Outline of Course Structure

100 LEVEL FIRST SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
GST 101	Use of English & Communication Skills I	2	C
GST 107	The Good Study Guide	2	C
BIO 101	General Biology 1	2	C
BIO 191	General Biology Practical 1	1	C
CHM 191	Introductory Chemistry Practical I	1	C
CHM 101	Introductory Inorganic Chemistry I	2	C
CIT 101	Introduction to Computer	2	C
MTH 101	General Mathematics I	3	C
PHY 101	Elementary Mechanic, Heat, and Properties of matter	3	C
	Total Credit Units – Compulsory	**20**	

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	Total Credit Units – Elective	**0**
	Total Credit Units	**20**

100 LEVEL SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
GST 102	Use of Library	2	C
CHM 102	Introductory Organic Chemistry	2	C
CHM 192	Introductory Chemistry Practical II	1	C
CIT 102	Software Application Skills	2	C
BIO 102	General Biology 11	2	C
ESM 102	The Nigerian Environment	2	C
ESM 104	Introduction to Environmental Science	2	C
ESM106	Environmental Resource Management	2	C
ESM 112	Introductory Ecology	2	C
MTH 102	General Mathematics II	3	C
	Total Credit Units – Compulsory	**20**	
	Total Credit Units – Elective	**0**	
	Total Credit Units	**20**	

200 LEVEL FIRST SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
GST 201	Nigerian Peoples and Cultures	2	C
GST 203	Introduction to Philosophy and Logic	2	C
ESM234	Soil Resources	2	C
ESM 273	Earth and earth surface processes	2	C
ESM 211	Global Environmental Issues	2	C
ESM 231	Introductory Toxicology	2	C
ESM 291	Map Analysis	2	C
ESM 261	Geochemistry	2	C
	Total Credit Units – Compulsory	**16**	
	Total Credit Units – Elective	**0**	
	Total Credit Units	**16**	

200 LEVEL SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
GST 202	Fundamentals of Peace Studies &Conflict Management	2	C
ESM 204	Environmental Hazards and Disaster Management	2	C
ESM 222	Water Resource Evaluation	2	C
ESM 236	Environmental Microbiology	2	C

ESM 238	Air Photo Interpretation	2	C
ECO 292	Environmental Economics	2	C
ESM 299	SIWES I	3	C
	Total Credit Units – Compulsory	**15**	
	Total Credit Units – Elective	**2**	
	Total Credit Units	**17**	

ELECTIVES

200 LEVEL SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 206	Community Participation in Environmental Management	2	E
ESM 212	Tropical Climatology	2	E

300 LEVEL FIRST SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
GST 302	Business Creation and Innovation	2	C
ESM 301	Introduction to Peace and Conflict Resolution	2	C

ESM 305	Field Trip in Environmental Science	3	C
ESM 311	Noise and Air Pollution	2	C
ESM 317	Land and Water Pollution	2	C
ESM 341	Introduction to Instrumentation Measurement and Field Methods in Environmental Science	2	C
ESM 343	Climate Change and Environment	2	C
ESM 345	Applied Climatology	2	C
	Total Credit Units – Compulsory	**17**	
	Total Credit Units – Elective	**2**	
	Total Credit Units	**19**	

ELECTIVES

300 FIRST SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 306	Environmental Politics	2	E
PUL303	Environmental Laws and Policies	2	E

300 LEVEL SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
CHM314	Environmental Chemistry	2	C

ESM 304	Research Methods	3	C
ESM 322	Water And Waste Water Management	2	C
ESM 328	Biodiversity Conservation	2	C
ESM 342	Environmental Impact Assessment and Auditing	3	C
ESM 392	Remote Sensing	2	C
ESM 399	SIWES II	3	C
	Total Credit Units – Compulsory	**17**	
	Total Credit Units – Elective	**2**	
	Total Credit Units	**19**	

ELECTIVES

300 SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 308	Rural Development Strategies	2	E
ESM 324	Urban Environmental Management	2	E
ESM 326	Oceanography	2	E

400 LEVEL FIRST SEMESTER
Course

Code	Title	Unit(s)	Status
ESM 401	Research Project	6	C
ESM 405	Environmental Protection Agencies: Case Studies	2	C
ESM 407	Geographic Information System	3	C
ESM 423	Hydrology and Water Resources	3	C
ESM 431	Environmental Health and Safety	2	C
	Total Credit Units – Compulsory	**16**	
	Total Credit Units – Elective	**0**	
	Total Credit Units	**16**	

400 LEVEL SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 403	Environmental Perception	2	C
ESM 426	Biogeography	2	C
ESM 428	Ecology of Natural Resources	2	C
ESM 444	Industrial Wastes and Industrial Water Treatment	2	C
	Total Credit Units – Compulsory	**8**	

Total Credit Units – Elective	**4**	
Total Credit Units	**12**	

ELECTIVES

400 SECOND SEMESTER			
Course Code	**Title**	**Unit(s)**	**Status**
ESM 424	Fresh Water Ecology	2	E
ESM 422	Resource Evaluation	2	E
ESM 411	Population, Environment and Development	2	E
ESM 421	Elements of Land Surveying	2	E

TOTAL CREDIT UNITS FOR CORE AND ELECTIVE COURSES IN ESM

	CORE COURSES	**ELECTIVE COURSES**	**TOTAL**	**Sum of Level 1st and 2nd Semester**
100 LEVEL				
First Semester	**20**	**0**	**» 20**	
Second Semester	**16**	**0**	**» 16**	**36**
200				

LEVEL					
First Semester	**16**	**0**	**» 16**		
Second Semester	**15**	**2**	**» 17**	**33**	
300 LEVEL					
First Semester	**17**	**2**	**» 19**		
Second Semester	**17**	**2**	**» 19**	**38**	
400 LEVEL					
First Semester	**16**	**0**	**» 16**		
Second Semester	**8**	**4**	**» 12**	**28**	
TOTAL	**125**	**10**	**135**	**135**	

100 LEVELS

GST101: USE OF ENGLISH AND COMMUNICATION SKILLS (2Unit)

Listening enabling skills, listening and comprehending comprehension, note taking and information retrieval. Including data, figures, diagrams and charts. Listening for main idea, interpretation and critical evaluation. Effective reading. Skimming and scanning. Reading and comprehension at various speed levels. Vocabulary development in various academic contexts. Reading diverse texts in narratives and expository. Reading and comprehension passages with tables, scientific texts. Reading for interpretation and critical evaluation.

GST102: Use of LIBRARY (2Unit)

Writing paragraphs; Topic sentence and coherence; Development of paragraphs; illustration; Description; cause and effect including definitions; Formal letters: essential parts and stylistic forms; complaints and requests; jobs; ordering goods Letters to government and other organizations; Writing reports; reporting events, experiments, writing summaries

GST107: The Good Study Guide (2Unit)

Getting started: How to use the book, why read about skills, getting yourself organised ; what is studying all about, reading and note taking; Introduction, reactions to reading, your reading strategy, memory, taking notes, conclusion. Other ways of studying: Introduction, learning in groups, talks and lectures, learning from TV and radio broadcasts, other study media. Working with numbers; Getting to know numbers, describing the world, describing with the tables, describing with diagrams and graphs; What is good writing? The Importance of writing, what does an essay look like, what is a good essay? Conclusion. How to write essays: Introduction, the craft of writing, the advantages of treating essay writing as a craft, making your essay flow, making a convincing case, the experience of writing. Preparing for examination.

BIO 101 GENERAL BIOLOGY I (2 UNITS)

Characteristics of living things; cell as the basic unit of living things, cell structure, organization, cellular organelles, tissues, organs and systems. Classification of living things, general reproduction and concept of inter-relationships of organism. Heredity and evolution. Elements of ecology (introduction) and habitats.

BIO 102 GENERAL BIOLOGY II (2 UNITS)

Systematic studies of diversity of life including monera, protista, plants (Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and angiosperms) and animals (Protozoa, Platyhelminthes, Annelids, Arthropods, Fishes, Amphibians, Reptiles, Birds and Mammals) based on similarities and differences in external morphology. Taxonomic divisions of plant and animal kingdoms. Ecological adaptations of these forms.

BIO 191: General Biology Practical 1 (2 units)

What practical biology in biology involves. Laboratory organisation. Handling Common Laboratory equipment; Microscopic handling and maintenance; Making microscopic measurement; Procuring animal materials for practical; Killing, preserving and maintaining animal materials; Procuring plant

materials; External features of plants (differences and similarities); Preparation of temporary slides; Preparation of strains and reagents; Techniques for microbial culture and grain staining; Setting up demonstration for physiological processes in plants; Setting up apparatus for demonstrating physiological processes in animals. Preparation required for dissection.

CHM 101: INTRODUCTORY Inorganic Chemistry (2 units)

Hypothesis, theory and law with appropriate illustrations, Nature of matter – 3 states of matter, Atomic structure, electronic energy levels and orbital. Periodic classification of elements and its relationship to their electronic configurations, Chemical bonding, Survey of properties and trends in groups I, II, IV, VI and transition metal

CHM 102: introductory organic chemistry (2 units)

Simple reactions of hydrocarbons, alcohols, and acids. Petroleum chemistry, Oils and fats, hydrogenation of oils, polymer and biologically important molecule.

CHM 191: INTRODUCTORY PRACTICAL CHEMISTRY I (2 UNITS)

Practical based on CHM 101 and CHM 103: Cations and Anions-Identification, Acid-base titrations, redox reactions and determinations

CHM 192: Introductory practical chemistry II (1 unit)

Practical based on general chemistry CHM 101 and introductory organic chemistry I CHM 102-Determination of melting and boiling points and reaction of functional groups.

CIT 101: Computers IN Society (2 UNITS)

What is Computer, Types of Computer, History of Digital Computer, Element of a Computer Hardware and Software. How to work with a computer. Operating System Windows Files word processing, copying a text, saving, Changes to a document and Formatting, spelling checker and introduction to Printing a document. Spread sheet, Entering and correcting data. Using Formula, Numeric Formats Creating Charts. Types of Charts Power Points and presentation. Networking, Internet and E-mail. Reading and responding to an E-mail message.

CIT 102: APPLICATION SOFTWARE SKILLS (2 UNITS)

Brief description of computer system: CPU, I/O devices; Operating systems; Computer File Management; Computer Software: overview, types, etc.; Application software: common application

software; Using Microsoft Word; Using Microsoft Excel; Features of Database Applications and Microsoft Access; Statistical Analysis Applications; Using SPSS software; Introduction to Desktop Publishing applications; Computer applications in Nursing; Computer applications in Agriculture; Managing the computer system with the Control Panel. Protection.

MTH 101: ELEMENTARY MATHEMATIC I (3 UNITS)

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematic I, induction real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand Diagram. Re Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formalae.

MTH 102: ELEMENTARY MATHEMATICS II (3 UNITS)

Calculus: Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

PHY 101: GENERAL PHYSICS I (3 UNITS)

(Mechanics, Thermal Physics and Waves)

Space and Time, Units and dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; bouyance, Archimedes' Principles., Surface tension; adhesion, cohesion, capilarity, drops and bubbles. Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases. Sound, Applications.

ESM 102: THE NIGERIAN ENVIRONMENT (2 UNIT)

General description of the natural, physical features of Nigeria: Vegetation, climate and climatic changes within the geographical expression; Geographical distribution of people and natural recourses. Brief description of economic importance of these features, Exploration and exploitation of natural resources, Brief impact of these on the environment.

ESM 104: INTRODUCTION TO ENVIRONMENTAL SCIENCE (2 UNIT)

Scope and meaning of environmental science; the concept of the earth's surface as the home of man; atmosphere and atmospheric processes; hydrosphere and the hydrological cycle; the lithosphere and the process of sculpturing the earth's surface; the lithosphere and the biological productivity of the earth's surface; the earth surface in natural history; the current environmental concern and environmental hazards.

ESM 106: ENVIRONMENTAL RESOURCE MANAGEMENT (2 UNIT)

Fundamentals of Environmental Resources Management, Historical Perspectives of Environmental

Resource Management, Instruments in Environmental Management, Fundamental of Wildlife Management, Problems of Forest Resource Management, Strategies for forest resource management; Renewable Resources Management and Non- Renewable Resources Management, The Nigerian Conservation Foundation and other agencies concerned with environmental resource management.

ESM112: INTRODUCTORY ECOLOGY

General consideration of ecosystem including influence and general consideration of ecosystems including influence and interaction of human beings with their environments.

MTH 102 ELEMENTARY MATHEMATICS III: (3 UNITS) CALCULUS:

Function of a real variable, graphs, limits and idea of continuity. The derivative as limit of rate of change, Techniques of differentiation, Extreme curve sketching. Integration as an inverse of differentiation, Methods of integration, Definite integrals; Application to areas and volumes

200 LEVEL

GST 201: Nigerian Peoples and Culture (2Unit)

Nigerian history, culture and arts in pre-colonial times; Nigerians' perception of their world; culture areas of Nigeria and their characteristics; evolution of Nigeria as a political unit; indigene/settler phenomenon; concepts of trade; economic self- reliance; social justice; individual and national development; norms and values; negative attitudes and conducts (cultism and related vices); re-orientation of moral and national values; moral obligations of citizens; environmental problems.

GST 203: INTRODUCTION TO PHILOSOPHY AND LOGIC (2 UNIT)

General introduction to logic; clarity of thought, expression and arguments as basis for conclusions; fundamentals of logic and critical thinking; types of discourse; nature of arguments; validity and soundness; techniques for evaluating arguments; distinction between inductive and deductive inferences; etc. Illustrations from familiar texts, including literature materials, novels, law reports and newspaper publications.

GST 202: FUNDAMENTALS OF PEACE STUDIES AND CONFLICT RESOLUTIONS (2 UNITS)

Basic Understanding of Conflict; Definitions, Causes and Types of Conflict, Conflict, Theories, Phases in Conflict, Conflict Analysis & Transformation. Dynamics of Conflict; Relationship between Perception and Conflict, Language Barriers in Conflict and Resolution, Early Warning and Early Response Mechanism, Arms Control and Demilitarisation, Peace and Education. Trends in Global Issues: International, Continental and Regional Organisations in the Pursuance of World Peace, Peaceful Methods of Conflict Resolution, Coercive Means of Conflict Resolution, Gender Issues and Humanitarian Intervention.

ESM211: GLOBAL ENVIRONMENTAL ISSUES (2 UNITS)

System theory; the ecosystem concepts; the Gaia hypothesis; environment and society; sustainable development concepts; marine pollution; population and environment; world energy picture; biotechnology and genetic engineering (clowning); environmental green movements; transportation; tourism; sustainable urban development

ESM 231: INTRODUCTORY TOXICOLOGY (2 UNITS)

General description of toxicology, toxicity, toxins and hazardous. Chemical assay, dose – response curve, Chemical statistics and their applications. Sources, types and effects of toxins.Cancer and cancer trends in Nigeria

ESM 234: SOIL RESOURCES (2 UNITS)

Scope and nature of soil resources; physical and chemical properties of soils; soil formation, soil profile, soil classification; progress in soil mapping in Nigeria; soil determination; methods of soil survey; laboratory determination of soil properties – particle size distribution; bulk density, total porosity, PH, organic matter content, available phosphorous. Fundamentals of soil science: Land as a resource, ecological and economic importance of soil; Soil formation; classification of soil; soil architecture; physical properties of soil; soil texture; soil water holding capacity; soil temperature; soil colloids; soil acidity and alkalinity; soil salinity and sodicity; soil organic matter; micronutrients of soil; nitrogen, sulphur, potassium and phosphorus economy of soil; soil biodiversity; soil taxonomy maps. Soil degradation – causes: Types and causes of soil degradation; Soil resistance and resilience; nature and types of soil erosion; non-erosive and erosive soil degradation; losses of soil moisture and its regulation; nutrient depletion; soil pollution due to mining and mineral extraction, impact soil degradation on agriculture and food security; industrial and urban development, toxic organic chemicals, and organic contaminants in soils; fertilizers and fertilizer management; recycling of soil nutrients. Land use changes and land degradation: Land resources: types and evaluation; biological and physical phenomena in land degradation; visual indicators of land degradation; drivers of land degradation deforestation, desertification; habitat loss, loss of biodiversity; range land degradation; land salinization; human population pressure, poverty, socio-economic and institutional factors; drivers of land use and land cover change in major geographic zones and biodiverse regions. Land degradation and its control: Economic valuation of land degradation; onsite and offsite costs of land degradation; loss of ecosystem services; effects on nutrient cycles; future effects of soil degradation; emerging threats of land degradation to developing countries Sustainable land use planning; role of databases and data analysis in land use planning control and management; land tenure and land policy; legal, institutional and sociological factors; integrating land degradation assessment into conservation

ESM 273: EARTH AND EARTH SURFACE PROCESSES (2UNITS)

Origin of Earth and System processes; Solar system formation and planetary differentiation; formation

of the Earth: formation and composition of core, mantle, crust; chemical composition of Earth; geological time scale and major changes on the Earth's surface; Holocene and the emergence of humans. Concept of plate tectonics and continental drift theory, continental collision and formation of the Himalaya; ocean floor spreading; mantle convection and, major plates; earthquakes; volcanic activities; orogeny; isostasy; gravitational and magnetic fields of the earth; paleontological evidences of plate tectonics. Minerals and rocks: Minerals and important rock forming minerals; rock cycle: lithification and metamorphism; Three rock laws; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical, biogeochemical processes; erosion: physical processes of erosion, factors affecting erosion; agents of erosion: rivers and streams, glacial and Aeolian transportation and deposition of sediments by running water, wind and glaciers. Earth surface processes: Atmosphere: evolution of earth's atmosphere, composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean–land interface; land surface processes: fluvial and glacial processes, rivers and geomorphology; types of glaciers, glacier dynamics

ESM 291: MAP ANALYSIS (2 UNITS)

Maps and their limitations, Projections and their properties, Qualities of Projections for Nigerian maps, Base maps, Cartographic instruments, analysis of physical and human features in topographical maps. Analysis of areas and linear properties of drainage basins, Slope analysis; analysis of geological maps, settlement analysis, and transport pattern.

ESM261: GEOCHEMISTRY (2 UNITS)

Overview of the formation of the solar system and the synthesis of chemical elements; chemical equilibrium; acids and bases; distribution and geochemical classification of elements; salts and aqueous geochemistry; chemical weathering and mineral equilibria; introduction to thermodynamics; oxidation-reduction reactions; isotope geochemistry: radioactive, radiogenic, and stable isotopes and their applications. Overview of the origin of the elements, their occurrence and the forms in which they exist in the Earth's crust. Chemical bonding and Goldschmidt classification. Principles for extraction of elements belonging to different groups in the period table and examples of production processes involving redox reactions applied to various compounds. Illustrations of acid and basic oxides. Relationship between thermodynamics and electrochemistry. Redox diagrams and Ellingham diagrams Phase diagrams and heterogeneous equilibria. Overview of organic material in sediment and geobacteria. Training in compiling information within the field of geochemistry as well as giving accounts of this information both orally and in writing.

ESM 204: ENVIRONMENTAL HAZARDS AND DISASTER MANAGEMENT (2 UNITS)

Hazard and risk management, Risk assessment of environmental hazards. Types of hazards, occurrence, impacts, prevention. Disaster management strategies for both short term and long term.

ESM206: COMMUNITY PARTICIPATION IN ENVIRONMENTAL MANAGEMENT (2 UNITS)

Concepts of participation; rationale for public and private participation; objectives of public and private participation; identification of various community's modes and techniques of participation; constraints to participation in environmental management; role of non-governmental organisations (NGOs) in environmental management.

ESM 212: TROPICAL CLIMATOLOGY (2 UNITS)

Meaning and scope of climatology and tropical climatology; the nature of the atmosphere; elements of weather and climate, radiation, temperature, precipitation; tropical climate; weather and climatic hazards in the tropics; physiological comfort; climate and urban planning in the tropics; tropical disturbances; tropical agro- climatology.

ESM 222: WATER RESOURCE EVALUATION (2 UNITS)

Water resources; sources and distribution; approaches to water resources evaluation; qualitative and quantitative approaches; water balance approach; need for evaluation; methods of measuring rainfall; analysis and interpretation of rainfall data; evapotranspiration measurements; stream flow measurements – stage, discharge- velocity, hydrographs analysis, flow variability and recession; hydrology of reservoirs. Water quality measurement and analysis – solute, suspended, bed load and yield.

ESM 236: ENVIRONMENTAL MICROBIOLOGY (2 UNITS)

General characteristics of microorganisms in the environment Sterilisation and disinfection. Structure, ecology and reproduction of selected common microorganisms. Isolation of bacteria, fungi and viruses. Antigens and antibodies. Economic importance of some microbial groups.

ESM 238: AIR PHOTO INTERPRETATION (2 UNITS)

History of air photo photography, flight height, instruments for air photo interpretation, image analysis and interpretation. Issues and problems in air photography in the tropics.

ECO292: ENVIRONMENTAL ECONOMICS (2 UNITS)

Key concepts in microeconomics, applications to management of renewable and non-renewable natural resources. Cost and benefit weighed for major environmental problems including global warming, toxic wastes, water and air pollution and conservation of wilderness and biodiversity; issues of social externalities.

ESM 299: INDUSTRIAL TRAINING (SIWES I) (3 UNITS)

The end of the second semester will be devoted to practical training in areas contributing to pollution such as Construction firms, Conservation Centres, Extractive Industries, Waste Management Authorities, Manufacturing Industries and Tourism/ Resort Centres. This is expected to enable students acquire practical skills that have been learnt theoretically.

300 LEVEL

CHM 314: ENVIRONMENTAL CHEMISTRY (2 UNITS)

Concepts of elementary cycles. Characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment. Composition of domestic wastes. Water Chemistry and analysis. Chemical and physical instrumentation in environmental sciences.

GST 302: Business Creation and Innovation (2 units)

Concept of Business and New Value Creation: Business Planning Process; Start-up Decision – What Motivate people to begin new businesses; Opportunity Search and Identification; Legal Issues at Start-up; & Feasibility Analysis of New Ventures and New Venture Financing. Theories of Growth: An Overview: Concepts and Reasons of Growth; Challenges of Growth; Strategies for Growth (External Growth Strategies Franchising, Buy-In and Buy-Out); Mergers and Acquisition; Sources of Funds: Internal Sources and External Sources; Formal and Informal Sources; Efficiency in the use of Resources. Marketing: Concept of Marketing: Small and Big Business Marketing; Marketing Mix; Modern Marketing Tools. Ethics and Social Responsibility: The Importance of Ethics in Business; Ethical Behaviour and Practices in Nigeria; Community Development Projects/Walfare. New Opportunities for Expansion: E-Commerce; E-Business; E-Trade. Managing Transition: From Start up to Growth: Personal Disciplines; Learning; Decision Making; Control.

ESM 301: INTRODUCTION TO PEACE AND CONFLICT RESOLUTION (2 UNITS)

Contending theories and approaches to the causes and characteristics of peace and conflict resolution. The acquisition, development and marketing of energy and other natural resources, conflict and co- operation between exploration/exploitation industries and host communities. Environmental impact of the activities of multinational corporations and industries. The logic of various forms of conflict interests including theories derived from problems mediation; emphasis on Nigerian situation and case studies.

PUL 303: ENVIRONMENTAL LAWS AND POLICIES (2 UNITS)

Analysis of legal, political, social and environmental dimensions of environmental problems; environmental control legislations; constitutional rights to environmental quality; the development and

problems of citizen – initiated environmental litigations; federal and state response to environmental quality and standards; legal status of the former Federal Environmental Protection Agency and the powers of the Ministry of Environment; case studies of oil pollution; noise pollution components of planning laws in Nigeria; environmental laws, conventions and protocols.

ESM 305: FIELD TRIP IN ENVIRONMENTAL SCIENCE (3 UNITS)

Fundamentals of field principles and measurements including dumpsites, land fill/land reclamation, marine pollution, flood or drought, erosion site, waste management/recycling, forestry/forest conservation schemes. Field studies of manufacturing/Industrial sectors, Climatic/Meteorological Stations, rural/ urban environment as well as environmental impact assessment of projects.

ESM 311: NOISE AND AIR POLLUTION (2 UNITS)

Composition of air, Requirements for air quality, source of pollutants and noise. Threshold levels of pollutants, physical and Chemical changes in air resulting from domestics and industrial wastes. Mitigation and remediation methods.

ESM 317: LAND AND WATER POLLUTION (2 UNITS)

General description of land and water resources – with emphasis on economic aspects. Sources of pollutants. Impact of specific pollutants on ecosystems. Mitigation and remediation methods.

ESM 341: INTRODUCTION TO INSTRUMENTATION, MEASUREMENTS AND FIELD METHODS IN ENVIRONMENTAL SCIENCE (2 UNITS)

Description of instruments for measuring air quality i.e. NO, O2, CO, Relative air humidity e.t.c Noise level etc. Water, soil measuring instruments, corrosivity, resistance, PH, Conductivity, BOD e.t.c. Instrumentation and parameters for measuring wastewater prior to discharge; potable water for safe drinking. Ecological Sampling techniques, measurement of properties and quality of water, soil and air.

ESM 343: CLIMATE CHANGE AND THE ENVIRONMENT (2 UNITS)

Description of the physical and chemical properties and processes that shape earth's surface, land, atmosphere, ocean and climate. Physical control on biological productivity will be evaluated. Specific topics will include global warming, air, pollution and transport. Stratospheric ozone, ocean upwelling of nutrients and productivity.

ESM 345: APPLIED CLIMATOLOGY (2 UNITS)

Application of Climate to Industry, Agriculture, Aviation, building and human settlements; weather modification and their implication; Acid rain, econoclimate, Drought, flood, climate change and human affairs.

ESM 304: RESEARCH METHODS (3 UNITS)

Elements of research, research design, Hypothesis formulation and testing, sampling techniques and Data sources, research proposal, thesis writing.

Logic of science and social science, various approaches to social inquiry, data gathering analytical tools in qualitative research; data gathering and analytical tools in quantitative research including descriptive statistics, inferential statistics and measures of association, programme evaluation research and thesis logic and structure.

ESM 306: ENVIRONMENTAL POLITICS (2 UNITS)

Description on how decisions on managing diverse natural resources, environmental quality and human health are made. Covers themes on liberty, justice, equality, power, democracy, property and risk important to understanding environmental politics. Studies environmental quality. Examination of diverse strategies of management, trading, pollution. Topics will include definition of conservation and development dichotomy and its resolution.

ESM 308: RURAL DEVELOPMENT STRATEGIES (2 UNITS)

Policy and policy thrusts for rural development in Nigeria 1900 to present day. Development needs of rural societies. Community development and roles of NGOs. Rural/urban migration. Urbanization of rural societies.

ESM 322:WATER AND WASTE WATER MANAGEMENT (2 UNITS)

General description of water and its management: Physical: temperature, colour, odour, total dissolved solids and total suspended solids; hydrological cycle; precipitation, runoff, infiltration, evaporation, evapo-transpiration; Chemical: major inorganic and organic constituents, dissolved gases, DO, COD, BOD, acidity and alkalinity, electrical conductivity, sodium adsorption ratio; Biological: phytoplankton, phytobenthos, zooplankton, macro-invertebrates and microbes. Potable water parameters, waste water treatment and parameters prior to discharge into the environment. Water treatment for consumption, general description of water treatment plants from source to table – design fundamentals. Element of wastewater microbiology. A follow through on a typical water or waste water engineering project. Surface and subsurface water: Introduction to surface and ground water; surface and ground water pollution; watertable; vertical distribution of water; formation and properties of aquifers; techniques for ground water recharge; river structure and patterns; watershed and drainage basins; importance of watershed and watershed management; rain water harvesting in urban settings. Marine resources; commercial use of marine resources; threats to marine ecosystems and resources; marine ecosystem and resource management (planning approach, construction techniques and monitoring of coastal zones). Wetlands and their management: Definition of a wetland; types of wetlands (fresh water and marine); ecological significance of wetlands; threats to wetlands; wetland conservation and management; major wetlands of Nigeria, National River linking plan: ecological and economic impacts. Water resources, conflicts, laws and treaties: Water resources (oceans, rivers, lakes and wetlands) and types of water; Overexploitation of surface and ground water resources; water quality standards in Nigeria; role of state in water resources

management. Water resources and conflicts on its sharing, case studies on river water disputes; Multipurpose river valley projects in Nigeria and their environmental and social impacts; case studies of dams and their issues. International agreements to resolve these conflicts. Water Acts and water treaty.

ESM 324: URBAN ENVIRONMENTAL MANAGEMENT (2 UNITS)

Urban growth and the rural-urban synergies; overcrowding and social disruption; the city as a source of environmental degradation; housing development; new management policies and strategies for urban liveability; human space, population and world resources.

ESM 326:OCEANOGRAPHY (2 UNITS)

Study of the temperature and chemistry of sea water. Biological activities and their distribution. Salinity, chlorinity, currents, tides, waves, sound and radiation in the sea, conductivity, diffusion, viscosity and dynamics of sea water distribution and behaviour of plankton. Brackish water condition and fauna. Interrelationship and physiological adaptations of marine organisms.

ESM 328: BIODIVERSITY CONSERVATION (2 UNITS)

Loss of biological diversity and environmental pollution. Basic ecological and evolutionary principles underpinning efforts to conserve the earth's biodiversity. These principles will be examined in the context of efforts to halt the rapid increase in disappearance of both plants and animals. Some sociological and economic issues will be treated with emphasis on biological aspects of the crucial problems and case studies.

ESM342: ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING (3 UNITS)

Origin and Evolution of Environmental Impact Assessment (EIA), Theory and practice of Environmental Impact Assessment, EIA legislation EIA process, Environmental Audit Process, Environmental Audit Report; (EAR) as management tools. Environmental Policy and compliance. Environmental Governance, Institutional framework for environmental management. Preparation of EIA report, methods of executing EIA. Selected case studies of EIA around the world.

ESM 392: REMOTE SENSING (2 UNITS)

Principles of remote sensing, Image analysis and interpretation Nigeria SAT 1. Remote sensing applications in environmental studies

ESM 399: INDUSTRIAL TRAINING (SIWES II) (3 UNITS)

The end of the second semester will be devoted to practical training in areas contributing to pollution such as Construction firms, Conservation Centres, Extractive Industries, Waste Management Authorities, Manufacturing Industries and Tourism/ Resort Centres. This is expected to enable

students acquire practical skills that have been learnt theoretically.

400 LEVEL

ESM 401: RESEARCH PROJECT (4UNITS)

Presentation of seminar. Topics on environmental studies (oral and written presentations) for discussion by students. Carry out original work on environment studies and resource management.

ESM 403: ENVIRONMENTAL PERCEPTION (2 UNITS)

The principles of man – environment relations. The objective environment. The environment as perceived. The concept of perception and formation of environmental images. Environmental perception and decision making.

ESM 405: Environmental Protection Agencies Case Studies(2 Units)

The role of protection Agencies – from ministry of works to FEPA and ministry of Environment; roles of EPA in selected countries; Edicts and regulations. Case studies of EAR and EIA Discusses sustainable development practices.

ESM 407: GEOGRAPHIC INFORMATION SYSTEM (3 UNITS)

Principles of GIS; GIS applications in Environmental Management, ARC Info, ARC view and other GIS packages.

ESM411: Population, Environment and Development (3 Units)

Global view of general trends in population growth and development with emphasis on Nigeria. The course will explore the dynamic relationships between environmental and social forces from the Pleistocene to the present. Topics will include the transition of societies from hunting and gathering to agriculture, responses of early urban civilisations to environmental constraints, deforestation land degradation and desertification in ancient and modern societies. The destruction and reconstruction of new world by the old. Consideration of means to distinguish natural from anthropogenic environmental changes.

ESM 423: Hydrology and Water Resources (3 Units)

Definition and scope of hydrology; trends in hydrology; the hydrological cycle and the

approaches to its study; the drainage basin as a hydrologic unit; precipitation, interception, infiltration and soil moisture evaporation and evapo-transpiration; runoff and floods; the hydraulic and mechanic of flood; runoff generation, contributing areas. Morphometry and runoff frequency: erosion by water on hill slope, sediment transport processes.

ESM 424: Fresh Water Ecology (2 Units)

Detailed knowledge of the interactions between physical, chemical and biological processes in aquatic ecosystems; influence of human activities; characteristics of aquatic ecosystems; the structure of aquatic plants and animals communities – biofilms, macrophytes, fishes, nutrient cycling, aquatic productivity, wetland and catchment management and ecosystem health. Macro-invertebrates as biomonitors; blue – green algae, salinity, eutrophication; fresh water aquaculture systems and effluent control.

ESM 426: Biogeography (2 Units)

Meaning scope and purpose of biogeography Ecosystem concepts, principles of ecology. Habitat preferences, ecophysiology, population dynamics and life history strategies of Nigerian Terrestrial vertebrates. The role of fire in Nigerian Environment, sampling and measuring wildlife habitat variables. Estimating animal abundance. Principles of wildlife management. Factors of plants distribution, vegetation analysis.

ESM 428: Ecology of Natural Resources (2 Units)

Nature of resources; man and the natural environment, sustainability in the use of resources. Policies, laws and regulations on natural resources. Instruments of environmental protection. Conflicts in resource conservation. Economic, cultural, political and social considerations in resource conservation and management. Watershed management and nature reserves. Wildlife conservation in Africa. Emerging issues in resources conservations.

ESM 444: Industrial Wastes and Industrial Water Treatment (2 Units)

Management of industrial waste water, cleaner production of industrial waste water management, toxicity, physical chemical processes, anaerobic industrial waste water treatment and sludge management and treatment, Operating and maintaining industrial wastewater treatment plants, safe practices and procedures. the importance and responsibilities of an industrial treatment plant operator, why industrial and municipal wastewaters must be treated, regulations governing industrial wastes, sources of wastes, methods for preventing and minimizing wastes at the source, and industrial waste monitoring. operating and maintain flow measurement equipment, preliminary treatment processes (equalization, screening, and pH adjustment), physical-chemical treatment processes (coagulation, flocculation, and sedimentation), pressure and gravity filters (including membrane filters), physical treatment processes (air stripping and carbon adsorption), and processes

for treatment of metal waste streams. Operating and maintain treatment plant instrumentation equipment and systems. Open and close recirculation water systems and their treatment. Boilers and boiler water treatment. Scaling tendencies, biofilming and control. Industrial wastes and their impact on the environment. Handling of wastes and treatment methods, wastes recycling and dumping – costs and effectiveness.

ESM 421: Elements of Land Surveying (2 Units)

Principles of surveying, measurement of distance and direction, chain surveying, compass survey, plane tabling. Area measurements, correction of errors of closure, height and slope measurements. Drafting of uncontoured and contoured maps, rectangular coordinators and triangulation. Traversing with theodolites, and levelling

ESM 422: Resources Evaluation (2 Units)

Resources, types, resource process, methods of resource evaluation, geomorphological techniques in resource evaluation.

ESM 431: Environmental Health and Safety (3 Units)

Our planet, the need for environmental sustainability, Environmental legislation, Environmental Management Systems (EMS), Environmental impact assessment, Strategic environmental assessment, Environmental audit, Cost benefit analysis, Life cycle assessment, clean technology, Environmental risk management, Sustainable development, Health and safety policies in industries and work environments, strategies and objectives. First aid and techniques; burns, poison stings and bites, artificial respiration etc. Accidents; classification, causes and costs; fire and firefighting. Health and safety audits as management tools. Health and safety plans. Accidents: case studies.