croakers (<u>Pseudolithophilus</u> sp.)</p> <p><u>log anus</u>(Snapper)</p> <p>clipeids (Ethmahosa)</p> <p>Ihsha)</p>	<p>Preserved a fresh cultureable and non-cultureable fish and shell species.</p> <p>Guide students on the characteristics of the different spp. For ease of identification.</p> <p>Cause students to separate fish into cultureable and non-cultureable species.</p> <p>Conduct practical on characteristics of cultureable and non-cultureable species (fin fish and shell fish)</p>	<p>Show students preserved or fresh cultureable and non-cultureable fish and shell species.</p> <p>Guide students on the characteristics of the different spp. For ease of identification.</p> <p>Cause students to separate fish into cultureable and non-cultureable species.</p> <p>Conduct practical on characteristics</p>	

			Arius spp., etc Alates' sp, Distidrodus, spp Bagrussp, Syavdoutiesspp, Chanaspp Cyriaid fishes.		of Cultureable and non cultureable species (fin fish and shell fish)	
General Objectives 2.0: Know Various Types Of Fish Cultutre Systems						
3-6	2.1 Define extensive, semi-intensive and intensive farming systems 2.2 Explain the differences between extensive, semi-intensive and intensive fish farming systems. 2.3 Identify the facilities for the culture of fish	Define extensive, semi-intensive and intensive farming systems Explain the differences between extensive, semi-intensive and intensive fish farming systems. Identify the facilities for the culture of fish	Reservoirs, pond raceways, aquarium, tanks cages pens, recirculating systems.	Take students to see different fish farming facilities	Take students to see different fish farming facilities	Explain the differences between extensive, semi-intensive and intensive fish farming systems
General Objectives 3.0: Understand Fish Pond Preparation For Stocking Purposes						
7-8	3.1 Explain the need for preparing pond bottoms in old and new ponds before stocking 3.2 Describe the use of liming material to condition pond bottoms 3.3 Explain the processes involved in impounding water in ponds 3.4 Explain the need for fertilization.	Explain the need for preparing pond bottoms in old and new ponds before stocking Describe the use of liming material to condition pond bottoms Explain the processes involved in impounding water in ponds Explain the need for	Lime Organic and inorganic fertilizer Pond or tank with earthen bottom.			

	<p>3.5 List inorganic fertilizers.</p> <p>3.6 Explain the principles of stocking ponds with desired species in monoculture, and polyculture systems.</p> <p>3.7 Describe how to condition pond bottom before stocking.</p> <p>3.8 Describe how to condition pond bottom using farming materials</p> <p>3.9 Explain fertilization of culture pond</p> <p>3.10 Stocking of pond with desired species</p> <p>3.11 Describe impounding fertilization and stocking of a pond</p>	<p>fertilization.</p> <p>List inorganic fertilizers.</p> <p>Explain the principles of stocking ponds with desired species in monoculture, and polyculture systems.</p> <p>Describe how to condition pond bottom before stocking.</p> <p>Describe how to condition pond bottom using farming materials</p> <p>Explain fertilization of culture pond</p> <p>Stocking of pond with desired species</p> <p>Describe impounding fertilization and stocking of a pond</p> <p>Demonstrate and guide students to prepare impound and fertilize A pond.</p> <p>Demonstrate stocking of pond with different species.</p>	<p>Culturable, finfish/shell fish species mentioned in 2.0</p>			
<p>General Objectives 4.0: Understand the Role of Natural feeds and Supplemental feeding in ponds</p>						

<p>9-10</p>	<p>4.1 List the methods available for the production of natural fish feed.</p> <p>4.2 Identify locally available common fish feed stuffs.</p> <p>4.3 Describe the procedure for compounding simple fish rations.</p> <p>4.4 Explain the estimate of quantity of supplemental feed to be applied to experimental pond</p> <p>4.5 Compound simple fish ration</p> <p>4.6 Explain production and packaging of feed pellets</p> <p>4.7 Carry out practical feeding of fish.</p> <p>4.8 Produce fish feed pellets.</p> <p>4.9 Package fish feed pellets.</p>	<p>List the methods available for the production of natural fish feed.</p> <p>Identify locally available common fish feed stuffs.</p> <p>Describe the procedure for compounding simple fish rations.</p> <p>Explain the estimate of quantity of supplemental feed to be applied to experimental pond</p> <p>Compound simple fish ration</p> <p>Explain production and packaging of feed pellets</p> <p>Carry out practical feeding of fish.</p> <p>Produce fish feed pellets.</p> <p>Package fish feed pellets</p>	<p>Natural fish feeds</p> <p>Different feed stuffs e.g. corn, meal, soybean meal, groundnut cake, fish meal, palm kernel cake, etc, and vitamin and mineral mixes</p> <p>Grinding mill domestic mixer, scoop/cup bowls, buckets, cooking pots frying pan</p>	<p>Observe mode of feeding of fish in ponds.</p>	<p>Conduct practical with students on Compounding ration and feeding fish in ponds.</p>	<p>Describe the procedure for compounding simple fish rations.</p> <p>Explain the estimate of quantity of supplemental feed to be applied to experimental pond</p>
<p>General Objectives 5.0: Understand the principles and methods fish food production Fish Seed Production</p>						
<p>11-12</p>	<p>Explain natural propagation of fish in ponds</p> <p>5.2 Explain the need for care and maintenance of</p>	<p>Explain the need for care and maintenance of brood fish.</p> <p>Describe artificial</p>	<p>Brood stock from any of the culturable spp in 2.0 above</p>			

	<p>brood fish.</p> <p>5.3 Describe artificial propagation of fish by different methods e.g. induced breeding</p> <p>5.4 Explain the need for specialized feeding of fry/fingerlings</p> <p>5.5 Explain the reasons for hybridization</p> <p>5.6 Describe methods of transporting fish</p> <p>5.7 Describe propagation of fish artificially.</p> <p>5.8 Package fish fry/fingerlings for transportation</p>	<p>propagation of fish by different methods e.g. induced breeding</p> <p>Explain the need for specialized feeding of fry/fingerlings</p> <p>Demonstrate packaging of fish fry/fingerlings for transportation</p> <p>Demonstrate hypophysation of fish</p>	<p>Feed</p> <p>Manure (organic, inorganic)</p> <p>Salt</p> <p>Hormone e.g. Ovaprin, Pituitary</p> <p>Syringe and needle</p> <p>Napkins</p> <p>Polythene bag (clear)</p> <p>Oxygen Cylinder</p> <p>Plastic buckets (covered)</p> <p>White jerry cans</p>			
General Objectives 6.0: Know Enemies of Fish Under Culture						
	<p>6.1 Explain water pollution.</p> <p>6.2 Identify ways of dealing with problems of water pollution in fish culture.</p> <p>6.3 Describe simple methods of improving water quality.</p> <p>6.4 Identify fish predators and control</p> <p>6.5 Describe methods of controlling fish predation</p> <p>6.6 Identify aquatic weeds.</p> <p>6.7 Describe methods of</p>	<p>Explain water pollution.</p> <p>Identify ways of dealing with problems of water pollution in fish culture.</p> <p>Describe simple methods of improving water quality.</p> <p>Identify fish predators and control</p> <p>Describe methods of controlling fish predation</p>	<p>Paddles</p> <p>Canoe</p> <p>Secchi disc</p> <p>Alum</p> <p>Palm frond/grass/hay</p> <p>Water hyacinth (dried or fresh)</p> <p>Water lettuce, water lily, etc.</p> <p>Weed album</p> <p>Preserved/pictures of diseased fish</p> <p>Preserved/pictures</p>	<p>Show different aquatic weeds associated with pond culture to students</p>	<p>Show different aquatic weeds associated with pond culture to students</p>	<p>Explain water pollution. Identify ways of dealing with problems of water pollution in fish culture</p>

	<p>control of aquatic weeds.</p> <p>6.8 Identify common fish diseases and parasites and how to control them.</p> <p>6.9 List methods of control of fish diseases.</p>	<p>Identify aquatic weeds.</p> <p>Describe methods of control of aquatic weeds.</p> <p>Identify common fish diseases and parasites and how to control them.</p> <p>List methods of control of fish diseases.</p>	<p>of diseased of parasitized fish</p> <p>A chest of parasites and fish disease</p>			
General Objectives 7.0: Understand the harvesting, transportation and marketing of fish						
15	<p>7.1 Define fish harvesting.</p> <p>7.2 List common methods of harvesting fish, explain total and partial cropping.</p> <p>7.3 Identify equipment used for harvesting fish by (a) Partial an (b) Total cropping.</p> <p>7.4 Harvest and crop fish by the methods in 7.3 above.</p> <p>7.5 Identify various methods of transporting harvested fish (live or dead).</p> <p>7.6 List precautions required in transporting fish.</p> <p>7.7 List outlets for marketing fish-seed, table fish, shell</p>	<p>Define fish harvesting.</p> <p>List common methods of harvesting fish, explain total and partial cropping.</p> <p>Identify equipment used for harvesting fish by (a) Partial an (b) Total cropping.</p> <p>Harvest and crop fish by the methods in 7.3 above.</p> <p>Identify various methods of transporting harvested fish (live or dead).</p> <p>List precautions</p>	<p>Seine nets</p> <p>Scoop nets</p> <p>Canoe</p> <p>Paddles</p> <p>Basins</p> <p>Buckets</p> <p>Fish transportation items e.g vats, plastic buds</p> <p>Calabash</p> <p>Jerry cans etc</p>			

	fish, ornamental fish etc.	required in transporting fish. List outlets for marketing fish-seed, table fish, shell fish, ornamental fish etc. Guide students in harvesting fish.				
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Programme: ND Oceanography and Fishery Science	Course Code:	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: BASIC AQUACULTURE PRACTICAL CONTENT	Pre-Requisite:	Theoretical: Hours/week
		Practical:
Semester: 1st Semester		

Course Main Aim/ Goal:

GENERAL OBJECTIVES

On completion of this course the student should be able to:

Programme ND Oceanography and Fishery Science

Course: BASIC AQUACULTURE PRACTICAL CONTENT			Course Code: FIT 123		CH/CU Hour:2	
Goal: This course is designed to acquaint students with general principle of aquaculture particularly as it affects warm water fish species (fish and shell fishes)						
General Objectives 1.0: Know the meaning and scope of aquaculture						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	<p>1.1 Identify key species of fish cultured in Nigeria</p> <p>1.2 Identify major fish types in Nigeria, fish seed, table fish, ornamental fish, shellfish.</p> <p>1.3 Draw different cultureable fish species</p>	<p>Identify key species of fish cultured in Nigeria</p> <p>Identify major fish types in Nigeria, fish seed, table fish, ornamental fish, shellfish.</p> <p>Draw different cultureable fish species</p>	<p><u>Tilapia sp.</u> <u>Clariassp</u> <u>Heterobranchus</u> <u>Heterotis</u> <u>Mullet</u> <u>Chrysichthys</u> Shrimps Macrobrachiam Peieausspp, etc Aquarian fishes e.g. Gold fish, Barbus sp. Etc</p>	<p>Show students preserved or fresh culturable and non-culturable fish and shell species. Guide students on the characteristics of the different spp. For ease of identification.</p> <p>Cause students to separate fish into Cultureable and non-culturable species. Conduct practical on characteristics of Cultureable and non cultureable species (fin fish and shell fish)</p>	<p>Show students preserved or fresh culturable and non-culturable fish and shell species. Guide students on the characteristics of the different spp. For ease of identification.</p> <p>Cause students to separate fish into Cultureable and non-culturable species. Conduct</p>	<p>Identify key species of fish cultured in Nigeria Identify major fish types in Nigeria, fish seed, table fish, ornamental fish, and shellfish.</p> <p>Draw different cultureable fish species</p>

					practical on characteristics of Cultureable and non cultureable species (fin fish and shell fish)	
General Objectives 2.0: KNOW VARIOUS TYPES OF FISH CULTURE SYSTEMS						
5-6	<p>2.1 Identify the facilities for the culture of fish</p> <p>2.2 Prepare ponds for Stocking</p> <p>2.3 Stock pond as desired</p> <p>2.4 Compound simple fish ration</p> <p>2.5 Carry out practical feeding of fish.</p> <p>2.6 Produce fish feed pellets.</p> <p>2.7 Package fish feed pellets</p> <p>2.8 Package fish fry/fingerlings for transportation</p>	<p>Explain the facilities for the culture of fish</p> <p>Prepare ponds for Stocking</p> <p>Stock pond as desired</p> <p>Compound simple fish ration</p> <p>Carry out practical feeding of fish.</p> <p>Produce fish feed pellets.</p> <p>Package fish feed pellets</p> <p>Package fish fry/fingerlings for transportation</p>	<p>Reservoirs, pond raceways, aquarium, tanks cages pens, recirculation systems.</p> <p>Ditto</p> <p>Already prepared pond.</p> <p>Grinding mill domestic mixer, scoop/cup bowls, buckets, cooking pots frying pan</p> <p>Polythene bag (clear)</p> <p>Oxygen Cylinder</p> <p>Plastic buckets (covered)</p>	<p>Show different fish farming facilities</p> <p>Plan for preparation for stocking</p> <p>Stock pond</p> <p>Identify ration and feeding fish in ponds.</p> <p>Demonstrate packaging of fish</p>	<p>Take students to see different fish farming facilities</p> <p>Guide students on pond preparation for stocking</p> <p>Guide students to stock pond</p> <p>Conduct practical with students on Compounding ration and feeding fish in ponds.</p> <p>Demonstrate packaging of fish</p>	<p>Identify the facilities for the culture of fish</p> <p>Prepare ponds for Stocking</p>

			White jerry cans			
General Objectives 3.0: Know Enemies of Fish Under Culture						
	<p>3.1 Identify ways of dealing with problems of water pollution in fish culture.</p> <p>3.2 Identify fish predators and control</p> <p>3.3 Identify aquatic weeds.</p> <p>3.4 Identify common fish diseases and parasites and how to control them.</p>	<p>Identify ways of dealing with problems of water pollution in fish culture.</p> <p>Identify fish predators and control</p> <p>Identify aquatic weeds.</p> <p>Identify common fish diseases and parasites and how to control them.</p>	<p>Paddles</p> <p>Canoe</p> <p>Secchi disc</p> <p>Alum</p> <p>Palm frond/grass/hay</p> <p>Water hyacinth (dried or fresh)</p> <p>Water lettuce, water lily, etc.</p> <p>Weed album</p> <p>Preserved/pictures of diseased fish</p> <p>Preserved/pictures of diseased or parasitised fish</p> <p>A chest of parasites and fish disease</p>	<p>See existing ponds, identify possible pollutants, predators, and weeds</p>	<p>Take students to existing ponds, identify possible pollutants, predators, and weeds</p>	<p>Identify ways of dealing with problems of water pollution in fish culture. Identify fish predators and control</p>
General Objectives 4.0: Understand the harvesting, transportation and marketing of fish						
	<p>4.1 Identify equipment used for harvesting fish by (a) Partial and (b) Total cropping.</p> <p>4.2 Harvest and crop fish by Total or partial cropping.</p> <p>4.3 Identify various methods of transporting harvested fish (live or dead).</p>	<p>Identify equipment used for harvesting fish by (a) Partial and (b) Total cropping.</p> <p>Harvest and crop fish by Total or partial cropping.</p> <p>Identify various methods of transporting harvested fish (live or</p>	<p>Seine nets</p> <p>Scoop nets</p> <p>Canoe</p> <p>Paddles</p> <p>Basins</p> <p>Buckets</p> <p>Fish transportation items e.g vats, plastic buds</p>	<p>Harvesting fish.</p>	<p>Guide students in harvesting fish.</p>	<p>Identify equipment used for harvesting fish by (a) Partial and (b) Total cropping.</p>

		dead).	Calabash Jerry cans etc			
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Programme: ND Oceanography and Fishery Science	Course Code:	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: FISHING GEAR AND CRAFT TECHNOLOGY I (PRACTICAL)	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal: **Goal:** This course is designed to teach the students the basic principles of designing, constructing and use common fishing gears and crafts in Nigeria.

GENERAL OBJECTIVES
On completion of this course the student should be able to:
General Objectives 1.0: Know the Various Classifications of Fishing Gears

Programme ND Oceanography and Fishery Science

Course: FISHING GEAR AND CRAFT TECHNOLOGY I (PRACTICAL)			Course Code: FIT 124		CH/CU Hour:2	
Goal: This course is designed to teach the students the basic principles of designing, constructing and use common fishing gears and crafts in Nigeria.						
General Objectives 1.0: Know the Various Classifications of Fishing Gears						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>1.1 Identify all the traditional and modern fishing gears in use in Nigeria.</p> <p>1.2 Classify fishing gears and methods under: -Active fishing gears (trawl, cast net, Seine nets claps, etc. Passive fishing gears (gill net, trammel nets traps etc.)</p>	<p>Physical Identification and sketches.</p> <p>Identify all the traditional and modern fishing gears in use in Nigeria.</p> <p>Classify fishing gears and methods under: -Active fishing gears (trawl, cast net, Seine nets claps, etc. Passive fishing gears (gill net, trammel nets traps etc.)</p>	<p>Collection of active and passive gears</p>	<p>Identify all the traditional and modern fishing gears in use in Nigeria.</p> <p>Classify fishing gears and methods under: -Active fishing gears (trawl, cast net, Seine nets claps, etc. Passive fishing gears (gill net, trammel nets traps etc.)</p>	<p>Show Physical Identification and sketches.</p>	<p>Classify fishing gears and methods under: -Active fishing gears (trawl, cast net, Seine nets claps, etc.</p>
General Objectives 2.0: Know netting materials for gear construction						
	<p>2.1 Identify natural fibre materials for net construction.</p> <p>2.2 Identify the origin, types structures and constraints, in usage of both-animal and plant fibre sources.</p>	<p>Physical identification and reports</p> <p>Identify synthetic fibre</p>	<p>Collections of samples of</p> <ul style="list-style-type: none"> - Cotton - Sisal - Ramie - Synthetic Fibres - Net Loft 			

	<p>2.3 Identify synthetic fibre materials for net construction.</p> <p>2.4 List some of the chemicals used in synthesizing fibres-relate them to chemical compounds.</p> <p>2.5 Identify derivation of types, structure and constrains in use of materials in 2.3 above.</p> <p>2.6 Explain the physical and chemical characteristics of synthetic fibres (flexibility, strength chemical reactions etc).</p> <p>2.7 Carry out identification tests on the various types of synthetic fibres (water, visual andsolubility tests)</p>	<p>materials for net construction.</p> <p>List some of the chemicals used in synthesizing fibres-relate them to chemical compounds.</p> <p>Identify derivation of types, structure and constrains in use of materials in 2.3 above.</p> <p>Explain the physical and chemical characteristics of synthetic fibres (flexibility, strength chemical reactions etc).</p> <p>Carry out identification tests on the various types of synthetic fibres (water, visual andsolubility tests)</p>	<p>Chemical reagents</p> <p>Glass jars, test tubes, burner</p>			
General Objectives 3.0: Know the basic processes of net construction						
8-11	<p>3.1 Define terms associated with net construction-normal and T –cut, bar cut combinations cut</p> <p>3.2 Explain the processes in net construction, braiding, strand formation (rope) tapering, creasing, joining, knotting etc.</p>	<p>Define terms associated with net construction-normal and T –cut, bar cut combinations cut</p> <p>Explain the processes in net construction, braiding, strand formation (rope) tapering, creasing, joining, knotting etc.</p>	<p>Net loft</p> <p>Gear models</p> <p>Cutting Blades</p> <p>Mending needles</p> <p>Net loft</p> <p>Netting material</p> <p>Kuralon rope</p> <p>Markers</p>			

	<p>3.3 Mount netting material on support ropes (head and foot)</p> <p>3.4 Explain handing ratio (coefficient) and its effects on shape of net and its application constraints.</p> <p>3.5 Mount net using 50% and 60% hanging.</p>	<p>Mount netting material on support ropes (head and foot)</p> <p>Explain handing ratio (coefficient) and its effects on shape of net and its application constraints.</p> <p>Mount net using 50% and 60% hanging.</p>				
General Objectives 4.0; Know the different types of fishing craft/boat						
	<p>4.1 Describe a typical fishing craft.</p> <p>4.2 Classify crafts into calabash; bamboo rafts (aids) canoes, dingy, boats, and trawlers etc.</p> <p>4.3 Identify different types of fishing boat e.g. wooden glass fibre, steel, genocement etc.</p> <p>4.4 Differentiate between mechanized and non mechanize boats.</p> <p>4.5 Identify simple tools for building wooden boats.</p> <p>4.6 Identify boat parts.</p> <p>4.7 Draw a simple fishing boat plant</p> <p>4.8 Design simple fish boat (model).</p>	<p>Explain a typical fishing craft.</p> <p>Classify crafts into calabash; bamboo rafts (aids) canoes, dingy, boats, and trawlers etc.</p> <p>Identify different types of fishing boat e.g. wooden glass fibre, steel, genocement etc.</p> <p>Differentiate between mechanized and non mechanize boats.</p> <p>Identify simple tools for building wooden boats.</p> <p>Identify boat parts.</p> <p>Draw a simple fishing boat plant</p> <p>Design simple fish boat (model).</p> <p>Guide students on</p>	<p>Metal/wood workshop</p> <p>Models (calabash, etc)</p> <p>Life size Model Boats (dingy, trawler, outboard engine on wooden, ferrocement or glass fibre boat).</p> <p>Tools box complete</p>			

		practical boat construction.				
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Programme: ND Oceanography and Fishery Science	Course Code:	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: Fish Farm Engineering (Theory & Practical)	Pre-Requisite:	Theoretical: Hours/week
		Practical:
Semester: 1st Semester		

Course Main Aim/ Goal:

GENERAL OBJECTIVES
On completion of this course the student should be able to:
know the criteria to apply in selection of site for fish farms

Programme ND Oceanography and Fishery Science

Course: Fish Farm Engineering (Theory & Practical)			Course Code: FIT 211		CH/CU Hour:2	
Goal: This course is designed to enable students understand the basic designs and constructions of simple fish culture facilities and maintain them.						
General Objectives 1.0: know the criteria to apply in selection of site for fish farms						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	<p>1.1 Describe fish farm engineering.</p> <p>1.2 Carry out reconnaissance survey of farm site for vegetation, water source/quality, topography, etc.</p> <p>1.3 Determine elevation and distance using simple instruments like, hand level, kem levels ranging poles, tape,.</p> <p>1.4 Conduct simple soil suitability tests e.g. underground water test, permeability test, soil structure.</p> <p>1.5 Estimate the area of farm site by using simple instruments such as plane table with alidade and rod</p> <p>1.6 Conduct simple water quality test on water source temperature,</p>	<p>Describe fish farm engineering.</p> <p>Carry out reconnaissance survey of farm site for vegetation, water source/quality, topography, etc.</p> <p>Determine elevation and distance using simple instruments like, hand level, kem levels ranging poles, tape,.</p> <p>Conduct simple soil suitability tests e.g. underground water test, permeability test, soil structure.</p> <p>Estimate the area of farm site by using simple instruments such as plane table with alidade and rod</p> <p>Conduct simple water</p>	<p>Staff rod, kern level, Tape range pole tripod stand.</p> <p>Digger, shovel, soil, auger, Cutlass, soil analysis kit, plane table. Water quality kit. Laboratory</p>	<p>Use kern level range pole. Draw graph, and use tape. Conduct practical on soil test with students. Estimate area of fish farm. Guide the student on how to determine water quality using water quality kit or titration method, in the laboratory</p>	<p>Use kern level range pole. Draw graph, and use tape. Conduct practical on soil test with students. Estimate area of fish farm. Guide the student on how to determine water quality using water quality kit or titration method, in the laboratory</p>	<p>Carry out reconnaissance survey of farm site for vegetation, water source/quality, topography, etc.</p> <p>Determine elevation and distance using simple instruments like, hand level, kem levels ranging poles, tape,.</p>

	turbidity, dissolved oxygen, PH alkalinity, ammonia, etc.	quality test on water				
General Objectives 2.0: Know the design of simple fish farm structures						
	<p>2.1 Identify the common structures found in fish farm e.g. pond, sluice gate, wooden tank, fiber glass tank, concrete tank etc.</p> <p>2.2 Describe the design of fish farm structures such as</p> <p>(a) Earthen pond e.g. barrage, contour, etc.</p> <p>(b) Other holding facilities e.g. aquarium tank, concrete tank, homestead pond, raceway, plastic tank, wood/ plank tank, fiber glass tank.</p> <p>2.3 Describe simple outline design of ancillary farm structures e.g. store, net rack, hatchery, counting shed etc.</p> <p>2.4 Design pond, dyke core trench, various aquarium shapes stand, etc.</p>	<p>Identify the common structures found in fish farm e.g. pond, sluice gate, wooden tank, fiber glass tank, concrete tank etc.</p> <p>Describe the design of fish farm structures such as</p> <p>(c) Earthen pond e.g. barrage, contour, etc.</p> <p>(d) Other holding facilities e.g. aquarium tank, concrete tank, homestead pond, raceway, plastic tank, wood/ plank tank, fiber glass tank.</p> <p>Describe simple outline design of ancillary farm structures e.g. store, net rack, hatchery, counting shed etc.</p> <p>Design pond, dyke core trench, various</p>	Model sluice gate	See the structures. Supervised trip to fish farms and reports.	<p>Lecture</p> <p>Take students out to see the structures. Supervised trip to fish farms and reports.</p> <p>Practical design</p>	Give assignment on pond design.

		aquarium shapes stand, etc.				
General Objectives 3.0: UNDERSTAND THE CONSTRUCTION OF FISH FACILITIES						
	<p>3.1 Identify the following devices: dyke (dam), monk, dyke protection devices, sluice gate, spillway, etc.</p> <p>3.2 Describe the construction of a typical earthen fish pond.</p> <p>3.3 Describe the construction of honest and/concrete pond, aquarium etc.</p> <p>3.4 Identify water control devices inlet, outlets e.g. monk, sluice gate spillway, Rivald, valve, elbow joints drainage trenches etc.</p> <p>3.5 Determine fish to water surface area requirements for stocking based on size and species in different fish holding facilities or structures.</p> <p>3.6 Under take installation of dyke (dam) protection devices.</p> <p>3.7 Construct/assemble model earthen pond, aquarium tank,</p>	<p>Identify the following devices: dyke (dam), monk, dyke protection devices, sluice gate, spillway, etc.</p> <p>Describe the construction of a typical earthen fish pond.</p> <p>Describe the construction of honest and/concrete pond, aquarium etc.</p> <p>Identify water control devices inlet, outlets e.g. monk, sluice gate spillway, Rivald, valve, elbow joints drainage trenches etc.</p> <p>Determine fish to water surface area requirements for stocking based on size and species in different fish holding facilities or structures.</p> <p>Under take installation of dyke (dam) protection devices.</p> <p>Construct/assemble</p>	<p>Fishpond.</p> <p>Bahama grass, stone, cement etc.</p> <p>Glass sheet net, plant shooter etc</p> <p>Sealant, Resin catalyst.</p> <p>Accelerator, plastic basin</p> <p>Diamond cutter.</p> <p>Hollow block, cement, sand gravel, and digger, shovel ect.</p>	<p>Show students the devices lecture</p> <p>Carryout installation and set up fish farms with students.</p> <p>Assign students in groups to construct various models:</p> <p>Assign students in groups to construct aquarium tanks etc using glass.</p>	<p>Show students the devices lecture</p> <p>Carryout installation and set up fish farms with students.</p> <p>Assign students in groups to construct various models:</p> <p>Assign students in groups to construct aquarium tanks etc using glass.</p>	<p>Describe the construction of a typical earthen fish pond.</p>

	<p>hapa/cage, and pen.</p> <p>3.8 Set up other small fish farm holding structures e.g. fiberglass tank, plastic bowl wood/plank tank etc.</p> <p>3.9 Cut glasses using diamond cutter.</p> <p>3.10 Take part in the construction of a standard fishpond earthen or concrete. (Each graduating class should add a pond to the college fish farm)</p>					
General Objective 4.0: Understand the design and construction of Recirculatory Aquaculture System (RAS)						
10-11	<p>4.1 Describe Recirculatory Aquarium System (RAS) with its advantages.</p> <p>4.2 List and explain different types of filtration systems e.g. biological filtration, mechanical filtration, etc.</p> <p>4.3 Design and construct a simple model of recirculatory aquaculture system.</p> <p>4.4 Identify sedimentation tank, bio-filter, pump tank, etc.</p> <p>4.5 Construct model of recirculatory system.</p>	<p>Explain Recirculatory Aquarium System (RAS) with its advantages.</p> <p>List and explain different types of filtration systems e.g. biological filtration, mechanical filtration, etc.</p> <p>Design and construct a simple model of recirculatory aquaculture system.</p> <p>Identify sedimentation tank, bio-filter, pump</p>	<p>Fiberglass tank.</p> <p>Glass sheet, silicone, model bio-filler, and sedimentation tank</p>			

		<p>tank, etc. Construct model of recirculatory system.</p> <p>Site visitation. Carry out construction with students.</p>				
General Objectives 5.0: Understand the care of fish farm facilities						
12	<p>5.1 Repair some fish farm facilities such as aquarium tank, hapa, cage, scoop net etc.</p> <p>5.2 Manage fish farm facilities e.g. farm store, holding facility, etc.</p>	<p>Repair some fish farm facilities such as aquarium tank, hapa, cage, scoop net etc.</p> <p>Manage fish farm facilities e.g. farm store, holding facility, etc.</p>	<p>Fiberglass tank. Glass sheet, silicone, model bio-filler, and sedimentation tank</p>	<p>Carryout repair of some fish farm facilities with students</p>	<p>Carryout repair of some fish farm facilities with students</p>	<p>Repair some fish farm facilities. Manage fish farm facilities e.g. farm store, holding facility</p>
General Objective 6.0: Understand the concept of Hatchery Design						
13-14	<p>6.1 Describe the various types of hatchery e.g. in door outdoor.</p> <p>6.2 Describe other supporting structures e.g. Nursery pond spawning tank.</p> <p>6.3 Identify incubator, spawning tank, bread stock tank etc.</p> <p>6.4 Design indoor and outdoor hatchery.</p> <p>6.5 Construct hatchery models.</p> <p>6.6 Visit existing hatcheries and observe 6.1 and 6.2</p>	<p>Describe the various types of hatchery e.g. in door outdoor.</p> <p>Describe other supporting structures e.g. Nursery pond spawning tank.</p> <p>Identify incubator, spawning tank, bread stock tank etc.</p> <p>Design indoor and outdoor hatchery.</p> <p>Construct hatchery models.</p> <p>Visit existing hatcheries</p>	<p>Spawning tank, incubator Glass sheet, cement fibre tank, silicone.</p>	<p>Visit hatchery with students. Construct hatchery models with students. Give assignment on model hatchery.</p> <p>Supervised hatchery construction exercise</p>	<p>Guide students in a Visit hatchery with students. Construct hatchery models with students. Give assignment on model hatchery.</p> <p>Supervised hatchery</p>	<p>Design indoor and outdoor hatchery.</p>

	above	and observe 6.1 and 6.2			construction exercise	
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Programme: ND Oceanography and Fishery Science	Course Code: FIT 212	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: Fish processing and storage Technology	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal: this course is designed to acquaint the student with the knowledge of fish handling preservation, processing and associated quality control measures.

GENERAL OBJECTIVES

On completion of this course the student should be able to:

- Know the nutritive value of fish in the diet.**
- Know the various fish handling methods**
- Know the courses of fish spoilage**
- Understand the techniques of evaluation of freshness of fish**

Programme ND Oceanography and Fishery Science						
Course: Fish processing and storage					Course Code: FIT 212	CH/CU Hour:2
Goal: this course is designed to acquaint the student with the knowledge of fish handling preservation, processing and associated quality control measures.						
General Objectives 1.0: Know the nutritive value of fish in the diet.						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Describe the nutritional composition of fish 1.2 Explain the importance of fish in human nutrition. 1.3 List other uses of fish e.g. as a source of oil.	Describe the nutritional composition of fish Explain the importance of fish in human nutrition. List other uses of fish e.g. as a source of oil.	Sample of fish			Explain the importance of fish in human nutrition
General Objectives 2.0: Know the various fish handling methods						
3-4	2.1 Identify common fish handling equipment (a) Onboard (b) Landing site (c) Off shore 2.2 Operate and maintain all fish handling equipment. 2.3 Explain how the various handling methods affect fish quality.	Identify common fish handling equipment (d) Onboard (e) Landing site (f) Off shore	Fish handling containers e.g. basin, boxes, canoes, sacks; thermometer, Fish samples shed, Gutting board, gutting knife, and table.	Identify handling of equipment only used by fisher folk. Conduct practical on the effect of different handling methods on the keeping	Carry out Practicals on identification of handling equipment only used by fisher folk. Conduct practical on the effect of different handling methods on the keeping quality of fish and guide	Explain common fish handling equipment Onboard Landing site Off shore

	<p>2.4 Explain the effect of gutting on the keeping quality of fish.</p> <p>2.5 Handle fish using the equipment in 2.1 above.</p>	<p>Operate and maintain all fish handling equipment.</p> <p>Explain how the various handling methods affect fish quality.</p> <p>Explain the effect of gutting on the keeping quality of fish.</p> <p>Handle fish using the equipment in 2.1 above.</p>		<p>quality of fish and guide students to do so.</p> <p>Keep fish in shade in water and in the sun and observe evaporative cooling, gutting of fish etc</p>	<p>students to do so.</p> <p>Keeping fish in shade in water and in the sun and evaporative cooling, gutting of fish etc</p>	
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General Objectives 3.0: Know the courses of fish spoilage

	<p>3.1 List the courses of fish spoilage.</p> <p>3.2 Describe the factors responsible for spoilage of fish</p> <p style="margin-left: 20px;">a) Bacteria</p> <p style="margin-left: 20px;">b) Enzymes</p> <p style="margin-left: 20px;">c) Chemical oxidation</p> <p>3.3 Identify types of microorganisms found on the body that are responsible for fish spillage</p> <p>3.4 Identify the locations of the microorganisms on the fish body and their mode of entry.</p> <p>3.5 Describe the mode of action of</p>	<p>Explain the courses of fish spoilage.</p> <p>Describe the factors responsible for spoilage of fish</p> <p>Bacteria</p> <p>Enzymes</p> <p>Chemical oxidation</p> <p>Identify types of microorganisms found on the</p>	<p>Fish processing laboratory fish sample or conkey agar, colony counter, incubator, petridish, test tube, smoking kiln etc.</p> <p>Microbiology Laboratory</p>	<p>Determine the microbial load in fresh and spoilt fish</p>	<p>Lecture on the causes of fish spoilage.</p> <p>Conduct practicals with students to determine the microbial load in fresh and spoilt fish</p> <p>Assess report practicals on identification of bacteria, enzymes on fish body.</p>	<p>List and explain the courses of fish spoilage.</p> <p>the factors responsible for spoilage of fish</p> <p>Bacteria</p> <p>Enzymes</p> <p>Chemical oxidat</p>
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	<p>fish</p> <p>3.6 Spoilage microorganisms and their control measures.</p> <p>3.7 List the types of enzymes responsible for fish spoilage and the mode of action of the enzymes in fish spoilage.</p> <p>3.8 Explain chemical spoilage and methods for their control.</p>	<p>body that are responsible for fish spillage</p> <p>Identify the locations of the microorganisms on the fish body and their mode of entry</p>				
General Objectives 4.0; Understand freshness of fish						
8-9	<p>4.1 Identify the physical properties of freshly caught fish e.g. eyes, gut appearance, and flesh.</p> <p>4.2 Identify changes that occur in fish stored at various temperatures on the flesh, eyes gills, and general appearance.</p> <p>4.3 Describe organoleptic changes as indices of quality control- odour, taste, texture.</p> <p>4.4 Identify signs of deterioration in fish e.g. off colour off odour. Flabbiness.</p>	<p>Identify the physical properties of freshly caught fish e.g. eyes, gut appearance, and flesh.</p> <p>Identify changes that occur in fish stored at various temperatures on the flesh, eyes gills, and general appearance.</p> <p>Describe organoleptic changes as indices of quality control- odour, taste, texture.</p> <p>Identify signs of deterioration in</p>	<p>Sample of some of the commercially important fish in Nigeria e.g. <u>Chrysichthy.sp</u>, <u>Tilapia, sp</u>, <u>Lates, niloticuscrockerped</u> othelitusspBongaEt hmotheticsa Sardine- Sadinelia,sp.</p>	<p>Assess fish soft up taste panel.</p>	<p>Conduct practical with students on organoleptic assessment of fish soft up taste panel.</p>	<p>Describe organoleptic changes as indices of quality control- odour, taste, texture.</p>

		fish e.g. off colour off odour. Flabbiness.				
General Objectives 5.0: Know the various methods for preserving fish						
10-12	<p>5.1 Describe the various traditional fish preservation methods-boiling, frying, smoking, sun drying salting, fermentation</p> <p>5.2 Identify the equipment for each method in 5.1 above.</p> <p>5.3 Different between icing freezing and cold storage.</p> <p>5.4 Explain the advantages and disadvantages of duration of each of the methods in 5.1.</p> <p>5.5 Describe the principle and equipment used in each .</p> <p>5.6 Sketch the layout of a fish canning line.</p> <p>5.7 Describe the process of fish canning.</p> <p>5.8 Preserve fish by boiling, sun drying, smoking, salting, low temperature.</p> <p>5.9 Design simple smoking kilns, salting vat.</p> <p>5.10 Identify the various components of a cold room.</p>	<p>Describe the various traditional fish preservation methods-boiling, frying, smoking, sun drying salting, fermentation</p> <p>Identify the equipment for each method in 5.1 above.</p> <p>Different between icing freezing and cold storage.</p> <p>Explain the advantages and disadvantages of duration of each of the methods in 5.1.</p> <p>Describe the principle and equipment used in each .</p>	<p>Pots, frying pans, traditional fish smoking kiln ice box deep freezer.</p> <p>Cold storage</p>	<p>Practice on preservation methods fish boiling, frying, smoking, sun drying, salting, fermentation, icing, freezing and cold storage.</p>	<p>Practice on preservation methods fish boiling, frying, smoking, sun drying, salting, fermentation, icing, freezing and cold storage</p>	<p>Describe the various traditional fish preservation methods-boiling, frying, smoking, sun drying salting fermentation</p>

		<p>Sketch the layout of a fish canning line.</p> <p>Describe the process of fish canning.</p> <p>Preserve fish by boiling, sun drying, smoking, salting, low temperature.</p> <p>Design simple smoking kilns, salting vat.</p> <p>Identify the various components of a cold room.</p>				
General Objectives 6.0: Know how to minimize Losses in dried fish during storage and transportation						
13-14	<p>6.1 Describe the containers used for storage of dried fish in Nigeria</p> <p>6.2 Explain the causes of spoilage of stored dried fish. Microorganism, insects, fragmentation.</p> <p>6.3 Describe the methods for prevention and control of losses in dried fish during storage and transportation.</p> <p>6.4 Identify insects that attack dried fish.</p> <p>6.5 Determine relative effect of actelic on infested dried fish.</p>	<p>Describe the containers used for storage of dried fish in Nigeria</p> <p>Explain the causes of spoilage of stored dried fish. Microorganism, insects, fragmentation.</p> <p>Describe the methods for</p>	<p>Containers, petridish incubator, co lorry counter</p>	<p>provide specimen</p> <p>Fish infested with insects, bacterial and fungal</p> <p>Conduct practical with students on identification of insect, bacterial and fungal that infested dried fish.</p> <p>Provide insecticide and rodenticide such</p>	<p>Show provide specimen</p> <p>Fish infested with insects, bacterial and fungal</p> <p>Conduct practical with students on identification of insect, bacterial and fungal that infested dried fish.</p> <p>Provide</p>	<p>Explain the cause of spoilage of stored dried fish. Microorganism, insects, fragmentation</p>

		prevention and control of losses in dried fish during storage and transportation. Identify insects that attack dried fish. Determine relative effect of		as actelic, ratax, etc Conduct practicals using the insecticide and rodenticide to determine their effectiveness		
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Programme: ND Oceanography and Fishery Science	Course Code: FIT 213	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: ELEMENTARY NAVIGATION AND SEAMANSHIP (THEORY & PRACTICAL)	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal: This course is designed to acquaint students with the basic concepts of navigation and seamanship in marine and inland water bodies to make them able to operate motorized fishing boats and understand the operation of small fishing vessels.

GENERAL OBJECTIVES
On completion of this course the student should be able to:
<ul style="list-style-type: none"> 1.0: Understand the meaning of Navigation and Seamanship in fishing and shipping operations 2.0: Know the various terminologies in navigation in marine and fresh water fisheries 3.0: Understand the use of Navigational aids 4.0: Understand the use of celestial body for navigation 5.0: Know the various types of fishing vessels, equipment and their maintenance 6.0: Know the various engines used in fishing vessels

Programme ND Oceanography and Fishery Science						
Course: ELEMENTARY NAVIGATION AND SEAMANSHIP (THEORY & PRACTICAL)				Course Code: FIT 213		CH/CU Hour:2
Goal: This course is designed to acquaint students with the basic concepts of navigation and seamanship in marine and inland water bodies to make them able to operate motorized fishing boats and understand the operation of small fishing vessels.						
General Objectives 1.0: Understand the meaning of Navigation and Seamanship in fishing and shipping operations						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Explain navigation and seamanship. 1.2 Describe the importance of navigation and seamanship to fishing. 1.3 Differentiate between navigation in fishing and in shipping	Explain navigation and seamanship. Describe the importance of navigation and seamanship to fishing. Differentiate between navigation in fishing and in shipping	Navigational charts			
General Objectives 2.0: Know the various terminologies in navigation in marine and fresh water fisheries						

3	2.1 Identify the equator, meridian, poles, latitude, longitudes, leeway and tideway, etc. on world map 2.2 Outline the roles of 2.1 above in fishing.	Identify the equator, meridian, poles, latitude, longitudes, leeway and tideway, etc. on world map Outline the roles of 2.1 above in fishing	A large political World Map	Identify the equator, meridian, poles, latitude, longitudes, leeway and tideway, etc. on world map	Show the equator, meridian, poles, latitude, longitudes, leeway and tideway, etc. on world map	Outline the roles of meridian, poles, latitude, longitudes, leeway and tideway fishing
General Objectives 3.0: Understand the use of Navigational aids						
4-5	3.1 Identify various types of navigational aids used in the lakes, seas, rivers etc. such as radar, compasses, echo sounder, logbooks, tide table, azimuth, etc . 3.2 Describe the uses of 3.1 above in fisheries navigation. 3.3 Draw various types of navigational aids 3.4 Simulate Navigation using simple navigational aids.	Explain the various types of navigational aids used in the lakes, seas, rivers etc. such as radar, compasses, echo sounder, logbooks, tide table, azimuth, etc . Describe the uses of navigation. Explain the various types of navigational aids Simulate Navigation using simple navigational aids	A navigational aid laboratory equipped with radar compasses, etc. boueyage system display board and models	Illustrate navigation aids. Simulate navigation using the aids.	Coordinate the identification and illustration of navigation aids students to simulate navigation using the aids.	With the aid of illustration , explain various types of navigational aids And various types of navigational aids
General Objectives 4.0: Understand the use of celestial body for navigation						
	4.1 Explain the role of stars and moon in navigation 4.2 Explain the role of the length of day and night on navigation	Explain the role of stars and moon in navigation Explain the role of the length of day and night	Nautical Almanac	Observe moon during day and night	Guide in the observation during day and night	Explain the role of stars and moon in navigation

	4.3 Explain the use of nautical almanac.	on navigation Explain the use of nautical almanac.				
General Objectives 5.0: Know the various types of fishing vessels, equipment and their maintenance						
7-8	<p>5.1 Classify fishing vessels into trawlers, boat, dinghy, canoe etc.</p> <p>5.2 Draw the vessels in 5.1 above.</p> <p>5.3 Identify the major equipment in fishing vessels, e.g. which derrick, landline, tackle gallows gantry etc.</p> <p>5.4 Draw equipment in 5.3 above.</p> <p>5.5 Describe the uses in fishing of equipment in 5.3 above.</p> <p>5.6 Describe basic principles involved in fishing boats and vessels maintenance e.g. planking, painting, scrapping, decorating, etc.</p>	<p>Explain the classification of fishing vessels into trawlers, boat, dinghy, canoe etc.</p> <p>Draw the vessels in 5.1 above.</p> <p>Identify the major equipment in fishing vessels, e.g. which derrick, landline, tackle gallows gantry etc.</p> <p>Draw equipment in 5.3 above.</p> <p>Describe the uses in fishing of equipment in 5.3 above.</p> <p>Describe basic principles involved in fishing boats and vessels maintenance e.g. planking, painting, scrapping, decorating, etc.</p> <p>Take student to a jetty to identify the parts of a fishing vessel.</p> <p>Visit to a boat-building</p>	Fishing boat models			

		yard.				
General Objectives 6.0: Know the various engines used in fishing vessels						
9-11	<p>6.1 Classify engines into outboard and inboard.</p> <p>6.2 Classify engines according to horsepower rating.</p> <p>6.3 Explain engine horsepower in relation to fishing boat capacity.</p> <p>6.4 Carry out simple maintenance of outboard engines e.g. servicing, repair of broken sheet pins, fuel/oil mixing ratio etc.</p>	<p>Explain engines types into outboard and inboard.</p> <p>Classify engines according to horsepower rating.</p> <p>Explain engine horsepower in relation to fishing boat capacity.</p> <p>Carry out simple maintenance of outboard engines e.g. servicing, repair of broken sheet pins, fuel/oil mixing ratio etc.</p>	<p>Outboard Engine of at least two horsepower ranges (20,25,45 horsepower).</p> <p>Cut out engine for an engine repair demonstration workshop. Trip on a trawler</p>	<p>Practice the upkeeps of the engine maintenance workshop of artisanal/industrial fishing companies.</p> <p>Assist in repair exercise in a workshop and evaluate report</p>	<p>Take students to the engine maintenance workshop of artisanal/industrial fishing companies.</p> <p>Students to assist in repair exercise in a workshop and evaluate report</p>	<p>Classify engines into outboard and inboard.</p> <p>Classify engines according to horsepower rating.</p>
General Objectives 7.0: Understand safety procedures in fishing vessels						
12	<p>7.1 Identify the life-saving equipments in fishing vessels such as life buoy, life jacket fender etc.</p> <p>7.2 Explain the use of the life-saving equipments mentioned in 7.1 above.</p> <p>7.3 Carry out a rescue operation for a vessel and crew in case of emergencies and</p>	<p>Identify the life-saving equipments in fishing vessels such as life buoy, life jacket fender etc.</p> <p>Explain the use of the life-saving equipments mentioned in 7.1 above.</p> <p>Carry out a rescue operation for a vessel</p>	<p>Life – saving equipment</p>	<p>Practice swimming pools or nearby rivers or lakes. Swimming sessions.</p>	<p>Show samples of equipment in. Swimming pools or nearby rivers or lakes. Swimming sessions.</p>	<p>Explain the use of the life-saving equipments mentioned</p>

	accidents, under simulated conditions.	and crew in case of emergencies and accidents, under simulated conditions				
General Objectives 8.0: Know the use of fire fighting equipment in fishing vessels						
13-15	<p>8.1 Identify fire extinguishers and fire equipment on a fishing vessel.</p> <p>8.2 Distinguish between fire extinguishers useable on board and on shore.</p> <p>8.3 Explain the operations of fire extinguishers used in fishing vessels and on shore.</p> <p>8.4 Explain the preventive measure and general regulations for fire outbreak on board.</p> <p>8.5 Operate fire extinguishers on board in a vessel.</p>	<p>Identify fire extinguishers and fire equipment on a fishing vessel.</p> <p>Distinguish between fire extinguishers useable on board and on shore.</p> <p>Explain the operations of fire extinguishers used in fishing vessels and on shore.</p> <p>Explain the preventive measure and general regulations for fire outbreak on board.</p> <p>Operate fire extinguishers on board in a vessel.</p> <p>Demonstrate use of fire extinguishers and make students do same</p>	<p>Fire extinguishers Demonstration charts on operations</p>			

Programme: ND Oceanography and Fishery Science	Course Code: FIT 215	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: AQUATIC ECOLOGY (THEORY & PRACTICAL)	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal: This course is designed to acquaint the students with the structure and function of aquatic ecosystems.

GENERAL OBJECTIVES
On completion of this course the student should be able to:
1.0: Understand the meaning of aquatic ecology

Programme ND Oceanography and Fishery Science

Course: AQUATIC ECOLOGY (THEORY & PRACTICAL)				Course Code: FIT 215		CH/CU Hour:2	
Goal: This course is designed to acquaint the students with the structure and function of aquatic ecosystems.							
General Objectives 1.0: Understand the meaning of aquatic ecology							
Course Specification: THEORETICAL CONTENT							
	Theoretical Content			Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation	
1-2	1.1 Define the term aquatic ecology 1.2 Identify water bodies in the local environment.	Explain the term aquatic ecology Identify water bodies in the local environment.	Water bodies	Take a tour to see local aquatic ecosystems	Take students on study tour to local aquatic ecosystems	Define the term aquatic ecology Identify water bodies in the local environment	
General Objectives 2.0: Know the ecosystem							
3	2.1 Explain the concept of ecosystem and its components. 2.2 Explain biotic and abiotic factors, and their effects on the ecosystem. 2.3 Classify ecosystems based on first order, and nature of the environment.	Explain the concept of ecosystem and its components. Explain biotic and abiotic factors, and their effects on the ecosystem. Classify ecosystems based on first order, and nature of the environment	Water bodies	Take a visit to local aquatic ecosystem(s) e.g reservoirs ponds estuaries, rivers, lake, streams etc	Take students on study visit to local aquatic ecosystem(s) e.g reservoirs ponds estuaries, rivers, lake, streams etc	Explain biotic and abiotic factors, and their effects on the ecosystem	
General Objectives 3.0: Know the Characteristics and classification of Aquatic Environments							
4-5	3.1 Describe how rainfall and atmospheric temperature affect other physico-	Describe how rainfall and atmospheric temperature affect other physico-chemical	Water quality kit pH meter D.O ₂ meter Secchi disc etc.	Conduct water analyses of physico-chemical parameters	Conduct water analyses of physico-	Carry out water physico-chemical	

	<p>chemical properties(pH, dissolved O₂, salinity, transparency) of water, and life in water.</p> <p>3.2 Carry out water physics-chemical analysis.</p> <p>3.3 Classify water bodies on bases of thermal stratification, and salt content (Fresh, brackish and Marine).</p>	<p>properties(pH, dissolved O₂, salinity, transparency) of water, and life in water.</p> <p>Carry out water physics-chemical analysis.</p> <p>Classify water bodies on bases of thermal stratification, and salt content (Fresh, brackish and Marine).</p>	<p>Chemistry laboratory</p> <p>Water body</p>	<p>Lecture and visit to near by water body</p> <p>Visit to nearby water body to Carry out water physics-analysis</p>	<p>chemical parameters</p> <p>Visit to nearby water body to Carry out water physics-analysis</p>	<p>analysis</p> <p>(pH, dissolved O₂, salinity, transparency) of water, and life in water.</p>
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General Objectives 4.0: Know Characteristics of the Freshwater Environment

6-8	<p>4.1 Describe the general features of the freshwater environment.</p> <p>4.2 Describe the various types of the freshwater environments rivers, streams, lakes etc.</p> <p>4.3 Identify organisms of the freshwater environment, and their habitats (Neustons, pelagic and benthos)</p> <p>4.4 Explain the origin and modes of natural and non-made lakes.</p> <p>4.5 Classify lakes and rivers into various types; e.g. Natural and man-made lakes, primary secondary</p>	<p>Describe the general features of the freshwater environment.</p> <p>Describe the various types of the freshwater environments rivers, streams, lakes etc.</p> <p>Identify organisms of the freshwater environment, and their habitats (Neustons, pelagic and benthos)</p> <p>Explain the origin and modes of natural and non-made lakes.</p> <p>Classify lakes and rivers into various types; e.g. Natural and</p>	<p>Plankton net,</p> <p>-Sample bottles</p> <p>-Glass slides and cover slips</p> <p>Light microscopes</p>	<p>Using plankton net, sample locally existing water bodies with student. Mount drops of concentrated plankton sample for students to appreciate by means of the light microscope.</p> <p>Explain the origin and modes of natural and non-made lakes.</p> <p>Classify lakes and rivers into various types; e.g. Natural</p>	<p>Using plankton net, sample locally existing water bodies with student. Mount drops of concentrated plankton sample for students to appreciate by means of the light microscope.</p> <p>Explain the origin and modes of natural and non-made lakes.</p> <p>Classify lakes and rivers into various types; e.g. Natural and man-made lakes, primary secondary and tertiary rivers and their productivity.</p>	<p>Describe the various types of the freshwater environment s rivers, streams, lakes etc</p> <p>Identify organisms of the freshwater environment, and their habitats (Neustons, pelagic and benthos)</p>
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	<p>and tertiary rivers and their productivity.</p> <p>4.6 Draw plankton net and plankton samples.</p> <p>4.7 Explain the hydrological circle and water balance of lakes</p>	<p>man-made lakes, primary secondary and tertiary rivers and their productivity.</p> <p>Draw plankton net and</p>		<p>and man-made lakes, primary secondary and tertiary rivers and their productivity.</p> <p>Draw plankton net and plankton samples.</p> <p>Explain the hydrological circle and water balance of lakes</p>	<p>Draw plankton net and plankton samples.</p> <p>Explain the hydrological circle and</p>	
General Objectives 5.0: Understand Characteristics of the brackish ecosystem						
9	<p>5.1 Describe the brackish environment and cite examples (lagoons, coastal bays, creeks, etc.)</p> <p>5.2 Explain diversity of life in brackish environments.</p>	<p>Describe the brackish environment and cite examples (lagoons, coastal bays, creeks, etc.)</p> <p>Explain diversity of life in brackish environments</p>	Charts			
General Objectives 6.0: Understand Characteristics of the Marine Ecosystem						

<p>10-12</p>	<p>6.1 Explain the composition and chemical properties of marine water, oceans and seas.</p> <p>6.2 Identify the zones of the marine environment, e.g. supratidal, intertidal, bathyal; zones, etc.</p> <p>6.3 Explain ocean floor, ocean current and their influence on marine life and fishing ground.</p> <p>6.4 Identify organisms of the marine environment the amphibious forms and the purely aquatic forms,</p> <p>6.5 List niches of purely aquatic forms, e.g. Neustons, benthos, pelagic.</p>	<p>Explain the composition and chemical properties of marine water, oceans and seas.</p> <p>Identify the zones of the marine environment, e.g. supratidal, intertidal, bathyal; zones, etc.</p> <p>Explain ocean floor, ocean current and their influence on marine life and fishing ground.</p> <p>Identify organisms of the marine environment the amphibious forms and the purely aquatic forms,</p> <p>List niches of purely aquatic forms, e.g. Neustons, benthos, pelagic.</p>	<p>As above</p>			
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General Objectives 7.0: Understand how aquatic fauna solve their ecological problems

13	<p>7.1 Describe life in the freshwater environment, in terms of Osmo-regulation, respiration, locomotion, reproduction etc.</p> <p>7.2 Describe life in brackish water ecosystem in terms of conditions in 7.1 above.</p> <p>7.3 Describe life in the marine ecosystem in terms of conditions in 7.1 above</p>	<p>Describe life in the freshwater environment, in terms of Osmo-regulation, respiration, locomotion, reproduction etc.</p> <p>Describe life in brackish water ecosystem in terms of conditions in 7.1 above.</p> <p>Describe life in the marine ecosystem in terms of conditions in 7.1 above</p>	freshwater environment			
General Objectives 8.0: understand how ecosystems function						
14	<p>8.1 Describe energy flows in ecosystems, through food chains, food webs trophic levels.</p> <p>8.2 Describe the cycling and recycling of matter in ecosystems, through biogeo-chemical cycles like N₂ cycle, Suphur cycle carbon cycle etc.</p>	<p>Explain the energy flows in ecosystems, through food chains, food webs trophic levels.</p> <p>Describe the cycling and recycling of matter in ecosystems, through biogeo-chemical cycles like N₂ cycle, Suphur cycle carbon cycle etc.</p>	Charts.			

Programme: ND Oceanography and Fishery Science	Course Code FIT 216	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: Practical Fishing I	Pre-Requisite:	Theoretical: Hours/week

Semester: 1st Semester		Practical:

Course Main Aim/ Goal: This course is design to teach the students basic fishing methods using less sophisticated equipment

GENERAL OBJECTIVES
On completion of this course the student should be able to:
Understand the preparation necessary for fishing trips.

Programme ND Oceanography and Fishery Science						
Course: Practical Fishing I				Course Code: FIT 216		CH/CU Hour:2
Goal:.						
General Objectives 1.0: Understand the preparation necessary for fishing trips.						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content		Practical Content			
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	1.1 Assemble necessary materials for fishing trip (Boat, engine, fuel, gears, accessories) 1.2 Identify suitable site for fishing operation	Assemble necessary materials for fishing trip (Boat, engine, fuel, gears, accessories)	Models of fishing equipment. -nets -boat -life jackets. -out board engine	Assemble necessary materials for fishing trip (Boat, engine, fuel, gears, accessories)	Assemble necessary materials for fishing trip (Boat, engine, fuel, gears, accessories) Identify suitable	Assemble necessary materials for fishing trip (Boat, engine, fuel,

	<p>1.3 Select the appropriate gear suitable for the site.</p> <p>1.4 Carry out swimming exercises</p>	<p>Identify suitable site for fishing operation</p> <p>Select the appropriate gear suitable for the site.</p> <p>Carry out swimming exercises</p>	<p>boat</p> <p>-paddles</p> <p>-first aid box etc.</p> <p>-water body.</p>	<p>Identify suitable site for fishing operation</p> <p>Select the appropriate gear suitable for the site.</p> <p>Carry out swimming exercises</p>	<p>site for fishing operation</p> <p>Select the appropriate gear suitable for the site.</p> <p>Carry out swimming exercises</p> <p>Lecture using models</p> <p>Guide students on swimming exercise</p>	<p>gears, accessories)</p>
General Objective 2.0: Introduction to fish detection equipment and methods						
	<p>2.1 Explain the local methods of detecting fish in water.</p> <p>2.2 Explain methods of detecting fish using equipment.</p> <p>2.3 Explain the physical parameters of detecting fish e.g visual surveys</p> <p>2.4 Explain the behavioral distribution of fishes (pelagic, demersal, schools).</p> <p>2.5 List common species in lotic and lentic water bodies</p>	<p>Explain the local methods of detecting fish in water.</p> <p>Explain methods of detecting fish using equipment.</p> <p>Explain the physical parameters of detecting fish e.g visual surveys</p> <p>Explain the behavioral distribution of fishes (pelagic, demersal, schools).</p> <p>List common species in lotic and lentic water bodies</p> <p>Carry out swimming exercises</p>	<p>Fishing site</p> <p>Fisher men</p>	<p>Visit with students to fishermen and fishing sites</p> <p>Carry out swimming exercises</p>	<p>Visit with students to fishermen and fishing sites</p> <p>Carry out swimming exercises</p>	<p>Explain methods of detecting fish using equipment.</p>

General Objectives 3.0: Understand fish legislative and regulatory laws						
5-7	<p>3.1 Explain the delimitation of inland water bodies in Nigerian territorial waters and other fishing grounds</p> <p>3.2 Explain procedures for licensing and granting of fishing permits.</p> <p>3.3 Differentiate between noxious fishing methods and acceptable fishing methods.</p> <p>3.4 Explain gear selectivity and recruitment of juvenile fishes.</p> <p>3.5 Select gears based on</p> <ul style="list-style-type: none"> - Species - Mesh size 	<p>Explain the delimitation of inland water bodies in Nigerian territorial waters and other fishing grounds</p> <p>Explain procedures for licensing and granting of fishing permits.</p> <p>Differentiate between noxious fishing methods and acceptable fishing methods.</p> <p>Explain gear selectivity and recruitment of juvenile fishes.</p> <p>Select gears based on</p> <ul style="list-style-type: none"> Species Mesh size 	<p>Different fishing gears</p> <ul style="list-style-type: none"> -Boat -Outboard engine -Paddle -Life jackets 	<p>Carry out gear selectivity exercise using different gears.</p> <p>Carry out swimming exercises</p>	<p>Carry out gear selectivity exercise using different gears.</p> <p>Carry out swimming exercises</p>	<p>Differentiate between noxious fishing methods and acceptable fishing methods</p>

		Carry out gear selectivity practical with students				
General Objectives 4.0: Understand seasonal variation and fish distribution						
	<p>4.1 Identify reproductive seasons for some commercial fishes.</p> <p>4.2 Identify the seasons in Nigeria as they affect water temperatures, volumes, currents/waves turbidity and transparency.</p> <p>4.3 Explain gear application based on seasons.</p> <p>4.4 Explain migration of some commercial fishes based on season and report.</p>	<p>Identify reproductive seasons for some commercial fishes.</p> <p>Identify the seasons in Nigeria as they affect water temperatures, volumes, currents/waves turbidity and transparency.</p> <p>Explain gear application based on seasons.</p> <p>Explain migration of some commercial fishes</p>				

	<p>4.5 Observe character in water bodies and report.</p> <p>4.6 Carry out swimming exercise.</p>	<p>based on season and report.</p> <p>Observe character in water bodies and report.</p> <p>Carry out swimming exercise.</p> <p>Lectures on seasonal variation</p> <p>Take students to water and write report</p>				
General Objectives 5.0: Know how to catch fish						
11-15	<p>5.1 Classify fishing gear into active and passive</p> <p>5.2 Identify suitable site for active Fishing</p> <p>5.3 Carry out fishing using appropriate active gear.</p> <p>5.4 Identify suitable site for passive fishing</p> <p>5.5 Carry out fishing using appropriate passive gear e.g.</p> <p>5.6 List other fishing methods e.g. light attraction, electro fishing (for research)</p> <p>5.7 Describe the use of simple fishing gear for sport and recreation of fishing</p> <p>5.8 Carry out swimming exercise</p>	<p>Classify fishing gear into active and passive</p> <p>Identify suitable site for active Fishing</p> <p>Carry out fishing using appropriate active gear.</p> <p>Identify suitable site for passive fishing</p> <p>Carry out fishing using appropriate passive gear e.g.</p> <p>List other fishing methods e.g. light attraction, electro fishing (for research)</p> <p>Describe the use of simple fishing gear for sport and</p>				<p>Classify fishing gear into active and passive</p>
General Objectives 6.0: Understand conservation methods in management techniques						

<p>13-15</p>	<p>6.1 Methods of protecting aquatic environments by use of Agro chemicals</p> <p>6.2 Identify Agrochemicals that are carcinogenic to fish.</p> <p>6.3 Erosion control (debris, silt etc.) drainage diversion</p>	<p>Methods of protecting aquatic environments by use of Agro chemicals</p> <p>Identify Agrochemicals that are carcinogenic to fish.</p> <p>Erosion control (debris, silt etc.) drainage diversion</p>				
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Programme: ND Oceanography and Fishery Science	Course Code FIT 221	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course: Pond Management	Pre-Requisite:	Theoretical: Hours/week
Semester: 1st Semester		Practical:

Course Main Aim/ Goal: This course is designed to enable students understand the basic principles and requirements for the management of fish Ponds

GENERAL OBJECTIVES
On completion of this course the student should be able to:
<p>Understand history of Pond and water quality parameters in ponds</p> <p>Understand the preparation necessary for fishing trips</p> <p>Understand stocking of ponds</p> <p>Know common fish diseases, pests, weeds, and their control</p> <p>Understand The procedure for feeding fish in pond</p>

Programme ND Oceanography and Fishery Science						
Course: Pond Management			Course Code FIT 221		CH/CU Hour:2	
Goal: This course is designed to enable students understand the basic principles and requirements for the management of fish Ponds						
General Objectives 1.0: Understand history of Pond and water quality parameters in ponds						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1-2	1.1 Narrate the history of	Discuss the history of	Water quality			

	<p>pond e.g. previous dates of stocking, liming, fertilization, type of fertilizer applied, pond type, pond depth, rate of feeding etc.</p> <p>1.2 List water quality parameters for a pond e.g. physical, chemical, biological, etc.</p> <p>1.3 Explain the effect of the parameter in 1.2 above, on pond productivity and fish growth.</p> <p>1.4 Carry out simple tests to assess the parameters in 1.2 above.</p> <p>1.5 Estimate dissolved oxygen in ponds by use of oxygen meter, Winkler method and other.</p> <p>1.6 Describe and apply the simple methods for preventing incidence of low dissolved oxygen.</p>	<p>pond e.g. previous dates of stocking, liming, fertilization, type of fertilizer applied, pond type, pond depth, rate of feeding etc.</p> <p>List water quality parameters for a pond e.g. physical, chemical, biological, etc.</p> <p>Explain the effect of the parameter in 1.2 above, on pond productivity and fish growth.</p> <p>Carry out simple tests to assess the parameters in 1.2 above.</p> <p>Estimate dissolved oxygen in ponds by use of oxygen meter, Winkler method and other.</p> <p>Describe and apply the simple methods for preventing incidence of low dissolved oxygen.</p> <p>Conduct practicals on water quality with students</p>	kit			
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General Objectives 2.0: Outline the processes in Pre-stocking preparation of Pond

<p>3-4</p>	<p>2.1 Outline the processes in pre-stocking preparation of pond (a) Draining and drying (b) Distillation (c) Checking bottom/dyke, inlet and outlet leakages for cracks, leakages, blockages, holes (g) Checking and removal of undesired organisms (h) Application of lime (i) Impoundment, (j) Fertilization.</p> <p>2.2 Describe the draining and drying of old pond.</p> <p>2.3 Drain and dry old pond.</p> <p>2.4 Inspect old pond for cracks, holes, depressions, unwanted organisms and weeds.</p> <p>2.5 Remove unwanted organisms and weeds using manual, chemical, or</p>	<p>Outline the processes in pre-stocking preparation of pond (a) Draining and drying (b) Distillation (c) Checking bottom/dyke, inlet and outlet leakages for cracks, leakages, blockages, holes (k) Checking and removal of undesired organisms (l) Application of lime (m) Impoundment, (n) Fertilization.</p> <p>Describe the draining and drying of old pond. Drain and dry old pond. Inspect old pond for cracks, holes, depressions, unwanted organisms and weeds. Remove unwanted organisms and weeds using manual, chemical, or mechanical method. Estimate the quantity of lime and apply lime. Carry out pond</p>	<p>Pond (earthen concrete)</p> <p>Shovels, Rakes And chemical Pumping machine, pipe, date valve, stop cock, inorganic fertilizer, poultry dung, pig dung compost etc</p>	<p>Practice pre-stocking pond preparation. Show the processes in pre-stocking preparation of pond (a) Draining and drying (b) Distillation (c) Checking bottom/dyke, inlet and outlet leakages for cracks, leakages, blockages, holes Checking and removal of undesired organisms Application of lime Impoundment, Fertilization.</p> <p>Drain and dry old pond. Inspect old pond for cracks, holes, depressions, unwanted organisms and weeds. Remove unwanted organisms and weeds using manual, chemical, or mechanical method.</p>	<p>Practice pre-stocking pond preparation. Show the processes in pre-stocking preparation of pond (a) Draining and drying (b) Distillation (c) Checking bottom/dyke, inlet and outlet leakages for cracks, leakages, blockages, holes Checking and removal of undesired organisms Application of lime Impoundment, Fertilization.</p> <p>Drain and dry old pond. Inspect old pond for cracks, holes, depressions, unwanted organisms and weeds. Remove unwanted organisms and weeds using manual, chemical, or mechanical method.</p>	<p>Describe the draining and drying of old pond</p>
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	<p>mechanical method.</p> <p>2.6 Estimate the quantity of lime and apply lime.</p> <p>2.7 Carry out pond impoundment to the required level.</p> <p>2.8 Estimate quantity of fertilizer (organic or inorganic) and apply at a appropriate rates.</p>	<p>impoundment to the required level.</p> <p>Estimate quantity of fertilizer (organic or inorganic) and apply at a appropriate rates</p>		<p>Estimate the quantity of lime and apply lime.</p> <p>Carry out pond impoundment to the required level.</p> <p>Estimate quantity of fertilizer (organic or inorganic) and apply at a appropriate rates.</p> <p>Students to prepare pond for stocking</p>	<p>Estimate the quantity of lime and apply lime.</p> <p>Carry out pond impoundment to the required level.</p> <p>Estimate quantity of fertilizer (organic or inorganic) and apply at a appropriate rates.</p> <p>Students to prepare pond for stocking</p>	
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General Objectives 3.0: Understand stocking of ponds

7-8	<p>3.1 Identify the species of fish to be stocked in pond, and the source</p> <p>3.2 Estimate the number of fish to be stocked, based on area/volume of pond.</p> <p>3.3 Explain the need for</p>	<p>Discuss the species of fish to be stocked in pond, and the source</p> <p>Estimate the number of fish to be stocked, based on area/volume of pond.</p> <p>Explain the need for proper packaging of fish</p>	<p>Polythene sheet.</p> <p>Transportation tank,</p> <p>Oxygen bottle.</p> <p>Live fry and fingerlings.</p>	<p>Show student life or preserved specimen of cultivable species.</p>	<p>Show student life or preserved specimen of cultivable species.</p>	<p>Explain how to estimate the number of fish to be stocked, based on area/volum</p>
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	proper packaging of fish during transportation. 3.4 Explain the methods of handling various stages/types of fish during stocking. 3.5 Explain the importance of acclimatizing fish before stocking	during	Of cultivable fish species			e of pond
General Objectives 4.0: Understand The procedure for feeding fish in pond						
9	4.1 Identify type and size of feed for different stages of fish growth (larvae, fingerlings adult). 4.2 Estimate the quantity of feed for 4.1 above 4.3 Design appropriate feeding schedule.	Identify type and size of feed for different stages of fish growth (larvae, fingerlings adult). Estimate the quantity of feed for 4.1 above Design appropriate feeding schedule.	Pilleting machine feed ingredients. Scale, Fish specimens feed.	Differentiate type and size of feed e.g. flake, pellet of different diameters. Students to take weight of fish and from this calculate quantity of feed	Show student different type and size of feed e.g. flake, pellet of different diameters. Students to take weight of fish and from this calculate quantity of feed	Design appropriate feeding schedule
General Objectives 5.0: Know common fish diseases, pests, weeds, and their control						
Understand The procedure for feeding fish in pond						
10-12	Identify common aquatic weeds in ponds (Emergent flaoingetc). 5.1 Describe the effect of weeds in pond. 5.2 Describe methods for weed control (manual, mechanical, biological and chemical)	5.9 Describe the effect of weeds in pond. Describe methods for weed control (manual, mechanical, biological and chemical) List some common diseases of fish due to bacteria, viral fungal parasitic origin.	Preserved or live specimen of different weeds. Weed album Rake, water hyacinth harvester.	Illustrate various aquatic weeds e.g. water hyacinth, elodea, myio-phyllum etc. Differentiate pests diseased or pest-affected and assign them-affected fishes and assign them to	Illustrate various aquatic weeds e.g. water hyacinth, elodea, myio-phyllum etc. Differentiate pests diseased or pest-affected and assign them-affected fishes and assign them to	

	<p>5.3 List some common diseases of fish due to bacteria, viral fungal parasitic origin.</p> <p>5.4 Identify common pests of fish, diseased and/or pest-afflicted fishes by observation or diagnosis.</p> <p>5.5 Describe measure to check pests, parasites and diseases fish.</p> <p>5.6 Check pests, parasites and diseases of fish.</p> <p>5.7 Describe basic treatment of fish disease.</p> <p>5.8 Carry out basic treatment of fish diseases.</p>	<p>Identify common pests of fish, diseased and/or pest-afflicted fishes by observation or diagnosis.</p> <p>Describe measure to check pests, parasites and diseases fish.</p> <p>Check pests, parasites and diseases of fish.</p> <p>Describe basic treatment of fish disease.</p> <p>Carry out basic treatment of fish diseases.</p>	<p>Live or preserved specimen of pest, diseased fish or pest-affected fish.</p> <p>Laboratory</p> <p>Diseased fish</p>	<p>examine and draw.</p>	<p>examine and draw.</p>	
General Objectives 6.0: Know Management techniques for nursery, hatchery grow-out and other ponds.						
13	<p>6.1 Describe hatchery layout, nursery, grow-out and other ponds.</p> <p>6.2 Sketch hatchery layout, nursery, grow out.</p> <p>6.3 Inspect and feed different growth stages of fish (fry, fingerling broodstock).</p>	<p>Describe hatchery layout, nursery, grow-out and other ponds.</p> <p>Sketch hatchery layout, nursery, grow out.</p> <p>Inspect and feed different growth stages of fish (fry, fingerling broodstock).</p>	<p>Hatchery Nursery Fry, fingerlings Brood stock Zoodankton, Artemia fish feed</p>	<p>Supervise routine weekly feeding of fish of various stages of growth by students</p>	<p>Supervise routine weekly feeding of fish of various stages of growth by students</p>	<p>Sketch hatchery layout, nursery, grow out</p>

General Objectives 7.0: Understand Emergency in Pond Management						
14	<p>7.1 Identify emergency situations in ponds management.</p> <p>7.2 Apply proper corrective measures during over flooding, etc.</p> <p>7.3 Identify and block sees page area, plankton dies off.</p> <p>7.4 Aerate pond and introduce fresh, higher dissolved oxygen water.</p>	<p>Explain emergency situations in ponds management.</p> <p>Apply proper corrective measures during over flooding, etc.</p> <p>Identify and block sees page area, plankton dies off.</p> <p>Aerate pond and introduce fresh, higher dissolved oxygen water.</p>	<p>Model plank Sluice gate Inlet etc.</p> <p>Pumping machine paddle wheel aerator.</p> <p>Air pump, etc</p>	<p>Show drainage/spillage devices, add maker and seal pond bottom/wall and sea page areas.</p> <p>Pump more water use paddle wheel, aerator and air pump where necessary</p>	<p>Take students out and show them, over flooding excessive see page.</p> <p>Supervise students open gates and other drainage/spillage devices, add maker and seal pond bottom/wall and sea page areas.</p> <p>Conduct practicals on pump more water use paddle wheel, aerator and air pump where necessary</p>	<p>Explain proper corrective measures during over flooding, etc.</p>
General Objectives 8.0: Understand the techniques for harvesting fish						
15	<p>8.1 Describe the main methods for harvesting fish.</p> <p>8.2 Outline basic procedures in harvesting.</p> <p>8.3 Apply the procedures in 8.2 and carry out harvesting</p>	<p>Describe the main methods for harvesting fish.</p> <p>Outline basic procedures in harvesting.</p> <p>Apply the procedures in</p>	<p>Drag net, scoop net.</p>	<p>Show</p> <p>(a) Harvesting schedule</p> <p>(b) Gear selection</p> <p>(c) Reduction of water level</p> <p>(d) Harvesting</p> <p>(e) Disposal of fish.</p> <p>Conduct practical on harvesting.</p> <p>Supervise students on routine in ponds</p>	<p>Show partial and total harvesting, and when to apply them.</p> <p>Lectures students on</p> <p>(a) Harvesting schedule</p> <p>(b) Gear selection</p> <p>(c) Reduction of water level</p> <p>(d) Harvesting</p> <p>(e) Disposal of fish.</p> <p>Conduct practical on</p>	<p>Describe the main methods for harvesting fish</p>

				carry out harvesting	harvesting. Supervise students on routine in ponds	
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Programme: ND Oceanography and Fishery Science	Course Code OFS 221	Credit Hours: 30
		Credit Unit: 2
		Total Contact Hours: 60
Course:Introduction to Geographic Information System (GIS) and Remote Sensing	Pre-Requisite:	Theoretical: Hours/week
Semester: 4th Semester		Practical:

Course Main Aim/ Goal:

GENERAL OBJECTIVES
On completion of this course the student should be able to:
<ul style="list-style-type: none"> 1.0 Understand what GIS is and what it can be used for. 2.0 Know how to create and edit vector and attribute data 3.0 Understand how attribute data are associated with vector features and can be used to symbolize data 4.0 Understand what raster data is and how it can be used in a GIS 5.0 Understand topology in vector data as well as the Coordinate Reference Systems, map production, the use of buffering in vector spatial analysis and interpolation as part of spatial analysis. 6.0 Explain what Remote Sensing is. 7.0 Be able to use Remote Sensing Application effectively

Programme						
Course: Introduction to Geographic Information System (GIS) and Remote Sensing				Course Code OFS 221		CH/CU Hour:2
Goal:						
General Objectives 1.0: Introduction to GIS						
Course Specification: THEORETICAL CONTENT						
	Theoretical Content			Practical Content		
Week	Specific Learning Outcomes	Teacher's Activities	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
1	<p>1.1 Describe the general overview of GIS</p> <p>1.2 Define GIS and GIS Softwares and Application</p> <p>1.3 Explain GIS Data</p> <p>1.4 Describe examples of GIS data as Vector and Raster dat</p> <p>1.5 Explain the differences in data as geographical or non-geographical data</p>	<p>Explain what GIS stand for and its overview.</p> <p>Describe the general overview of GIS</p> <p>Define GIS and GIS Softwares and Application</p> <p>Explain GIS Data</p> <p>Describe examples of GIS data as Vector and Raster dat</p> <p>Explain the differences in data as geographical or non-geographical data</p>	<p>Video tabs ,</p> <p>Overhead projector</p> <p>GIS laboratory,</p> <p>overhead projector,</p> <p>white board</p>	<p>Explain GIS application with Spatial Information.</p> <p>Explain what GIS stands for and made of:</p> <p>Digital data,</p> <p>Computer Hardware,</p> <p>Computer Software.</p> <p>Give examples of uses of GIS application in Digital maps, population studies, etc</p> <p>Define data as information with</p>	<p>Introduction to the basic components of GIS</p> <p>Computer hardware and software as well as their functionality.</p>	<p>Define GIS and GIS Softwares and Application</p>

				geographical aspects (spatial) Geographical data and non-geographical data		
General Objectives 2.0: Understanding of Vector Data Models in GIS						
2	<p>2.1 Define Vector data</p> <p>2.2 Explain the attributes and features of vector data</p> <p>2.3 Define Point Features in details</p> <p>2.4 Explain Polyline Features in details</p> <p>2.5 Explain Polygon Features in details</p> <p>2.6 Describe vector data in layers</p> <p>2.7 Explain editing and scale in vector data</p> <p>2.8 Description of Vector Attribute Data</p> <p>2.9 Explain the General Overview of Vector Data</p> <p>2.10 Explain Attributes for a Vector features</p> <p>2.11 Describe single symbols</p> <p>2.12 Explain Graduated symbols</p> <p>2.13 Describe continuous colour symbols</p> <p>2.14 Explain unique value symbolsData Capture</p> <p>2.15 Describe the general overview of how to create and</p>	<p>Define Vector data</p> <p>Explain the attributes and features of vector data</p> <p>Define Point Features in details</p> <p>Explain Polyline Features in details</p> <p>Explain Polygon Features in details</p> <p>Describe vector data in layers</p> <p>Explain editing and scale in vector data</p> <p>Description of Vector Attribute Data</p> <p>Explain the General Overview of Vector Data</p> <p>Explain Attributes for a Vector features</p> <p>Describe single</p>	<p>Video tabs , Overhead projector</p> <p>GIS laboratory, overhead projector, white board</p> <p>QGIS User Guide GIS Software Maps Aerial maps Digital maps</p> <p>Video tabs , Overhead projector</p>	<p>Explain features in Vector data with their attributes e.g. Vector point, Vector Polyline and Vector Polygon features</p> <p>Explain the use of point features to imply scale, convenience and type of feature to be represented</p> <p>Describe Polyline with its two or more vertices</p> <p>Explain map scale as an important aspect of vector data in GIS</p> <p>Describe how attribute data are associated with vector features and can be used to represent data pollution levels along a river.</p> <p>Explain shape file format allows to store numerical field information as either a whole number (interior) or a decimal number (floating point).</p>	<p>Visit to GIS laboratory, Display of vector data and its features</p> <p>Visit to GIS laboratory, Display of vector data and its features</p>	<p>Explain the attributes and features of vector data</p> <p>Define Point Features in details</p>

	<p>edit vector and attribute data</p> <p>2.16 Explain GIS data storage processes</p> <p>2.17 Identify planning processes before data capture and storage</p> <p>2.18 Describe the process of shapefiles creation</p> <p>2.19 Explain Addition of data to shapefiles</p> <p>2.20 Describe the process of Heads-up digitizing</p> <p>2.21 Describe the use of digitizing table</p> <p>Explain graduated symbols as useful for clear differences between features with attributes values in different value range</p> <p>Explain the usefulness of colour range (from one colour to another)</p> <p>Always know what attributes are needed.</p> <p>Explain the process of creating and editing vector data – both the geometry and attributes of vector-features.</p> <p>Describe the use of data base to store digital data.</p> <p>Give examples of creating tourism map or map of</p>	<p>symbols</p> <p>Explain Graduated symbols</p> <p>Describe continuous colour symbols</p> <p>Explain unique value symbols</p> <p>Data Capture</p> <p>Describe the general overview of how to create and edit vector and attribute data</p> <p>Explain GIS data storage</p>	<p>Video tabs , Overhead projector</p>	<p>Explain digitizing table as a tool for professional GIS Users to capture map information</p>		
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General Objectives 3.0: Understanding Raster Data and its uses in GIS						
6	<p>3.1 Explain the general overview of Raster data as composed of rows and columns</p> <p>3.2 Define Raster data and their uses</p> <p>3.3 Explain Georeferencing</p> <p>3.4 Describe the sources of raster data</p> <p>3.5 Explain spatial Resolution in GIS</p> <p>3.6 Explain spectral Resolution</p> <p>3.7 Describe Raster to Vector Conversion and Vector to Raster Conversion</p> <p>3.8 Explain Raster Analysis</p>	<p>Explain the general overview of Raster data as composed of rows and columns</p> <p>Define Raster data and their uses</p> <p>Explain Georeferencing</p> <p>Describe the sources of raster data</p> <p>Explain spatial Resolution in GIS</p> <p>Explain spectral Resolution</p> <p>Describe Raster to Vector Conversion and Vector to Raster Conversion</p> <p>Explain Raster Analysis</p> <p>Give the general overview of Raster data as composed of rows and columns</p>	<p>Video tabs ,</p> <p>Overhead projector</p> <p>GIS laboratory, overhead projector, and white board.</p> <p>QGIS User Guide</p> <p>GIS Software</p> <p>Maps</p> <p>Aerial maps</p> <p>Digital maps</p>	<p>Visit to GIS laboratory, Display of Raster data and its features</p>	<p>Visit to GIS laboratory, Display of Raster data and its features</p>	<p>Explain spatial Resolution in GIS</p>
General Objectives 4.0: Understanding Topology in Vector Data						
7	<p>4.1 Describe the General Overview of</p>	<p>Describe the General Overview of Topology</p>	<p>Video tabs ,</p> <p>Overhead</p>		<p>Visit to GIS laboratory</p>	

	<p>Topology</p> <p>4.2 Define Topology</p> <p>4.3 Explain Topology errors, rules and tools</p> <p>4.4 Describe snapping distance</p> <p>4.5 Explain search Radius</p>	<p>Describe the General Overview of Topology</p> <p>Define Topology</p> <p>Explain Topology errors, rules and tools</p> <p>Describe snapping distance</p> <p>Explain search Radius</p>	<p>projector</p> <p>QGIS User Guide</p> <p>GIS Software Maps</p> <p>Aerial maps</p> <p>Digital maps</p>			
Genera Objectives 5.0: Understanding of Coordinate Reference Systems						
8	<p>5.1 Describe the general overview of coordinate reference systems as it relates to map projections</p> <p>5.2 Define map projections and the three categories of M projections</p> <p>5.3 Identify the Accuracies of map projections</p> <p>5.4 Explain map projections with</p> <p style="padding-left: 40px;">a. Angular conformity</p> <p style="padding-left: 40px;">b. equal distance</p> <p style="padding-left: 40px;">c. and equal areas</p> <p>5.5 Describe Cordinate Reference Systems (CRS)</p>	<p>Describe the general overview of coordinate</p> <p>Describe the general overview of coordinate reference systems as it relates to map projections</p> <p>Define map projections and the three categories of M projections</p> <p>Identify the Accuracies of map projections</p> <p>Explain map projections with</p> <p style="padding-left: 40px;">Angular conformity</p> <p style="padding-left: 40px;">equal distance and</p>	<p>Video tabs , Overhead projector</p> <p>QGIS User Guide</p> <p>GIS Software Maps</p> <p>Aerial maps</p> <p>Digital maps</p> <p>Road Network Maps.</p> <p>Population Maps.</p> <p>Projectors</p> <p>QGIS User Guide.</p>	<p>Visit to GIS laboratory, Display the different projected maps and its features</p>	<p>Visit to GIS laboratory, Display the different projected maps and its features</p>	

	<p>and Geographic Coordinate Systems</p> <p>5.6 Explain projected coordinate reference systems, universal transverse mercator (UTM) CRS and On-the Fly projection</p> <p>5.7 Understanding the Use of Buffering in Vector Spatial Analysis</p> <p>5.8 Describe the use of Buffering n Vector Spatial Analysis</p> <p>5.9 Explain the process of Buffering and define buffer zone</p> <p>5.10 Describe variations in buffering</p> <p>5.11 Explain Multiple Buffer zones</p> <p>5.12 Describe Buffering with Intact or dissolved boundaries and outward and Inward Buffering</p>	<p>equal areas</p> <p>Describe Cordinate Reference Systems (CRS) and Geographic Coordinate Systems</p> <p>Explain projected coordinate reference systems, universal transverse mercator (UTM) CRS and On-the Fly projection</p> <p>Understanding the Use of Buffering in Vector Spatial Analysis</p> <p>Describe the use of Buffering n Vector Spatial Analysis</p> <p>Explain the process of Buffering and define buffer zone</p> <p>Describe variations in buffering</p> <p>Explain Multiple Buffer zones</p> <p>Describe Buffering with Intact or dissolved boundaries</p>	<p>Video tabs , Overhead projector</p>		<p>Visit to GIS laboratory,</p>	
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	5.13 Explain more spatial analysis tools	and outward and Inward Buffering Explain more spatial analysis tools Describe the use of Buffering in Vector Spatial Analysis				
General Objectives 6.0: Understanding Interpolation as Part of Spatial Analysis						
	6.1 Describe the general overview of spatial analysis 6.2 Explain spatial Interpolation 6.3 Explain Inverse Distance Weighted (IDW) 6.4 Describe the Triangulated irregular Network (TIN) Identify other Interpolation Methods	Describe the general overview of spatial analysis Explain spatial Interpolation Explain Inverse Distance Weighted (IDW) Describe the Triangulated irregular Network (TIN) Identify other Interpolation Methods Describe the general overview of spatial analysis	Weather Maps. GIS Literatures. QGIS User guide			
General Objectives 7.0: Remote Sensing						
14	7.1 Explain the Concept of Geometrical principles of imagery (air photos, satellite image); 7.2 Explain the basic topographic features – coastline; continental shelf etc;	Explain the Concept of Geometrical principles of imagery	Video tabs , Overhead projector White Board,	Show Remote Sensing data structure and means of sharing such data.	At the laboratory, display different remote	Explain the Concept of Geometrical principles of imagery

	7.3 List Remote sensing techniques applicable to Bathymetry and Coastal mapping		Marker, duster and Power point projector. GIS Hardware and Software, aerial photographs		sensing images and air photographs, explain their application in remote sensing.	(air photos, satellite image);
Genera Objectives 7.0: Remote sensing application						
11	8.1 Describe how laser and radar Altimetry are used for water surface mapping. 8.2 Describe the use of remote sensing for Oil Spill mapping; 8.3 Process remotely sensed data to determine Bathymetry and Map Water surface features	Describe how laser and radar Altimetry are used for water surface mapping.	Video tabs , Overhead projector White Board, Marker, duster and Power point projector. GIS Hardware and Software, aerial photographs			

Programme: NATIONAL DIPLOMA IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: OFS 214		Total Contact Hours: 3
Course Title: MARINE ENVIRONMENTAL POLLUTION AND PROTECTION			Theoretical: 2 hours/week
Semester: 3rd	Pre-requisite:		Practical: 1 hour /week

General Objectives:

On Completion of this course the students will be able to:

- 1 Have an overview of pollution**
- 1 Understand Marine Pollution and Pollutants**
- 2 Know the effects of Pollution on the Marine Environment.**
- 3 Be aware of public water contaminants**
- 4 Understand ship-related threats to the marine environment**
- 5 Understand the legislative framework for marine environment protection**

	Course Title: MARINE ENVIRONMENTAL POLLUTION AND PROTECTION	Course Code: OFS 214		Total Contact Hours: 3
				Theoretical: 2 hours/week
	Semester: 3rd			Practical: 1 hour /week

	Theoretical Content			Practical Content		
	General Objective 1: An overview of pollution					
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1-3	<ul style="list-style-type: none"> • Define pollution • Types of Pollution • Sources of Pollution <ol style="list-style-type: none"> 1. Point source Pollution 2. Non-Point source Pollution • Point and non-point source pollution of ground water. • Point and non-point source pollution of surface water 	Discuss industrial discharge, sewage treatment plant, Agriculture production such as animal feeding operations, animal waste treatment lagoons or storage, handling, mixing, and clearing areas for pesticides, fertilizers as point and non-point sources of pollution.	Video tabs , Overhead projector	.		List types and sources of pollution.
	General Objective 2: Marine Pollution and Pollutants					
4-5	<ul style="list-style-type: none"> • The meaning of marine pollution. • Sources of marine pollution <ul style="list-style-type: none"> ➤ Land-based and vessel-generated pollution ➤ Dumping at sea, ➤ Sea bed activities 	<p>The meaning of marine pollution.</p> <p>Sources of marine pollution Land-based and vessel-generated pollution</p>	Video tabs , Overhead projector	.		

	<ul style="list-style-type: none"> • Types of marine pollutants <ul style="list-style-type: none"> ➤ Hydrocarbon compounds (crude and refined oil and gas) ➤ Persistent toxic substances (PTS), ➤ Persistent Organic Pollutants (POPs) ➤ Heavy metals ➤ Radioactive Materials ➤ Nutrients 	<p>Dumping at sea, Sea bed activities</p> <p>Types of marine pollutants Hydrocarbon compounds (crude and refined oil and gas) Persistent toxic substances (PTS), Persistent Organic Pollutants (POPs) Heavy metals Radioactive Materials Nutrients</p> <p>Discuss the variety of sources of marine pollution Discuss the scale of distribution of pollutants Discuss the global effect of pollution.</p>				
6-7	<ul style="list-style-type: none"> • An overview of Oil spillage • Categories of oil spillage (minor, medium, major and disaster) • Effect of Oil Pollution on Coastal areas 	<p>Give an overview of oil spillage and its effects.</p>	<p>Video tabs , Overhead projector</p>	<p>Students are expected to understand the different sources of oil spills and how it affects the marine</p>	<p>Discuss Oil spillage, oil pipeline leakage and destruction, accidental oil discharge as well</p>	

	<ul style="list-style-type: none"> Impact of Oil Pollution on marine habitats/fisheries and mariculture. 			<p>environment. Students are expected to know the major tanker accidents and the effect of such incidents in the marine environment</p>	<p>as the major sources of Oil Pollution Describe oil spill from accidents at sea. Provide data of major oil tanker incidents and the volume of spilt oil in the marine environment.</p>	
General Objective 3: Effect of marine pollution on marine environment.						
8-9	<p>Effect on marine resources</p> <ul style="list-style-type: none"> Threat to human health Eutrophication Ecological effect Weather and Climate 	<p>Discuss the effect of marine pollution on marine environment</p>	<p>Video tabs , Overhead projector</p>	<p>Students will understand the effect of pollution on the natural marine ecosystem</p>	<p>Discuss direct discharge of effluents and solid wastes into the sea. Discuss land runoff into the coastal zone.</p> <p>Discuss atmospheric fallout of pollutants into the sea.</p> <p>Discuss Pollution as the most widespread and</p>	<p>Assess understanding of learning outcome.</p>

					dangerous anthropogenic factor in the hydrosphere.	
General Objective 4: Public water contaminants						
	<ul style="list-style-type: none"> • Microorganisms • Disinfectants and water disinfection by-products • Inorganic chemicals • Radionuclides • Organic chemicals 	Discuss the effect of biological and chemical pollutants on marine environment.	Video tabs , Overhead projector			Assess specific learning outcome.
General Objective 5: Ship related threats to the marine environment						
	<ul style="list-style-type: none"> • Operational pollution, e.g., from ballast water. • Accidental pollution, e.g., Exxon-Valdez tanker disaster. • Damage to habitats and animals. 	Discuss ship related threats to the marine environment.	Video tabs , Overhead projector			Assess the understanding of learning objective.
General Objectives 6: Legislative framework for marine environment protection.						

Programme: ND NATIONAL DIPLOMA IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: OFS 222		Total Contact Hours: 2
Course Title: INTRODUCTION TO OCEAN LAWS			Theoretical: 2
Semester: 4th	Pre-requisite:		Practical:

General Objectives:

On Completion of this course the students will be able to:

1. Understand laws protecting the oceans
2. Describe the United Nations Convention on Law of the Sea
3. Explain Clean Water Act
4. Understand Estuaries Habitat Act
5. Understand the 1972 convention on the prevention of marine pollution by dumping of wastes and other matters
6. Understand Aquatic Invasive Species
7. Understand the convention on fishing and conservation of the living resources of the high seas and other related instruments.

	Course Title:	Course Code:		Total Contact Hours:
	INTRODUCTION TO OCEAN LAWS	OFS 222		Theoretical: 2
	Semester: 4th			Practical:
	Theoretical Content		Practical Content	

General Objective 1: Understand laws protecting the oceans						
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1-4	<p>1. Differentiate between convention, treaty, protocol and act</p> <p>2. Describe Coral Reef Conservation Act (CRCA)</p> <p>3. Explain Endangered Species Act (ESA)</p> <p>4. Explain Marine Mammal Protection Act (MMPA)</p> <p>5. Explain National Policy on Environment and related regulations such as Convention on Biodiversity (CBD)</p> <p>6. Explain National Marine Sanctuary Act</p> <p>7. Explain the Code of Conduct on Responsible Fishing and other related instruments.</p>	<p>Discuss the various laws protecting the ocean.</p> <p>Demonstrate how to interpret specific guidelines.</p>	<p>Video tabs , Overhead projector</p>			
General Objective 2: Describe United Nations Convention on Law of the Sea (UNCLOS)						
5-7	<p>Discuss the historical background of UNCLOS.</p> <p>Distinguish between internal and territorial waters.</p> <p>Understand contiguous zone, exclusive economic zone, continental shelf and landlocked states</p>	<p>Describe United Nations Convention on the Laws of the Sea (UNCLOS).</p> <p>Explain various aspects of the convention</p>	<p>Video tabs , Overhead projector.</p> <p>Maps and diagrams.</p>			

		(UNCLOS) already implemented in Nigeria.				
8-10	<p>Explain the technical aspects of ocean laws.</p> <p>Explain the term Geodesy, including examination of Geodetic representation of a section of the earth.</p> <p>Explain the outer limits related to continental shelf.</p> <p>Describe bilateral boundaries.</p>	Explain the technical aspects of ocean laws.	<p>Video tabs , Overhead projector.</p> <p>Maps and diagrams.</p>			
General Objective 3: Understand Clean Water Act						
11-13	<p>Explain the content of Clean Water Act.</p> <p>Explain the role of government implementing agency (administrator).</p> <p>Discuss the need for research and development related to Clean Water Act.</p>	Discuss the Clean Water Act and the role of Government in implementing the act.	<p>Video tabs , Overhead projector.</p> <p>Diagram.</p>			
General Objective 4: Understand other laws and strategies pertinent to ocean laws						
14-15	<p>Describe estuary habitat restoration strategy</p> <p>Discuss Act enacted to prevent pollution from ship</p> <p>Explain other strategies of mitigating ocean dumping</p>	Discuss Act enacted to prevent pollution from ship and the strategy for restoration of estuary	Video tabs , Overhead projector			

		habitat.				
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Programme: NATIONAL DIPLOMA IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: OFS 211		Total Contact Hours: 3
Course Title: Oceanographic Instrumentation			Theoretical: 1 hour/week
Semester: Third	Pre-requisite:		Practical: 2 hours /week

General Objectives:

On Completion of this course the students will be able to:

1. Understand Oceanographic Instruments & Observation
2. Understand sea surface temperature
3. Understand salinity – at surface and depth levels
4. Understand ocean current instruments at surface and depth levels
5. Understand wind speed and direction
6. Understand water transparency and colour instruments

	Course Title:	Course Code:		Total Contact Hours: 3
	Oceanographic Instrumentation	OFS 211		Theoretical: 1 hour/week
	Semester: 3rd			Practical: 2 hours /week

	Theoretical Content			Practical Content		
	General Objective 1: Understand the basic oceanographic instruments					
	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
	<p>Describe the temperature salinity bridge for sea surface temperature measurements and swell salinity.</p> <p>Describe the features: Deep sea Buoy, Shallow water Buoy.</p> <p>List the relevant end users of the instrument: Shore station, fisheries, oil platform, etc.</p> <p>State the areas of relevance: EIA, Oceanography, Meteorology, Fisheries, Off Shore installation, Shipping industries, etc.</p>	<p>Outline the different oceanographic instruments and their uses</p>	<p>White board for writing</p> <p>Models of Oceanographic Instruments</p> <p>Catalogues of Oceanographic Instruments</p>	<p>Describe the use of Bathythermograph (MBT), current meters, tide gauge and Buoys.</p>	<p>Demonstrate the use of the instruments.</p>	<p>Ask questions on learning objectives</p>
	General Objective 2: Understand sea surface temperature					
	<p>Describe the General principles of Sea Surface Temperature and Temperature to be observed.</p> <p>Describe the methods of observation and the basic requirements.</p> <p>Explain the Instruments,</p>	<p>Describe the General principles of Sea Surface Temperature and Temperature to be observed.</p> <p>Describe the methods of observation and the basic requirements.</p>	<p>White board for writing</p> <p>Models of Oceanographic Instruments</p> <p>Catalogues</p>	<p>Demonstrate the use of temperature-measuring equipments</p>	<p>Demonstrate the use of temperature-measuring equipments.</p>	<p>. Describe the General principles of Sea Surface Temperature and Temperature to be</p>

	<p>Exposure and Management</p> <p>Explain Remote Sensing with Infrared Thermometers and Applications of Remote Temperature Sensors</p> <p>Define Thermometer Characteristics</p>	<p>Explain the Instruments, Exposure and Management</p> <p>Explain Remote Sensing with Infrared Thermometers and Applications of Remote Temperature Sensors</p> <p>Define Thermometer Characteristics</p>	<p>of Oceanographic Instruments</p>			<p>observed.</p>
General Objective 3: Understand salinity – at surface and depth levels						
	<p>Define Salinity</p> <p>Define Salinity – Temperature – Depth (STD) system</p> <p>Describe the principles of Temperature-depth relation</p>	<p>Differentiate between salinity, temperature and depth</p>	<p>White board for writing</p> <p>Models of Oceanographic Instruments</p> <p>Catalogues of Oceanographic Instruments</p>			
General Objective 4: Understand salinity – at surface and depth levels						
	<p>Definitions of Wind wave and Swell Terminologies: Sea, Swell, Breaker, Surf, Breaking</p>	<p>Explain the General methods of</p>	<p>Reference textbooks</p>	<p>Use Wave Measurement Instrumentation</p>	<p>Visits to laboratories and coastal stations</p>	<p>Explain the General methods</p>

<p>Sea, Wavelength, Wave height, Wave period, wave speed.</p> <p>Explain the General methods of Observation which should include measurements or estimation of sea surface characteristics</p> <p>Explain the observations from ordinary Merchant Ships</p> <p>Explain observations from Ocean Station Vessels and Special Ships to make accurate observations.</p> <p>Describe the specifications for sea and swell Waves</p>	<p>Observation which should include measurements or estimation of sea surface characteristics</p>	<p>Practical observation at sea</p> <p>Overhead projector</p> <p>Charts</p> <p>Internet illustration</p> <p>RS – Software Oceanography laboratory</p>	<p>Practice the measurement of waves from coastal stations</p>	<p>Use Wave Measurement Instrumentation</p> <p>Practice the measurement of waves from coastal stations</p>	<p>of Observation which should include measurements or estimation of sea surface characteristics</p>	
<p>General Objective 5: Understand Ocean Current instruments at surface and depth levels</p>						
<p>Explain the general ocean current measuring Instruments.</p> <p>Describe the Fixed, Fathered and Shipboard Instruments and Methods.</p>	<p>Outline the general ocean current-measuring instruments</p>	<p>Catalogues</p> <p>Projectors</p> <p>Practical Observation</p>	<p>Identify free-floating instruments and methods: dye marks, parachute drogues,</p>	<p>visits to laboratories to Identify free-floating instruments and methods: dye marks, parachute drogues,</p>	<p>Explain the general ocean current measuring Instruments</p>	

<p>Describe the methods of data recording.</p> <p>Explain the types of current meters: Propeller Meters, Ekman Current Meter, Plessey Current Meter, Rotor Meters, etc.</p>		<p>Charts</p> <p>Reference textbooks</p> <p>Oceanography laboratory</p> <p>RS Software</p>	<p>Neutrally Bouyant floats, aircraft-launched Probes</p>	<p>Neutrally Bouyant floats, aircraft-launched Probes</p>	
General Objective 6: Understand wind speed and direction					
<p>Explain the methods of wind speed measurement and direction observation.</p> <p>Explain the basic requirement and management of Instruments.</p> <p>Enumerate the wind instruments and sensors.</p>	<p>Explain the methods of wind speed measurement and direction observation.</p> <p>Explain the basic requirement and management of Instruments.</p> <p>Enumerate the wind instruments and sensors.</p>	<p>Catalogue of wind instruments</p> <p>Oceanography laboratory</p> <p>Installation manuals and specification on wind instruments</p>	<p>Illustrate the Automatic wind Equipments, their Installation and Maintenance.</p>	<p>Visits to laboratories</p> <p>Illustrate the Automatic wind Equipments, their Installation and Maintenance</p>	
General Objective 7: Water transparency and colour instruments					

	<p>Description of Water Transparency Instruments and Procedures: Secchi Disc.</p> <p>Description of Water Colour Instruments and Procedures: Forel Scale</p>	<p>Outline water transparency and colour instruments</p>	<p>Installation manual for water transparency equipment</p> <p>Oceanography laboratory</p>	<p>Show the Installations of the Water Transparency and Colour Instruments</p>	<p>Visits to laboratories</p> <p>Show the Installations of the Water Transparency and Colour Instruments</p>	
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	Coursework/ Laboratory Reports	Final	Total
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Programme: ND IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code:		Total Contact Hours: 3
Course Title: Marine Biology	OFS 212		Theoretical: 1 hour/week
Semester: Third	Pre-requisite:		Practical: 2 hours /week

General Objectives:

On Completion of this course the students will be able to:

- 1. Understand marine biology**
- 2. Know Plankton and marine primary producers**
- 3. Know the Intertidal communities**
- 4. Understand Estuaries and Mangrove swamp**
- 5. Know benthic communities**
- 6. Know Coral reefs**
- 7. Know seagrass and seagrass bed**
- 8. Know Marine Reptiles**
- 9. Know marine Birds**
- 10. Know marine Mammals**
- 11. Know Human Impact on the Sea**

	Course Title:	Course Code:		Total Contact Hours: 3		
	Marine Biology	OFS 212		Theoretical: 2 hours/week		
	Semester: Third			Practical: 1 hour /week		
	Theoretical Content			Practical Content		
	General Objective 1: Understanding Marine biology					
	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
	General Objective 3: Know the Intertidal Environment and its Communities					
	3.1 Describe the intertidal region of the sea	<ul style="list-style-type: none"> • Describe the intertidal 	White board, duster,	Understanding the intertidal environment.	Teacher should take students on ecological field trip	Field trip and laboratory

<p>3.2 Explain zonation of intertidal communities.</p> <p>3.3 Identify and classify common intertidal organisms</p> <p>3.4 Explain adaptations of organism to the intertidal environment.</p>	<p>region of the sea</p> <ul style="list-style-type: none"> Identify and classify each of the intertidal organisms. Explain adaptations of organisms to the intertidal environment 	<p>marker, Video tabs , Overhead projector</p>		<p>to the intertidal environment.</p>	<p>evaluations.</p>
General Objective 4: Understand Estuaries and Mangrove swamp					
<p>4.1 Define Estuarine and Mangrove environments.</p> <p>4.2 Explain characteristic features of estuarine and mangrove environments.</p> <p>4.1 Identify and classify common estuarine and mangrove plants and animals organisms</p>	<p>Define Estuarine and Mangrove environments.</p> <p>Explain characteristic features of estuarine and mangrove environments.</p> <p>Identify and classify common estuarine and mangrove plants and animals</p>	<p>White board, duster, marker, Video tabs , Overhead projector</p>	<p>Identify and classify common estuarine and mangrove plants.</p>	<p>Identify and show student common estuarine and mangrove plants.</p>	<p>Field trip</p>

		organisms				
General Objectives 5: Know benthic communities						
	5.1 Describe benthic zone of the sea	Describe benthic zone of the sea.	White board, duster, marker, Video tabs			Field trip
	5.2 Identify and classify common benthic organisms	Identify and classify common benthic organisms.	, Overhead projector			
	5.1 Explain Adaptive features of benthic organisms	Explain Adaptive features of benthic organisms.				
General Objective 6: Know corals and coral reefs.						
	6.1 Define coral	Define coral	White board, duster, marker, Video tabs	classify coral organisms, e.g., hydroids	Guidance in the identification and classification of coral reef.	List common types of coral
	6.4 Describe the constituents of coral reef	Describe the constituents of coral reef	, Overhead projector			
	6.5 List common types of coral	List common types of coral	Field trip			
	6.6 Explain the ecological services of	Explain the				

	coral reefs	ecological services of coral reefs				
	6.5 Explain major threats to coral reef	Explain major threats to coral reef				
General Objective 7: Know seagrasses and seagrass bed						
	7.1 Define sea grass	Define sea grass	White board, duster, marker, Video tabs	Identify and classify common sea grasses in Nigeria	Field trip to areas where sea grasses occur.	Assess students' understanding of sea grasses and their ecological importance.
	7.2 List common types of sea grass	List common types of sea grass	Overhead projector			
	7.3 Explain the ecological services of sea grass	Explain the ecological services of sea grass				
	7.4 Explain major threats to sea grass	Explain major threats to sea grass				
General Objective 8: Know marine reptiles						
	8.1 Outline the characteristic features of marine reptiles	Outline the characteristics features of	White board, duster, marker,			

	8.2 Identify the common marine reptiles	marine reptiles Explain the common marine reptiles e.g. sea turtles, iguanas, saltwater crocodiles, sea snakes.	Video tabs , Overhead projector			
General Objective 9: Know marine birds						
	8.1 Outline the characteristics features of marine birds 8.2 Describe common marine birds and their ecological importance.	Outline the characteristic features of marine birds Explain the common marine birds, e.g., seagulls, pelicans, penguins, puffins, and their ecological importance.	White board, duster, marker, Video tabs , Overhead projector	Identify the common marine birds		
General Objective 10: Know marine mammals						
	9.1 Outline the characteristic features of marine mammals.	Outline the characteristic features of	White board, duster,			

	9.2 Understanding the common marine mammals	marine mammals Identify the common marine mammals e.g. whales, dolphin, sea otter, manatees, seals	marker, Video tabs , Overhead projector			Assess on the basis of learning objectives.
General Objective 11: Understand human impact on the sea						
	11.1 Explain human activities that affect the oceans, e.g., shipping, fishing, coastal development, pollution, etc.	Explain human activities that affect the oceans e.g. shipping, fishing, coastal development, pollution, etc.	White board, duster, marker, Video tabs , Overhead projector			

Programme: ND IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: OFS 121		Total Contact Hours: 3
Course Title: Physical Oceanography			Theoretical: 1 hour/week
Semester: Second	Pre-requisite:		Practical: 2 hours /week

General Objectives:

On Completion of this course the students will be able to:

- 1. Know the major oceans**
- 2. Know the ocean topography**
- 3. Understand the physical properties of the ocean waters**
- 4. Understand ocean currents**
- 5. Understand ocean tides**
- 6. Understand ocean waves**
- 7. Understand the physical processes at land –sea interface.**
- 8. Know the physical resources of the sea**

	Course Title:	Course Code:		Total Contact Hours: 3		
	Physical Oceanography	OFS 121		Theoretical: 1 hour/week		
	Semester: 2nd			Practical: 2 hours /week		
	Theoretical Content			Practical Content		
	General Objective 1: Know the major oceans					
Week/ s	Specific Learning Outcomes	Teacher’s activities	Resources	Specific Learning Outcomes	Teacher’s activities	Evaluation
	1.1 Define oceanography. 1.2 Name the major oceans and their	Define oceanography	Marker, Duster, White	Draw map of the world showing the	Guide students to draw map of the	Name the major oceans of

1.	<p>geographical boundaries; Atlantic, Pacific, Indian, Arctic and Antarctic.</p> <p>1.3 Name the major marginal seas, e.g., Mediterranean sea, Red sea, etc.</p>	Name the major oceans and their geographical boundaries	board Video tabs , Overhead projector ,	oceans.	world.	the world
General Objective 2: Understand the physical properties of the ocean waters						
3-4	<p>3.1 Describe the ocean zones in terms of depth in relation to land</p> <p>3.2 Describe light penetration in oceanic zones</p> <p>3.3 Describe ocean temperature zones</p>	<p>Describe and draw ocean zones e.g. pelagic, epipelagic, mesopelagic</p> <p>Describe and draw ocean light zones e.g. photic, disphotic, aphotic zones,</p> <p>Describe ocean temperature zones, surface</p>	Marker, Duster, White board Video tabs , Overhead projector ,	Draw and label each of these zones.	Guide students to draw and label each of these zones.	Assess understanding of learning objectives.

	3.4 Explain ocean pressure	zone, thermocline and deep zone Explain and calculate ocean pressure				
General Objective 4: Understand ocean currents						
5-6	4.1 Define ocean current. 4.2 Explain how ocean currents are formed. 4.3 Identify and draw major ocean currents 4.4 Explain the importance of ocean currents in ocean productivity, temperature, shipping, marine debris, etc.	Define ocean current. Explain how ocean currents are formed Identify and draw major ocean currents Explain the importance of ocean currents in ocean productivity, temperature, shipping, marine debris	Marker, Duster, White board Video tabs , Overhead projector, Ocean chart	Draw the map of the world to show major ocean currents.	Guide students to draw the map of the world to show major ocean currents.	Define ocean current

General Objective 5: Understand ocean tides							
7-8	5.2	Define ocean tides.	Define ocean tides.	Marker, Duster, White board Video tabs, Overhead projector	show how to read and interpret tide tables.	Direct students to read and interpret tide tables.	Assess students' understanding on the importance of tides.
	5.3	Explain how ocean tides are formed.	Explain how ocean tides are formed.				
	5.4	Explain tidal patterns: Diurnal, semi-diurnal, etc.	Describe different types of tides				
	5.5	Describe different types of tides; high tide, low tide, flood tide, ebb tide etc.	Explain the importance of ocean tides				
	5.6	Explain the importance of ocean tides					
General Objectives 6: Understand ocean waves							

9-10	<p>6.1 Define ocean waves</p> <p>6.2 Explain the formation of ocean waves</p> <p>6.3 Describe different types of ocean waves: capillary, wind, Seiche, seismic, tidal waves</p> <p>6.4 Explain the importance of ocean waves: beach creation, weathering, temperature, ocean-atmosphere gas exchange, dispersal of marine organisms,.</p>	<p>Define ocean waves</p> <p>Explain how ocean waves are formed</p> <p>Describe the different types ocean waves</p> <p>Explain the importance of ocean waves</p>	<p>Marker, Duster, White board Video tabs , Overhead projector ,</p>			<p>Assess students' understanding of learning outcome.</p>
General Objective 7: Understand the physical processes at land –sea interface.						
11-12	<p>7.1 Define coastal terms: estuary, beach, lagoon, delta, bay, cove, headland, peninsula, salt marsh, etc.</p> <p>7.2 Explain the physical processes at land-</p>	<p>Define coastal terms; estuary, beach, lagoon, delta, bay, cove, headland, peninsula, salt marsh etc.</p> <p>Explain the physical</p>	<p>Marker, Duster, White board Video tabs , Overhead projector .</p>	<p>Visit coastal field trip</p>	<p>Take students on coastal field trip.</p>	<p>Evaluate students on field trip performance</p>

	sea interface, e.g., estuaries, beaches, deltas, etc.	processes at land-sea interface, e.g., estuarine, beaches, deltas, etc.				
General Objective 8: Understand the role of the ocean in global climate change, water cycle and energy transfer						
11-12	8.1 Explain the role of the ocean in: i. Climate change ii. Water cycle iii Energy transfer	Explain the role of the ocean in: i. Climate change ii. Water cycle iii. energy transfer				
General Objective 10: Know the physical resources of the sea						
13-14	9.1 Outline physical resources of the sea: waves, tide, wind, etc.	Outline physical resources of the sea: waves, tide, wind, etc.				

Programme: ND IN OCEANOGRAPHY AND FISHERY SCIENCE	Course Code: OFS 122		Total Contact Hours: 3
Course Title: Chemical Oceanography			Theoretical: 1 hour/week
Semester: Second	Pre-requisite:		Practical: 2 hours /week

General Objectives:

On Completion of this course the students will be able to:

- 1. Understand the composition and nature of seawater**
- 2. Know the dissolved gases in seawater**
- 3. Know the organic matter in the sea**
- 4. Understand nutrient composition of sea water**
- 5. Understand the chemical processes at freshwater –seawater interface.**
- 6. Understand the role of the ocean in biogeochemical cycles**
- 7. Know the diversity of marine mineral resources**

	Course Title:	Course Code:		Total Contact Hours: 3		
	Chemical oceanography	OFS 122		Theoretical: 1 hour/week		
	Semester: 2nd			Practical: 2 hours /week		
	Theoretical Content		Practical Content			
	General Objective 1: Understand the composition and nature of seawater					
Week/	Specific Learning Outcomes	Teacher's	Resources	Specific Learning	Teacher's activities	Evaluatio

s		activities		Outcomes		n
1-2	<p>1.1 Explain salinity: definitions, measurements, and variations, e.g., brine, saline water, brackish water, freshwater/ oligohaline, mesohaline, polyhaline, etc.</p> <p>1.2 Explain major and minor ions in seawater e.g. NaCl, MgSO₄, KNO₃, Na₂CO₃ etc.</p> <p>1.3 Trace elements in the seawater</p> <p>1.4 Explain origin of seawater</p>	<p>Explain salinity: definitions, measurements and variations</p> <p>Explain major and minor ions in seawater.</p> <p>Explain the trace elements of the sea</p> <p>Explain the origin of seawater</p>	<p>Marker, Duster, White board Video tabs , Overhead projector ,</p>			
General Objective 2: Know the dissolved gases in seawater						
3-4	<p>1.1 Outline non-carbon dioxide gases of the sea: distribution, solubility and exchange process across the sea surface.</p>	<p>Outline non-carbon dioxide gases of the sea: distribution,</p>	<p>Marker, Duster, White</p>			

	1.2 Outline Carbon dioxide in the sea: pH, alkalinity, exchange between the sea and the atmosphere.	solubility and exchange process across the sea surface. Explain Carbon dioxide in the sea: pH, alkalinity, exchange between the sea and the atmosphere.	board Video tabs , Overhead projector ,			
General Objective 3: Know the organic matter in the sea						
5-6	1.1 Explain the dissolved organic matter in the sea: origin and fate, distribution and biological effects 1.2 Explain the particulate organic matter in the sea: origin and fate,	Explain the dissolved organic matter in the sea: origin and fate, distribution and biological effects Explain the particulate organic matter	Marker, Duster, White board Video tabs , Overhead projector ,			

	distribution and biological effects	in the sea: origin and fate, distribution and biological effects				
General Objective 4: Understand nutrient composition of sea water						
7-8	1.1 Outline the major nutrient of the sea: Nitrogen, Phosphorus, Silicon, etc.	Outline the major nutrient of the sea: Nitrogen, Phosphorus, Silicon etc.	Marker, Duster, White board Video tabs			
	1.2 Explain variation, cycle and distribution of nitrogen and Phosphorus.	Explain variation, cycle and distribution of nitrogen and Phosphorus.	, Overhead projector, Ocean chart			
	1.3 Explain the biological importance of Silicon in the sea	Explain the biological importance of Silicon in the sea				
	1.4 Explain the importance of nutrients					

	in ocean productivity	Explain the importance of nutrients to ocean productivity				
General Objective 5: Know the organic matter in the sea						
9-10	<p>5.1 Explain the dissolved organic matter in the sea: origin and fate, distribution and biological effects</p> <p>5.2 Explain the particulate organic matter in the sea: origin and fate, distribution and biological effects</p>	<p>Explain the dissolved organic matter in the sea: origin and fate, distribution and biological effects</p> <p>Explain the particulate organic matter in the sea: origin and fate, distribution and biological effects</p>	<p>Marker, Duster, White board, Video tabs, Overhead projector ,</p>			
General Objectives 6: Understand the chemical processes at freshwater –seawater interface.						

11-12	<p>6.1 Compare the chemical composition of seawater, brackishwater and freshwater</p> <p>6.2 Describe the various types of estuary: salt wedge, well-mixed, partially-mixed and reversed estuaries</p> <p>6.3 Explain Saltwater intrusion</p>	<p>Explain the chemical composition of seawater, brackishwater and freshwater.</p>	<p>Marker, Duster, White board, Video tabs, Overhead projector.</p>			
General Objective 7: Understand the role of ocean in biogeochemical cycles						
9-10	<p>7.1 Explain the role of the ocean in:</p> <p>i. Carbon cycle</p> <p>ii. Carbonate cycle</p> <p>iii Nutrient cycles: Nitrogen, Phosphorus, Iron</p>	<p>Explain the role of the ocean in:</p> <p>i. Climate change</p> <p>ii. carbon cycle</p> <p>iii energy transfer</p> <p>iv water cycle</p>	<p>Marker, Duster, White board, Video tabs, Overhead projector.</p>			
General Objective 8: Know the diversity of marine mineral resources of the ocean						
	<p>8.1 Outline mineral resources from the ocean: inorganic, metal</p>	<p>Outline mineral resources from the ocean: inorganic, metal</p>	<p>Video tabs, overhead</p>			

11-12	<p>and organic</p> <p>8.2 List inorganic minerals from the sea and their importance: salt, potassium, magnesium, sand & gravel, limestone & gypsum, manganese, phosphorite, water, etc.</p> <p>8.3 List metals from the sea and their importance: placer gold, tin, titanium, diamonds</p> <p>8.4 List organic minerals from the sea and their importance: Oil, gas, gas hydrate.</p>	<p>and organic</p> <p>List inorganic minerals from the sea and their importance: salt, potassium, magnesium, sand & gravel, limestone & gypsum, manganese, phosphorite, water, etc.</p> <p>List metals from the sea and their importance: placer gold, tin, titanium, diamonds</p> <p>List organic minerals from the sea and their importance</p>	<p>projector, marker and duster</p>			
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Programme: ND Oceanography and Fishery Science	Course Code: STA 111	Credit Hours: 2
		Credit Unit: 2
		Total Contact Hours: 45
Course: Introduction to Statistics	Pre-Requisite:	Theoretical: Hours/week: 2
Semester: 3rd Semester		Practical:

Course Main Aim/ Goal: This course is designed to enable students to acquire a basic knowledge of descriptive statistics.

GENERAL OBJECTIVES

On completion of this course, students should be able to:

- 1.0 **Understand statistics and all that it stands for.**
- 2.0 **Understand the different methods of data collection and their limitations.**
- 3.0 Know the different forms of data presentation
- 4.0 **Understand the use and the importance of some measures of central tendency in summarizing data.**
- 5.0 **Understand the use and importance of measures of dispersion in summarizing data**
- 6.0 Know the different types of random variables
- 7.0 Understand the basic principles of probability
- 8.0 Understand some basic probability distributions and be label to identify each distribution
- 9.0 **Understand the principles of correlation of two variables and the regression of one variable on another.**

PROGRAMME: National Diploma In Oceanography and Fishery Science						
COURSE: Introduction to Statistics		COURSE CODE: STA 111		CONTACT HOURS: 2 – 0 - 0		
Course Specification: Theoretical Contents						
WEEK	Special Learning Outcomes	Teachers Activities	Resources	Special Learning Outcomes	Teachers Activities	Evaluation
	General objectives 1.0: Understand statistics and all that it stands for.					
1	1.1 Define statistics 1.2 Explain with approximate illustrations, the use of statistics in Government, Biological Sciences, Physical Science. Business and Economics.	Define statistics Explain with approximate illustrations, the use of statistics in Government, Biological Sciences, Physical Science. Business and	Instructional Manual. Recommended textbooks, e-books, lecture notes,	▪	▪	▪

		Economics	Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
General Objective 2.0: Understand the different methods of data collection and their limitations.						
2-3	<p>2.1 State the method of collecting data</p> <p>2.2 Describe the two main methods of collecting primary data:</p> <p>a) Established published sources</p> <p>b) "Ad-hoc" basic or experimentation</p> <p>2.3 State the merits and demerits of the methods of collecting primary data</p> <p>2.4 Explain the concept of data "editing" and its application in editing primary and secondary data.</p> <p>2.5 Describe the sources of error in data collection</p>	<p>State the method of collecting data</p> <p>2.2 Describe the two main methods of collecting primary data:</p> <p>a) Established published sources</p> <p>b) "Ad-hoc" basic or experimentation</p> <p>2.3 State the merits and demerits of the methods of collecting primary data</p> <p>2.4 Explain the concept of data "editing" and its application in editing primary</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪

		and secondary data. 2.5 Describe the sources of error in data collection				
General Objectives 3.0: Know the different forms of data presentation						
4-5	<p>3.1 Explain the objectives of classification of a mass of raw data</p> <p>3.2 Prepare a frequency distribution from a given data</p> <p>3.3 Explain the usefulness of diagrams in presenting statistical data</p> <p>3.4 Construct bar chart, pie chart, histogram, frequency polygon and cumulative frequency polygon for a given set of data</p> <p>3.5 Outline the merits and demerits of each diagram in 3.4 above.</p>	<p>Explain the objectives of classification of a mass of raw data</p> <p>Prepare a frequency distribution from a given data</p> <p>Explain the usefulness of diagrams in presenting statistical data</p> <p>Construct bar chart, pie chart, histogram, frequency polygon and cumulative frequency polygon for a given set of data</p> <p>Outline the merits and demerits of each diagram in 3.4 above</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪

General Objective 4.0 Understand the use and the importance of some measures of central tendency in summarizing data.						
6-7	<p>4.1 Define Arithmetic mean, Geometric Mean, Median, Mode and harmonic Mode and harmonic mean</p> <p>4.2 Compute the measurer in 4.1 above given:</p> <p>i. ungrouped</p> <p>ii. grouped data</p> <p>4.3 Explain the uses of Geometric means</p> <p>4.4 Calculate:</p> <p>Quantiles</p> <p>Deciles</p> <p>Percentiles given a set of data</p> <p>List the merits and demerits of all the above measured of central tendency.</p>	<p>Define Arithmetic mean, Geometric Mean, Median, Mode and harmonic Mode and harmonic mean</p> <p>Compute the measurer in above given:</p> <p>i. ungrouped</p> <p>ii. grouped data</p> <p>Explain the uses of Geometric means</p> <p>Calculate:</p> <p>Quantiles</p> <p>Deciles</p> <p>Illustrate with good examples activities in 4.1 to 4.4.</p> <p>Assess the student</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪

General Objective 5.0: Understand the use and importance of measures of dispersion in summarizing data						
8	<p>5.1 State the importance of measures of dispersion</p> <p>5.2 Defined and calculate the: mean deviation, Semi interquartile range Variance and standard deviation</p> <p>5.3 Describe the application of the measures of dispersion defined in 5.2 above.</p> <p>5.4 Calculate these standard error of the sample mean for given data</p>	<p>State the importance of measures of dispersion</p> <p>Defined and calculate the: mean deviation, Semi interquartile range Variance and standard deviation</p> <p>Describe the application of the measures of dispersion defined in 5.2 above.</p> <p>Calculate these standard error of the sample mean for given data</p> <p>Illustrate with good examples activities in 5.1 to 5.4.</p> <p>Assess the student</p>	<p>Instructional Manual.</p> <p>Recommend ed textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪

	General Objective: 6.0 Know the different types of random variables					
9	<p>6.1 Define a random variable</p> <p>6.2 Explain the concept of randomness</p> <p>6.3 Define discrete and continuous variables</p> <p>6.4 State examples of discrete and continuous variables</p>	<p>Define a random variable</p> <p>Explain the concept of randomness</p> <p>Define discrete and continuous variables</p> <p>State examples of discrete and continuous variables</p> <p>Illustrate with good examples activities in to</p> <p>Assess the student</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪
	General Objective 7.0: Understand the basic principles of probability					
10	<p>7.1 Define probability</p> <p>7.2 Explain probability using the relative frequency approach</p> <p>7.3 State the laws of probability</p> <p>7.4 Solve simple problems by applying the laws of probability</p> <p>7.5 Define conditional probability for two events.</p>	<p>Define probability</p> <p>Explain probability using the relative frequency approach</p> <p>State the laws of probability</p> <p>Solve simple problems by applying the laws of probability</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic</p>	▪	▪	▪

		<p>Define conditional probability for two events.</p> <p>Illustrate with good examples activities in 7.1 to 7.5.</p> <p>Assess the student</p>	Board, flip charts, etc.			
General Objectives 8.0: Understand some basic probability distributions and be label to identify each distribution						
11-13	<p>8.1 State the probability distribution of a random variable</p> <p>8.2 Define mathematical expectation of discrete and continuous random variable</p> <p>8.3 Define expectations of functions of discrete random variable</p> <p>8.4 Define the binomial distribution</p> <p>8.5 Define conditional probability for two events</p> <p>8.6 Calculate the means and variance under the Binomial and the poison distributions</p> <p>8.7 Define Normal distribution</p> <p>8.8 Approximate probabilities for given continuous random variables using normal</p>	<p>State the probability distribution of a random variable</p> <p>Define mathematical expectation of discrete and continuous random variable</p> <p>Define expectations of functions of discrete random variable</p> <p>Define the binomial distribution</p> <p>Define conditional probability for two events</p> <p>Calculate the means and variance under the Binomial and the poison</p>	<p>Instructional Manual.</p> <p>Recommend ed textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>	▪	▪	▪

	distribution	distributions				
8.9	Explain the characteristics of Binomial distribution	Define Normal distribution				
8.10	Apply Binomial distribution of samples with replacement	Approximate probabilities for given continuous random variables using normal distribution				
8.11	Solve given problems applying binomial distribution	Explain the characteristics of Binomial distribution				
8.12	Describe normal distribution curve and the empirical distribution rule	Apply Binomial distribution of samples with replacement				
8.13	Explain the characteristics of Normal distribution. Calculate the probability given the deviation from the mean	Solve given problems applying binomial distribution				
8.14	Calculate the deviation given the means, standard deviation and a particular observation	Describe normal distribution curve and the empirical distribution rule				
8.15	Calculate the area under the curve at different point from either side of the mean.	Explain the characteristics of Normal distribution. Calculate the probability given the deviation from the mean				
8.16	Apply Normal distribution curve to simple problems	Calculate the deviation				

		<p>given the means, standard deviation and a particular observation</p> <p>Calculate the area under the curve at different point from either side of the mean.</p> <p>Apply Normal distribution curve to simple problems</p> <p>Illustrate with good examples activities in 8.1 to 8.16.</p> <p>Assess the student</p>				
General Objectives 9.0: Understand the principles of correlation of two variables and the regression of one variable on another.						
14 – 15	<p>9.1 Define correlation</p> <p>9.2 State the types of correlation</p> <p>9.3 Describe the methods of studying correlation</p> <p>i. Scatter diagram (graphic method)</p> <p>ii. Karl Pearson's coefficient of correlation</p>	<p>Define correlation</p> <p>State the types of correlation</p> <p>Describe the methods of studying correlation</p> <p>i. Scatter diagram (graphic method)</p> <p>ii. Karl</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector,</p>	▪	▪	▪

	<p>iii. Spearman's rank correlation</p> <p>9.4 Calculate Pearson's and Spearman's correlation coefficients</p> <p>9.5 Define regression equation of the form $Y=a+bx$ using free-hand method and method of least squares.</p>	<p>Pearson's coefficient of correlation</p> <p>iii. Spearman's rank correlation</p> <p>Calculate Pearson's and Spearman's correlation coefficients</p> <p>Define regression equation of the form $Y=a+bx$ using free-hand method and method of least squares.</p> <p>Give sample Charts</p> <p>Give students assignments</p>	<p>Screen, Magnetic Board, flip charts, etc.</p>			
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ASSESSMENT: The continuous assessment, tests and quizzes will be awarded 40% of the total score. The end of the Semester Examination will make up for the remaining 60% of the total score.

COMPETENCY: The Student should be able to apply basic statistical methods in the construction industry

PROGRAMME: NATIONAL DIPLOMA	COURSE CODE:	UNIT:2	
OCEANOGRAPHY AND FISHERY SCIENCE	GNS 224		CONTACT : 3
COURSE TITLE: PHYSICAL GEOGRAPHY			HRS/WK
			THEORETICAL: 1
			HS/K

SEMESTER: 2ND	PRE-REQUISITE		PRACTICAL: 2HRS/WK
GOAL: This course is designed to enable the student understand the structure of the earth universe, landforms evolve, how climate and vegetations are determined and how to read maps			
GENERAL OBJECTIVES: On completion of this course, the student will be able to:			
1.0 Know the Earth and the Universe			
2.0 Know the Earth's crust.			
3.0 Understand volcanic actions and earthquakes.			
4.0 Know rock weathering soil formation, and erosion.			
5.0 Understand landforms.			
6.0 Understand world climates			
7.0 Understand world vegetations			
8.0 Understand maps.			

OCEANOGRAPHY AND FISHERY SCIENCE

	COURSE CODE: GNS 224	CH/CU HOURS: 2
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ent understand the structure of the earth universe, landforms evolve, how climate and vegetations are and the Universe

THEORETICAL CONTENTS			PRACTICAL CONTENTS		
Specific Learning Objectives	Teacher's Activities	Resources	Specific Learning Objectives	Teacher's Activities	Evaluation
1.1 Describe the Earth. 1.2 Define the Universe. 1.3 Sketch the solar system 1.4 List evidence of the spherical shape of the	Describe the Earth. Define the Universe. Sketch the solar system List evidence of the spherical shape of the	Instructional Manual. Recommended			

<p>earth.</p> <p>1.5 Describe the earth's rotation and revolution</p> <p>1.6 Analyse the rotation and the revolution of the earth.</p> <p>1.7 Describe longitudes and latitudes</p> <p>1.8 List the uses of longitudes and latitudes</p> <p>1.9 Calculate distances and time using longitude and latitude.</p>	<p>earth.</p> <p>Describe the earth's rotation and revolution</p> <p>Analyse the rotation and the revolution of the earth.</p> <p>Describe longitudes and latitudes</p> <p>List the uses of longitudes and latitudes</p> <p>Calculate distances and time using longitude and latitude.</p>	<p>textbooks , e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>			
<p>2.1 Define the Earth's Crust.</p> <p>2.2 Identify the constituents of the Earth's Crust</p> <p>2.3 Draw the structure of the Earth.</p> <p>2.4 Label the structure of the Earth drawn on 2.3 above</p> <p>2.5 Explain rock formation.</p> <p>2.6 Classify rocks.</p> <p>2.7 Describe mountain, plateaus and plains.</p> <p>2.8 List the various mountain, plateau, and plain types in Nigeria.</p> <p>2.9 Identify the various uses of the landforms listed in 2.8 above.</p>	<p>Define the Earth's Crust.</p> <p>Identify the constituents of the Earth's Crust</p> <p>Draw the structure of the Earth.</p> <p>Label the structure of the Earth drawn on above</p> <p>Explain rock formation.</p> <p>Classify rocks.</p> <p>Describe mountain, plateaus and plains.</p> <p>List the various mountain, plateau, and plain types in Nigeria.</p> <p>Identify the various uses of the landforms listed in 2.8 above.</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>			
<p>s and earthquakes.</p>					

<p>3.1 Define volcanic actions. 3.2 Define earthquakes. 3.3 State the causes of volcanoes and earthquakes. 3.4 List the results of volcanoes. 3.5 List the results of the earthquakes. 3.6 Identify the primary and secondary volcanic and earthquake prone areas of the world. 3.7 Describe the consequences of volcanoes and earthquakes</p>	<p>Define volcanic actions. Define earthquakes. State the causes of volcanoes and earthquakes. List the results of volcanoes. List the results of the earthquakes. Identify the primary and secondary volcanic and earthquake prone areas of the world. Describe the consequences of volcanoes and earthquakes</p>	<p>Instructional Manual. Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>			
formation, and erosion.					
<p>4.1 Define weathering. 4.2 Describe factors of weathering. 4.3 Describe types of weathering. 4.4 Define soil. 4.5 Identify the relationship between weathering and soil formation processes. 4.6 Describe soil profiles. 4.7 Differentiate soil types. 4.8 Identify the various types in Nigeria. 4.9 Define erosion. 4.10 Describe the various</p>	<p>Define weathering. Describe factors of weathering. Describe types of weathering. Define soil. Identify the relationship between weathering and soil formation processes. Describe soil profiles. Differentiate soil types. Identify the various types in Nigeria. Define erosion.</p>	<p>Instructional Manual. Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip</p>			

	<p>types of erosion.</p> <p>4.11 Analyse the landform produced by erosion.</p> <p>4.12 Describe some techniques of erosion control.</p> <p>4.13 Analyse the relationship between rock weathering, soil formation, and erosion.</p>	<p>Describe the various types of erosion.</p> <p>Analyse the landform produced by erosion.</p> <p>Describe some techniques of erosion control.</p> <p>Analyse the relationship between rock weathering, soil formation, and erosion.</p>	<p>charts, etc.</p>			
formation, and erosion.						
	<p>5.1 Define various types of landforms (including those listed in 2.8, 3.4, 3.5 and 4.11 above)</p> <p>5.2 Describe the landforms created by river erosion and deposition.</p> <p>5.3 Describe the landforms created by wind erosion and deposition.</p> <p>5.4 Describe the landforms created by underground water</p> <p>5.5 Describe coastal landforms.</p> <p>5.6 Identify the uses of the various landforms mentioned in 5.2 to 5.5 above.</p>	<p>Define various types of landforms (including those listed in 2.8, 3.4, and 4.11 above)</p> <p>Describe the landforms created by river erosion and deposition.</p> <p>Describe the landforms created by wind erosion and deposition.</p> <p>Describe the landforms created by underground water</p> <p>Describe coastal landforms.</p> <p>Identify the uses of the various landforms mentioned in 5.2 to 5.5 above.</p>	<p>Instructional Manual.</p> <p>Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.</p>			
	6.1 Define Climate.	Define Climate.				

<p>6.2 Distinguish Climate from weather.</p> <p>6.3 Explain the determinations of Climate (elements and factors).</p> <p>6.4 Identify the global Climate regions.</p> <p>6.5 Describe the global Climate regions.</p> <p>6.6 Explain the effects of Climate on man and the environment.</p> <p>6.7 Explain seasonal variations and problems associated with them in Nigeria.</p>	<p>Distinguish Climate from weather.</p> <p>Explain the determinations of Climate (elements and factors).</p> <p>Identify the global Climate regions.</p> <p>Describe the global Climate regions.</p> <p>Explain the effects of Climate on man and the environment.</p> <p>Explain seasonal variations and problems associated with them in Nigeria.</p>				
ns					
<p>7.1 Define Vegetation.</p> <p>7.2 Explain the determinants of vegetation.</p> <p>7.3 Label a drawn vegetation regions of the world.</p> <p>7.4 Describe the various vegetation religions of the world.</p> <p>7.5 Describe factors in vegetation change (including desertification)</p> <p>7.6 Explain the effect of vegetation on man and the environment.</p> <p>7.7 Suggest techniques of desertification control.</p>	<p>Define Vegetation.</p> <p>Explain the determinants of vegetation.</p> <p>Label a drawn vegetation regions of the world.</p> <p>Describe the various vegetation religions of the world.</p> <p>Describe factors in vegetation change (including desertification)</p> <p>Explain the effect of vegetation on man and the environment.</p> <p>Suggest techniques of desertification control.</p>				

8.1 Define map. 8.2 Describe uses of maps. 8.3 Define scales. 8.4 List types of scales. 8.5 Distinguish between bearing and direction. 8.6 Calculate distances and bearing. 8.7 Define contour. 8.8 Identify natural and man – made features. 8.9 Read different types of maps.	Define map. Describe uses of maps. Define scales. List types of scales. Distinguish between bearing and direction. Calculate distances and bearing. Define contour. Identify natural and man – made features.	Instructional Manual. Recommended textbooks, e-books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
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LIST OF FACILITIES

NATIONAL DIPLOMA IN OCEANOGRAPHY AND FISHERY SCIENCE

1.0 OCEANOGRAPHIC EQUIPMENTS

S/No	ITEM	QTY	REMARK
1.	Teaching/Research Boat		
2.	Tide gauge	4	
3.	Wave recorder	1	
4.	Current meter	2	
5.	Conductivity meter	2	
6.	Eckman grab	2	

7.	Nansen reversing water bottle	1	
8.	Reversing thermometer	2	
9.	Secchi Disc	4	
10.	Nephelometer	2	
11.	Echosounder	2	
12.	Handheld GPS	3	
13.	Corer	2	
14.	Waverider Buoy	1	
15.	pH meter	4	
16.	Dissolved Oxygen meter	2	
17.	Salinometer	2	
18.	Hydrometer set (cylinder, thermometer, TSD graph)	4	
19.	Bathythermograph	1	
20.	Bucket Thermometer	4	
21.	Binocular	10	
22.	Life jacket	30	
23.	Compass	10	
24.	Weather Tracker	2	
25.	Diving kit	2	

2.0 METEOROLOGICAL EQUIPMENT

S/No	ITEM	QTY	REMARK
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1	Stevenson's screen	1	
2	Them hydrographs	1	
3	Maximum and minimum thermometer	2	
4	Measuring glasses	2	
5	Wind vane	2	
6	Anemometer	1	
7	Evaporimeters	2	
8	Hygrometers	2	
9	Barometers	2	
1			

3.0 SURVEYING EQUIPMENT

S/N	ITEM	QTY	REMARK
1	Stereoscope	4	

2	Prismatic	3	
3	Ranging pole	8	
4	Chain	2	
5	Metric tope	2	
6	Drawing	10	
7	Protractors	10	
7	Protractors	1	
8	Planimeter	1	
9	Theodolite and staff	1	
10	Scale rule	15	
11	Set Square	1 of 10	
12	Set of arrows	30	
13	Levels	4	
14	T- square	10	
15	Pantograph	10	

4.0 GEAR AND CRAFT

S/N o	ITEM	QTY	REMARK
1	Working space	For 30	
2	Model for Gillnets	1	
3	Model for Trammel net	1	
4	Model for castanet	1	
5	Model for seine net	1	
6	Model for Traps (various)	1 each	
7	Model for Hook and line	1	
8	Model for mid- water trawl	1	
9	Model pure seine	1	
10	Model light fishing net	1	
11	Model net	2 bundles	
12	Netting materials	2 each: 3,	
13		3 1/2,	
14		4	
15		And 5	

16	Hook packet	1 pkts of Nos: 1to 20	
17	Nylon ropes	2 pkts each Of Nos. 6	
18	Mounting twine	210D/3to 210D/60	

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5.0 FISH FEED MILL

S/No	ITEM	QTY	REMARK
1	Hammer mill	2	
	Sieves		
2	Mixer / blender	10	
3	Refrigerators with freezer	1	
4	Feed storage facility / packaging room	2	
5		1	
6	Pelleting machine	1	

6.0 AQUACULTURE

S/No	ITEM	QTY	REMARK
1	Hatchery troughs	6	
2	Air pumps and accessories	6	
3	Secchi disc	5	

4	pH meter	2	
5	Portable field water analysis kit	2	
6	Ruttner water sampler	1	
7	Eckman grab	1	
8	Portable oxygen meter	2	
9	Aerators		According to number of tanks
10	Thermometer	10	Various sizes
11	Seine net	5	
12	Sample bottles	10	
13	Aquarium (various sizes)	5	
14	MacDonalds jar (for incubating egg)	2	
15	Chlorophyl (a) grinding (general purpose)		
	Incubator	1	
16	Cell counting chamber	10	
17	Occular micrometer	10	
18		10	

19	Binocular microscope		
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7.0 FISH PROCESSING EQUIPMENT

S/No	ITEM	QTY	REMARK
1	Cutting knives	30	
2	Measuring boards	30	
3	Weighing balances	2	
4	Hand gloves	30	
5	Freezer	2	
6	Oven	2	
7	Kilns (different types)	5	
8	Thermometers	10	
9	Deep freezers	2	
10	Fish drying rack	2	
11	Fish boxes	10	
12	Salting trays/ basins	10	

13	Sun drying vats	10	
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8.0 FISH MUSUEM

S/No	ITEM	QTY	REMARK
1	Aquaria	10	Various types of all Nigeria Freshwater and as many as marine fish and animals
2	Fish skeleton	5	
3	Preserved specimens		

9.0 FISH PONDS

S/N	ITEM	QTY	REMARK
0			
1	Concrete Ponds	3	

S/N	ITEM	QTY	REMARK
1	Rules of the road instructional display panel with cable and switch	1 unit	
2	Flat ten ponds	3	
2	International code flags display board	1 unit	
	Binoculars		
3	Compass	24	
4	Azimuth mirror	10	
5	Baader planetarium	1	
6	Walker, log	1	
7	Barometer (aneroid)	1	
10.0 NAVIGATION AND SEAMANSHIP			
LIST OF PARTICIPANTS			
S/N	NAME	ADDRESS	E-MAIL/PHONE NUMBER
8	PROF. OLUKOTUN M. O. OJODIONG	1	DEPT. OF FISHERIES AND AQUATIC ENVIRONMENTAL MANAGEMENT, FACULTY OF AGRICULTURE, UNIVERSITY OF UYO, UYO. AKWA IBOM STATE.
9	Original station pointer	1	
10	Pelorus	1	
11	DR. B. D. OLAOSEBIKAN Instructional magnet board with model	1	FEDERAL COLLEGE OF FRESHWATER FISHERIES TECHNOLOGY, NEW BUSSA.
12	DR. EMMANUEL ATING Plastic sextants	1	MARITIME ACADEMY OF NIGERIA, ORON, AKWA IBOM STATE.
13	DR. LADAN A. ALIYU Pyrotechnics box	1	FEDERAL UNIVERSITY DUTSIN MA, KATSINA STATE.
14	NSAN TIKUNSAN Life buoys jacket		NBTE, KADUNA
15	YUSUF BELLO YAKUBU Buoyage system display	1	NBTE, KADUNA
16	DUGUJI ISGOGO Buoyage system model	5	NBTE (Ag. DPPG)
17	DR. FATIMA KABIR UMAR		NBTE KADUNA
16	International code flags	1	
17	Fog signalling bell	1	
18	Model fishing vessel	1 set	

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