

NATIONAL BOARD FOR TECHNICAL EDUCATION



CURRICULUM AND COURSE SPECIFICATION FOR HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY

**DEVELOPED IN COLLABORATION WITH CENTRE OF EXCELLENCE FOR SOLID MINERALS
DEVELOPMENT, WORLD BANK STEP-B PROJECT, KADUNA POLYTECHNIC**

MARCH, 2013

GENERAL INFORMATION

1.0 GOALS AND OBJECTIVES OF THE HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING PROGRAMME

The programme is designed to produce Petroleum Engineering Technologists who will be able to undertake exploration, drilling and production activities in the upstream sector of the petroleum industry.

On completion of this programme, the Diplomates should be able to:

- i. take active part in the planning and operation of petroleum exploration, drilling and production.
- ii. select suitable equipment to accomplish (i) above.
- iii. operate *and* maintain equipment in (ii) above.
- iv. undertake rock, reservoir and production analysis.
- v. contribute meaningfully to the effective management of petroleum resources.
- vi. undertake direct or supportive role in academic research and teaching.

2.0 ENTRY REQUIREMENTS

The general entry requirements for the HND programme include:

- a. all the requirements for admission into the ND Mineral Resources Engineering Technology and ND Mineral and Petroleum Engineering Technology Programmes.
- b. minimum of lower credit pass (CGPA) of 2.50 and above in the ND examination in both Mineral Resources and Mineral and Petroleum Resources Engineering Technology Programmes; and
- c. a minimum of one year cognate work experience.

In exceptional cases, the ND diplomats with a pass grade (CGPA) 2.0 - 2.49) in the ND examination that had two or more years of cognate work experience may be considered for admission into the HND programme. However, the number of such candidates should not be more than 10% of the total student intake in each class.

3.0 DURATION

The programme is designed to run for four semesters, i. e., two academic sessions.

4.0 CURRICULUM

4.1 The curriculum of HND programme consists of four main components. These are:

- a. General studies/education
- b. Foundation courses.
- c. Professional courses
- d. Project.

4.2 The General Education component shall include courses in:

English Language, Communication, Industrial Management and Engineer in Society, The General Education component shall account for not more than 15% of the total contact hours for the programme.

Foundation courses include courses in Mathematics. The number of hours for the programme may account for about 10-15% of the total contact hours.

Professional courses are core courses of the programme which give the student the theory and professional skills he needs to practice his field of calling at the technician/technologist level. These may account for between 60-70% of the contact hours.

5.0 CURRICULUM STRUCTURE

The structure of the Higher National Diploma programme consists of four semester of classroom, laboratory and workshop activities in the college. Each semester shall be of 17 weeks duration made up as follows:

- a. 15 weeks of teaching, i.e. recitation, practical exercise, quizzes, test, etc; and
- b. 2 weeks for examinations and registration.

6.0 ACCREDITATION

The programme shall be accredited by the National Board for Technical Education before the diplomates can be awarded the National Diploma certificates. Details about the process of accrediting a programme for the award of the National Diploma are available from the Executive Secretary, National Board for Technical Education, Plot "B", Bida Road, P.M.B. 2239, Kaduna, Nigeria. Website: www.nbte.edu.gov.ng

7.0 AWARD OF HIGHER NATIONAL DIPLOMA

Conditions for the award of Higher National Diploma include the following:

- a. Satisfactory performance in all prescribed course work which may include class work, tests, quizzes.
- b. Workshop practice, laboratory work.
- c. Satisfactory performance at all semester examinations.
- d. Satisfactory completion of final year project work. Normally, continuous assessment contributes 30%, project work 10% while semester examinations are weighted 60% to make a total of 100%.

Higher National Diploma should be awarded in four classes:

- | | |
|--------------------|--------------------------|
| (i) Distinction | - CGPA of 3.50 and above |
| (ii) Upper Credit | - CGPA of 3.0 - 3.49 |
| (iii) Lower Credit | - CGPA of 2.50 - 2.99 |
| (iv) Pass | - CGPA of 2.00 - 2.49. |
| (V) Fail | - CGPA of below 2.00 |

8.0 GUIDANCE NOTES FOR TEACHERS

- 8.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already completed in an institution similar standard from which he/she is transferring.
- 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 provides the student with technician operative skills, which can be used for employment purposes self - and otherwise.
- 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 behavioral objectives, so that it is clear to all the expected performance of the student who successfully completed some of the courses or the diplomates of the programme. This is slight departure in the presentation of the performance based curriculum which requires the conditions under which the performance are expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the staff of the department teaching he programme

to write their own curriculum stating the conditions existing in their institution under which performance can take place and to follow that with the criteria for determining an acceptance level of performance.

Departmental submission on the final curriculum may be vetted by the Academic Board of the institution. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the Polytechnic system.

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 practical in the ratio of 50:50 or 60:40 or the reverse.

9.0 FINAL YEAR PROJECT

Final year students in this programme are expected to carry out a project work. This could be on individual basis or group work, but should be reported individually. The project should, as much as possible incorporates basic element of design, drawing and complete fabrication of a marketable item or something that can be put to use. Project reports should be well presented and should be properly supervised.

The departments should make their own arrangement of schedules for project work.

COURSE OUTLINE

General Studies and Management Courses
Communication in English III
Engineer in society
Entrepreneurship development
Industrial Management
Mathematical courses
Advanced algebra
Advanced calculus
Numerical methods
Statistical methods in engineering
Computer and information technology
Automation and Computer Application
Geological engineering courses
Petroleum Geology
Applied Geophysics
Structural Geology
Mechanical engineering courses
Engineering Drawing
Fluid Mechanics
Electrical Engineering
Instrumentation and control engineering
Petroleum Engineering
Advanced Petroleum Production technology
Reservoir Engineering
Advanced Petroleum Drilling Technology
Automaton and Computer Application in Petroleum Industry
Petroleum Equipment, Operation and Maintenance
Applied Thermodynamics
Drilling Design Technology
Petroleum Economics
Stratigraphy and Sedimentology
Petroleum Reservoir Analysis
Corrosion Science, Prevention and Control

Petroleum Production Design
Well Testing and Control
Safety and Environmental Control in Petroleum Industry
Petroleum Processing Technology
Project
General Engineering
Research Method

HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY
CURRICULUM TABLE

First Semester

COURSE CODE	COURSE/MODULE TITLE	L	T	P	CU	CH	PQT
GNS 301	Communication in English III	2	-	-	2	2	-
GNS 311	Engineers in Society	2	-	-	2	2	-
MTH 311	Advanced Algebra	2	-	-	2	2	-
MPE 303	Automation and Computer Application	1	-	3	4	4	-
MEC 201	Engineering Drawing	1	-	3	4	4	-
GLE 406	Petroleum Geology	2	-	2	4	4	-
PET 301	Advanced Petroleum Production Technology	2	-	2	4	4	-
PET 303	Reservoir Engineering	2	-	-	2	2	-
PET 305	Advanced Petroleum Drilling Technology	2	-	2	4	4	-
	TOTAL	16	-	12	28	28	-

Second Semester

COURSE CODE	COURSE/MODULE TITLE	L	T	P	CU	CH	PQT
GNS 420	Industrial Management	2	-	-	2	2	-
MPE 302	Research Method	2	-	-	2	2	-
MTH 312	Advanced Calculus	2	-	-	2	2	-
GLE 302	Applied Geophysics	2	-	2	4	4	-
GLE 306	Structural Geology	2	-	2	4	4	-
EEC 304	Instrumentation and Control Engineering	1	-	3	4	4	-
MEC 306	Fluid Mechanics	2	-	2	4	4	-
PET 302	Automation and Computer Application in Petroleum Industry	2	-	3	5	5	-
PET 304	Petroleum Equipment, Operation and Maintenance	2	-	3	5	5	-
	TOTAL	17	-	15	32	32	-

Third Semester

COURSE CODE	COURSE/MODULE TITLE	L	T	P	CU	CH	PQT
MTH 321	Numerical Methods	2	-	-	2	2	-
EED 413	Entrepreneurship Development	2	-	2	4	4	-
PET 401	Applied Thermodynamics	1	-	2	3	3	-
PET 403	Drilling Design Technology	2	-	2	5	5	PET 305
PET 405	Petroleum Economics	2	-	-	2	2	-
PET 407	Petroleum Reservoir Analysis	2	-	2	4	4	PET 305
PET 409	Corrosion Science Prevention and Control	2	-	2	4	4	-
PET 411	Stratigraphy and Sedimentology	2	-	3	5	5	-
PET 412	Project	-	-	1	-	1	-
	TOTAL	15		14	29	30	-

Fourth Semester

COURSE CODE	COURSE/MODULE TITLE	L	T	P	CU	CH	PQT
MTH 313	Statistical Methods in Engineering	2	-	-	2	2	-
PET 402	Petroleum Production Design	2	-	2	4	4	PET 303
PET 404	Well Testing and Control	2	-	3	5	5	-
PET 406	Safety and Environmental Control in Petroleum Industry	2	-	-	2	2	-
PET 408	Petroleum Processing Technology	2	-	2	4	4	-
PET 412	Project	-	-	5	6	5	-
	TOTAL	12	-	12	23	22	-

PROGRAMME: HND IN GEOLOGICAL, PETROLEUM, MINING AND MINERALS ENGINEERING TECHNOLOGY						
Course: AUTOMATION AND COMPUTER APPLICATIONS			Course Code: MPE 303		Contact Hours: 4hrs/wk: L=1 P=3	
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Goal: To give the students the skill needed to appreciate the use of automation and computer specialist software Packages in a competent manner, within the Extractive Industries (Geosciences, Petroleum, Mining, Minerals Engineering). The learning Methodology should be student centered, with the student using various available packages in order to be competent when using them. The use of student workbooks or guided learning materials is recommended.						
Week	General Objective 1.0: Understand the principles of Automation					
	Specific Learning Outcome:	Teacher Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
1-2	1.1 Review the use of automatic control in production processes. 1.2 Explain the operating principles of automatic control system. 1.3 Explain the main concepts and classification of automatic systems 1.4 Illustrate the basic principles of Automation 1.5 Explain the general characteristics of measuring instruments and measurements. 1.6 Give examples of electrical and mechanical types of measuring devices. 1.7 Explain the principles of various automation parameters, e.g. displacement, stress, speed, time, temperature, colour. 1.8 Site examples of measuring devices based on the various parameters	Illustrate with the aid of diagram automatic control system Site examples of automatic control system	White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			

Week	General Objective 2.0: Know Automated systems in petroleum and minerals industries					
3-4	Specific Learning Outcome:	Teachers Activities	Resources			
	2.1 Classify automatic controllers: Positioning (positional-level; proportional; proportional-integral-derivative controllers); - Self-actuating controllers; - Pressure, temperature, level controllers. - Pneumatic controllers. 2.2 Site examples of automated systems in the petroleum and minerals industries: - exploration: mineral analysis, drilling - petroleum industry: gas analysers, oil-field, gas condensate field; - mining industry: shaft hoisting, load-haul-dump; drilling - minerals engineering: process control, sample grade control 2.3 Explain the use of computers in automation: robotics, artificial intelligence	Explain with the aid of diagrams and real life examples	Ditto			
Week	General Objective 3.0: Understand the use of operating systems and software application packages					
5-7	Specific Learning Outcome:	Teachers Activities	Resources			
	3.1 Discuss the impacts of the computer and ICT in industry. 3.2 Outline the purpose and components of a computer: hardware and software 3.3 Recall input – output devices	Explain with specific examples	Ditto	3.1 Show the components of a computer 3.2 Identify storage devices, RAM, ROM,	Show how to start a computer, open/close the window operating system, move around in the windows environment.	<ul style="list-style-type: none"> • Maximum of 4 students to 1 computer • Maximum of 4 computers to a printer except

	<p>3.4 Explain the concept of an operating system: PC-DOS/MS-DOS, Windows, Linux, Unix</p> <p>3.5 Discuss the advantage of the Windows Operating System.</p> <p>3.6 Explain the windows menu and tools</p> <p>3.7 Describe the use of Windows operating system: Open/Close and sizing a window; Program Manager; Button bars/scroll bars/menu bars; Moving from one window to another</p> <p>3.8 Explain file management: Creating a file and folder; manipulating files (moving, copying, saving, deleting); Print manager</p> <p>3.9 Explain the concept of a software package: MS Office; Corel Suite; Search Engines; Adobe</p>			<p>Fixed discs, Removable discs</p> <p>3.3 Load MS Office with the students and show the various packages that make up MS Office.</p>	<p>Demonstrate the use of various input – output and storage devices</p> <p>Demonstrate creating a file, manipulating the file, and printing.</p>	<p>when a Network is in use.</p> <ul style="list-style-type: none"> • 1 Ream of A4 papers to 10 students. • Ink cartridges per printer per semester.
Week	General Objective 4.0: Understand the use of word-processing package such as MS Word					
8-9	Specific Learning Outcome:	Teachers Activities	Resources			
				<p>4.1 Mention the use of MS Word</p> <p>4.2 Explain the procedures for:</p> <ol style="list-style-type: none"> Entering text Formatting text (boldening, font size, italicising) Creating and Saving text files Editing and moving text Importing objects Spelling and Grammar 	<ul style="list-style-type: none"> • Demonstrate the installation of MS Words. • Identify the different features of the software. • Ask students to type a short document and save it. • Ask students to edit a document and carry out a spelling check. • Demonstrate the use of tables. 	Ditto

				Checking g. Creating and manipulating tables, text boxes, equations h. Printing		
Week	General Objective 5.0: Know the use of a graphics package such as Corel Draw					
10	Specific Learning Outcome:	Teachers Activities	Resources			
				<p>5.1 Explain the various procedures in Corel Draw:</p> <p>a. Drawing tools b. Text as graphics c. Creating and saving image files d. Editing and moving images e. Importing and exporting graphics f. Windows 'Clipboard' facility g. Creating and manipulating images (re-sizing etc) h. Image file standard (JPEG, PCX, GIF etc)</p>	<ul style="list-style-type: none"> • Load Corel Draw. • Explain features of the soft wares. • Demonstrate the creating and saving of images. • Edit the images saved. • Export the graphics to other packages • Demonstrate the manipulation (re-sizing) of images. 	Ditto
Week	General Objective 6.0: Understand the use of a spreadsheet package such as MS Excel					
11	Specific Learning Outcome:	Teachers Activities	Resources			
				<p>6.1 Explain the procedures in the use of MS Excel:</p> <p>a. Setting up the worksheet b. Entering data c. Formatting data (decimal places, alpha-numeric) d. Creating and saving worksheets e. Creating a formula in cells f. Importing objects g. Exporting the worksheet h. Creating and manipulating graphical representations of data i. Printing</p>	<ul style="list-style-type: none"> • Load MS Excel. • Explain features of the software. • Create a worksheet and edit it. • Demonstrate how to format a workshop. 	Ditto

Week	General Objective 7.0: Understand the use of a database package such as MS Access					
12-13	Specific Learning Outcome:	Teachers Activities	Resources			
				<p>7.1 Explain the features and working of MS Access.</p> <p>7.2 Illustrate the following procedures: entering records in the structure querry modifying and producing reports. indexing and sorting files</p>	<p>Load MS Access. Uses students record as example and enter the records in the structure query modify and produce typical report. Show how to index and sort files in alphabetical order</p>	Ditto
<p>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>						
PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
Course: PETROLEUM GEOLOGY		Course Code: GLE 406		Contact Hours: 4 hours/week: L = 2 P = 2		

Goal : The Course is designed to give the student an in depth knowledge of the principles of Petroleum geology						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0: Understand Origin of Petroleum and Organic Source Rock					
	Specific Learning Outcome:	Teacher Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
1-3	1.1 Define petroleum 1.2 Explain organic and inorganic origin of petroleum 1.3 Explain how organic matter accumulates in sediments 1.4 Discuss the evidence that confirm 1.2 1.5 Describe the carbon cycle 1.6 Explain various rocks types and rock cycles 1.7 Give the composition of various types of sedimentary rock	<ul style="list-style-type: none"> • Explain the major organic source material • Draw the carbon cycle • Explain organic productivity and preservation factors • Explain the three rock types: sedimentary, Igneous and Metamorphic. • Give the mineralogical composition of clastic rocks, carbonate rocks and evaporates. • Assess students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Show various organic rich sediments	Identify various organic rich sediment Identify general physical properties of organic sediment; Colour, texture, hardness, organic content, specific gravity etc.	Sediments, hand lenses, glass/plastic trays, slate.
General Objective 2.0: Understand of Oil Formation, Migration and Accumulation						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
4-6	2.1 Discuss the chemistry of kerogen 2.2 Classify various types of Kerogen 2.3 Define biomarkers 2.4 Explain the stages of oil formation: Diagenesis, Catagenesis and Metagenesis. 2.5 Explain how oil migrates from the source rock to the reservoir and within the reservoir rock into oil pools. 2.6 Explain how oil and/or gas accumulate into pools 2.7 Describe the	<ul style="list-style-type: none"> • Classify Kerogen based on their organic composition • State the temperature and pressure condition at which oil and/or gas is formed. • Classify oil migration into primary and secondary with their respective driving forces • Categorize surface occurrence as seepages and springs. • Explain sub surface as oil pools, field and oil province • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

	petroleum occurrence as surface and sub surface occurrences					
General Objective 3.0: Understand Geologic Age and Geographic Distribution of Petroleum						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
7-8	3.1 Explain why some rocks of geologic age produce more oil than others 3.2 Describe the global distribution of petroliferous sedimentary basins.	<ul style="list-style-type: none"> List the geologic period of various rocks and their respective percentage or world oil production Classify sedimentary basins Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, Geological time scale.	-	-	-
General Objective 4.0: Understand Basic Organic Geochemical Analysis						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
9-11	4.1 Discuss geochemical character of the element in sediment. 4.2 Describe the geochemical circle 4.3 Explain Geochemistry of the weathering zone and associated processes of mineral deposit.	<ul style="list-style-type: none"> Describe the formation and classification of coal and Kerogen. Define biomarkers. Assess the students 	White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Perform sampling procedure Describe sample preparation methods. Explain the principles governing geochemical analytical techniques Explain Geochemical prospecting methods Explain how geochemical data and maps are used.	Collect sample (Crude oil/Organic sediment), Prepare sample for geochemical analysis Carry out geochemical analysis by weight and instrumental methods	Samples, glass wires, atomic absorption/spectrophotometry, X-ray fluorescence, calorimetry.
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY		
COURSE: Advanced Petroleum Production	Course Code: PET 301	Contact Hours: 4HRS/WK L = 2 P = 2

Technology						
Goal : This Course is designed to acquaint student with the principles of Oil and Gas production						
Course Specification: THEORITICAL CONTENT					PRACTICAL CONTENT	
Week	General Objective: 1.0 Understand Well Completion.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	1.1 State types of well completion (single and dual types). 1.2 Describe the well-completion types in 1.1. 1.3 Explain the following: Casing and tubing assembly: Casing strings, Perforations, Packers, Tubing hangers, Sand consolidation. 1.4 State the relevance of the terms in 1.3 in well completion.	<ul style="list-style-type: none"> Enumerate different classes of oil well completion Differentiate between casing and tubing assembly Explain casing strings, packers and other well completion terms and their importance Asses the students 	Computers, Related Software's, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 2.0 Understand the Development of Oil and Gas Fields.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3- 5	2.1 Explain the gathering systems (individual and Satellite). 2.2 Outline the use of flow-stations. 2.3 Describe the equipment used: Manifold, Separators, Gas scrubber, Heater treated, surge vessels. Etc.	<ul style="list-style-type: none"> Enumerate the various component of flow station. Explain the operations and functions of flow station. Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Visit flow station. Identify various equipment in the flow station.	Demonstrate the operation procedures of flow station.	Simulator Film.
General Objective 3.0 Understand Production Techniques						
Week	Specific Learning	Teachers Activities	Resources	Specific Learning	Teachers Activities	Resources

	Outcome			Outcome:		
6-8	<p>3.1 Describe the permeable medium.</p> <p>3.2 Describe the drainage areas and well spacing patterns.</p> <p>3.3 Describe the following Natural drive mechanisms: - Water drive, Gas cap drive, Solution Gas drives, Gravity segregation and Combination drives, etc.</p> <p>3.4 Explain well performance with pressure and production decline curve</p> <p>3.5 State types of reservoir fluids.</p> <p>3.6 Outline the properties and characteristics (e.g. P.V.T. data, viscosity, density, etc) of 3.5.</p> <p>3.7 Describe the following Artificial lift methods: Gas lift, Sucker rod, Centrifugal, Hydraulic pumping.</p>	<ul style="list-style-type: none"> • Explain permeability • Explain types of natural drive system of petroleum production. • Describe well production performance with pressure and production decline curve. • Enumerate types of reservoir fluid, its properties and characteristics. • Demonstrate the activities in 3.7 to students • Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-
General Objective 4.0 Understand Crude Oil and Gas Measurement						
Week	Specific Learning Outcome	Teacher activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
9 - 11	<p>4.1 Explain method of identifying nature of fluid.</p> <p>4.2 Identify equipment used in crude oil measurement (e.g. PD-meters and tickets).</p> <p>4.3 Identify equipment used in gas measurement (e.g. orifice meters, the flow</p>	<ul style="list-style-type: none"> • Describe the process of identifying nature of fluids • Demonstrate activities in 4.2 to 4.7. • Asses the students 	Computers, Related Software's, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes &	<p>Demonstrate the equipment used in oil and gas measurement</p> <p>Demonstrate surveillance of well head by THP, CHP and WHP.</p>	<p>Carry out measurement of oil and gas.</p> <p>Carry out well head surveillance.</p>	<p>Floco meter, PD meter, API gravity meter, orifice meter, flow chart.</p>

	<p>charts).</p> <p>4.4 Explain principles involved in the use of the equipment in 4.2 and 4.3.</p> <p>4.5 Explain water measurement by use of floco meter, and Water Oil Ratio (WOR).</p> <p>4.6 Explain sampling by Basic Sediment and Water (B.S.W), Gas Liquid Ratio (G.L.R) etc. Undertake the measurements in 4.2, 4.3, 4.5 and 4.6.</p> <p>4.7 Describe well head surveillance by Tubing Head Pressure (T.H.P), Casing Head Pressure (C.H.P), Well Head Pressure (W.H.P), etc.</p> <p>4.8 Undertake the operation in 4.7</p>		Related Journals			
General Objective: 5.0 Understand Storage and Measurement						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
12-13	<p>5.1 State types of storage tanks and their applications.</p> <p>5.2 Describe the features of the tanks in 5.1.</p> <p>5.3 Identify the storage tanks in 5.1.</p> <p>5.4 Describe the construction of storage tank according to API standards.</p> <p>5.5 Explain losses on storage tanks and the safety devices.</p> <p>5.6 Describe tank farms,</p>	<ul style="list-style-type: none"> • Explain importance of storage facilities in production • Highlight the importance of product measurement • Explain the characteristics of storage tanks and its various types • Explain storage construction according to API standard, its safety 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Determine products volume using meters and tanks gauges	Measure products volume using meters and tanks gauges	Dipping stick, Paste, gauge, Hydrometer, thief cup, storage tank.

	Outline the layout, safety precautions and management involved in 5.6. 5.7 Explain the determination of volume using meters and tank gauging (e.g. hydrostatic, and dip stick). 5.8 Undertake the operation in 5.7. 5.9 Explain the significance of temperature gravity (API), BSW for exporting crude.	<p>approach, layout and general management</p> <ul style="list-style-type: none"> Asses the students 				
General Objective 6.0: Understand Work Over Operations.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
14 - 15	6.1 State types of work over jobs and tools. 6.2 Explain well stimulation (acidizing). 6.3 Describe production logging, types and applications. 6.4 Undertake well testing and sampling. 6.5 Interpret well test data (charts) obtained from 6.4	<ul style="list-style-type: none"> List type of work over jobs and tools Enumerates methods of production logging and application Enumerate well testing, sampling and data interpretation. Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Perform well testing and sampling	Carry out well testing and sampling	Core samples, tracing paper, paper, ruler, chemicals, core holder etc.
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY		
Course: Reservoir Engineering	Course Code: PET 303	Contact Hours: 2HRS/WK L = 2 P = 0

Goal: This Course is designed to enable student acquire basic knowledge of engineering practice in oil and gas reservoir						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0 Understand Elements of Reservoir Engineering.					
	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
1-4	1.1 Describe types of Reservoir. 1.2 Explain the physical characteristics of reservoir rocks. 1.3 Explain Gas laws and formation volume factors. 1.4 Explain the properties of reservoir rocks, and fluids numerical applications on porosity, permeability, fluid saturation. 1.5 Explain hydrocarbon composition and properties.	<ul style="list-style-type: none"> • Explain activities 1.1 to 1.3 and ask students to perform the activities. • Enumerate properties of reservoir rocks and fluid • Perform numerical applications on porosity, permeability, and fluid saturation • Assess the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 2.0 Understand Phase Behavior of Reservoir Fluids						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
5-7	2.1 Explain reservoir pressure and temperature. 2.2 Describe the elementary phase behavior of hydrocarbon gases. 2.3 Describe the following: Single phase and multiphase fluid flow through porous materials, Volumetric and material balance for gas and oil reservoirs, Pressure-Volume-Temperature data for hydrocarbons system, Bottom hole static flow pressures, skin effect and damage factor.	<ul style="list-style-type: none"> • Explain the phase envelop 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-
General Objective 3:0 Understand Volumetric Reservoir Performance						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources

8-10	<p>3.1 Explain Reservoirs under water influx and gas cap expansion.</p> <p>3.2 Explain water conning.</p> <p>3.3 Describe Reservoir performance curves.</p> <p>3.4 State the need for 2.3 in oil production.</p>	<ul style="list-style-type: none"> • Explain 3.1 to 3.2 and allow students to practice • Assess the students. 	<p>Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, Design materials, simulators.</p>	-	-	-
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4.0 Understand Estimation of Oil and Gas Reserves.

Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
11-13	<p>4.1 Describe the estimation of oil and gas reserves and ultimate recovery factors.</p> <p>4.2 Undertake the estimate in 4.1 above.</p>	<ul style="list-style-type: none"> • Explain activity 4.1 and ask students to carry out exercises on recovery factors • Assess the students 	<p>Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.</p>	-	-	-

5.0 Understand Oil and Gas Flow in Transmission Lines and their Storage Facilities.

Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
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14-15	5.1 Describe gas flow in transmission lines, and gas storage fields	<ul style="list-style-type: none"> • Explain different methods of Oil and Gas transportation and storage • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals valves, pumps, compressors fan actuators, pipe copplings, fittings, torque and converters.	-	-	-
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Advanced Drilling Technology			Course Code: PET 305	Contact Hours: 4HRS/WK L = 2 P = 2		
Goal: The Course is designed to acquaint the student with the fundamental principles and practice of oil and gas well drilling						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective: 1.0. . Understand Drilling Technology Concept					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
1 - 2	1.1 Define oil and gas well 1.2 State types of oil and gas well. 1.3 State general drilling methods (eg. percussion, rotary, etc). 1.4 Describe the methods in 1.3. 1.5 State types of drilling rigs (eg. Rotary, off-shore swamp, etc). 1.6 Describe the purpose, design and main parts of rotary rig. 1.7 Describe the types and design principles of drill bits. 1.8 Explain the factors influencing the selection of drill bits. 1.9 Describe the drill string and its components. 1.10 Describe the functions of 1.9. 1.11 Describe prime movers, draw works, blocks, etc, and the efficiency of the drill line. 1.12 Explain the factors affecting drilling, eg. Weight on bit, rotary speed, hydraulic factors, etc. 1.13 Describe the following hole problems: lost circulation; pipe sticking; shale sloughing and formation damage.	<ul style="list-style-type: none"> • Explain different types of oil and gas wells. • Explain different types of drilling methods. • Explain types of drilling rigs. • Explain types of drilling bits. • Explain drilling string and its components. • Explain component of a drilling rig • Explain factors affecting drilling operations. • Explain the problems arise while drilling operation. • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate how to carry out different methods of drilling. Demonstrate different drilling rig used in on-shore, swamp and off-shore drilling operation. Demonstrate criteria in bit selection on different formation. Demonstrate hole problems while drilling operation	Carry out different methods of drilling (rotary, percussion, horizontal) using simulator. Perform drilling in on-shore, swamp and off-shore operation using simulator Display different types of bits: Diamond bit, cone bit, etc. Carry out drilling problems using simulator	Simulator,

General Objective 2.0 Understand Pressure Control in Drilling.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
3 - 5	2.1 Explain how well-bore pressure develops viz normal, subnormal, and abnormal pressures 2.2 Explain the hydrostatic, static, circulating and equivalent circulating pressures. 2.3 Explain how to detect blow-outs. 2.4 Explain the control of blow-outs. 2.5 Describe the types, mechanisms, operations and pressure ratings of blow out preventers	<ul style="list-style-type: none"> Describe the formation pressure and its sources. Explain blow-out and blow-out preventer. Assess the students 	Computers, Related Software's, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 3.0: Understand Drilling Fluid and the Circulating System.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
6	3.1 Explain the purposes and functions of drilling fluids. 3.2 Mention tests procedures for drilling mud properties. 3.3 Explain the engineering data and calculations involved in 3.2. 3.4 Explain composition and properties of clay-water muds. 3.5 Describe the characteristics and specifications of clay mixtures. 3.6 Describe the mud-pump: d-Exponent and shale factor; dc-Exponent and mud circulation.	<ul style="list-style-type: none"> Describe the purposes and functions of drilling fluids. Describe the criteria used in selection of drilling fluids on different formation. Carry calculation to determine mud weight, hydrostatic pressure and shale swelling 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate a complex mud pump in drilling operations.	Carry out mud pump operations and maintenance.	Simulator

		<ul style="list-style-type: none"> factor. Assess the students 				
General Objective 4.0: Understand Hole Drilling						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
7 - 8	<p>4.1 State different types of holes viz; straight crooked, and directional holes.</p> <p>4.2 Describe squeeze cementing under the following headings: nature of cement and porous system; cement and additives used for squeezing; high and low pressure techniques; testing the job success.</p> <p>4.3 Explain other squeeze operations; open hole and casing plugs, and small pipe cementing (concentric cementing).</p> <p>4.4 Explain the significance of fishing during workover, plugs backs, and side tracking.</p> <p>4.5 Describe fishing tools and procedure.</p>	<ul style="list-style-type: none"> Explain different types of holes. Explain cementing procedure. Describe the wire line operation in fishing. Describe the fishing tools and procedure Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective: 5.0. Understand Drilling Completion						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources

9	<p>5.1 Explain methods of preparing well for completion eg: Single stage, dual stage, multiple zone, open hole, and liner completions, perforated casing completion.</p> <p>5.2 Describe subsurface equipment such as tubing and nipples; packers, joint subs, flow coupling, and sleeves, etc.</p>	<ul style="list-style-type: none"> • Describe different methods of well completion. • Explain subsurface equipment used in well completion • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate how to carry out well completion operation using simulator	Carry out well completion procedure.	Simulator
General Objective 6.0: Understand Basics of Directional Drilling						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources

11 - 13	6.1 Define Directional drilling. 6.2 State tools and processes used to achieve a deviated well. 6.3 State how to measure deviation. 6.4 State common directional well profiles. 6.5 State how well deviated 6.6 State the advantages of Directional Drilling.	<ul style="list-style-type: none"> • Explain directional drilling operations • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate directional drilling operation using simulator	Carry out directional drilling	Simulator
General Objective 7.0: Understand Coring						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
14	7.1 Define Coring. 7.2 State different method of coring. 7.3 Explain why do you cut bottom hole cores. 7.4 Explain laboratory core analysis. 7.5 State the tools for bottom hole coring eg. The core catcher, rabbit core bits, etc. 7.6 State coring problems: Jamming; Core stabilization; Bits whirl; Gas expansion, etc.	<ul style="list-style-type: none"> • Describe coring and coring procedures • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate how to cut coring, core slabbing and core plugging. Perform core laboratory analysis	Carry out core laboratory operations	Core box, rags, tape measure, hammer, chisels, sample bag, maker pens

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General Objective 8.0: Understand Mud Logging						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
14	8.1 Define mud logging. 8.2 State the basic equipment found in mud logging unit eg, cupboards, heavy duty work-tops, computers and printers, Air conditions, heaters, sample processing document equipment, chemicals etc. 8.3 State the common sensors and what they record. 8.4 State the maintenance and calibration of mud logging tools (QAQC).	<ul style="list-style-type: none"> • Explain mud logging and its procedure. • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Demonstrate how to carry out mud logging.	Carry out mud logging operations	Core box, rags, tape measure, hammer, chisels, sample bag, maker pens

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.

PROGRAMME: PROGRAMME: HND IN GEOLOGICAL, MINING AND MINERAL PROCESSING ENGINEERING TECHNOLOGY.						
Course: Research Methods		Course Code: MPE 302		Contact Hours: 2HRS: L=2 P=0		
GOAL: This Course is designed to enable student acquire basic research knowledge.						
Course Specification: Theoretical				Practical		
Week	General Objective 1.0: Select a research topic.					
	Specific Learning Outcome	Teachers Activities	Resources			
1-3	1.1 Explain the criteria for choosing a Research topic. 1.2 Choose a project or research topic relevant to the area of specialization.	<ul style="list-style-type: none"> Advise students on choice of project. 	<ul style="list-style-type: none"> Reference Books Project layout Examples Library books 			
Week	General Objective 2.0: Formulate a Research Problem.					
	Specific Learning Outcome	Teachers Activities	Resources			
4-6	2.1. Define a Research Problem. 2.2. Explain aspects of Research Problem Formulate study objectives Define study area.	<ul style="list-style-type: none"> Advise students on choice of project 	Reference Books <ul style="list-style-type: none"> Project layout Examples Library books 			
Week	General Objective 3.0: Know theoretical/conceptual basis of Research.					
	Specific Learning Outcome	Teachers Activities	Resources			
7-10	3.1 Situate research within the framework of theories, models and concepts. 3.2 Discuss importance of literature review. 3.3 Visit library to obtain literature materials.	<ul style="list-style-type: none"> Advise students on choice of project 	Reference Books <ul style="list-style-type: none"> Project layout Examples Library books 			

Week	General Objective 4.0: Know how to Analyze data.				
	Specific Learning Outcome	Teachers Activities	Resources		
11-13	4.1 Mention main sources of data. 4.2 Discuss techniques of data collection: a. Laboratory. b. Field survey/measurement c. Questionnaire d. Oral interviews.	<ul style="list-style-type: none"> • Guide student on project • Presentations 	Reference Books <ul style="list-style-type: none"> • Project layout • Examples • Library books 		
Week	General Objective 5.0: Know how to present information/data				
	Specific Learning Outcome	Teachers Activities	Resources		
14	5.1 Explain how to present data in a manner suitable for research in the following form: Tables, Graphs, Charts, bars 5.2 Input information into computer. 5.3 Print out results.	<ul style="list-style-type: none"> • Guide student on project • Presentations 	<ul style="list-style-type: none"> • Computers • Software 		
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.					

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Applied Geophysics			Course Code: GLE 302	Contact Hours: 5HRS/WK L = 2 P = 3		
Goal: The Course is designed to acquaint student the principles and practice of geophysics						
Course Specification: Theoretical Content				Practical content		
Week	General Objective 1.0: Understand the main branches of geophysics and the underlying principles.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1	1.1 Define Geophysics. 1.2 List the different branches of geophysics (e.g. gravity, Magnetic, seismic, electrical, etc.). 1.3 Explain the basic principles of each of the methods listed in 1.2 above.	Ask the student to: 1. State and explain the principle of each branch of Geophysics. 2. Assess the student on the above	White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	-	-	-
Week	General Objective 2.0: Understand the gravity method of geophysical exploration.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
2 - 3	2.1 Explain the basic theory of the gravity method (Le. Newton's law of gravity, etc.) 2.2 Newton's law of gravity, etc.) 2.3 Apply the law of gravity and gravitational potential (e.g. in determination of density). 2.4 Describe field techniques, equipment and data collection methods for gravity exploration 2.5 Explain data reduction and presentation	Ask the student to: 1. State Newton's Law of gravity 2. Explain how density of body can be determine using the law of gravity 3. Compute several data from field techniques 4. Explain the need for data reduction, correction, enhancement 5. Define anomaly 6. State the importance of gravity methods	Gravimeter, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	Demonstrate the application and interpretations of the gravity meter	Carry out field measurements data acquisition and corrections and interpretations	Gravimeter, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.

	2.6 Explain the interpretation of gravity data as presented in 2.4 Explain applications of gravity methods in mineral exploration (e.g. heavy density minerals such as chromite, petroleum basin analysis).	in mineral exploration				
Week	General Objective 3.0: Understand the magnetic method of geophysical exploration.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
4-6	3.1 Explain the basic theory of magnetic method. 3.2 Explain the magnetic properties of rocks. 3.3 Describe the geomagnetic field. 3.4 Describe field techniques and data collection methods. 3.5 Explain data reduction and presentation. 3.6 Explain the interpretation of data as presented in 3.5 above. 3.7 Explain applications of magnetic method in mineral exploration.	Ask the student to: 1. Explain the origin of magnet. 2. Distinguish Para, Diamagnetism etc. 3. Explain the origin of geomagnetic 4. Carry out field techniques 5. State the need for data reduction 6. List some minerals that are magnetic 7. State the importance of magnetism in mineral exploration 8. Assess the student	Magnetometer, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	Demonstrate applications and interpretations of the magnetometer	Carry out field measurements, data acquisition corrections and interpretations	Magnetometer, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.
Week	General Objective 4.0: Understand The Seismic Method Of Geophysical Exploration.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
7-9	4.1 Explain the basic theories of seismic method. Explain the elastic constants and waves. 4.2 Classify seismic methods employed in mineral exploration (reflection and refraction methods). 4.3 Describe the field	Ask the student to: 1. Define a coastic impedence 2. Explain the principle of reflection/refraction 3. Describe source of signals, cables arrangement, receivers etc	White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended	Demonstrate the application and interpretation of seismic refraction and reflection using the seismogram	Carry out measurements, data acquisition, correction, processing and interpretation of seismic refraction and reflection surveys	Seismogram. White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended

	<p>techniques, equipment and data collection methods;</p> <p>4.4 Explain data reduction, presentation and interpretation.</p> <p>4.5 Explain application of seismic methods in ground water exploration, petroleum exploration, overburden thickness determination etc.</p> <p>4.6 Understand seismic applications as in 4.5</p>	<p>4. Describe steps in data processing/interpretation computer software</p> <p>5. Use a seismic section to indicate structural traps, bright spots etc.</p> <p>6. State application of seismic method in geotechnical engineering.</p> <p>7. Assess the student above</p>	<p>Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>			<p>Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>
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General Objective 5.0: Understand The Electrical Method Of Geophysical Exploration

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
10	<p>5.1 Explain the basic theories of electrical method.</p> <p>5.2 Explain the electrical properties of rocks and minerals</p> <p>5.3 List and classify the various electrical methods of exploration - (a) Natural Methods: Self-potential (SP), Telluric, Magnetotelluric. (b) Artificial Methods: resistivity, (vertical electrical sounding and electric trenching).</p> <p>5.4 Describe the field techniques, equipment and data collection for the various types of electrical methods. Explain data reduction, presentation and interpretation.</p>	<p>Ask the student to:</p> <ol style="list-style-type: none"> 1. State ohm's law 2. Define resistivity 3. Relate rock composition and resistivity 4. State the sources of SP 5. Distinguish between artificial and natural methods 6. Describe profiling, VES 7. Explain the differences between schlumberger/wenner arrays 8. Distinguish between the various field procedure full schlumberger, ½ Schulumberger, dipole etc 9. Define KAH Curve type 	<p>Log-log graph sheet, Arithmetic Graph Sheet, White Board, Computers, related Software, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>	<p>Demonstrate the application and Interpretation of electrical resistivity methods</p>	<p>Carry out measurements data acquisition, correction and interpretation of electrical resistivity survey</p>	<p>Resistivity Meter</p> <p>Log-log graph sheet, Arithmetic Graph Sheet, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>

	5.5 Explain applications of the electrical methods of mineral exploration (e.g.:- petroleum, ground water, etc.). 5.6 Undertake petroleum exploration using electrical method.	10. Use computer software for interpretation of IPWIN, IXID, 2Day, 3Day software's 11. Carry out resistivity survey 12. Assess the student on the above				
General Objective 6.0: Understand The Electromagnetic Method Of Geophysical Exploration.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
11	6.1 Explain the basic theory of EM exploration methods. 6.2 Classify the various EM methods of exploration (Le. EM, VLF, AFMAG, etc.). 6.3 Describe the field techniques, equipment and data collection methods. 6.4 Explain reduction, presentation and interpretation of EM data. 6.5 Explain applications of the EM methods (Le. petroleum exploration, etc.). 6.6 Carry out EM exploration of petroleum.	Ask the student to: 1. State the principle of EM 2. Use equipment and obtain data 3. State the need for data reduction.	EM meter, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	Demonstrate the applications and interpretations of EM and/or VLF	Carry out measurements, data acquisition, processing, correction of EM. Survey	EM, VLF, AMMAG (either or all) EM meter, White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.
General Objective 7.0 Understand the Radiometric Method of Geophysical Exploration and Well Logging						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
12	7.1 Explain the theory of radiometric methods. 7.2 Describe the various radioactive methods of exploration	Ask the student to : 1. Define radioactivity 2. Explain the principles behind radioactivity	White Board, Computers, related Softwares,	Demonstrate the application and interpretations of radiometric methods of	Carry out measurements, data acquisition, processing of radiometric survey	Radiometric machines, Ground

<p>7.3 (e.g. Gamma ray, Neutron methods etc.).</p> <p>7.4 Describe the field techniques, equipment and data collection method.</p> <p>7.5 Explain the reduction, presentation and interpretation of radiometric exploration data.</p> <p>7.6 Explain application of the radiometric methods; (e.g. Age determination and well logging).</p> <p>7.7 Carry out radioactive explometric as in 7.5 above</p>	<p>3. Define gamma, beta and alpha radiation</p> <p>4. List various radioactive minerals</p> <p>5. Assess the student on the above</p>	<p>Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>	<p>ground penetration Radar (GPR)</p> <p>Demonstrate bore-hole logging method</p>	<p>Carry out SP Gamma ray Temperature log porosity and permeability log</p>	<p>penetration Radar</p> <p>Logger SAS300C, 300M and accessories.</p> <p>White Board, Computers, related Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>
<p>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>					

PROGRAMME: HND IN PETROLEUM ENGINEERING TECHNOLOGY

Course: Structural Geology		Course Code: GLE 306	Contact Hours: 3HRS/WK L = 1 P = 2			
Goal: The Course is designed to enable student have a working knowledge of structural geology						
Course Specification: Theoretical Content				Practical Content:		
General Objective 1.0 Understand Stress and Strain Effects In Rocks						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1-3	1.1 Explain various types of stress and strain (e.g. tensile, compressive, shear, etc.). 1.2 Describe with illustration the response of rocks to stress (ductile and brittle behavior). 1.3 Explain factors controlling behavior of materials subjected to stress. 1.4 Describe the use of compass and clinometer to measure strike and dip. 1.5 Measure strike and dip using compass and clinometer. 1.6 Describe the use of stereographic nets in plotting altitudes of rocks. 1.7 Demonstrate 1.6 above. 1.8 Describe various methods of determining strike and dip. 1.9 Distinguish between true and apparent dip. 1.10 Solve problems involving 1.9	The teacher asks the students to: 1. Explain stress/strain using relevant examples. 2. Solve simple calculations of stress and strain. 3. He and the students perform tensile, compressive and shear test, carry out Hooke's law test. 4. The teacher demonstrates the use of compass and clinometers. 5. He asks the student to define stereographic projections, solve problems of dip and strike using stereographic net. 6. Asses the students	Compass clinometers, stereo nets , White Board, Computers, related Software, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	To demonstrate how to measure strike and dip on an inclined plane	Carry out strike and dip measurements on an inclined plane Plot attitudes of rocks on stereographic nets	Field note book Writing materials Compass/clinometers Stereographic net
General Objective 2.0 Understand Fracturing in Rocks						

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
4-5	2.1 Describe various types of fractures (i.e. joints, faults) in rocks. 2.2 Relate 2.1 to various rock types. 2.3 Describe the principles of failure by stress. 2.4 Relate rupture to stress and strain in rocks. 2.5 Classify joints based on geometry and genetics (e.g. shear or tension joints). 2.6 Classify faults based on geometry pattern, attitude, absolute movement, etc. 2.7 Describe the nature of movement along faults. 2.8 Explain method of measuring throw and heave. 2.9 Calculate the net slip in fault. 2.10 Describe the mechanics of reverse faulting, thrust faulting and overthrust. 2.11 List mineral deposits associated with faults and joints (including local examples).	1. The teacher asks the student to distinguish between joint and fault and explain them using relevant examples. 2. Demonstrate failure by stress and classify joints and faults. 3. Draw a well labeled fault and determine throw, heave, hade, etc 4. Use 3D block diagram to relate stress/stain directions in joints and various fault types. 5. List fracture mineralization. 6. To measure throw and heave from several diagrams 7. Calculate net slip 8. List local deposit that are structurally (fractured) controlled.	Structural maps, mineral chart of Nigeria, White Board, Computers, related Software, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.	Demonstrate failure in rocks Rock fracturing	Carry out deformation (failure) in rocks Carry out 2.1, 2.5 – 2.9 using models	Unconfined strength testing machine Block models
General Objective 3.0 Understand Folding						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
6-8	1.1 Describe folds e.g. reclined fold, synorms, antiform. 1.2 Describe fold systems (viz geosyncline, geoanticline, anticlinorium, etc.).	The Teacher asks the students to: 1. Draws the various types of folds and classifies them. 2. Demonstrate the use of stereographic	Drawing paper, pencil, stereonet, tracing paper, White Board, Computers, related	Demonstrate plotting of fold planes, axes, plunge, pitch etc in stereonet Demonstrate the construction of structure contour maps	Carry out plotting of planes, axes, plunge, pitch etc in stereonet Carry out construction of structure contour map	Drawing paper, pencil, stereonet, tracing paper, White Board, Computers, related Softwares, Power Point Projector, Flip

	<p>1.3 Explain office techniques in study of folds (e.g. equal area and stereographic projections).</p> <p>1.4 Apply the techniques in 3.3 above to study folds.</p> <p>1.5 Explain the use of Pi-diagrams and beta diagrams in analyzing folds.</p> <p>1.6 Analyze folds using the diagrams in 3.5 above.</p> <p>1.7 Explain how to calculate the depth of folding.</p> <p>1.8 Perform calculations on folding depth.</p> <p>1.9 Explain the preparation of structure contour maps.</p> <p>1.10 Prepare structure contour maps.</p> <p>1.11 Describe flexure folding, shear folding and flow folding.</p> <p>1.12 Explain the dynamics of folding the problem of temperature, confining pressure, stress and time involved.</p> <p>1.13 Differentiate between tectonic and non-tectonic folds.</p>	<p>projections in describing fold orientations</p> <p>3. Plot fold planes, axes, plunge, pitch etc in stereonet.</p> <p>4. Construct structure contour maps.</p> <p>5. Explain environmental factors on folding.</p> <p>6. The teacher gives assignment on preparation of structure contour maps and equal area and stereographic projections.</p> <p>7. Look at graphical picture describing the effects confining pressure temperature etc on folding.</p>	<p>Softwares, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>			<p>Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.</p>
General Objective 4.0 Understand three point problems in structural geology.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
9	<p>4.1 Explain method of locating height of a bed at three or more points.</p> <p>4.2 Calculate the height of a bed from its known depth in boreholes, mine shafts, etc.</p> <p>4.3 Locate the direction of strike in a three-point</p>	<p>1. Explain using relevant examples.</p> <p>2. Demonstrate using geologic maps, borehole data and mine shafts to solve 3point problems</p>	<p>Maps, borehole data, mine shafts, White Board, Computers, related Softwares, Power Point Projector, Flip</p>	<p>Demonstrate how to solve 3 point problem using geologic maps, bore hole data and mine shaft</p>	<p>Solve 3 point problem using geologic maps borehole data and mine shaft</p>	<p>Writing and drawing material.</p>

	problem. 4.4 Calculate dip from a three-point problem.		Charts, Interactive Board, Recommended Textbooks, Related Journals and Lecture Notes, Drawing tools, etc.			
General Objective 5.0 Understand fundamental concepts of Geotechnics						
week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
10-12	5.1 Describe the following concepts: 5.2 Petroleum and plate tectonics. 5.3 Island arcs and deep sea troughs. 5.4 Mountain chains and Geosynclines. 5.5 Shields and Basin Structures. 5.6 Describe Blocks on the following basis: 5.7 Transform faults and mid-ocean ridges. 5.8 Continental drift. 5.9 Petroleum provinces. 5.10 Apply geotectonic concepts to structural geology problems.	1. The teacher asks the students to state the plate tectonic theory. 2. Relate the plate tectonic theory to major geologic processes. 3. List the different types of crustal movements with relevant examples. 4. Review the major petroleum provinces and relate to plate boundaries. 5. Relate crustal movements to structures	Tectonic map of the earth, White Board, Computers, related Software, Power Point Projector, Flip Charts, Interactive Board, Recommended Textbooks, Related Journals.			
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: FLUID MECHANICS		COURSE CODE: MEC 306		CONTACT HOURS: 4HRS/WK L = 2P = 2		
GOAL: The Course is Intended to Acquaint the Students with the Principles of Fluid Flow and Measurement and Working Principles of Hydraulic Machines and their Applications						
COURSE SPECIFICATION : THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
General Objective: 1.0 Understand the working principles and the use of different types of fluid flow measuring devices						
1	1.1 Explain the need for fluid flow measurement (Review) 1.2 Explain stagnation point, stagnation pressure and dynamic pressure in a fluid 1.3 Define the coefficients of velocity, contraction and discharge	Explain the working principles and the use of different types of fluid flow measuring devices Assess the students.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Identify fluid flow measuring devices	Demonstrate the working principles and the use of different types of fluid flow measuring devices Assess the students.	Venturimeter, Pressure gauge, tanks, fluid nozzle etc
General Objective: 2.0: Understand the working principles and use of different types of fluid flow measuring devices						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
2	2.1 Describe a flow nozzle venturimeter with the aid of a sketch. 2.2 Derive expressions for the actual and ideal discharges through a venturimeter, nozzle 2.3 Obtain the expression for the actual and ideal discharges through an orifice meter, venturimeter and nozzles.	Explain the working principles and the use of different types of fluid flow measuring devices Assess the students.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Carry out simple measurement of fluid flow test.	Demonstrate the working principles and the use of different types of fluid flow measuring devices Assess the students	As in 1 above.

General Objective 3.0: Understand the working principles and use of different types of fluid flow measuring devices						
Week	Specific Learning Outcome:	Teachers' Activities	Resources			
3	3.1 Describe a flow nozzle. 3.2 Obtain an expression for the actual and ideal discharges through a flow nozzle. 3.3 Define a notch. 3.4 Describe rectangular and V-notches. 3.5 Describe a weir and determine its coefficient of discharge	Explain the working principles and the use of different types of fluid flow measuring devices Assess the students.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Carry out a simple test and determine coefficient of discharge of the test	Demonstrate the working principles and the use of different types of fluid flow measuring devices Assess the students.	As in 1 above
General Objective 3.0: Understand the working principles and use of different types of fluid flow measuring devices						
4	Explain the use of notches and determine their coefficient of discharge. 4.2 Describe a suppressed weir 4.3 Derive an expression for the head lost due to friction. 4.4 Explain the graph of Vs/Re for pipe flows 4.5 Solve problems related to 4.1- 4.3 above	Explain the working principles and the use of different types of fluid flow measuring devices Assess the students.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Carry out measurement through notches and determine coefficient of discharge	Demonstrate the working principles and the use of different types of fluid flow measuring devices Assess the students.	Notches Tanks, Pressure gauge etc
General Objective 5.0: Understand Channel Flow						
Week	Specific Learning Outcome:	Teachers' Activities	Resources	Specific Learning Outcome:	Teachers' Activities	Resources
5	5.1 Define an open channel flow 5.2 Identify the instances where open channel flow exists. 5.3 Explain the terms, 'wetted perimeter' (p) and 'hydraulic mean depth (m)	Explain to students different open channel flows	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Identify different open channel flow	Show different open channel flow	Channel rectangular chain, circular channel etc

General Objective 6.0: Understand the principles in Channel Flow						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
6	6.1 Develop Chazi formula for a rectangular open channel 6.2 State the formula for flow in channels 6.3 Determine the head loss due to friction in an open channel flow	Show examples of calculations on different open channel flows	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Carry simple experiments and determination of head loss due to friction in an open channel flow	Demonstrate examples of calculations on different open channel flows	Channels Fluid gauge
General Objective 7.0: Understand the different types of flow in open channel and the parameters governing them.						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
7	7.1 Derive the expression for the friction factor 7.2 Solve simple problems related to 3.7 above 7.3 Determine the Reynolds number in a pipe flow 7.4 Calculate the friction loss along pipes.	Show examples of calculations on different open channel flows	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
General Objective 8.0: Know the working principles of positive displacement and rotor-dynamic machines and their relative uses.						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
8	8.1 Classify hydraulic machines as positive displacement and rotor-dynamic machines. 8.2 Give at least 3 examples for each type of machines in 4.1 above 8.3 Describe the main parts of positive	Explain the working principles of positive displacement and rotor-dynamic machines and their relative uses	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			

	displacement and rotor-dynamic machines 8.4 Explain the working principles of positive displacement and rotor-dynamic machines					
General Objectives 9.0 :Understand the principles in reciprocating Pumps						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
9	9.1 Identify the merits and demerits of each type of machines. 9.2 Draw the essential parts of a reciprocating pump and explain its working principles. 9.3 Draw the PV diagram for a reciprocating pump for a complete working cycle. 9.4 Derive an expression for the discharge from reciprocating pump.	Show the principles in reciprocating Pumps	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
General Objective 10.0: Know the working principles of positive displacement and rotor-dynamic machines and their relative uses.						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
10	10.1 Distinguish between single acting and double acting single cylinder and multi-cylinder pumps 10.2 Define the terms coefficient of discharge and percentage slip. 10.3 Draw the essential parts of a centrifugal pump and explain its working principles	Demonstrate the working principles of positive displacement and rotor-dynamic machines and their relative uses	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			

General Objective 11.0: Know the working principles of Pumps						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
11	11.1 Discuss the various types of centrifugal pumps 11.2 Draw the velocity triangles for the inlet and outlet sides of the impeller 11.3 Explain the terms absolute velocity and relative velocity. 11.4 Develop an expression for the work pump power. 11.5 Explain the working principles of impulse and reaction turbines 11.6 Describe the pelton wheel and explain its working principles 11.7 Draw the velocity triangles and derive and expression for the power of pelton wheel	Show different types of pumps.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			

General Objective 12.0: Know the working principles of positive displacement and rotor-dynamic machines and their relative uses.						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
11-12	12.1 Draw the velocity triangles and derive an expression for the power developed by a reaction wheel 12.2 Define unit speed, unit discharge unit power and specific speed for hydraulic machines. 12.3 Solve problems related to 1.3 above. 12.4 Explain the following phenomena in fluid flow; pressure surge, water hammer, cavitation. 12.5 Explain the effects of problems on rotor dynamics machines and their prevention. 12.6 Conduct load tests on reciprocating pump and analyze the results. 12.7 Conduct load tests on centrifugal pump and analyze the results. 12.8 Conduct load test on pelton wheel 12.9 Conduct load test on a Francis wheel	Outline the working principles of positive displacement and rotor-dynamic machines and their relative uses	Power point projector/whiteboard	Demonstrate practicals on the working principles of positive displacement and rotor-dynamic machines and their relative uses	Carry out practicals on the working principles of positive displacement and rotor-dynamic machines and their relative uses	Pumps
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Automation and Computer Application in Petroleum Industry			Course Code: PET 302	Contact Hours: 5HRS/WK L = 2 P = 3		
Goal: The Course is designed to acquaint the student with the basic principles of automation and application of computer in the petroleum industry						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective: 1.0 Understand Analysers					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1-2	1.1 Explain Analysers. 1.2 Describe different types of analysers; electrical, chemical, magnetic, and chromatographic gas analysers. 1.3 Describe instrument used for determining density of petroleum products, e.g. viscometer, concentration meter 1.4 Describe salt Analysers. 1.5 Describe instrument used for determining relative density of petroleum.	<ul style="list-style-type: none"> Describe different types of analysers. Explain the instrument used for determining density of petroleum products Assess the students. 	White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Determine density and relative density of petroleum product using appropriate techniques. Perform gas analysis using analysers	Carry out determination of density and relative density of petroleum product. Carry out gas analysis using analysers	Petroleum products, Analysers, viscometer, concentration meter
General Objective 2.0 Understand Automatic Control						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3-6	2.1 Review the use of automatic control in production process. 2.2 Explain the operating principles of automatic control systems. 2.3 Explain the main concepts and classification of automatic systems. 2.4 Explain the concept of stability of automatic control. 2.5 Explain the indicators of quality of control process; static accuracy of control, overcontrol, process reaction rate, damping	<ul style="list-style-type: none"> Illustrate activities 2.1 to 2.7 with computer demonstration where necessary. Assess the students. 	White Boards, Computers, Related Software's, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

	<p>factor.</p> <p>2.6 Classify automatic controllers; positioning controllers, self-actuating controllers, pressure controllers, temperature controllers, level controllers, pneumatic controllers.</p> <p>2.7 Describe actuating systems</p>					
General Objective 3.0 Understand the Automation of Oil-field						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
7-10	<p>3.1 Describe the conventional representation of automatic means.</p> <p>3.2 Explain the automation of oil-wells.</p> <p>3.3 Describe automated block-type of separator with preliminary blow-off of formation water.</p> <p>3.4 Explain the unit of hot-vacuum separation.</p> <p>3.5 Describe the automation of pumping plant.</p> <p>3.6 Describe the automation of unit of formation pressure maintenance system.</p>	<ul style="list-style-type: none"> • Illustrate activities 3.1 to 3.6 with computer demonstration where necessary. • Assess the students. 	<p>White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals</p>	-	-	-
General Objective: 4.0. Understand the Automation of Gas Condensate Field						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
11-12	<p>4.1 Explain the methods and means for controlling the operation of gas well.</p> <p>4.2 Explain automation in unit of low temperature separation of gas.</p> <p>4.3 Describe the automation of process of short-cycling absorption.</p>	<ul style="list-style-type: none"> • Illustrate activities 4.1 to 4.4 with computer demonstration and make notes. • Assess the students. 	<p>White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture</p>	-	-	-

	4.4	Explain automation of field gas-dividing plant		notes & Related Journals			
General Objective 5.0: Understand the Application of Computer in the Petroleum Industry							
Week	Specific Learning Outcome		Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
13-14	5.1	Explain the mathematics for petroleum engineering calculations	<ul style="list-style-type: none"> • Illustrate activities 5.1 to 5.4 with computer demonstration where necessary. • Assess the students. 	White Boards, Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Solve petroleum engineering problems using the computer.	Use computer to solve petroleum engineering problems	Computers, Related Softwares, PowerPoint Projectors,
	5.2	Develop fluid equations pertinent to petroleum production.					
	5.3	Solve potential and diffusivity equations.					
	5.4	Explain the numerical simulation by finite differences and finite element methods.					
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.							

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
Course: Petroleum Equipment, Operations and maintenance		Course Code: PET 304		Contact Hours: 5HR/WK: L=2 P=3		
Goal: This Course is designed to impart in the student the necessary skills for the operation and maintenance of drilling equipment						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0 Understand the Equipment Used in Drilling and Production Operations					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1-2	<p>1.1 Describe the various equipment used in drilling operations, e.g. drilling string, prima movers, draw work, shale shaker and screens, derrick and mast, Substructures, rotary table, swivel, drillers instrument panel, BOP, etc.</p> <p>1.2 Describe the various equipment used in productions: casing heads, packers, tubing, hanger, Christmas tree, valves and fittings, pressure gauge, temperature gauge, etc.</p> <p>1.3 Identify each item in 1.1 and 1.2.</p>	<ul style="list-style-type: none"> List the various equipment for drilling and production operations Describe the features of drilling and production equipment. Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals,	Dismantle, clean, lubricate and re-assemble drilling and production equipment.	Carry out the operation and maintenance processes.	Valves, Pumps, Compressors, Fan actuators, Pipe couplings and fitting, Torque converter.
General Objective 2:0 Understand the operations of drilling and production equipment						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3-6	<p>2.1 Explain the operation of each item in 1.1 and 1.2 above.</p> <p>2.2 Operate the various equipment in 1.1 and above.</p>	<ul style="list-style-type: none"> Describe the operation of all drilling and production equipment listed in 1.1 and 1.2. Explain the operation to students. Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective3.0. Understand Care and Maintenance of Drilling and Production Equipment						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
7-14	3.1 Describe the care and maintenance of the drilling	<ul style="list-style-type: none"> Explain each procedure for proper 	Computers, Related Softwares,	-	-	-

	<p>and production equipment in 1.1.</p> <p>3.2 Carry out maintenance of drilling equipment and production equipment in 1.1.</p>	<p>use and routine maintenance of drilling and production equipment as in 1.1</p> <ul style="list-style-type: none"> • Produce operation and maintenance report on each equipment. • Asses the students. 	<p>PowerPoint Projectors, Flip Charts, Interactive</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.

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM GINEERING TECHNOLOGY						
COURSE: Applied Thermodynamics			COURSE CODE: PET 401		CONTACT HOURS: 3HOURS: L=1 P=2	
GOAL: The Course is Designed to enable the Student apply the concepts of Thermodynamics to practical engineering problems						
COURSE SPECIFICATION : THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0: Understand the laws relating to gas mixtures so as to solve problems related to petroleum industry.					
	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
1-2	1.1 State the laws of partial pressure (Gibbs/Dalton Law). 1.2 Explain the terms; specific humidity, relative humidity, dew point, saturated and unsaturated air. 1.3 Carry out relevant calculations in systems such as air-conditioner, cooling tower.	<ul style="list-style-type: none"> Demonstrate the use of psychrometric charts to determine the properties of gases and vapours. Explain the terms in 1.2 and 1.3 Perform calculations in systems such as cooling tower and air-conditioner Assess the student 	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Use psychrometric charts to determine the properties of gases and vapours.	Determine the properties of gases and vapours using psychrometric charts.	psychrometric charts
General Objective 2.0: Understand the Second Law of Thermodynamics and its corollaries						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
3-6	2.1 Review the laws of thermodynamics. 2.2 State the second law of thermodynamics. 2.3 Explain the relationship between heat and work, and the related changes in the properties of the system. 2.4 Explain the relationship between the second law and entropy. 2.5 Explain the relationship between internal energy, enthalpy and flow work. 2.6 Relate heat transfer and entropy for a reversible process.	<ul style="list-style-type: none"> Illustrate the Second Law of thermodynamics Assess the students. 	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

	2.7 Solve problems relating to 2.2 to 2.6 above.					
General Objective 3.0: Understand Power Cycles and Performance Characteristic for Internal Combustion Engines						
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
7-10	<p>3.1 Explain the following cycles; Otto, diesel, dual combustion and joule.</p> <p>3.2 Explain the following terms; piston displacement, compression ratio, indicated power, friction power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, air/fuel ratio, calorific value, volumetric efficiency, specific fuel consumption, air-saturated efficiency and relative efficiency.</p> <p>3.3 Explain energy balance.</p> <p>3.4 Perform necessary calculations in 3.2.</p>	<ul style="list-style-type: none"> • Explain terms in 3.1 and 3.2 • Explain energy balance and the necessary calculations. • Assess the students. 	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-
General Objective 4.0: Understand Compressors						

Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
11-13	<p>4.3 Explain the following terms; Compression ratio, pressure ratio, clearance volume, volumetric efficiency, compressor work, isothermal efficiency, adiabatic efficiency, multi-staging, inter-cooling and after-cooling.</p> <p>4.4 Analyse; single stage reciprocating compressor, multi-stage reciprocating compressor and rotary compressor.</p> <p>4.5 Carry out calculations of air-flow(capacity) and compression work efficiency on each of the compressors in 4.2</p>	<ul style="list-style-type: none"> • Illustrate the terms in 4.1 and 4.2 • Perform calculations of air-flow(capacity) and compression work efficiency on each of the compressors in 4.2 • Assess the student on the above 	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Determine the performance characteristics of compressors	Carry out performance characteristics of compressors	compressor
<p>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>						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Drilling Design Technology		Course Code: PET 403	Contact Hours: 5HRS/WK L = 2 P = 3			
Goal: The Course is designed to acquaint the student with the concepts of drilling design and technology						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective: 1.0. . Understand Drill-Bit Design and Selection Criteria					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
1 - 2	1.14 Explain the fundamentals bit design for roller bearings, cones, teeth, etc. 1.15 Describe the heart-treatment (hard-facing) of drill bit teeth. 1.16 State criteria for selecting bits e.g. type, formation, etc. 1.17 Explain the determination of the wear factor of the bit working surface and its efficient performance at the hole bottom. 1.18 Explain the following drilling data and job evaluation: - bit record, drilling data acquisition, drilling cost as represented by the drilling cost Equation; $C = \frac{B + R(T + t)}{F}$	<ul style="list-style-type: none"> Explain activities in 1.2 to 1.4 Compute data acquisition on drilling operation Asses the student 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Identify types of drill bits	Show various types of drill bits Dismantle and couple drill bits	Different types of drill bits
General Objective 2.0 Understand the Factors Affecting Penetration Rate in Drilling.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
3 - 5	2.6 Explain factors that affect penetration Rate of drill-bit: Bit selection and weight, Rotary speed, Fluid properties (plastic viscosity, yield point, density, and solid content), Operating practice, Fluid flow (Newtonian and plastic), Pressure drop across bit nozzles.	<ul style="list-style-type: none"> Explain factors controlling drill bit penetration rates Explain the process of pressure changes due to pipe movement Asses the students. 	Computers, Related Software's, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

	2.7 Describe the phenomenon of pressure surges caused by pipe movement.					
General Objective 3.0: Understand the Selection and Use of Drill Pipes.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
6	<p>3.7 Explain the selection criteria of drill pipes for various drilling methods.</p> <p>3.8 Describe turbo drill, and Electro drill in gas wells.</p> <p>3.9 Explain the forces acting on the drill pipe string e.g. Tongue, tension, fatigue, etc.</p> <p>3.10 Explain tubular (casing, tubing and drill pipe) design for hydrogen sulphide and fatigue corrosion</p>	<ul style="list-style-type: none"> Discuss the factors to be considered in drill pipes selection for various drilling methods Explain the activities in 3.2 to 3.4 Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	<p>Identify the components of drill string.</p> <p>Dismantle and couple drill string.</p>	Demonstrate various components of drill string	Drill bits, Drill pipe, Bit sub, Torque Rotary table, Drill collar.
General Objective 4.0: Understand Bottom Hole Assembly						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
7 - 8	<p>4.6 Describe the drill collars.</p> <p>4.7 Outline the effect of 4.1 on bit performance and sticking in key seats.</p> <p>4.8 State types of drill collars.</p> <p>4.9 Describe the features; care and maintenance of drill Collars in 4.3.</p> <p>4.10 Describe straight hole drilling under the following: Hourly survey, Pendulum effect, Anti-pendulum effect, Stabilization and Stabilizer reamer.</p>	<ul style="list-style-type: none"> Explain types of drill collars and how they affect drilling bit performance Explain the activities in 4.4 and 4.5 Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	<p>Identify drill collar.</p> <p>Service drill collar.</p> <p>Dismantle and couple bottom hole assembly</p>	Demonstrate the coupling of bottom hole assembly.	<p>Various hoses and fittings/couplings. Used/serviceable automatic gear box.</p> <p>Drill collar.</p> <p>Stabilizer reamer.</p>

General Objective: 5.0. Understand the Selection Criteria and Circulation of Drilling Fluids.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
9	5.3 Describe types of drilling fluids. 5.4 Explain the selection parameters of 5.1. 5.5 Compute clay/water ratio to obtain a given mud weight. 5.6 Perform hydraulic calculation of fluid circulation for rotary, turbo, and electro drilling. 5.7 Describe the preparation of Mud-Report. 5.8 Describe the fluid circulation system.	<ul style="list-style-type: none"> • Discuss types of drilling fluid and criteria for selection of a particular fluid for drilling • Explain the activities in 5.3 to 5.6 • Prepare mud-report • Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Prepare drilling mud,	Demonstrate drilling mud preparation	Water, Clay, Bentonite, Container, Chemicals, Rheometer, Viscometer,
General Objective 6.0: Understand Chemical Treatment of Drilling Muds						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
11 - 13	6.7 Enumerate chemical agents for treatment of drilling muds. 6.8 Discuss the effects of the agents in 6.1.	<ul style="list-style-type: none"> • Describe the chemical agents for treating drilling muds and the resultant effects • Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

General Objective 7.0: Understand Mud Weighting						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
14	7.7 Explain mud-weighting. 7.8 Explain how to raise the weight of a unit for Drilling mud by a given factor.	<ul style="list-style-type: none"> • Explain the activities in 7.1 and 7.2 • Raise the weight of a drilling mud using different given factors • Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Measure the physical properties of drilling mud.	Carry out the following tests: <ul style="list-style-type: none"> • Viscosity • Density • Yield strength • Temperature • Swelling properties 	Fann Viscometer, Rheometer Mud testing kits Thermometer Density bottles Stop watches Centrifuge machine Mud balance Mud tank Blender Measuring cylinder Hot plate
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Petroleum Economics		Course Code: PET 405	Contact Hours: 2HRS/WK L = 2			
Goal : The Course is designed to enable Students appreciate the principles of economics and financial management applicable to upstream petroleum industries						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective: 1.0 Understand the Fundamentals of Petroleum Accounting					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	1.1 Define management accounting. 1.2 Explain decision accounting and control accounting as elements of 1.1. 1.3 Describe the stages of profit planning and control cycle. 1.4 Explain the following financial statements: Balance sheet, Profit and loss account, Profit and loss appropriation account, Cash flow or funds flow statements. 1.5 Explain the terms - Assets, Capital, Liabilities and give their relationship 1.6 Explain the following costing systems: Absorption costing, Marginal costing, Differential costing 1.7 Describe the application of the costing systems in .1.6. 1.8 Explain Job-costing and process costing and state how they can be applied in the upstream oil industry. 1.9 Differentiate between Historical and standard costing based on 1.8. 1.10 Describe the Break-Even Analysis using appropriate chart.	<ul style="list-style-type: none"> Highlight the meaning of management accounting and its relevance as a control key, using any profit making venture Explain activities in 1.3 to 1.7 Define job costing and other forms of costing. Illustrate their applications in upstream oil industry Explain with a classical example the use of break-even analysis in a given venture Produce break-even analysis of some selected venture Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

	1.11 Perform calculations on 1.10.					
General Objective 2.0 Understand the Various Methods of Financial Appraisal in the Upstream Oil Industry.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3-5	<p>2.1 Explain the obligations of licenses and licensor including the concept of Memorandum of Understanding (MOU).</p> <p>2.2 Explain the royalty system.</p> <p>2.3 Explain the concepts of petroleum profit taxes.</p> <p>2.4 Explain the inter-relationship between leases, licenses, royalties and profit taxes.</p>	<ul style="list-style-type: none"> Highlight the duties on licenses and its holder and business ownership agreement Explain memorandum of understanding (MOU) Describe royalty system, profit taxes and community development as it affects oil industry Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, MOU certificates	-	-	-
General Objective 3.0: Understand Leases, Licenses, and Royalties, Profit Taxes.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
6-8	<p>3.1 Explain the various types of leases and licenses.</p> <p>3.2 Explain the laws and regulations relevant to leases.</p> <p>3.3 Explain the procedure for obtaining leases and licenses.</p> <p>3.4 Explain the obligations of the leases and leasor.</p> <p>3.5 Explain the various types of licenses, (e.g. OPL, OML, Pipelines license, etc.).</p> <p>3.6 Explain the concepts of petroleum profit taxes.</p> <p>3.7 Explain the inter-relationship between leases, licenses, royalties and profit tax</p>	<ul style="list-style-type: none"> Enumerate steps to be satisfied for obtaining licenses. Cite relevant laws and regulations governing the administration, operation and control of leases and licenses Describe royalty system, profit taxes, community development as it affects the upstream petroleum industry Distinguish between leases and licenses, royalties and profit tax Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

General Objective 4.0: Understand Relevant Laws and Regulations						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
9 - 11	4.1 State the relevant laws and regulations governing petroleum exploration and exploitation.	<ul style="list-style-type: none"> Cite and interpret relevant laws and regulations governing petroleum exploration, drilling, production, refining and marketing. Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective: 5.0 Understand The Contribution and Importance of Petroleum to the National Economy						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
12-13	5.1 Explain the contribution of petroleum to the national economy in term of: (1) Share of total National Revenue, (2) Contribution of Gross Domestic Production (G.D.P) etc. 5.2 Explain the roles of international organization such as OPEC, APPA etc, in regulating petroleum production and export levels.	<ul style="list-style-type: none"> Explain the activities in 5.1 and 5.2 Organize seminar on the roles of oil cartels: OPEC, APPA etc Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Petroleum Reservoir Analysis		Course Code: PET 407	Contact Hrs: 4HRS/Week 2=L 2=P			
Goal : The Course is designed to acquaint the student with the principles and practice of petroleum reservoir analysis						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0: Understand the Occurrence and Classification of Reservoir Rock					
	Specific Learning Outcome:	Teacher Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
1-3	1.1 Describe the following surface occurrence: mud volcanoes, disseminated deposits, vein deposits, Kerogen shale. 1.2 Identify the occurrences in 1.1. 1.3 Describe sub-surface occurrence: showings, pools, fields, provinces. 1.4 Explain how geological age of reservoir rocks can be determined. 1.5 Classify and give the nomenclature of reservoir rocks e.g. fragmental, chemical, marine and non-marine reservoir rocks. 1.6 Identify the rocks in 1.5.	1.6 Define mud volcanoes, disseminated deposits, vein deposits, Kerogen shale. <ul style="list-style-type: none"> • Distinguish between showings, pools fields and provinces. • Classify reservoir rocks. • Assess the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 2.0: Understand Reservoir Pore Space and Its Significance						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning	Teacher	Resources

				Outcome:	Activities	
4-6	<p>2.1 Define porosity.</p> <p>2.2 Explain porosity measurement.</p> <p>2.3 Define permeability</p> <p>2.4 Explain permeability measurement.</p> <p>2.5 Distinguish between effective and relative permeability.</p> <p>2.6 Explain the relationship between porosity and permeability.</p> <p>2.7 Explain the origin of reservoir pore space</p> <p>2.8 Describe reservoir pore space e.g. primary or intergranular, secondary or intermediate.</p> <p>2.9 Explain the significance of reservoir pore space in petroleum exploitation.</p>	<p>Distinguish between porosity and permeability and their relationships</p> <p>Enumerate the origin of pore space in reservoir</p> <p>Describe the various pore spaces</p> <p>Assess the students.</p>	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards etc.	Perform porosity and permeability tests.	Carry out porosity and permeability measurement	Pore sample, porosimeter, permeameter, core holder, core cutter.
General Objective 3.0: Understand Reservoir Traps						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
7-9	<p>3.1 Describe the anti-clinal theory of reservoir traps.</p> <p>3.2 Classify traps e.g. structural traps, Stratigraphic and combination traps.</p>	<ul style="list-style-type: none"> Describe by drawing to distinguish the various traps. Explain the essence of geologic 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive	-	-	-

	<p>3.3 Describe structural traps caused by folding, faulting and fracturing.</p> <p>3.4 Identify traps in 3.3</p> <p>3.5 Describe: (i) primary Stratigraphic traps in clastic rocks, in carbonate rocks; (ii) secondary Stratigraphic traps. (iii) Fluid traps (hydrodynamic traps).</p> <p>3.6 Describe the following combination traps: (i) salt domes and their occurrence. (ii) Gulf coast salt plugs, etc.</p> <p>3.7 Identify 3.5 and 3.6.</p> <p>3.8 Explain the significance of reservoir traps in petroleum reservoir analysis.</p>	<p>deformities as natural traps of fluids</p> <ul style="list-style-type: none"> • Differentiate features of salt domes, gulf coast, salt plugs etc • Enumerate the importance of fluid traps in petroleum reservoir analysis • Assess the students 	<p>Boards, Recommended textbooks, lecture notes & Related Journals etc.</p>			
General Objective 4.0: Understand Reservoir Fluids						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
10-12	<p>4.1 Define reservoir fluids.</p> <p>4.1 List f reservoir fluids. e.g. water, oil, gas.</p> <p>4.2 Explain the following: fluid distribution & fluid contacts.</p>	<ul style="list-style-type: none"> • List the various reservoir fluids and the characteristics of these fluids. • Assess the students 	<p>Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, etc.</p>	<p>Determine characteristics of reservoir fluids e.g. (composition, chemical and physical properties).</p> <p>Determine the impurities of reservoir fluids</p>	<p>Characterize reservoir fluids.</p> <p>Determine: H₂S, sulfur content, nitrogen, and mercaptans etc</p>	<p>Gas chromatography, atomic absorption spectrometer, X-ray fluoresce, X-ray diffractormeter</p>
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.						

PROPROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: CORROSION SCIENCE, PREVENTION AND CONTROL		COURSE CODE: PET 409		CONTACT HOURS: 4hrs L = 2 P = 2		
Goal : This Course is designed to acquaint the student with the principles of corrosion and its control						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
General Objective 1.0: Understand Classification and Types of Corrosion						
Week	Specific Learning Outcome	Teachers Activities	Resource	Specific Learning Outcome:	Teacher Activities	Resources
1-3	1.1 Define Corrosion. 1.2 Classify corrosion into dry and wet. 1.3 Explain the electrochemistry and metallurgy relevant to corrosion.	<ul style="list-style-type: none"> Explain why corrosion is common with some metals but negligible in others Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 2.0: Understand the Prevention of Corrosion						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
4-8	2.1 Describe passivity. 2.2 Define cathodic and anodic protection. 2.3 Explain the application of cathodic protection. 2.4 Describe pretreatment metal surfaces. 2.5 Outline types of metallic coatings. 2.6 Explain application of various types of metallic coatings, galvanizing, cladding, electro plating, shreddazing, aluminizing. 2.7 Explain the use of non-metallic materials such as polymer and ceramics in conditioning the environment or protecting materials e.g. enameling, glazing, paints, vanishes etc.	<ul style="list-style-type: none"> Illustrate the differences between cathodic and anodic corrosion prevention processes Explain the activities in 2.3 to 2.7 Show the application of non-metallic materials e.g. polymer and ceramic in corrosion preventions Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Perform corrosion test. Apply cathodic and anodic protection on samples subjected to corrosive media.	Carry out corrosion test, Carry out cathodic and anodic protection on samples subjected to corrosive media.	Chemicals, Electrolytic cells, Water Glass wires
General Objective 3.0: Understand the Control of Corrosion						
Week	Specific Learning Outcome:	Week	Specific Learning	Specific Learning	Teacher Activities	Resources

k			Outcome:	Outcome:		
9-12	<p>3.1 Name and define the role of inhibitors.</p> <p>3.2 Describe the basic monitoring, testing and inspection techniques in corrosion and corrosive environment.</p> <p>3.3 Explain anti-corrosion designs.</p> <p>3.4 Explain the role of design and economic aspects of corrosion in oil, chemical, light and heavy engineering industries including the domestic industries.</p>	<ul style="list-style-type: none"> • Explain the importance of role inhibitors • Highlight methods and techniques for general evaluation of corrosive environment • Prepare group reports on the roles of design and economic aspect of corrosion in (a) oil (b) chemical (c) light and heating industries • Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Perform galvanizing treatment on corroded methods	Carry out galvanizing treatment on corroded metals	Paint, Water, Iron brush, Sandpaper Chemicals
<p>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>						

PROGRAMME: HND IN PETROLEUM ENGINEERING TECHNOLOGY						
Course: Stratigraphy and Sedimentology		Course Code: PET 411	Contact Hours: 5 hours/week 2=L 3=P			
Goal : The Course is designed to acquaint the student with the Stratigraphy of Nigeria and principles of Sedimentology						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
General Objective1.0 Understand the Stratigraphy of Nigeria						
Week	Specific Learning Outcome	Teacher Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1-2	1.1 Define Stratigraphy. 1.2 Describe the following Stratigraphic features: basement rocks and meta-sediments, cretaceous' deposits, Tertiary' deposits, recent sediments. 1.3 Give examples of the features in 1.2.	<ul style="list-style-type: none"> Use Stratigraphic column to describe 1.2 Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, Stratigraphic charts	-	-	-
General Objective 2.0: Understand Weathering and Rock Cycle.						
Week	Specific Learning Outcome	Teacher Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3-4	2.1 Describe the rock cycle. 2.2 Describe the following weathering processes: biological weathering and soil formation, - physical weathering, chemical weathering. 2.3 State economic significance of the weathering processes in 2.2.	Explain rock cycle and weathering.	Board, writing tools and recommended text books, rock samples etc	-	-	-

General Objective 3.0: Understand Different Types of Sediments						
Week	Specific Learning Outcome	Teacher Activities	Resources	Specific Learning Outcome	Teacher Activities	Resources
5-7	3.1 Describe the following: Allochthonous sediments (mudrocks): sapropelites and oil shales, orthoclauystones and clay minerals. 3.2 Identify the sediments in 3.1 3.3 Describe pyrochlastic sediments (sandstones). 3.4 Give the nomenclature and classification of 3.3. 3.5 Explain the effect of diagenesis on the porosity of sandstones. 3.6 Identify sandstones. 3.7 Describe Autochthonous sediments e.g.:- carbonates, sedimentary iron-stones, phosphates, evaporites. 3.8 State the carbonate minerals and the physical component of carbonate rocks. 3.9 Give the nomenclature and classification of 3.8. 3.10 Identify sediments in 3.7	<ul style="list-style-type: none"> Define sediment. Enumerates various ways in identifying different sediments. display classification tables for the different sediments Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, Rocks samples	Identify various types of clastic sediments: (shale, sand, stone etc). Perform sieve analysis.	Show various types of rocks samples Carry out sieve analysis	Sieve shakers, sediments samples, mortals and petals, pulverizes, graph sheets, set of sieves.
General Objective 4.0: Understand Transportation and Sedimentation Processes						
Week	Specific Learning Objectives	Teacher Activities	Resources	Specific Learning Objectives	Teacher Activities	Resources
8-9	4.3 Describe the following processes: Aqueous Processores, Sedimentation from traction currents, Sedimentation from turbidity currents, Sedimentation from suspension, Eolian sedimentation from traction carpets, Eolian sedimentation from suspension, Glaciation and gravitational processes.	<ul style="list-style-type: none"> Explain the various hydrodynamic, glacial, and wind processes involve in transportation and deposition. Distinguish between traction and suspension Define turbidity. Assess the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

General Objective 5.0: Understand Sedimentary Structures						
Week	Specific Learning Outcome	Teacher Activities	Resources	Specific Learning Outcome	Teacher Activities	Resources
10-12	5.1 Describe the following sedimentary structures: Biogenetic sedimentary structures, Primary inorganic sedimentary structures, Pre depositional (interbed) structures, Syn depositional (interbed) structures, Post depositional sedimentary structures 5.2 Give examples of sediments with structure in 5.1	<ul style="list-style-type: none"> Define sedimentary structures. Classify sedimentary structures. Take students to the field to see the various sedimentary structures. Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Identify various sedimentary structures on the field.	Undertake field work. Demonstrate different structures.	Compass, global positioning system (GPS), hammer and chisel, sample bag, marker, masking tape etc.
General Objective 6.0: Understand Sedimentary Environment and Facies						
Week	Specific Learning Objectives	Teacher Activities	Resources	Specific Learning Objectives	Teacher Activities	Resources
12-15	6.1 State sedimentary environments. 6.2 Describe sedimentary facies. 6.3 State Walther's law. 6.4 Explain genetic increments of sedimentation sequences and cycles. 6.5 Classify sedimentary basins.	<ul style="list-style-type: none"> List the various sedimentary environments. Define facies. Introduce the processes of erosional, transportational and depositional cycles. Explain the popular systems of basin classification. Assess the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Identify micro fossils. Explain micro fossils. Correlate the rock and fossils	Determine micro fossils.	Microscope , rock sample, water, containers, relevant chemicals etc
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Petroleum Production Design		Course Code: PET 402	Contact Hours: 4HRS/WK L = 2 P = 2			
Goal : The Course is designed to acquaint the student with in depth knowledge of the concepts applicable to oil and gas production equipment and systems						
Course Specification: THEORITICAL CONTENT					PRACTICAL CONTENT	
Week	General Objective: 1.0. Understand the Exploitation Of Oil And Gas Fields.					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	1.1 State the fundamental properties of fluid filled rocks. 1.2 Explain the properties of porous medium containing multiple phase fluid. 1.3 State types of reservoir energy. 1.4 Perform calculation of the critical oil in place using volumetric method. 1.5 Explain methods of optimizing the production of the oil field.	<ul style="list-style-type: none"> Explain the types of reservoir rocks and fluids in the oil field. Explain activities in 1.4 and 1.5 Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	Identify different types of separators, Heaters, pressure and temperature gauges	Demonstrate the measuring and separating equipment.	Different separators types Measuring instrument: Orifice meter Thermometer etc
General Objective 2.0 Understand the Design of Oil and Gas Gathering Systems.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
3 - 5	2.1 Describe the natural flow gathering systems. 2.2 Describe the basic assemblies and equipment of automatic measuring and separating units. 2.3 Undertake design of gathering systems.	Explain design of surface production facilities separators, heater treaters etc. Explain types of gathering system	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-
General Objective 3.0: Understand Well Stimulation and Work Over.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
6-8	3.1 Explain hydraulic fracturing on the following basis:	<ul style="list-style-type: none"> List features of fracture fluids 	Computers, Related Softwares,	-	-	-

	<p>fracture fluids and their properties, fracturing techniques, Numerical problems on hydraulic fracturing.</p> <p>3.2 Explain acidizing operation.</p> <p>3.3 Describe work over operations on the following bases: Work over fluids, Selection criteria of work over fluids and coiled tubing work over operations.</p> <p>3.4 Undertake design of well-stimulation and work over.</p>	<ul style="list-style-type: none"> • Describe fracturing techniques • Solve numerical problems on hydraulic fracturing • Define acidizing operation • Explain the nature of work over fluid selection processes of the fluids and coiled tubing work over operations • Present group design of well simulation and work over • Asses the students 	<p>PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.</p>			
General Objective 4.0: Understand Secondary and Tertiary Recovery Processes.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
9 - 10	<p>4.1 List types of artificial lift.</p> <p>4.2 List types of reservoir.</p> <p>4.3 Explain the Artificial lift in 4.1</p> <p>4.4 State properties of natural gas.</p> <p>4.5 Describe the reservoir fundamentals required for gas Lift design.</p> <p>4.6 Explain the multiphase vertical and horizontal flow.</p> <p>4.7 State the design criteria of 4.6.</p> <p>4.8 Undertake a design for 4.6.</p> <p>4.9 Explain valve mechanics.</p> <p>4.10 Design a gas lift installation.</p> <p>4.11 Explain the compressor system.</p> <p>4.12 State the economics of gas lift installation.</p> <p>4.13 Explain the practical and</p>	<ul style="list-style-type: none"> • Mention types of artificial lifts and reservoir • List properties of natural gas • Explain the importance of basic requirement for gas lift design • Describe valve mechanism • Carry out gas lift installation design • Describe water flooding in residual oil recovery and flooding applications method • Show video film on operation of artificial lift • Report same on flood 	<p>Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards.</p>			

	<p>theoretical consideration of Water flooding in residual oil recovery.</p> <p>4.14 Describe the prediction methods for miscible and chemical flooding.</p> <p>4.15 Describe the following thermal oil recovery methods: - underground combustion or in-situ combustion. - Cyclic steam injection and steam flooding.</p> <p>4.16 Undertake calculation of oil recovery and heat losses In 4.15</p>	<p>recovery techniques</p> <ul style="list-style-type: none"> • Carry out numerical analysis of oil recovery and heat processes • Asses the students 				
General Objective: 5.0. Understand Wire-line Operations						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
11	<p>5.1 Describe wire line operations.</p> <p>5.2 Describe various wire line tools used in petroleum Operations including fishing tools.</p> <p>5.3 Undertake design of wire line programme.</p>	<ul style="list-style-type: none"> • Define wire line operation. • Explain the tools applied in petroleum operations • Carry out the design as in 5.3 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards.	-	-	-

General Objective: 6.0. Understand Transportation and Storage Systems of Oil and Gas						
Week	Specific Learning Outcome	Week	Specific Learning Outcome	Specific Learning Outcome:	Teachers Activities	Resources
12-13	6.1 State facilities for surface production. 6.2 Explain flow line network, flow line corrosion and protective devices. 6.3 Describe the paraffin formation control. 6.4 State types of separators. 6.5 Describe the operating principles and installation of separators. 6.6 Describe separator accessories. 6.7 Explain fluid measuring devices such as positive displacement (PO) meters, pumps, compressors, etc. 6.8 Describe the basic design, application and limitation of heater-treaters (emulsion treatment). 6.9 Describe the construction and maintenance of pipelines, terminals, and pumping stations.	<ul style="list-style-type: none"> • Describe flow line network accessories, corrosion and equipment for protection • Mention types of separators. • Explain separator operations and installation. • Enumerate separator accessories, • List devices used for fluid measuring • Explain the design and scope of heater-treaters in (emulsion treatment). • Asses the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Perform design and construction of pumping stations and its features	Carry out design and construction of pumping stations and its features	Floor coupling, hose, PVC pipe, fittings and valves, temperature and pressure gauges.
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.						

PROGRAMME: HND PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: WELL TESTING AND CONTROL		Course Code: PET 404	Contact Hrs: 5HRS/WK L = 2 P = 3			
Goal : The Course is designed to acquaint the student with the principles and practice of well-testing, control and blow-out prevention						
Course Specification: THEORITICAL CONTENT					PRACTICAL CONTENT	
Week	General Objective 1.0: Understand Fundamental Mechanics of Fluids in Porous Media					
	Specific Learning Outcome:	Teacher Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
1-2	1.1 Describe the single-phase flow. 1.2 Explain continuity equation (Darcy's law), transient flow and multi-phase flow.	<ul style="list-style-type: none"> Differentiate between Single phase and multiphase with examples Demonstrate the equation of (Darcy's Law) Assess students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, recommended textbooks, lecture notes & Related Journals	Perform Darcy's law experiment	Carry out Darcy's law experiment	Darcy's flow apparatus
General Objective 2.0: Understand Well Completion.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome	Teacher Activities	Resources
3-5	2.1 Explain well preparation for completion such as completion fluid preparation, hole cleaning etc. 2.2 Explain various completion modes such as:- single zones; dual zone; multiple zones; open hole; liner completion; perforated casing. 2.3 Describe the equipment used for completion e.g.: tubing, packers, joint subs, christmas tree, etc.	<ul style="list-style-type: none"> Show student relevant well on the simulation module List the various well completion methods Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, recommended textbooks, lecture notes & Related Journals, Field Trip.	Draw and label well head equipment	Demonstrate sub-surface equipment	Tubing, packers, joint subs and Christmas tree etc

General Objective 3.0: Understand Well Testing.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
6-9	<p>3.1 Explain Well testing programmes e.g. drill stem (dst), production test for non-eruptive well, pumping well, gas lifted well, etc.</p> <p>3.2 Describe oil and gas well testing.</p> <p>3.3 Explain radial flow, back pressure test, isochrone test.</p> <p>3.4 Analyse and interpret data collected from well tests viz: (a) (i) derivation of productivity index (PI); (ii) determination of permeability from (i), (iii) transient flow rate curve (Draw Down). (b) Pressure build up. (c) Determination of skin effect. (d) Determination of pressure gradient for closed. and open well.</p>	<ul style="list-style-type: none"> • Give assignment on well testing simulation. • Give worked examples • Assess the students 	<p>Computers, Related Softwares(well Simulation), PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals</p>	<p>Perform the following: Radial flow test, back pressure test, isochrone test.</p>	<p>Carry out radial flow test, back pressure test and isochrone test</p>	<p>Memory gauge, DD meter, separator, tank, pressure measuring tools and thermometers.</p>

General Objective 4.0: Understand Measurement of Bottom Hole Pressure and Temperature.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teacher Activities	Resources
10-11	4.1 Explain choice of reference point, and registration point. 4.2 Convert pressure to reference point.	<ul style="list-style-type: none"> • Identify a suitable well been drilled and organize a field trip • Assessment of field trip. • Explain conversion of pressure points. • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Undertake bottom hole pressure and temperature measurements	Simulate bottom hole pressure and temperature measurements	Relevant softwares
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.						

PROGRAMME: HND PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: SAFETY AND ENVIRONMENTAL CONTROL IN PETROLEUM INDUSTRY				Course Code: PET 406	Contact Hrs: 2HRS/WK L = 2 P = 0	
Goal : This Course is designed to acquaint the student with the safety and environmental pollution control procedures needed in the petroleum industry						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective 1.0: : Understand general safety requirements in the petroleum industry					
	Specific Learning Outcome:	Teacher Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
1-4	<p>1.1 Explain fire prevention and fighting with respect to: - theory of fire occurrence; extinguishing of fire; fire preventing appliances; fire fighting appliances; fire protective appliances.</p> <p>1.2 Explain elements of first aid for: wounds and bleeding; Burns (heat and chemical); Fracture, sprains and strains; Heat and sun-stroke; Penetration of foreign bodies; Electric shock; Chemical poisoning; Artificial respiration; transportation of the injured personnel.</p> <p>1.3 Illustrate 1.1. and 1.2 using charts, demonstrations and video films.</p>	<ul style="list-style-type: none"> • Fire service expert demonstrate to students • Organize fire drilling activity • Show related video films 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, fire extinguishers, water hydrants, sand bucket and fire alarm/smoke detector.	-	-	-
General Objective 2.0: Understand Ecosystem.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
5-6	2.1 Explain the inhabitants and environmental equilibrium.	<ul style="list-style-type: none"> • List reasons why man is the greatest cause of environmental disequilibrium • List the factors that man uses to cause disequilibrium 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

General Objective 3.0: Understand Causes of Disturbance of Ecological Equilibrium.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
7-11	3.1 State causes of disturbance of ecological equilibrium. 3.2 Describe the control of chemical pollutants 3.3 State the regulations and operation with respect to pollutants in 3.1. 3.4 State the sources and the effects of mechanical pollutants (e.g. Noise, Dust, Light, etc.). 3.5 Explain control measures for 3.4. 3.6 State the sources and effects of radioactive pollutants e.g.:- Alpha, Beta, Gamma and Neutron in petroleum operations. 3.7 Explain control measures employed to combat radioactive pollutants. 3.8 State the regulations and operation with respect to 3.6 3.9 Describe restorative procedures with respect to 3.1, 3.4, and 3.6.	<ul style="list-style-type: none"> • Give assignment on various pollutants and their effect on the Environment • Organize seminar on environmental pollution and control • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals.	-	-	-

General Objective 4.0: Understand industrial Pollution of Water and Control.						
Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
12-14	4.1 State causes of petroleum related pollution. 4.2 Discuss the effects of oil spillage on the environment, (water and land). 4.3 Explain the effect of gas emission on the environment. 4.4 Describe the control procedure and safety regulations for gas emission. 4.5 Describe the procedures for the restoration of the habitats.	<ul style="list-style-type: none"> • Give assignment on oil and gas. • Assess the students 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-
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.						

PROGRAMME: HIGHER NATIONAL DIPLOMA IN PETROLEUM ENGINEERING TECHNOLOGY						
COURSE: Petroleum Processing Technology		Course Code: PET 408		Contact Hours: 4HRS/WK L = 2 P = 2		
Goal: This Course is designed to acquaint the student with the fundamental principles of petroleum refining and quality control						
Course Specification: THEORITICAL CONTENT				PRACTICAL CONTENT		
Week	General Objective: 1.0. Understand procedure of crude oil preparation for primary processing					
	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
1 - 2	1.1 Define "Petroleum Refining." 1.2 State roles of the refineries in the petroleum industry. 1.3 Describe crude oil (petroleum) composition, physical Properties and classification. 1.4 Explain the following methods of preparing crude oil for primary processing: degassing, desalting, dewatering, Caustic washing, heating, flashing, Desulphurization. 1.5 State the relevance of each of the methods in 1.4 above.	<ul style="list-style-type: none"> Draw the symbols using hydraulic and Pneumatic circuits. Illustrate activities 1.1 to 1.5 with diagrams. Assess the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Prepare samples of Crude oil for primary processing using the methods in 1.4.	<ul style="list-style-type: none"> Carry out sample preparations Carry out primary refining processes 	<ul style="list-style-type: none"> Crude oil sample Distillation unit Recommended chemicals additives Laboratory glass wires
General Objective 2.0 Understand primary processes						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
3 - 5	2.1 Describe crude-oil atmospheric distillation process. 2.2 Enumerate the essential equipment used for the Process in 2.1. 2.3 Describe briefly the fractionating column (topping tower). 2.4 Explain the processes taking place in the column. 2.5 Explain the use of strippers, stabilizer reboilers, and condensers in atmospheric distillation. 2.6 State the products of atmospheric distillation. 2.7 Explain LPG production	<ul style="list-style-type: none"> Illustrate activities 2.1 to 2.6 with diagrams. Describe LPG production by liquefaction Explain activities 2.8 and 2.9 List the properties and areas of application of the product of vacuum distillation List product obtained from lubricating oil production. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

	<p>from off gas of topping unit, by liquefaction.</p> <p>2.8 Explain the principle of vacuum distillation process.</p> <p>2.9 Describe the vacuum tower and vacuum producing equipment used for 2.8.</p> <p>2.10 State feed and main products of the process in 2.8.</p> <p>2.11 State the properties and uses of the products in 2.10.</p> <p>2.12 Describe the process of lubricating oil production.</p> <p>2.13 State main products of 2.12 above (e.g. greases and waxes) and their uses.</p> <p>2.14 Describe the process of Bitumen/Asphalt production</p> <p>2.15 State uses of the products in 2.14.</p>	<ul style="list-style-type: none"> • Compare and contrast processes of bitumen production from crude oil and tar sand • Assess the students. 				
General Objective 3.0 Understand secondary processes.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
6	<p>3.1 Describe" the following conversion processes: Catalytic cracking, Catalytic reforming, Isomerization, Alkylation, Polymerization.</p> <p>3.2 State the products from each of the processes in 3.1 and their uses.</p> <p>3.3 Explain catalyst regeneration process.</p> <p>3.4 Draw a process flow chart for a typical secondary process.</p>	<ul style="list-style-type: none"> • Illustrate activities 3.1 to 3.3 with examples and diagrams. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Undertake industrial visit	-	-

General Objective 4.0: Understand Petroleum Treatment Processes.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
7	4.1 State chemical additives for corrosion control. 4.2 Describe the following gas treatment and scrubbing Processes: Acid/Caustic washing, Merox (mercaptan oxidation). 4.3 Describe the Hydro finishing Desulphurization (HDS) processes. 4.4 State the relevance of the processes in 4.2 and 4.3 in petroleum refining processing.	<ul style="list-style-type: none"> • Illustrate activities 4.1 to 4.3 with diagrams. • Asses the students. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals, hoses and fittings/couplings, Used/serviceable automatic gear box, Chalk, Chalkboard, duster	Undertake industrial visit	-	-
General Objective: 5.0. Understand Auxiliary refining systems.						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
9	5.1 Describe the following: <ul style="list-style-type: none"> • Fuel Gas • Raw and treated water • Fuel oil • Hydrogen and Nitrogen gas supplies • Gas flare system 5.2 State the relevance of system in 5.1	<ul style="list-style-type: none"> • Illustrate activities in 5.1 with diagrams. 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	-	-	-

General Objective 6.0: Understand quality control in petroleum refining						
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learning Outcome	Teachers Activities	Resources
11 - 13	6.1 State the important quality control parameters and their significance e.g. (Octane number pour point, viscosity index and penetration index)	<ul style="list-style-type: none"> • Explain parameters and quality control. • Describe method used for the test in 6.1 	Computers, Related Softwares, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals	Perform the following test: Pour point, flash point, viscosity, density etc.	Carry out test for the parameters stated in 6.1.	Viscometer, flash point meter, API gravity meter.
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.						

LIST OF RECOMMENDED JOURNALS FOR THE PROGRAMME

1. Nigerian Association of Petroleum Explorationist (NAPE)
2. Journal of Petroleum Technology (JPT)
3. Oil and Gas Journal
4. American Association of Petroleum Geologist (AAPG)
5. Society of Petroleum Engineers (SPE)

LIST OF RECOMMENDED SOFTWARES FOR THE PROGRAMME

1	Design Expert
2	Intel Visual Fortran
3	COMSOL MULTIPHYSICS
4	PETREL
5	ECLIPSE
6	Plate N Sheet Development Software
7	AVEVA Solutions for Oil and Gas Industry
8	Mineral Economic Analysis Tools
9	RIGZONE: Oil and Gas Directory
10	Oil dex
11	Camo Softwares
12	CES, cost Estimation system
13	SURPAC 6.2
14	MATCAD PRIME 1.0
15	MATLAB 2011
16	AUTOCAD 2011
17	Complete Microsoft Visual Studio 2010
18	ArcView 10
19	ARCGIS
20	AQUACHEM
21	RockWorks
22	Geochemist Work bench – GWB Standard 8.0 (Academics)
23	Matbal
24	DSP-one
25	MEPO
26	Merrick system

LIST OF RECOMMENDED BOOKS FOR THE PROGRAMME

S/No	Textbooks	REMARK
1	Applied Clay Mineralogy, Volume 2: Occurrences, Processing and Applications of Kaolins, Bentonites, Palygorskitesepiolite, and Common Clays (Developments in Clay Science) by Haydn H. Murray (Hardcover - Feb 21, 2007)	Recommended
2	Applied Clay Mineralogy, Murray H.H. 2007, Blackwell Science Ltd.	Recommended
3	Applied Mineral Inventory Estimation by Alastair J. Sinclair and Garston H. Blackwell (Hardcover - April 2002)	Recommended
4	Applied Mineral Inventory Estimation Sinclair J. Alastair, Blackwell H.Garston 2004 Elsevier	Recommended
5	Applied Stratigraphy, Koutsoukos A.M. Eduardo, 2007, Elsevier	Recommended
6	Applied Subsurface Geological Mapping with Structural Methods, Tearpock J. Daniels; Bischike E.Richard, 200 Oxford University Press	Recommended
7	Applied Subsurface Geological Mapping, Walker G. Laurence, 2003, Bernard Goodwin	Recommended
8	Archae-mineralogy, Rapp (RIP) George 2002 Satish Kumar Jain	Recommended
9	Borehole Flow Modelling in Horizontal, Deviated and Vertical Wells, Chin C. Wilson, 2003, CRC Press	Recommended
10	Colloid and Surface Properties of Clays and Related Minerals, Giese F. Rossman; Oss Van J. Carel, 2004, Oxford University Press	Recommended
11	DESIGN ANALYSIS IN ROCK MECHANICS, London, 2007, Pb, 560 Pages, Pariseau, W.G. /	Recommended
12	DESIGN ANALYSIS IN ROCK MECHANICS, LONDON, 2007, Pb,560 Pages, [Chapters Include Introduction, Slope Stability; Shafts; Tunnels; Entities in Stratified Ground; Three-Dimensional Excavations; Subsidence; Appendix; Background; Literature; Appendix - Mechanical Properties Of Intact Rock And Joints; Appendix - Rock Mass Classification Schemes For Engineering; Appendix - Some Useful Formulas] Pariseau, W.G /	Recommended
13	Dictionary of Geology & Mineralogy, McGraw-Hill, 2003	Recommended
14	Drilling Fluids Processing Handbook by ASME Shale Shaker Committee (Hardcover - Dec 3, 2004)	Recommended
15	Engineering Geology, Bell F.G., 2007, Elsevier	Recommended
16	Essentials of Geology, Lutgens Tarbuck, Tasa	Recommended
17	Fundamentals of Reservoir Engineering, Dake L.P. 2005, Elsevier	Recommended
18	Gas Well Testing Handbook, Chaundhry Amanatu, 2007, Pennwell Corporation	Recommended
19	Geologic Analysis of Naturally Fractured Reservoirs, Nelson A. Ronald, 2001, Elsevier	Recommended

20	Geotechnical Engineering Calculations and Rules-of-Thumb (New Edition) by Ruwan Rajapake (2008)	Recommended
21	Natural Gas Conversion VI, Iglesia E. Spivey J.J. & Fleisch, 2001, Elsevier	Recommended
22	Phase Behaviour of Petroleum Reservoir Fluids, Pederson Schou Karen & Christensen L. Peter, 2007, Taylor & Francis	Recommended
23	Pipeline Rules of Thumb, Mc Allister E.W., 2005, Elsevier	Recommended
24	Remote Sensing for Geologists, Prost L. Gary, 2001, Taylor & Francis	Recommended
25	Surface Production Operations, Stewart Maurice & Ken Arnold, 2008, Elsevier	Recommended
26	A Generalised Approach to Primary Hydrocarbon Recovery, Walsh P. Mark & Lake W. Larry, 2008	Recommended
27	Advanced Drilling Solutions Geifgat A.Yakov; Geifgat Y.Mikhail, et al, 2001 Taylor & Francis	Recommended
28	Clay Seals of Oil and Gas Deposits,Osipov V.I.,Sokolov V.N.et al, 2004 Elsevier	Recommended
29	Encyclopedia of Sediments and sedimentary Rocks,Middleton V.Gerard,200,Taylor & Francis	Recommended
30	Evaluation of Mineral Reserves - A Simulation Approach, Journal G. Andre; Kyriakidis C. Paedon	Recommended
31	Fundamentals of Geotechnical Engineering, Das M. Braja, 2002	Recommended
32	Geology of Petroleum, Levorsen A.I, 2004, Satish Kumar Jain	Recommended
33	International Petroleum Accounting, Wright J. Charlotte & Gallum A. Rebecca, 2005, Pennwell Corporation	Recommended
34	Oil Hydraulic Systems, Majumodar S.R. , 2001, Tata Mc-Graw Hill Publishing	Recommended
35	Pipeline Design & Construction, Mohitpour M., Golshan H. Murray A., 2007, The American Society of Mechanical Engr.	Recommended
36	Principles of Applied Geophysics parasnis D.S,2003, McGraw-Hill	Recommended
37	The Politics of Oil, Gokay Bulent, 2006, Routledge	Recommended
38	Basin Analysis, Principles and Applications, Allen A. Philip; Allen R. John, 2004, Taylor & Francis	Recommended
39	Drilling Fluids Processing Handbook, Elsevier, 2000, St. Lucie Press	Recommended
40	Mining Royalties, James Otto, Craig Andrews, Fred Cawood, 2006, International Bank For Reconstruction and Dev.	Recommended

41	Pipeline Operation & Maintenance, Mohitpour M.O., Szabo Jason, Hardeveld Van Thomas, 2005	Recommended
42	Chemical Process Simulation and the Aspen Hysys Software, Michael Hanyak	Recommended
43	Petroleum Evaluation and Economic Decision, Author W. McCray	Recommended
44	Elements of Petroleum Geosciences, by Richard C. Selley	Recommended
45	Geology of Petroleum, I.A... Levorsen A.I, 2004, Satish Kumar Jain	Recommended
46	Modern Fracturing Enhancing Natural Gas Production, Michael J. Economides	Recommended
47	World Oil's Cementing Handbook including casing handling producers, George O. Suman Jr. and Richard C. Ellis	Recommended
48	Petroleum Production Engineering	Recommended
49	Calculations and formulae in daily production and work over operations	Recommended
50	Fundamentals of Reservoir Engineering by L.P. Dele	Recommended
51	PVT and Phase Behaviour of Petroleum Reservoir Fluids by Ali Danesh	Recommended
52	Drilling Fluids Processing Handbooks, Elsevier, 2000, St Lucie Press	Recommended
53	Politics of Oil by Gokay Bulent, 2006, Routledge	Recommended
54	Introduction to Geophysical Exploration, By Kearey Philip Books Michael Hill IAN 2002, Blackwell	Recommended
55	Remote Sensing in Geology, Siegal S. Barry, Gillespe R. Alan, 2006 McGraw-Hill	Recommended
56	Encyclopedia of Sediments and Sedimentary Rocks, Middlexon V. Gerard, 200, Tailor & Francis	Recommended

**LIST OF PHYSICAL FACILITIES REQUIRED TO MOUNT HIGHER NATIONAL DIPLOMA (HND)
IN PETROLEUM ENGINEERING TECHNOLOGY**

LABORATORIES/ WORKSHOPS/ STUDIOS REQUIRED

FOR

**HIGHER NATIONAL DIPLOMA (HND) PETROLEUM ENGINEERING
TECHNOLOGY**

PROGRAMME	LABORATORIES	WORKSHOPS	STUDIOS
Petroleum Engineering	(i) Drilling Mud Analysis (ii) Mechanics of Machine (iii) Fluid Mechanics (iv) Thermodynamics/Heat Engine (v) Geology/Geophysical (vi) Reservoir Engineering	(i)Petroleum drilling. (ii)Petroleum Production	(i) Engineering Drawing (ii) Computer

**LIST OF EQUIPMENT/TOOLS FOR LABORATORIES AND WORKSHOPS/STUDIOS REQUIRED
FOR HIGHER NATIONAL DIPLOMA PROGRAMME**

A) LABORATORIES

1. GEOLOGY/GEOPHYSICAL LABORATORY

As in National Diploma (ND) Programme.

Additional equipment are:

S/No	Description	Quantity
1	Magnetometer	3 nos
2	Gravimeter	3 nos
3	Terrameter	3 nos
4	Seismograph	2 nos
5	Core holder	30
6	Core cutter	30
7	Microscope	5
8	Pulverizes	2
9	Global Positioning System (GPS)	10
10	Compass	10
11	Hammer/Chisel/Shovel	10 each
12	Mortars and Petals	4
13	Hand lenses	10

2. DRILLING MUD ANALYSIS LABORATORY

S/No	Description	Quantity
1	Mud Testing Kit	1
2	Mixer Machine	1
3	Mash Funnels	5
4	Mash Cups	5
5	Mud Balance	2
6	Centrifuge Machine	1
7	Measuring Balance	2
8	Hot Plate	1
9	Incubator	1

10	Microscope	1
11	Compression Machine	1
12	Oven	2
13	PH – Meters	4
14	Fann Viscometers	2
15	Manual Centrifuge	2
16	Bunsen Burners	20
17	Hydrometers	20
18	Pipettes	30
19	Thermometers	10
20	Burettes	10
21	Density Bottles	10
22	Stop Watches	30
23	Measuring Cylinders	30
24	Flask	30
25	Mud Tank	30
26	Beakers	30
27	Reagent Bottles	10

3. Reservoir Engineering Laboratory

S/No	Description	Quantity
1	Porosimeter	4
2	Permeameter	4
3	Darcy's flow meter/apparatus	2
4	Gas Chromatography (GC)	1
5	Atomic Absorption Spectrometer (AAS)	1
6	X- ray fluoresce (XRF)	1
7	X- ray diffractometer (XRD)	1

WORKSHOPS/ STUDIOS

1. PETROLEUM DRILLING WORKSHOP

S/No	Description	Quantity
1	14 Ib sledge hammer	4
2	10 Ib sledge hammer	2
3	2" pipe wrench	1
4	1 ½ pipe wrench	1
5	Tubing elevator	2
6	36" Chain tong	1
7	24" chain tong	1
8	Blow lamp	1
9	Dynamometer	1
10	Over short	3
11	Fishing reamer	2
12	Fishing tap	2
13	A model of travelling hook	2
14	Tubing mill	1
15	Casing non-return valve	3
16	Drill pipe stop valve	5
17	Pipe hand vice	3
18	Drag mills	5
19	Wash pipe couplings	6
20	Screw Jacks	2
21	Screw extractors	1
22	Junk fishing tools	3
23	Tubing rotary table stopper,	3
24	Rig tool kit	2
25	Fitter's tool kit	1
26	Sucker rod power tong	1
27	Tubing power tong	1
28	A board of stage cementing tools (cut away view)	1
29	Cementing top and bottom plugs	6
30	Casing collars'	4
31	Drilling line sensor	1
32	Flow meter	1
33	Drag bits	5
34	Polycrysline Diamond Cone Bit (PDC)	3

35	Three cones rock bits	3
36	Tungsten carbide bit	3
37	Casing packet	1
38	Travelling block	2
39	Crown block	2
40	Power tong	1
41	Wash pipe couplings	4
42	Casing mill	1
43	Cement gauge	4
44	Drilling recording instrument	1
45	Pressure unit	3
46	Spiral resistance meter	1
47	Fire extinguisher	4
48	Inclinometer	1
49	Drilling rate recorder	3
50	Weight indicator	4
51	Injector pump	1
52	Slush pump liner	1
53	Slush pump valve seal	2
54	Teaching aid tool cupboard	2
55	Swivels	4
56	Model drilling rig	1
57	Working benches with vices	30
58	Chairs with arm	30
59	Instructors tables	2
60	Instructors chairs	2
61	Sand Bucket	2
62	Digital Moisture Content Determination Equipment	1
63	Funnel Viscometer	2
64	Chromatography Equipment with Full Accessories	1
65	Sand Content Kit	1
66	Variable Speed Electronic Rheometer	1
67	FTIR Spectrophotometer	1
68	High Speed Centrifuge	1
69	Electrophoresis Apparatus	1
70	Simultaneous Thermal Analyzer	1
71	Dynamic Linear Swellmeter with Compactor Full Unit	1
72	Rheometer	2
73	Used/Serviceable Automatic gear box	2 each
74	Rig operation Simulator	1

2. PETROLEUM PRODUCTION WORKSHOP

S/No	Description	Quantity
1	Hacksaw	5
2	Pipe cutters	2
3	Ball pin Hammer	3
4	Pipe Wrench	4
5	Hand Gloves	40
6	Overall light green	40
7	Well Head ring (oval steel ring gasket)	4
8	Barometer pressure recorder	4
9	Sucker rod Machine	1
10	Heavy Duty Jack	1
11	Electric Furnace	2
12	Hydraulic packer. .	4
13	A set of subsurface rod pump	1
14	A set of wire line tools	1
15	Polished Rod Stuffing	1
16	Thickness Gauge	4
17	Instructor's table	2
18	Instructor's chair	2
19	Fire extinguisher	3
20	Heyce Socket spanner	2
21	Trainee's chairs	30
22	Helix Drawing equipment	4
23	T. Drawing ruler	2
24	Back pressure valve	1
25	Choke (Beam)	2
26	Gas Orifice	3
27	Heyco Scrappers	10
28	Oil Can	3
29	Heavy Duties gate valves (Production)	27
30	Brass valves 2"	18
31	Brass valves 4"	40
32	Big ball	3
33	Globe valves	5
34	Niddle valves	5
35	Audeco Marster valves	5
36	Angle valves	5
37	Flat gasket 4" (Flexitalic)	10
38	Flat gasket 2"	10

39	Flat gasket (4 x 300)	10
40	Flat gasket (3 x 150)	10
41	Flat gasket (4 x 150)	10
42	Flow station and its accessories (Simulator)	1
43	Subsea completion unit	1
44	Simulator for Well head and Accessories	1
45	Flow station Simulator	1
46	Floor coupling	10
47	Hose	assorted
48	PVC pipes	assorted
49	Fittings and valves	assorted
50	Thermometers	10
51	Pressure gauges	4
52	Orifice meter	1
53	Corrosion kits	2
54	Valves	2 each
55	Pumps	2
56	Fann actuators	2
57	Torque converter	2
58	Concentration meter	2
59	Petroleum product analysers	2
60	Dipping stick	4
61	Thief cup	2
62	Flocometer	2
63	Positive Displacement meter (PD Meter)	4
64	Production Simulator	1

4. Computer

i.	Computer System	30
ii.	Ups	30
iii.	Relevant Petroleum Engineering Softwares	-
iv.	Projector	1

5. Safety Equipment for each Laboratory

i.	First Aid box	1
ii.	Fire Extinguisher	3
iii.	Sand buckets	3
iv.	Safety charts and drawing	assorted

6. Safety Equipment for each Workshop

i.	First Aid box	1
ii.	Safety goggles	30
iii.	Safety helmets	30
iv.	Safety boots	30 pairs
v.	Leather Apron	30
vi.	Leather hand gloves	30
vii.	Fire Extinguishers	3
viii.	Sand buckets	3
ix.	Safety charts and drawing	assorted

GUIDELINES FOR TEXTBOOK WRITERS

HIGHER NATIONAL DIPLOMA

The following guidelines are suggestions from the Engineering Committees to the writers of the textbooks for the new curricula. They are intended to supplement the detailed syllabuses which have been produced, and which define the content and level of the courses.

Authors should bear in mind that the curriculum has been designed to give the students a broad understanding of applications in industry and commerce, and this is reflected in the curriculum objectives.

- i. One book should be produced for each syllabus
- ii. Page size should be A4
- iii. The front size should be 12 point for normal text and 14 point where emphasis is needed
- iv. Line spacing should be set to 1.5 lines
- v. Headings and subheadings should be emboldened
- vi. Photographs, diagrams and charts should be used extensively throughout the book, and these items must be up-to-date
- vii. In all cases, the material must be related to industry and commerce, using real life examples wherever possible so that the book is not just a theory book. It must help the students to see the subject in the context of the 'real world'
- viii. The philosophy of the courses is one of an integrated approach to theory and practice, and as such, the books should reflect this by not making an artificial divide between theory and practice.
- ix. Illustrations should be labeled and numbered.
- x. Examples should be drawn from Nigeria wherever possible, so that the information is set in a country context.
- xi. Each chapter should end with student self-assessment questions (SAG) so that students can check their own master of the subject
- xii. Accurate instructions should be given for any practical work having first conducted the practical to check that the instructions do indeed work
- xiii. The books must have a proper index or table of contents, a list of references and an introduction based on the overall course philosophy and aims of the syllabus.
- xiv. Symbols and units must be listed and a unified approach used throughout the book
- xv. In case of queries regarding the contents of the books and the depth of information, the author must contact the relevant curriculum committee via the National Board for Technical Education
- xvi. The final draft version of the books should be submitted to Nigerian members of the curriculum working groups for their comments regarding the content in relation to the desired syllabus.

PROJECT FORMAT AND MARKING SCHEME TIME TABLE

Format:

All Projects are to be written up and printed on A4 paper, double spaced and should normally not exceed 40 pages; appendices and tables outside the text may be incorporated as extra. The department or school shall give as much assistance as possible, for example, where funds permit in subsidising the binding cost.

Four bound copies should be submitted about a month to the HND II second semester examinations; one of these copies will be returned to the student.

Marking Scheme

There are three categories of assessing and marking student's project, these being:

- Supervisor's Marks -15%
- Project Report Assessment by Supervisor/External Examiner - 60%
- Oral Examination - 25%

Supervisor's Marks

15% of the total marks will be allocated to the Supervisor exclusively who shall assess those aspects of practical work which are very difficult to quantify and are not necessarily apparent in the written, work. Such will include; the student's diligence, attitude and initiative in the face of non-controllable internal and external difficulties encountered.

Project Report

60% of the total marks will dwell on the overall quality and content of the project. The supervisor marks the project initially and this is without disclosure of original score passed on the External Examiner who using the same guidelines as below, awards his own marks. The two marks are moderated by the Board of Examiners which shall consist of all academic staff of the department or school. A general marking guide would include.

General Presentation

Considering: layout, quality of diagrams and photography, quality of English -20%

Approach

Considers: Depth and Scope of Literature survey presentation of the aims of the project, design and construction work, operation of equipment, deficiencies in the techniques, precautions taken at experimental level and originality of thought or work -20%

Treatment of Results

Considers: discussion, interpretation and critical assessment of results, linking up to previous and other work, conclusions and recommendation for further work

-20%

Oral Examination

The Board of Examiners of Moderating committee needs to familiarize themselves more fully with the work of the student as well as clarity of areas of misunderstanding that may arise from the report through an oral examination. This also aims at determining whether the report is a true and original account of work actually carried out.

The student shall be judged by his, confidence, presentation including mode of appearance, technical accuracy and other attributes that individual committees may deem necessary -25%

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