



# Center for Geotechnical & Coastal Engg Research (CGCER) University of Port Harcourt



## Post Graduate Diploma (PGD) Programme Proposal

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# Center for Geotechnical & Coastal Engg Research (CGCER)

## University of Port Harcourt



### 1. Introduction

The Center for Geotechnical and Coastal Engineering Research, University of Port Harcourt proposes to run the PostGraduate Diploma (PGD) in Geotechnical & Coastal Engineering Programme as part of its mandate on "Human Capital Development through Research in the Geotechnical and Coastal Environment".

### 2. Philosophy

The Philosophy of the PGD Programme of the Center is to sustain the culture of turning in Engineering Graduates that would bridge the gap between the University and the Industry in the areas of Geotechnical and Coastal Engineering through Innovative Research and Development.

### 3 Vision

To produce hands on ready industry and educationally driven Graduates whose knowledge would be very relevant in solving industry-based problems through innovative research breakthroughs in the Geotechnical and Coastal Environments.

### 4 Mission

To bridge the educational Gap between Graduate and Undergraduate education. The PGD Programme would also bridge the skills gap between the industry and the class room worlds in the areas of Geotechnical and Coastal Engineering.

### 5. Justification / Rationale

Flood, Erosion and Ocean encroachment around Coastal civilizations have made infrastructural development in that domain highly challenging, hence man is forced to thinker ways of living with the Sea environment. Exploring challenging Soils, Marine and Coastal environment therefore becomes inevitable, both for Geotechnical research and Infrastructural development.

Besides, the harsh Onshore Oil and Gas exploration, exploitation and processing activities deriving from Security threats and militancy in the host Onshore communities has forced International Oil and Gas companies (IOCs) to extend the frontiers of their activities Offshore, into the deepwaters region. This further necessitates advanced research activities into the Coastal environment.

### 6. Aim & Objectives

#### Aim

The PostGraduate Diploma (PGD) in Geotechnical & Coastal Engineering programme is aimed at preparing and training interested students to the requisite level of advanced studies, hence, bridging the gap between the undergraduate and the post graduate levels of studies.

## Objectives

To achieve the aim of the PostGraduate Diploma Programme in Geotechnical & Coastal Engineering, the following under listed objectives will be pursued:

1. Sourcing of highly qualified resource persons from both the academic and industrial worlds to deliver knowledge filled and experienced based lectures.
2. Organization of conferences, seminars and workshops in the relevant areas of interest.

### 7. Course Delivery

All lectures for every Programme shall be administered / delivered on modular basis from 08.00am to 04.00pm (with One Hour (12.00-01.00) break) from Mondays to Fridays. That is, 40 hours lecture per week per Course which is approximately equal to 14 weeks Semester of Academic work for a 3 Credit Units (2-Hours lecture plus 1 Hour Practical or Tutorial per week) Course. Examination for a Course is taken after the Lectures on Saturdays, while the Continuous Assessment is done within the lecture periods as Practical reports, Test, Group Discussions, Field Trips reports and Assignments.

### 8. Examination Regulations & Scoring / Grading System

To qualify for sitting for a final Examination in a Course student is expected to have 75% lectures attendance of ALL lectures in that Course. The overall Examination score in a Course shall be 100% which shall be comprised of:

Examination	-	70%
Continuous Assessment	-	30%

Every student is expected to score a minimum of 50% in the overall evaluation for a Course in order to PASS, otherwise he or she shall be deemed to have failed the Course. In which case, the student is allowed a second final chance to retake a Supplementary Examination in the Course which cannot be scored above a C-Grade. The Examination Grading shall be:

Score( %)	Grade	Grade Points
70 – 100	A	5.00
60 – 69	B	4.00
50 – 59	C	3.00
0 – 49	F	0.00

### 9. Programme Structure

1. **The full-time option** is for a minimum of 12 calendar months and a maximum of 24 calendar months
2. **The part-time option** is for a minimum of 24 calendar months and maximum of 36 calendar months.

## 10. Career Opportunities

The main aim of the programmes of the Center is to produce a hands-on, Industry-ready Geotechnical Engineers and Coastal Engineers with a wide-range of Job Opportunities in Marine & Coastal Environment, Shore Protection, Artificial Intelligence, Dams, Port & Harbour, Geotechnical Services, Ocean Survey, Construction, Consultancy, Coastal Infrastructure Research & Development.

## 11 Programme Requirement and Criteria for the Award of the PGD Certificate

To realize the above objectives and qualify for the award of the Post Graduate Diploma, the student must take and pass all the prescribed courses in the chosen area of study, participate in any required field study, present research seminars and produce a supervised thesis on an approved research topic relevant to the aim and purpose of the Center establishment.

## 12 Entry / Admission Requirements

To be admitted into the PGD in Geotechnical & Coastal Engineering programme a candidate must have graduated with at least a Third Class Degree in Civil, Mechanical, Marine Engineering or other related Engineering Discipline from any NUC Accredited University.

## 13 Course Listings

The course listing for the PostGraduate Diploma (PGD) programme consists of Compulsory and Electives Courses in Geotechnical & Coastal Engineering.

### 13.1 Course listing for Post Graduate Diploma (PGD) in Geotechnical & Coastal Engineering

These include:

S/Nos	Course Code	Course Title	Credit Units
1	GCE 701	Basic Coastal Engineering	3
2	GCE 702	Introduction to Geotechnical Engineering	3
3	GCE 703	Applied Numerical Methods	3
4	GCE 704	Fluid Statics & Dynamics	3
5	GCE 705	Applied Statistics & Data Analysis	3
6	GCE 706	Environmental Engineering	3
7	GCE 707	Geology for Civil Engineers	3
8	GCE 708	Basic Wave & Hydromechanics	3
9	GCE 709	Dynamics & Vibrations	3
10	GCE 710	Geotechnical Construction Materials	3

11	GCE 711	Engineering Hydrology & Hydrogeology	3
12	GCE 712	Geotechnical Engineering Design	3
13	GCE 713	Finite Element Analysis in Engineering Design	3
14	GCE 714	Environmental Nearshore Hydrodynamics	3
15	GCE 715	Theory of Coastal Engineering Structures	3
16	GCE 716	Ground Improvement	3
17	GCE 717	Hydrodynamics of Offshore Structures	3
18	GCE 718	Port & Harbor Engineering	3
19	GCE 719	Construction Management for Field Operations	3
20	GCE 730	Technical Seminar	3
21	GCE 700	Research Project	6
<b>Total</b>			<b>66</b>

### 13.2 PGD Geotechnical & Coastal Engineering Programme Course Details

#### **GCE 701 - Basic Coastal Engineering**

Mechanics of wave motion; wave refraction, diffraction and reflection; wave forecasting; shore processes; planning of coastal engineering projects; design of seawalls, breakwaters, beach nourishment and fixed and floating installations; dredging; risk analysis.

#### **GCE 702 - Introduction to Geotechnical Engineering**

Physical properties of soils, classification systems, soil exploration, permeability, consolidation, compaction, and shear strength; laboratory tests conducted to determine the physical and engineering soil properties needed for application in geotechnical engineering design.

#### **GCE 703 - Applied Numerical Methods**

Application of numerical methods to geotechnical-related engineering problems; development, evaluation and comparison of various techniques for root finding, curve fitting, numerical integration, simultaneous linear algebraic equations, matrix methods, probability and statistics and ordinary differential equations in geotechnical-related engineering applications.

#### **GCE 704 - Fluid Statics & Dynamics**

Fluid properties; statics; kinematics; ideal gas law; conservation of mass; linear momentum and Newton's Second Law; conservation of energy; Bernoulli's equation; control volume analysis, similitude and hydraulic

models; homogeneous flow in pipes; fluid drag, boundary layer basics. Fluid measurements; determination of fluid properties; visualization of types of flow; experiments in closed conduit flow turbomachinery tests; open channel and gravity wave demonstrations

### **GCE 705 - Applied Statistics & Data Analysis**

An introduction to applied data analysis, designed to enable students to effectively collect data, describe data, and make appropriate inferences from data. Students are expected to communicate effectively about statistical results and to use a statistical software package for data analysis

### **GCE 706 - Environmental Engineering**

Water quality; material balances; chemical, physical and biological processes; water quality modeling; water and wastewater treatment; air quality; solid and hazardous waste management.

### **GCE 707 - Geology for Civil Engineers**

Principles of physical and engineering geology; properties of minerals, rocks and soils; active surface and subsurface processes; applications to the siting, design, construction, operation and maintenance of engineered works and the protection of the environment. A three-day field trip is required (a field trip fee is charged at registration).

### **GCE 708 – Basic Wave & Hydromechanics**

Kinematics of fluids; differential analysis of fluid flow; homogeneous, incompressible, irrotational and turbulent flows; Euler equations; Navier-Stokes equations; flow of viscous fluids; pumps; introduction to water waves. Physical and mathematical fundamentals of ocean wave behavior; mechanics of wave motion; use of statistics and probability to develop design wave criteria.

### **GCE 709 - Dynamics & Vibrations**

Application of Newtonian and energy methods to model dynamic systems with ordinary differential equations; dynamics and vibrations of linear single- and multi-degree of freedom systems of particles and rigid bodies; solutions of models using analytical approaches; interpreting solutions.

### **GCE 710 – Geotechnical Construction Materials**

Physical and mechanical properties of construction materials; portland cement concrete, bituminous materials, wood, ferrous and non-ferrous metals, glass, plastics and masonry units; proportioning of concrete mixtures including admixtures.

### **GCE 711 - Engineering Hydrology & Hydrogeology**

Occurrence, distribution and properties of natural waters of the earth; measurement and engineering analysis of hydrologic phenomena including precipitation, streamflow and groundwater, hydrologic design of water resources development and management projects. Geologic conditions determining the distribution and movement of ground water and their effect on the hydrologic properties of aquifers.

### **GCE 712 - Geotechnical Engineering Design**

A design course covering prediction of settlement, analysis of the stability of slopes, prediction of bearing capacity of shallow and deep foundations and determination of earth pressures acting on retaining structures; a general course in geotechnical engineering design for undergraduates and for graduate students not primarily interested in the geotechnical field, but desiring additional study beyond the introductory undergraduate level.

### **GCE 713 - Finite Element Analysis in Engineering Design**

Introduction to the fundamental theory and techniques; direct approach and energy formulation; element equations, assembly and solution schemes; computer implementation, design considerations; applications to field problems; original computer project required.

### **GCE 714 - Environmental Nearshore Hydrodynamics**

Fundamentals of current and shallow water wave motions; beach response to nearshore processes; coastal sediment and pollutant transport including nearshore currents, longshore onshore-offshore transport and shoreline configuration; facilities for shoreline stabilization, backshore protection and inlet stabilization; environmentally conscious coastal engineering design.

### **GCE 715 - Theory of Coastal Engineering Structures**

Loadings and Functions of ocean engineering structures, including sea walls, harbor structures, sea-going vessels, offshore structures and underwater vehicles; analysis of structures including trusses, beams, plates, shells and arches; introduction to stress and failure analysis; introduction to finite element analysis (FEA) including computational mechanics of ocean engineering structures using FEA.

### **GCE 716 – Ground Improvement**

Ground Improvement principles & Design Considerations, Techniques of Improving granular, cohesive & peaty soils, Field controls & monitoring; Field evaluation – specification, performance evaluation, acceptance criteria and case studies. Basic Seepage theory & Consolidation theory.

### **GEC 717 - Hydrodynamics of Offshore Structures**

Introduction to offshore structures; wave force formulation; wave forces on small structures; floating structure dynamics; modeling dynamics systems of rigid body motion; structure response statistics.

### **GEC 718. - Port & Harbor Engineering**

Engineering background and specific skills for design of marine facilities and harbors; includes development of design criteria, channel design, evaluation of operations and extreme loads, dredging and disposal.

### **GCE 719 - Construction Management of Field Operations**

Effects of industrialization on construction methods and resultant construction management problems; Basic elements of management of civil engineering projects; roles of all participants in the process--owners, designers, contractors and suppliers; emphasis on contractual aspect of the process--project estimating, planning and controls.

### **GCE 730. - Technical Seminar**

Responsibilities and obligations of new Geotechnical & Coastal Engineers; professional ethics, membership in professional societies and professional registrations; case studies and lectures presented by staff and practicing engineers.

### **GCE 700 - Research Project**

Every Student will be required to carry out a Research Project related to Geotechnical and/or Coastal Engineering under the close Supervision of a Supervisor. This Research Project will be examined at the end of its completion.

## **14. Graduation Requirements**

To be awarded the PGD degree in Geotechnical & Coastal Engineering, students' must have passed all prescribed courses with a total credit unit of 66 units.

## **15. List of Participating Lecturers / Instructors**

<b>S/Nos</b>	<b>Names</b>	<b>Qualifications</b>	<b>Specialization</b>	<b>Rank</b>
1	Ejezie, S.U.	PhD, MSc., BSc., R.Engr (COREN).	Geotechnical Engineering	Professor
2	Nwaogazie, I.L.	PhD, MSc., BSc., R.Engr (COREN).	Engineering Modeling	Professor
3	Teme, S.C.	PhD, MSc., BSc., (FNMGS).	Geology & Geotechnical Engg	Professor (RSU)
4	Jimoh, Y.	PhD, MSc., BSc., R.Engr (COREN).	Geotechnical Engg	Professor (Unilorin)
5	Oguara, T.M.	PhD, MSc., BSc., R.Engr (COREN).	Highway Engineering	Professor
6	Johnary, T.	PhD, MSc., BSc., R.Engr (COREN).	Engineering Structures	Professor
7	Igwe, E.A.	PhD, MTech., BTech., R.Engr (COREN)	Highway Engineering	Reader (RSU)
8	Ossia, C.V.	PhD, MTech., BTech., R.Engr (COREN).	Applied Mechanics	Senior Lecturer
9	Big-Alabo, A.	PhD, MSc., B.Eng., R.Engr (COREN).	Applied Mechanics	Senior Lecturer
10	Douglas, I.E.	PhD, MTech., R.Engr (COREN)	Marine Engineering & Turbines	Senior Lecturer (RSU)
11	Orji, C.U.	PhD, MSc., BTech., R.Engr (COREN)	Marine Engineering	Senior Lecturer (RSU)
12	Tamunodukobipi, D.	PhD, MTech., BTech., R.Engr (COREN).	Applied Rotodynamics	Senior Lecturer (RSU)
13	Akandu, E.	PhD, MTech., BTech	Marine & Offshore Structures	Senior Lecturer (RSU)



14	Nwofor, T.	PhD, M.Tech., B.Tech. R.Engr (COREN).	Engineering Structures	Senior Lecturer
15	Eme, D.B.	PhD, M.Tech., B.Tech., R.Engr (COREN).	Highway Engineering	Senior Lecturer
16	Nwaobakata, E.	PhD, M.Tech., B.Tech., R.Engr (COREN).	Highway Engineering	Senior Lecturer
17	Sule, S.	PhD, M.Tech., B.Eng., R.Engr (COREN).	Engineering Structures	Senior Lecturer
18	Ugwoha, E.	PhD, MSc, BTech., R.Engr (COREN)	Environmental Engineering	Senior Lecturer
19	Kamalu, U.A.	PhD, MEng., BEng., R.Engr (COREN)	Electronics Engineering	Senior Lecturer
20	Ukpong, E.U.	PhD, MSc, BSc., R.Engr (COREN)	Geotechnical Engineering	Senior Lecturer (UNIUYO)
21	Nwaigwe, C.	PhD, MSc., BSc.	Computation Fluid Dynamics	Lecturer-1 (RSU)
22	Ibekwe, A.U.	PhD, M.Tech., B.Tech., R.Engr (COREN).	Marine Engineering Platforms	Industry (SNEPCO)
23	Tam-Jones, Atuboyedia	PhD, M.Tech., B.Tech., R.Engr (COREN)	Highway Engineering	Industry
24	Orusoso, P.	MTech., BTech., R.Engr (COREN)	Engineering Structures	Industry
25	Henshaw, T.	PhD., MEng., BEng., R.Eng (COREN)	Water Resources	Industry
26	Nnennaya, F.	MSc, BSc	Geotechnical Engineering	Lecturer 1
27	Ikebude, C.	PhD., MEng., BEng., R.Eng (COREN)	Water Resources	Lecturer 1
28	Raheem, K.	MEng, BEng., R.Engr	Marine (Hydrological) Survey	Lecturer 1
29	Okoni, B.	PhD, MSc, BSc	Computer Science	Lecturer 1
30	Ohwerhi, K.E.	M.Eng., BEng.	Highway Engineering	Research Assistant

## 15 Facilities

### 15.1 Personnel

Being multi-disciplinary in nature, academic Faculty is drawn different academia from relevant Disciplines at the University of Port Harcourt, Other Sister Universities and Industry. The current list of proposed teaching faculty is shown above. However, more Teachers, Instructors and Researchers of high professional repute shall be co-opted as collaborators to build a center of Excellence in Geotechnical and Coastal Engineering. Besides, there are two Professorial Chairs domiciled in the Center, namely: Enoch George Professorial

Chair in Geotechnical Engineering and the Gesi Assamaoewei Professorial Chair in Coastal Engineering Research

### **15.2 Offices & Classrooms Space**

Besides, the Director's Office, there are two other Offices at ETF Gas Engineering Building for the Center of Geotechnical Engineering and Coastal Engineering which can house the Administrative staff of the Center. The Center also has another four (4) Classrooms domiciled at the Civil & Environmental Engineering Building at UniPark (Abuja) Campus of the University of Port Harcourt.

### **15.3 Library / Laboratory Facilities**

Currently, the Faculty of Engineering eLibrary, Donald Ekong (Uniport) Library and the World Bank Center of Excellence in Oilfield Chemicals (ACE-CEFOR) have full Access to Research Libraries. (Online and Offline). The Center currently collaborates with the Center of Excellence in Marine & Offshore Engineering, Rivers State University to share Laboratory Facilities built and equipped by Shell Petroleum Development Company (SPDC) to enhance research in this area.