CURRICULUM AND COURSE SPECIFICATIONS

FOR

NATIONAL INNOVATION DIPLOMA (NID) IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

FOREWORD

This national curriculum which leads to the award of the National Innovative Diploma (NID) in Gemology and Goldsmithing Technology is designed to produce manpower in the different sub-sectors of social and industrial development nationwide.

The acute shortage of professionally trained manpower in this relatively new field in the Nigerian society and the consequent "dire need to inculcate in the individual social development practitioner the ethics of the profession through the acquisition of desirable values, knowledge and skills" informed the production of this national curriculum.

It is the belief of the Board that this curriculum and course specifications are the minimum required to produce sound NID holders in social and industrial development if properly offered with the required resources (qualified teaching staff in adequate number and mix, adequate consumable training materials, teaching aids), and qualified candidates are admitted in to the programme.

I wish to express my deep appreciation to the promoters of this curriculum and the resources persons for their invaluable contributions to the curriculum.

It is my hope that the curriculum, if properly implemented, will produce the technicians of our dream in Mechatronics and Automation Technology.

Dr. M.A. Kazaure, *min*
Executive Secretary,
NBTE, Kaduna.

NATIONAL BOARD FOR TECHNICAL EDUCATION

GENERALINFORMATION

NOMECLATURE

The programme is to be titled: National Innovative Diploma (NID) Gemology and Goldsmithing Technology

The National Innovative Diploma in Gemology and Goldsmithing Technology is designed to reflect a **FUNCTIONAL** philosophy of education, while seeking to achieve academic excellence and promote the furtherance of knowledge, the NID Gemology and Goldsmithing Technology programme also seeks to aid "the acquisition of appropriate skills, abilities and competence, both mental and physical as equipment for the individual to live in and contribute to the development of his/her society".

GOAL: The Programme is designed to produce Diplomates who should be able to identify, grade, price and market gemstones. And also to design, produce and market jewellery, flatware and hollowware.

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OBJECTIVES: On completion of the programme, the diplomats should be able to:

I. Identify, grade, price and market gemstones.
II. Design, produce and market jewellery, flatware and hollowware.
III. Operate and maintain simple equipment commonly used in the gemology and goldsmithing industry.
IV. Use different gemology and goldsmithing software applications necessary for handling jewellery and gemstones jobs.
V. Apply general safety rules and health management in gemology and goldsmithing industry.

2.0 MINIMUM ENTRY REQUIREMENTS

(i) The minimum entry requirement into the programme is five (5) credit passes in Senior Secondary Certificate Examination (S.S.C.E) or its equivalent i.e. General Certificate of Education (GCE O'Level), West African School Certificate (WASC), National Technical Certificate (NTC), National Vocational Certificate (NVC), Grade II Teachers' Certificate, etc), at not more than two (2) sittings. The subject combination for admission into the programme must include; English Language, Mathematics, Chemistry and Physics and other one subject from Technical Drawing, Further Mathematics, Statistics, Basic Electronics, Applied Electricity or Basic Electricity, Metal Work, Economics, Welding & Fabrication, Auto-Mechanic and Vehicle Body Building.

3.0 DURATION

The NID **Gemology and Goldsmithing Technology** programme is terminal and structured to last for a minimum of two academic sessions (4 semesters) on full-time or four academic sessions (8 semesters) on part-time. Each semester consist of 15 weeks, which include 2 weeks for registration and examination**.**

4.0 TYPES OF LECTURERS/INSTRUCTORS REQUIRED

For the National Innovative Diploma, four (4) lecturers will be needed for a class of 30 student's asfollows:-

(i). Two senior lecturers, one of whom should be the Head of department.

(ii). Two lecturers, who should vary from position of Lecturer III to Lecturer I.

The academic qualifications plus cognate industrial experience of lecturers should be in the following mix:-

(i). HND/B.Sc. in Gemology Engineering
(ii). HND/B.Sc. in Goldsmithing Engineering.

Note: A candidate with M.Sc/Ph.D in any of the above disciplines with good industrial experience would be an advantage.

Each laboratory and workshop should be manned by qualified technologist whose academic qualification should not be below HND in relevant fields. Industrial experience for such staff is mandatory.

5.0 COURSE CURRICULUM

The Curriculum of NID Programme consists of four main components. These are:

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

The General Education component shall include courses in English Language, Mathematics and Entrepreneurship etc, and should account for not more than 15% of total contact hours for the programme.

Foundation courses shall include courses in Economics, Mathematics, Pure Science, Technical Drawing, Descriptive Geometry, Statistics and Probability etc. The number of hours will vary with the programme and may account for about 10 - 15% of the total contact hours.

Professional courses are courses which give the student the theory and practical skills he/she needs to practice his/her

field of calling at the technician level. These may account for between 60 – 70% of the contact hours of the programme.

Supervised Industrial Work Experience Scheme (SIWES) shall be taken during the long vacation following the end of the second semester of the first year. See details of SIWES on paragraph 10.0.

6.0 PROGRAMMESTRUCTURE

NATIONAL INNOVATIVE DIPLOMAPROGRAMME

The structure of NID programme consists of four semesters of classroom, laboratory and workshop activities in the institute; and a semester (3 – 4 months) of Students Industrial Work Experience Scheme (SIWES). Each semester shall be of 15 weeks duration made up as follows:-

12 contact weeks of teaching, recitation, practical exercise, quiz, test, etc and 2 weeks of examination and registration. SIWES shall take place at the end of the second semester of the first year.

7.0 FINAL YEAR NIDPROJECT

Final year (NID) students in this programme are expected to carry out a project work. The department should make its own arrangement of schedules for project work. This could be on individual basis or group work. The project should, as much as possible incorporate basic elements of design, drawing and complete fabrication of a marketable item or object that can be put to use. Project reports should be well presented and properly supervised.

Every department in an institution is encouraged to make its own arrangement of schedules for project work and supervision.

8.0 ACCREDITATION

Each programme offered at the NID level shall be accredited by NBTE before the diplomats can be awarded certificate. Details about the process of accrediting a programme for the award of NID is available from The Executive Secretary, National Board for Technical Education, Plot B, Bida Road, PMB 2239, Kaduna.

9.0 CONDITIONS FOR THE AWARD OF NATIONAL INNOVATIVE DIPLOMA

Institutions offering accredited programme will award the NID to candidates who successfully completed the programme after passing prescribed course – work examination, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 100 and 120 semester credit units.

10.0 GRADINGSYSTEM

The approved grading system is as follows:-

MARKED RANGE	LETTER GRADE	WEIGHTING
75% and above	A	4.00
70% – 74%	AB	3.50
65% – 69%	B	3.25
60% – 64%	BC	3.00
55% – 59%	C	2.75
50% – 54%	CD	2.50
45% – 49%	D	2.25

40% – 44%	E	2.00
Below 40%	F	0.0

Diplomas shall be awarded based on the following classification:-

Distinction	-	CGPA 3.50 and above
Upper Credit	-	CGPA 3.00 - 3.49
Lower Credit	-	CGPA 2.50 - 2.99
Pass	-	CGPA 2.00 - 2.49

GUIDANCE NOTE FORTEACHERS

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 unit course system, which enables a student who wishes to transfer the units already completed in an institution of similar standard from which he/she istransferring.

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 technical operative skills, which can be used for employmentpurposes.

As the success of the unit course system depends on the articulation of programmes between the institution 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.

It is a deliberate attempt to further involve the staff of the department teaching the 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.

The Academic Board of the Institution may vet departmental submission on the final curriculum. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for enquiring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio of 50:50 or 60:40 or the reverse.

GUIDELINES ON SIWESPROGRAMMES

For the smooth operation of the SIWES, the following guidelines shall apply:

RESPONSIBILITY FOR PLACEMENT OF STUDENTS

(a) Institutions offering the National Innovation Diploma programme shall arrange to place the students in industry. By end of first quarter of each year, six (6) copies of the master-list showing where each student has been placed shall be submitted to the Executive Secretary, National Board for Technical Education, which shall, in turn, authenticate the list and forward it to the Industrial Training Fund, Jos.

(b) The placement officer should discuss and agree with industry on the following:

(i). A task inventory of what the students should be expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field.

(ii). There should be an industry based supervisor for the students during the period. It should be noted that the final grading of the students during the period of attachment should be weighted more on the evaluation by his/her industry-based supervisor.

EVALUATION OF STUDENTS DURING SIWES

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

(a). Punctuality. (b). Attendance.

(c). General attitude to work. (d). Respect for authority.

(e). Interest in the field/technical area.
(f). Technical competence as a potential technician in his/her field.

GRADING OFSIWES

To ensure uniformity of grading seals, the institution should ensure that the uniform grading of students work, which has been agreed to by Innovation Enterprise Institution, Polytechnics/Monotechnics and Similar Tertiary Institution is adopted.

THE INSTITUTION-BASEDSUPERVISOR

The Institution-based supervisor should initial the log-book during each visit. This will enable him to check areas being met and also, assist students having any problems regarding the specific assignments given to them by their industry-based supervisor.

FREQUENCY OF VISIT

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

(i). There is another visit 6-8 weeks after the first visit;
(ii). A final visit in the last month of the industry attachment.

STIPEND FOR STUDENTS INSIWES

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

SIWES AS A COMPONENT OF THE CURRICULUM

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not. Failure in the SIWES is an indication that the student has not shown interest in the field or has no potential to become a skilled technician in his/her field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four months' SIWES at his/her own expense. The SIWES shall carry 4.0 credit units.

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

CURRICULUM TABLE

NID 1 FIRST SEMESTER

Course Code	Course Title	L	P	CU	CH	Pre requisite	Course Status
CSK 501	Basics of Communication	1	1	2	2		General Studies
MAT101	Algebra and Elementary Trigonometry	2	-	2	1		Foundation
MEC 102	Technical Drawing	1	3	4	4		Foundation
COM 101	Introduction to ICT	1	2	3	3		General Studies
EET 111	Electrical and Electronics Principles	1	2	3	3		Foundation
STC 123	Analytical Chemistry	2	3	5	5		Foundation
GGT 111	Introduction to Gemology	2	1	3	3		Core
GGT 112	Introduction to Goldsmithing	2	1	3	3		Core
GGT 113	Introduction to Mineralogy	2	1	3	3		Core
GGT 114	Introduction to Mining Engineering	2	1	3	3		Core
	TOTAL	**16**	**15**	**31**	**31**		

NID 1 SECOND SEMESTER

Course Code	Course Title	L	P	CU	CH	Pre requisite	Course Status
MAT 112	Logic and Linear Algebra	2	-	2	2		Foundation
MEC 104	Engineering Thermodynamics	1	3	4	4		Foundation
GGT 121	Goldsmithing Technology I	2	2	4	4		Core
GGT 122	Introduction to Lapidary Work	2	2	4	4		Core
GGT 123	Gemological Instruments	2	2	4	4		Core
GGT 124	Gem Evaluation	2	2	4	4		Core
GGT 125	Principles of Mineral Economics	2	2	4	4		Core
GGT126	Introduction to Geology	2	2	4	4		Core
	TOTAL	**17**	**15**	**32**	**32**		

NID 2 – THIRD SEMESTER

Course Code	Course Title	L	P	CU	CH	Pre requisite	Course Status
CSK 502	Project Reports	1	1	2	2		General Studies
MAT 221	Trigonometry and Analytical Geometry	2	-	2	2		Foundation
EDP 201	Introduction to Entrepreneurship	1	2	3	3		General Studies
WRE 102	Principles of Surveying	1	4	5	5		Foundation
MPE 209	Mining Methods	3	-	3	3		Foundation
GGT 211	Principles of Gemology I	2	2	4	4		Core
GGT 212	Goldsmithing Technology II	2	2	4	4		Core
GGT 213	Gold Evaluation	2	2	4	4		Core
GGT 214	Mining Law	2	2	4	4		Core
GGT 215	Safety and Environmental Control in Mining Industry	2	2	4	4		Core
	TOTAL	**20**	**17**	**37**	**37**		

NID 2 –FOURTH SEMESTER

Course Code	Course Title	L	P	CU	CH	Pre requisite	Course Status
EDP 202	Practice of Entrepreneurship	1	2	3	3		General Studies
MAT 232	Calculus	2	-	2	2		Foundation
MEC 205	Strength of Materials	1	2	3	3		Foundation
CEC 210	Soil Mechanics	1	3	4	4		Foundation
GGT 221	Gemology and Goldsmithing Softwares	2	2	4	4		Core
GGT 222	Principles of Gemology II	2	2	4	4		Core
GGT 223	Practice of Geology I	2	2	4	4		Core
GGT 224	Final Year Project	-	2	2	2		Core
	TOTAL	**11**	**15**	**26**	**26**		

First Semester

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 111**		**Contact Hours:**
	Subject/Course: Introduction to Gemology			**Theoretical:**
	Year: NID 1 Semester: 1st	**Pre-requisite:**	**-**	**Practical:**

General Objectives

1.0 Know the Origin of Gem

2.0 Know the Composition of Gem

3.0 Understand the properties of Gem

4.0 Understand principle of Gem processing

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY						
COURSE: Introduction to Gemology		**Course Code: GGT 111**		**Contact Hrs: HRS/WK**		
GOAL: The Course is Designed to equip Students with the knowledge and Importance of Gem						
COURSE SPECIFICATION : THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**General** Objective 1.0: Know the Origin of Gem					
	Specific Learning Outcome	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

	1. Define the term 'Gem" 2. Briefly discuss the history of Gem, 3. 3 Explain the occurrence of Gem. 4. Explain the Gem formation 5. Explain the types of Gem	Narrate the history of Gem and its occurrence,	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
	General Objective 2.0: Know the Composition of Gem					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

	1. Explain the chemical composition of Gem 2. Explain the physical composition of Gem 3. Discuss the occurrence of gem 4. Discuss gem location 5. Discuss gem classification	Explain the general composition of Gem	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals,			
	General Objective 3.0: Understand the properties of Gem					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**
	1. outline the physical properties of Gem 2. list the chemical properties of Gem 3. explain the optical properties of Gem 4. list characteristics of Gem	Explain the General properties of Gem	Recommended textbooks Lecture notes, chalkboard, charts Chalk, etc.			
	General Objective 4.0: Understand the principle of gem processing					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

	1. Explain the crystallography of Gem 2. Explain the classification of Gem 3. Outline the gem enhancement 4. Outline the gem fashioning 5. Explain gem evaluation	Explain the fashioning, evaluation and classification of Gem				

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 112**		**Contact Hours:**
	Subject/Course: Introduction to Goldsmithing			**Theoretical:**
	Year: NID 1 Semester: 1st	**Pre-requisite:**	**-**	**Practical:**

General Objectives

1.0 Know the Origin of Gold

2.0 Know the Composition of Gold

3.0 Understand the properties of Gold

4.0 Understand principle of Gold processing

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY						
COURSE: Introduction to Goldsmithing I		**Course Code: GGT 112**		**Contact Hrs: HRS/WK**		
GOAL: The Course is Designed to equip Students with the knowledge and Importance of Gold						
COURSE SPECIFICATION : THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**General** Objective 1.0: Know the Origin of Gold					
	Specific Learning Outcome	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

	1. Define the term 'Gold" 2. Briefly discuss the history of Gold, 3. 3 Explain the occurrence of Gold. 4. Explain the Gold formation 5. Explain the types of Gold	Narrate the history of Gold and its occurrence,	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
	General Objective 2.0: Know the Composition of Gold					

Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
	6. Explain the chemical composition of Gold 7. Explain the physical composition of Gold 8. Discuss the occurrence of Gold 9. Discuss Gold location 10. Discuss Gold classification	Explain the general composition of Gold	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals,			
	General Objective 3.0: Understand the properties of Gold					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**
	5. outline the physical properties of Gold 6. list the chemical properties of Gold 7. explain the optical properties of Gold 8. list characteristics of Gold	Explain the General properties of Gold	Recommended textbooks Lecture notes, chalkboard, charts Chalk, etc.			

	General Objective 4.0: Understand the principle of Gold processing					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**
	6. Explain the crystallography of Gold 7. Explain the classification of Gold 8. Outline the Gold enhancement 9. Outline the Gold fashioning 10. Explain Gold evaluation	Explain the fashioning, evaluation and classification of Gold				

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 113**		**Contact Hours:**
	Subject/Course: Introduction to Mineralogy			**Theoretical:**
	Year: NID 1 Semester: 1st	**Pre-requisite:**	**-**	**Practical:**

General Objectives

1.0 Understand the mineral processing

2.0 Know the mineral processing units operations

3.0 Understand ore sampling and assaying

4.0 Understand Communition and its stages

5.0 Know the Principles and methods of sizing

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Course: Introduction to Mineralogy		**CODE: GGT 113**		**CONTACT HOURS: 3 HRS/WK**	
					Theoretical: hours/week	
	Year: 1st Semester: 1st		**Pre-requisite:**		**Practical: hours/week**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objective: 1.0 Understand the Mineral Processing**					
	Specific Learning Outcome	**Teachers Activities**	**Resources**	**Specific Learning Outcome**	**Teachers Activities**	**Resources**

	1. Define Mineralogy 2. Define minerals, ore and rocks. 3. Define Mineral processing 4. Relate mineral processing to mining, geology, metallurgy, etc. 5. List major minerals (metallic and non-metallic Nigerian examples.) 6. State sources, characteristics, market requirements, current selling prices, uses and major buyers of minerals in 1.3 above.	1. Develop instructional manual for teaching this course. 2. Distinguish between minerals, ore and rocks 3. Describe the various specializations and stages of the mineral exploitation industry 4. Identify major minerals in Nigeria and their locations. 5. Evaluate the studentson the major stakeholders in mineral market.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective: 2.0 Know the mineral processing units operations					

	1. Explain the unit operations in mineral processing. 2. Identify the major unit operations. 3. Identify the auxiliary unit operations	□ List the unit operations □ Distinguish the functions of the unit operations □ Evaluate the students	Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	□ Appreciate mineral processing equipment in the laboratory.	Draw equipment found in mineral processing laboratory	Practical Manual. Drawing paper, pencils, ink, eraser, drawing board.
week	**General Objective 3.0:Understand sampling and assaying**					
	1. Explain methods of sampling 2. Describe sampling equipment 3. State the importance of sampling and sampling preparation 4. Describe assaying 5. Enumerate assaying types 6. State the importance of assaying -	1. Distinguish between hand and mechanical sorting. 2. Explain sampling assaying. 3. Ask the students to understand ore and product handling processes. 4. Evaluate the students	Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	□ Demonstrate the methods of sampling □ Demonstrate simple assaying	□ Develop practical manual for laboratory/workshop exercises in this course. □ Provide sample(s)	Practical Manual. Splitter, quartering equipment, Lab report book, basic reagents assaying, facilities
	General Objective 4.0: Understand Communition					

	1. Explain the theory and principle underlying Communition 2. State methods of Communition crushing and grinding. 3. Define crushing 4. Explain Primary and Secondary Crushing 5. Lists crushing equipment 6. Define grinding 7. Enumerate grinding equipment 8. Distinguish between crushing and grinding processes	□ State the and principle underlying Communition □ Describe crushing and grinding □ Differentiate between crushing and grinding □ Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	□ Perform crushing and grinding	□ Prepare practical as indicated in the manual □ Provide sample(s)	Practical Manual. Crusher, Pulveriser and grinding mill(s)
	General Objective: 5.0 Know the principles and methods of sizing					

	1. State types of sizing appliances, i.e. sieves, screens etc 2. Identify the appliances in 3.1 3. Explain the purpose of sizing 4. Enumerate types of screen surfaces 5. Explain screening efficiency 6. Enumerate factors affecting sizing operation 7. Give graphical illustration of sizing 8. Describe the action of particles on the screens 9. Distinguish between wet and dry screening 10. Describe sizing devices such as cyclones, thickeners,filters, setting cones, trommels, etc.	1. State, identify and explain types of sizing appliances. 2. List factors controlling sizing operation 3. Describe sieve analysis data generation and presentation in graphs and tables 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Use the appliances in 3.1 and devices in *3.10* to perform sizing operation Carry out sieve analysis and prepare reports	Prepare practical as indicated in the manual Provide sample(s)	Practical Manual. Crusher, Pulveriser, grinding mill(s), sieves and sieve shaker

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 114**		**Contact Hours:**
	Subject/Course: Introduction to Mining Engineering			**Theoretical: hours/week**
	Year: NID 1 Semester:1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand technical terminology used in mining
2. Understand elementary principles of prospecting and exploration
3. Understand factors involved in exploitation *of* mineral deposits
4. Know the types of mining methods
5. Know basic principles *of* rock drilling in mining operations
6. Know rock drilling equipment and their application
7. Know the types of mining explosives and their accessories
8. Know methods *of* priming explosive cartridges
9. Understand the mining laws and regulations vis-a-vis handling explosives

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Course: Introduction to Mining Engineering		**Course Code: GGT 114**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 1 Semester: 1st		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know technical terminology used in mining					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define geological terminologies, such as ore, lode, ore-shoot, vein, Bedded deposits, massive deposits, placer, deposits, folds, faults, etc. 2. Define the following mining terminologies; mining, prospecting, exploration, development, exploitation prospecting lease, mining lease, hanging-and footwall, shaft, drift, level drift, winze, tunnel, stope back, adit,	1. Develop instructional manual for teaching this course. 2. Explain geological and mining terminologies, 3. Sketch cross-sections and longitudinal sections of ore deposits and label them. 4. Illustrate diagrammatically a 3D view of a typical mine showing all the features therein	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Sketch cross-sections and longitudinal sections of ore deposits and label the relevant terms in 1.2 above	□ Develop practical manual for laboratory/workshop exercises in this course. □ Prepare practical as indicated in the manual	Practical Guide/Manual. Drawing paper, pencils, ink, eraser, drawing board

	cross cut.					

	General Objective 2.0: Know the elementary principles of prospecting and exploration					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Explain, (a) types of prospecting (b) methods of prospecting (c) types of sampling (d) methods of sampling	Describe prospecting and exploration methods Identify the prospecting and exploration equipment	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Using electronic media, appreciate the pre-mining, development and reclamation stages of mineral exploitation. Submit report on experiences above.	Anchor the film/slide presentation of the development/exploitation stages in mine development	Practical Manual. Overhead Projector, Computer/Laptop System, Slide, Internet/YouTube, CD/DVD Documentaries.
	General Objective: 3.0 Know the factors involved in exploitation of mineral deposits					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the factors influencing the methods of development; (a) size (b) shape (c) dip and strike (d) grade of deposits determined by drilling (e) faults and folds (f) Water bearing strata, etc. . 2. Explain environmental and economic factors, e.g. (a) location of the deposit (b) infrastructural facilities (c) Politics (f) economics.	1. Enumerate the factors involved in exploitation of mineral deposits 2. Discuss in details; technical, economic and other factors to be considered in the exploitation of mineral deposit. 3. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint, Projector, Screen, Magnetic Board, etc.			
	General Objective:4.0 Know the types of mining methods					

	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources

	1. Classify mining methods in the following general terms (a) Surface mining (b) Underground mining (c) Open-cut (d) Opencast mining (e) Placer-mining 2. Explain each method in 4.1 above 3. State the mining methods applicable to: (a) Coal deposits in Enugu and Okaba (b) Tin deposits in Jos and Cornwall U.K. (c) Iron deposits in	1. Classify and explain mining methods 2. Give an overview of all mining methods with emphasis to their selection in terms of technical as well as economic consideration, to be considered in applying a particular in favour of another, with examples from Nigerian mining industry 3. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Carryout field trip/excursion to quarries, mines, prospecting/exploration outfits etc.	Anchor field excursions.	Practical Manual. Journals. e-media, Internet etc.

	Itakpe and Kiruna Sweden (d) Pb/Zn in Obi and Alkaleri 4. Differentiate between placer mining and other forms of surface mining. 5. Differentiate between underground methods of mining metalliferrous and non-metalliferous deposits 6. List advantages and disadvantages of surface and underground workings in the following respects. (a)					

	environmental (b) economic (c) safety, etc.					

	General Objective: 5.0 Know basic Rock drilling principles in mining operations					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Define drilling 2. Describe the mechanics of rock fragmentation 3. Explain the need for the removal of rock chippings by: (a) air flushing (b) water flushing.	2. Describe rock drilling principles in mining Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 6.0:Know Rock drilling equipment and their application					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Classify rock drilling equipment according to working principles (a) percussive (b) rotary (c) rotary-percussive drilling. 2. List different types of rock drilling equipment in use (a) open cast work, (b) underground coal mining, and (c) underground metalliferous mining. 3. State essential features of equipment listed in 6.2 4. List and describe various types	2. List and explain rock drilling equipment and their application 3. Explain different types of drilling and where they are applied 4. Illustrate diagrammatically drilling equipment and 5. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Carry out practical on drilling operations.	□ Explain safety precautions in drilling. □ Guide on the conduct of practicals.	Variety of rock drilling machines.

	of drill-bits, ego chisel, cross and x-bits, button, retro and retrac, drag, rolling cutter, and cone bits. 5. Demonstrate the use of drill-bits in 6.4 in rock drilling.					

	General Objective 7.0: Know the types of mining explosives and their accessories					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the following properties of explosives; detonation velocity, detonation pressure, energy, strength, water resistance, sensitivity fume characteristics, flammability. 2. Tabulate principal types of explosives in relation to their essential ingredients and application. (a) straight dynamite (b) ammonia dynamite (c) straight gelatin (d) ammonia	Explain the types of mining explosives and their accessories Enumerate properties of explosives in tabular presentation List types of explosives and their composition Enumerate blasting accessories and their functions Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

	gelatin (e) blasting gelatin (f) granulated dynamite (g) permissible explosive for coal mines h) explosives not containing nitroglycerine (i) Ammonium nitrate, nitro starch and chlorate classes. 3. List and describe blasting accessories such as safety fuse, igniter *cord,* detonating cord, electric detonators, plain detonators, delay and relay.					

	4. Identify the accessories in 7.3 above 5. State the uses of accessories in 7.3					

	General Objective 8.0 Know Methods of priming explosive cartridges					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define the term priming 2. Explain safe method of priming with cap and fuse. 3. Explain with sketches, cap and fuse assembly 4. Identify the tools required for priming; (pricks, crimper). 5. Explain with sketches, the methods for priming explosive cartridge. 6. Demonstrate the methods with dummy caps and cartridges. 7. Explain recommended methods of firing explosives.	1. Define and explain methods of priming explosive cartridges 2. Demonstrate activities as in 8.2 to 8.4 3. Carry out as in 8.5 4. Asses the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 9.0 :Understand mining laws and regulations as regard to handling of explosives					

	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the mining laws regarding explosives handling, transportation and storage 2. State procedures of explosive transportation to the mine. 3. Explain the construction and features of explosive carriers. 4. Describe explosive handling care within the mine and quarry. 5. Explain the methods of disposal of damaged explosives and blasting	2. Cite relevant areas of Nigerian Mining and Minerals Act and regulations concerning explosives handling 3. Explain safety approaches to handling, care and application of explosives in mines and quarries 4. Assess the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

	caps.					

Second Semester

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 121**		**Contact Hours:**
	Subject/Course: Goldsmithing Technology I			**Theoretical: hours/week**
	Year: NID 1 Semester:2nd	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the Term used in Goldsmithing
2. Know the types of Goldsmith/Careers in Goldsmithing
3. Understand the Nature of Gold
4. Understand Chemical characteristics of Gold
5. Understand the crystalline nature of Gold

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Course: Goldsmithing Technology I		**Course Code: GGT 121**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 1 Semester: 2nd		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Understand the term used in Goldsmithing					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	3. Define the term Goldsmithing 4. Explain the brief history of Goldsmithing 5. Explain the Goldsmithing contribution to the society 6. Explain the Goldsmithing industry 7. Explain how the industry can contribute to the increase of country's GDP	5. Develop instructional manual for teaching this course. 6. Explain the Historical background of Goldsmithing and its advantages	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 2.0: Know the types of Goldsmith/Careers in Goldsmithing					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	2. Explain the laboratory Goldsmith 3. Explain Goldsmith appraiser 4. Explain Goldsmith Jeweler 5. Explain Auction Goldsmith 6. Explain Gold's buyer	Describe the Goldsmith types Identify the different types of careers in Goldsmithing	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective: 3.0 Understand the Nature of Gold					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the different types of Gold
	2. Distinguish the different type of gold
	3. Discuss the following types of gold:
	  Natural gold
	  Synthetic gold
	  Imitated gold
		1. Discuss in details; Natural, Synthetic and Imitative Gold				

	General Objective:4.0 Understand the chemical characteristics of Gold					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	7. Explain the Atomic structure of Gold 8. Discuss atomic constituents of Gold 9. Discuss the chemical composition of Gold 10. Explain the chemical reaction of Gold	4. Discuss in details; chemical characteristics of Gold	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective: 5.0 Understand the crystalline structure of Gold					

	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources

	4. Explain the crystalline structure of Gold
	5. Define Isometric system
	6. Explain gold without crystal system.
	7. Discuss the following systems:
	  Tetragonal system
	  Orthorhombic system
	  Monoclinic system
	  Triclinic system
	  Hexagonal system
		3. Describe the crystalline structure of gold	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 122**		**Contact Hours:**
	Subject/Course: Introduction to Lapidary Work			**Theoretical:**
	Year: NID 1 Semester: 2nd	**Pre-requisite:**	**-**	**Practical:**

General Objectives

1.0 Know the Origin of Lapidary works

2.0 Know the various aspects of Lapidary works

3.0 know the lapidary designs

4.0 Understand the operation of lapidary equipment and tools

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY						
COURSE: Introduction to Lapidary work		**Course Code: GGT 122**		**Contact Hrs: HRS/WK**		
GOAL: The Course is Designed to equip Students with the Principle operation of Lapidary works						
COURSE SPECIFICATION : THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Week	**General** Objective 1.0: Know the Origin of Lapidary works					
	Specific Learning Outcome	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

1-2	1. Explain the term 'Lapidary works 2. Briefly discuss the history of Lapidary works 3. Discuss the ancient lapidary works. 4. Explain the Modern Lapidary works 5. Explain the difference between ancient and modern lapidary works		White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
	General Objective 2.0: Know the aspect of Lapidary works					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**

	1. Explain the process of sorting stones 2. Explain the process of polishing and repolishing stones 3. Explain the process of lap recharge of stones 4. Explain the process of fashioning stones 1. Explain the types of cutting process of stones.		White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals,			
	General Objective 3.0: Understand the Lapidary crafting and Designing					
Week	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Resources**
	1. Outline the lapidary equipment and tools 2. Explain the art of Tumbling 3. Explain the art of Cabbing/Cabochon 4. Explain the art of Faceting 5. Outline the procedure for Round brilliant cut designing	Explain the General properties of Gem	Recommended textbooks Lecture notes, chalkboard, charts Chalk, etc.			

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 123**		**Contact Hours:**
	Subject/Course: Gemological Instruments			**Theoretical: hours/week**
	Year: NID 1 Semester:2nd	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Know the Gemological Instruments
2. Understand the operational principle of gemological instruments

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Course: Gemological Instruments		**Course Code: GGT 123**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 1 Semester: 2nd		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know the Gemological Instruments					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. List the various gemological instruments 2. List the characteristics features of gemological instrument 3. Discuss the various instruments and their features	Explain the gemological instruments	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate how to Identify the gemological Instruments	Guide on how to Demonstrate the gemological instruments	
	General Objective 2.0: Understand the operational principle of gemological instruments					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	a. List the types of Houpe b. Explain the uses and mode of operation of Houpe c. Explain the uses and mode of operation of Gemological Microscope d. Explain the uses and mode of operation of Gem Refractor e. Explain the uses and mode of operation of Gemological Spectroscope 2. Explain the uses and mode of operation of Diamond Tester 3. Explain the uses and mode of operation of Colour Filter 4. Explain the uses and mode of operation of Digital Scale	Discuss the methods and mode of operation of Various gemological Instruments	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate the mode of operation of the following: - Hope - Gemological Microscope - Gem Refractor - Gemological Specroscope - Diamond Tester - Colour Filter - Digital Scale - Polariscope - Dichroscope	Guide on how to demonstrate the mode of operation of the following: - Hope - Gemological Microscope - Gem Refractor - Gemological Specroscope - Diamond Tester - Colour Filter - Digital Scale - Polariscope - Dichroscope	

	5. Explain the uses and mode of operation of Polariscope 6. Explain the uses and mode of operation of Dichroscope					

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 124**		**Contact Hours:**
	Subject/Course: Gem Evaluation			**Theoretical: hours/week**
	Year: NID 1 Semester:2nd	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the Gem evaluation based on Colour
2. Understand the Gem evaluation based on Carat Weight
3. Understand the Gem evaluation based on Clarity
4. Understand the Gem evaluation based on Cut

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Course: Gem Evaluation		**Course Code: GGT 124**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 1 Semester: 2nd		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Understand the Gem Evaluation based on Colour					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Name the four C's that determine the value of gem 2. Discuss the colour grading for coloured gems 3. Explain the following when evaluating gems: - The Hue - Intensity - Tone - Distribution	Discuss the evaluation of gem based on colour	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate how to evaluate gems based on the following: - The Hue - Intensity - Tone - Distribution	Guide on how to Demonstrate the evaluation of gems	
	General Objective 2.0: Understand the Gem Evaluation based on Carat/Weight					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the Carat as a weight measure of gemstone 2. Explain why Carat is not a weight measure for Pearl and Coral 3. Name the weight measure for Peal and Coral 4. Convert Carat to Grams 5. Discuss why all one Carat gemstone are not the same in size	Discuss the detailed evaluation of gem based on Carat Discuss the operational procedures of weighing instruments	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate how to weigh different size of gemstone and evaluate them based on the weight	Guide on how to demonstrate the weighing of different size of gemstone and evaluate them based on the weight	
	General Objective: 3.0 Understand the Gem Evaluation based on Clarity					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the effect of clarity on transparent gems 2. Explain the effect of clarity on non transparent gems 3. Discuss the clarity type system for coloured gems introduced by GIA	Discuss the gems evaluation based on clarity				
	General Objective:4.0 Understand the Gem Evaluation based on Cut					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Discuss on how cut maximize gems beauty in both shape and proportion 2. Explain the Cut en cabochon and Faceted 3. Distinguish between the cut en cabochon and Faceted 4. Explain Scintillation and Brilliance 5. Explain how larger gems will have greater scintillation 6. Explain the economics of gems cut 7. Discuss Windows and Extinction	Explain in details the gem evaluation based on cut	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Cut the various sizes of gems using an appropriate tools and equipments	Demonstrate how to cut various sizes of gems using an appropriate tools and equipments	

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 125**		**Contact Hours:**
	Subject/Course: Principles of Mineral Economics			**Theoretical:**
	Year: NID 1 Semester: 2nd	**Pre-requisite:**	**-**	**Practical:**

General Objectives

1.0 **:** Know the relevance of mineral economics in national development

2.0 Know the need for mineral conservation

3.0 Understand national economy

4.0 Understand the nature of mineral markets and prices

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY						
COURSE: Principles of Mineral Economics		**COURSE CODE: GGT 125**	**CONTACT HOURS HRS/WK**			
Course Specification: THOERITICAL CONTENT Goal: The course is designed to acquaint students with the economics applicable to national and global exploitation of minerals.				**PRACTICAL CONTENT**		
Week	**General Objective 1.0: Know the relevance of mineral economics in national development.**					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**			

	1. Outline the history of mining in Africa eg: (a) Pre-Colonial era with respect to (i) gold, salt, cassiterite and Iron in West Africa. (ii) Copper mining in Congo and Central Africa. (iii) Iron-Age civilization on the banks of the Nile and Southern Africa; (b) European Settlers in South Africa and the kimberley diamond rush. 2. Review the role of Africa Minerals in World Economy. 3. Review the development and prospects of mining in Africa, (e.g. Nationalization, joint venture, state owned mining contracts). 4. Review the position of the Nigerian Minerals Industries (Iron, Steel, Petroleum, Coal, Tin, etc). 5. Describe the development and prospects of 1.4 above.	• Ask student read about the history of mining in Nigeria and Africa; • Ask student explain the role of minerals and mining in the development of Africa and Nigeria in particular.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
	General Objective: 2.0: Know the need for mineral conservation.					

Week	Specific Learning Outcome:	Teachers Activities	Resources			
	1. Explain how the following factors influence Mineral conservations: (i)Demand(ii) Supply(Hi) Control (iv) Technology. 2. State reasons why many Nations conserve Minerals. Explain Mining Policies on the following basis:(i) Company (ii) Governmental (iii) Multinational. 3. Narrate the packages of incentives available to the Minerals industry.	• Ask students to explain factors that influence mineral conservation and relate them to the mineral industry in Nigeria. • Ask students to give examples of incentives in the Nigerian mineral industry.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			

	General Objective 3.0: Understand national economy					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			
	1. Explain National Economy with. respect to the Gross National Product (GNP), Mineral Resources, and Economic growth. 2. Explain the influence of Minerals on the Nation's economy 3. Explain the emergence of Minerals Industry sector as a significant factor of economic development, based on 3.2 above.	Ask the student to explain the influence of mineral occurrence and development on Nation's economy, and relate this to Gross National Product (GNP). Assess the Student	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Boards, Recommended textbooks, lecture notes & Related Journals			
	General Objective 4.0: Understand the nature of mineral markets and prices.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			

	1. State the main mineral markets eg:(i) London Metal Exchange (LME): (ii) New York Commodity Exchange, (iii) Tokyo Commodity Exchange, (iv) Nigerian Stock Exchange (NSE). 2. Describe each market in 4.1 above and the mode of operation with respect to structure, demand and supply. 3. Explain the process of fixing mineral prices based on: (i) Moving averages method. (ii) exponential smoothing method.	Ask student to explain the features and modes of operations of the Nigerian Stock Exchange and other mineral markets; ask students to perform mineral prices fixing methods.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals, charts, government's official publications, bulletins and charts relating to mineral markets.			

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 126**		**Contact Hours:**
	Subject/Course: Introduction to Geology			**Theoretical: hours/week**
	Year: NID 1 Semester:2nd	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1.0: Know the origin, structure and composition of the earth

2.0: Understand the surface processes of the earth

3.0: Understand the internal processes of the earth

4.0: Appreciate geological engineering as a subject and its application

5.0: Know geology and the mineral occurrences in Nigeria

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Course: Introduction to Geology		**CODE: GGT 126**		**CONTACT HOURS: HRS/WK**	
					Theoretical: hr/wk	
	Year: NID 1 Semester:2nd		**Pre-requisite:**		**Practical: hrs/wk**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objectives 1.0: Know the origin, structure and composition of the earth**					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the formation *of* the earth 2. Give the various theories *of* the Earth's formation 3. Relate the origin *of* the earth to evolution of other planets. 4. Identify the internal zones *of* earth (crust, mantle and core) 5. Describe the physical characteristics *of* the zones in 1.4 6. List the major elements found in the different zones in 1.4 and their relative abundance.	Develop instructional manual for teaching this course. Explain the origin, structure and composition of the earth Identify and describe physical characteristics of the internal zones of the earth. List the major elements found in the different zones	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	1. Draw and label the internal structure of the earth 2. Indicate the composition of each of the three major zones of the internal structure	Develop practical manual for laboratory/workshop exercises in this course. Prepare practical as indicated in the manual	Practical Manual. Drawing paper, pencils, ink, eraser, drawing board, reference chart of the earth's structure
	General Objective 2.0 Understand the surface processes of the earth					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	2. Define weathering 3. Lists the types of weathering 4. Describe the mechanism *of* the processes in 2.1 5. Enumerate the importance of weathering 6. Describe hydrologic cycle 7. Define erosion 8. Describe the effect of erosion on terrains 9. nes and related forms).	1. Explain physical and chemical weathering 2. List the surface and internal processes of the earth. 3. Explain the activities in 2.3 to 2.10 4. Enumerate the adverse effect and by-product of erosion, earthquakeand volcanic eruptions 5. Evaluate the students.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Field trip to see weathered rock in-situ and erosion sites	Develop practical manual for laboratory/workshop exercises in this course. Prepare practical as indicated in the manual	Safety helmets, safety boots, first aid facilities, field vehicle, GPS, geological hammer, sample bags, topographic map
	General Objective 3.0 Understand the internal processes of the earth					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define earth quakes. 2. Explain the genesis of earth quake 3. Explain the method *of* measuring earthquakes 4. Enumerate the effects of earth quake 5. Define Volcano 6. Describe the nature *of* volcanic products (e.g. volcanic gases, lava flows, volcanic cones, etc.)	Explain the mechanisms involved in earth quake phenomena. Explain volcanic activities. Explain the after effect of volcanic eruptions on the ecosystem.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Field trip to see volcanic products e.g. vesicular basalt, pumice, volcanic ash, etc.	Develop practical manual for laboratory/workshop exercises in this course. Prepare practical as indicated in the manual	Practical Manual. Safety helmets, safety boots, first aid facilities, field vehicle, GPS, geological hammer, sample bags, topographic map
	General Objective 4.0: Appreciate geological engineering as a subject and its application					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define geological engineering 2. List the various applications of geological engineering 3. Relate geological engineering to other disciplines	Describe geological engineering and its various applications	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 5.0: Know geology and the mineral occurrences in Nigeria					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain with maps the distribution of major rock types. 2. Explain the major sedimentary basins and their successions. 3. Enumerate Nigeria's mineral resources. 4. Describe the occurrences and distribution of the mineral in 3.3 above. 5. Describe with maps, the Niger delta petroleum province. 6. Give the history of oil exploration and exploitation. 7. Undertake excursion to mineral deposit locations in Nigeria.	1. Explain the geology and the mineral occurrences of Nigeria 2. Give details of mineral resources distribution/locations in Nigeria using mineral map 3. Present with the aid of a map Niger Delta petroleum province 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	1. Draw geological maps of Nigeria to show the basement complex, sedimentary basins, meta-sediments and younger granites 2. Draw the minerals map of Nigeria	□ Develop practical manual for laboratory/workshop exercises in this course. □ Prepare practical as indicated in the manual	Practical Manual. Drawing paper, pencils, ink, eraser, drawing board

THIRD SEMESTER

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 211**		**Contact Hours:**
	Subject/Course: Principles Gemology I			**Theoretical: hours/week**
	Year: NID 2 Semester:1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the Term used in Gemology
2. Know the types of Careers in Gemology
3. Understand the Nature of Gem
4. Understand Chemical characteristics of Gem
5. Understand the crystalline nature of Gem

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Course: Principles Gemology I		**Course Code: GGT 211**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 2 Semester: 1st		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know the used in Gemology					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define the term Gemology 2. Explain the brief history of Gemology 3. Explain the Gemology contribution to the society 4. Explain the Gemology industry 5. Explain how the industry can contribute to the increase of country's GDP	Develop instructional manual for teaching this course. Explain the Historical background of Gemology and its advantages	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 2.0: Know the types of Careers in Gemology					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the laboratory Gemologist 2. Explain Gemstones appraiser 3. Explain Gemstones Jeweler 4. Explain Auction Gemologist 5. Explain Gemstones buyer	Describe the Gemologist types Identify the different types of careers in Gemology	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective: 3.0 Understand the Nature of Gem					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the different types of Gem
	2. Distinguish the different type of Gem
	3. Discuss the following types of Gem:
	  Natural Gem
	  Synthetic Gem
	  Imitated Gem
		1. Discuss in details; Natural, Synthetic and Imitative Gem				

	General Objective:4.0 Understand the chemical characteristics of Gem					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Explain the Atomic structure of Gem 2. Discuss atomic constituents of Gem 3. Discuss the chemical composition of Gem 4. Explain the chemical reaction of Gem	Discuss in details; chemical characteristics of Gem	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective: 5.0 Understand the crystalline structure of Gem					

	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources

	1. Explain the crystalline structure of Gem
	2. Define Isometric system
	3. Explain Gem without crystal system.
	4. Discuss the following systems:
	  Tetragonal system
	  Orthorhombic system
	  Monoclinic system
	  Triclinic system
	  Hexagonal system
		Describe the crystalline structure of Gem	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 212**		**Contact Hours:**
	Subject/Course: Goldsmithing Technology II			**Theoretical: hours/week**
	Year: NID 2 Semester:1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the physical and Optical characteristics of Gold
2. Know the Identification of Gold
3. Understand the Internal feature of Gold
4. Understand the synthetic Gold
5. Understand the treatment of Gold

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Course: Goldsmithing Technology II		**Course Code: GGT 212**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 2 Semester: 1st		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know the physical and Optical characteristics of Gold					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Discuss the chemical properties of natural gold 2. Explain how to measure the chemical property of gold through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture 3. Explain how to measure physical property of gold through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	2. Discuss the chemical and physical property of natural gold	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	2. Demonstrate how to measure gold properties through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	3. Guide on how to Demonstrate the measurement gold properties through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	
	General Objective 2.0: Know the Identification of Gold					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	2.1 Discuss the instruments used in gold identification 2. Explain the operational procedure of the instruments 3. Discuss the following terms: - Inclusion - Blemishing - Magnification 4. Discuss the following Gold identification methods: - Darkfield Illumination - Reflected lighting - Diffused lighting - Polarized lighting	2. Discuss the methods and procedures of gold identification	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	- Identify gold using the appropriate instruments - Identify Gold using the following methods: - Darkfield Illumination - Reflected lighting - Diffused lighting - Polarized lighting	- Demonstrate how to identify gold using an appropriate instruments and methods	
	General Objective: 3.0 Understand the Internal features of Gold					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the condition in which gold is formed 2. Explain the effect of temperature and pressure on gold formation 3. Discuss the geological features that may have been associated with its formation 4. Discuss the geographical features that may have been associated with its formation	Explain in details the internal features of Gold				
	General Objective:4.0 Understand the synthetic Gold					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. List the methods of growing gold in the laboratory
	2. Discuss the process of growing gold in the laboratory
	3. Discuss the following processes:
	  Vapour growth
	  Chemical vapour deposition
	  Melt growth (Verneulli techniques or flame fussion)
	  Solution growth
		Explain the process in growing gold in the laboratory	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Grow gold through the following processes:
				  Vapour growth
				  Chemical vapour deposition
				  Melt growth (Verneulli techniques or flame fussion)
				  Solution growth
					Demonstrate how to Grow gold through the following processes:
					  Vapour growth
					  Chemical vapour deposition
					  Melt growth (Verneulli techniques or flame fussion)
					  Solution growth	

	General Objective: 5.0 Know the treatment of gold					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define the term treatment of gold 2. List the advantage of gold treatment 3. List the disadvantage of gold treatment 4. List the methods of gold treatment 5. Discuss the following method of gold treatment: - Heating - Dyes - Radiation - diffusion	Describe the crystalline structure of gold	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate the gold treatment using the following methods: - Heating - Dyes - Radiation - diffusion	Guide to demonstrate the gold treatment using the following methods: - Heating - Dyes - Radiation - diffusion	

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Department/Programme: Gemology and Goldsmithing/NID	**Course Code: GGT 213**		**Contact Hours:**
	Subject/Course: Gold Evaluation			**Theoretical: hours/week**
	Year: NID 2 Semester:1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the Gold evaluation based on Colour
2. Understand the Gold evaluation based on Carat Weight
3. Understand the Gold evaluation based on Clarity
4. Understand the Gold evaluation based on Cut

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLGY

	Course: Gold Evaluation		**Course Code: GGT 213**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 2 Semester: 1st		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Understand the Gold Evaluation based on Colour					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Name the four C's that determine the value of Gold 2. Discuss the colour grading for coloured Gold 3. Explain the following when evaluating Gold: - The Hue - Intensity - Tone - Distribution	Discuss the evaluation of Gold based on colour	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate how to evaluate Gold based on the following: - The Hue - Intensity - Tone - Distribution	Guide on how to Demonstrate the evaluation of Gold	
	General Objective 2.0: Understand the Gold Evaluation based on Carat/Weight					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the Carat as a weight measure of Gold 2. Explain why Carat is not a weight measure for Pearl and Coral 3. Name the weight measure for Peal and Coral 4. Convent Carat to Grams 5. Discuss why all one Carat Gold are not the same in size	Discuss the detailed evaluation of Gold based on Carat Discuss the operational procedures of weighing instruments	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate how to weigh different size of Gold and evaluate them based on the weight	Guide on how to demonstrate the weighing of different size of Gold and evaluate them based on the weight	
	General Objective: 3.0 Understand the Gold Evaluation based on Clarity					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Explain the effect of clarity on transparent Gold 2. Explain the effect of clarity on non transparent Gold 3. Discuss the clarity type system for coloured Gold introduced by GIA	Discuss the Gold evaluation based on clarity				
	General Objective:4.0 Understand the Gold Evaluation based on Cut					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Discuss on how cut maximize Gold beauty in both shape and proportion 2. Explain the Cut en cabochon and Faceted 3. Distinguish between the cut en cabochon and Faceted 4. Explain Scintillation and Brilliance 5. Explain how larger Gold will have greater scintillation 6. Explain the economics of Gold cut 7. Discuss Windows and Extinction	Explain in details the Gold evaluation based on cut	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Cut the various sizes of Gold using an appropriate tools and equipments	Demonstrate how to cut various sizes of Gold using an appropriate tools and equipments	

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing Technology	**Course Code: GGT 214**		**Contact Hours:/week**
	Subject/Course: Mining Law			**Theoretical: hours/week**
	Year: ND 2 Semester:1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1.0: Understand Class of Mineral Ownership.

2.0: Understand the Origin of Nigerian Mining Law

3.0: Understand the formation of a business enterprise

4.0: Understand the Nigerian minerals and mining Act (NMMA), 2007

5.0: Understand the Nigerian minerals and mining Regulations 2011 (NMMR)

PROGRAMME: NID GEMOLOGY AND GOLDSMITHING						
COURSE : MINING LAW		**Course Code: GGT 214**	**Contact Hrs: 2HRS/WK**			
Course Specification: THEORITICAL CONTENT				**PRACTICAL CONTENT**		
Goal: The course is designed to acquaint the student with the legal provisions in the mining industry.						
Week	**General Objective 1.0:** Understand Class of Mineral Ownership.					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**			
	1. Classify mineral-ownership into: (i) Accension (ii) Dominial; (iii) Universal 2. State the origin of each class of ownership in 1.1 above. e.g.:- Ascension - UK and USA; Dominial - Nigeria, Developing Countries and Russia.	Ask students to research on mine ownership in Nigeria.	White Boards, Computers, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals			
	General Objective 2.0: Understand the Origin of Nigerian Mining Law.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			

	1. Narrate the historical development of Nigerian mining law. 2. Explain the general provisions of the First Regulation (e.g. Mineral wealth invested on the "Crown" definition of a "Native," etc.	□ Ask the students state why there must be regulation in the mining industry □ Ask the student explain the importance of regulations in the mining industry.	White Boards, Computers, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals			
	General Objective 3.0: Understand the formation of a business enterprise					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			

	1. State types of business enterprises e.g.: (a) Sole Trader; (b) Partnership (c) Private limited liability company (d) Public limited liability. (e) Trade Guilds and Joint Stock Company, (f) mergers &acquisitions e.t.c 2. Describe the business types in 3.1 above. 3. State the procedure for the registration of a business enterprise. 4. Explain the following terms:(a) Articles of Association.(b) Memorandum of Association, etc. required for the formation of business enterprise. 5. State the advantage and disadvantages of the terms in 3.4 above. 6. Explain the legal requirements for raising capital for business enterprises eg.: (a) Share/equities; (b) Loan or debenture, (c) Bonds, Securities etc. 7. Explain "Gearing Ratio" and its	□ Ask student to write a report on the setting up of a company. □ Ask student to make a presentation on mergers and acquisition in the mining industry. □ Ask the student to make presentation a various sources of funds for mining companies.	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals			

	implication to investments. 8. Explain capitalization in business and reasons for its application.					

	General Objective 4.0: Understand the Nigerian minerals and mining Act (NMMA), 2007					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			

	1. Explain the purpose of NMMA and its regulation. 2. Explain the provisions for appointment of Manager under Section 134 of Minerals S.M.A. 3. Explain the functions of the following Mine-Officers under the Mineral Act: (i) Honorable Minister of Mines. (ii) Director of Mineral Resources. (iii) Chief Inspector' of Mines; (iv) Area of Inspector of Mines. 4. Explain the functions of key mines officers and departments under the Act of NMMA. 5. State the major functions of the Nigerian mining office. 6. List some offences and penalties as captured in the NMMA.	□ Ask student to research on the development of NMMA regulations. □ Ask student to explain the importance of the mining cadaster office in modern minerals administration. □ Ask student to compare the functions of key officers and departments with those of other African countries. (e.g East African countries). □ Visit a quarry and let the manager explain the	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals.			

		day to day running of the facility. • Ask the student state his views on informal mining activities in Nigeria and the impact on the economy				

	General Objective 5.0: Understand the Nigerian minerals and mining Regulations 2011 (NMMR)					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**			

	1. Explain the importance of beacons in showing boundaries demarcating mineral tittles.. 2. Explain the payment of obligations such as: (i) royalties; (ii) surface rents (iii) fees etc. 3. Explain: (i) provisions for mineral returns in an operating mine; (ii) provisions of explosive regulation. 4. Explain provision of the quarries decree. 5. Explain provisions of reclamation requirements (e.g rehabilitation, restoration &revegetation).	Ask the student to explain how the government raises revenue through payment of royalties, rents and fees Ask the student to research on the effects of non – adherence to redaimation requirements. Let the manager explain the process of getting a mining license and his experience in get one in Nigeria	White Boards, Computers, Related Software, PowerPoint Projectors, Flip Charts, Interactive Board, Recommended textbooks, lecture notes & Related Journals			

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing Technology	**Course Code: GGT 215**		**Contact Hours:**
	Subject/Course: Safety and Environmental Control in the Mining Industry			**Theoretical: hours/week**
	Year: NID 2 Semester: 1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1.0: Know the legislations relevant to health and safety

2.0: Understand the Mining Legislations

3.0: Know the development of an effective safety policy

4.0: Understand accident reporting and investigation

5.0: Understand environmental control in the Mining industry

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN MINING ENGINEERING TECHNOLOGY

	Course: Safety and Environmental Control in the Mining Industry		**Course Code: GGT 215**		**Contact Hours 2HRS/WEEK**	
					Theoretical: hr/wk	
	Year: NID 2 Semester:1st		**Pre-requisite:**		**Practical: hrs/wk**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objective 1.0: Know the legislations relevant to health and safety**					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Outline the main provisions of the health and safety act at work. 2. Outline the main provisions of the Factories Act Fire Precautions. 3. State the relevance of Common Law to health and safety at work. 4. Explain the general duties in respect of health and safety of employers and employees others in work places, etc.	1. Develop instructional manual for teaching this course. 2. Outline the provisions of the health and safety act at work place. 3. State the relevance of common law to health and safety at work. 4. Narrate the general duties in respect of health and safety of employers and others in control of work places, employees, suppliers, etc.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 2.0: Understand the Mining Legislations					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Outline the main provision of (a) Nigerian Minerals and Mining Act. (b) Petroleum Act.	1. Outline the main provisions of minerals, petroleum and quarries act. 2. Outline the main provisions of petroleum act. 3. Explain the difference between PA and the proposed PIB 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 3.0: Know the development of an effective safety policy					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Outline the principles of developing effective safety policy 2. Explain the need for a. accident prevention b. Psychological basis for accident prevention. c. economic basis for accident prevention 3. Categorize potential causes of physical injuries and occupational illness. 4. Describe possible preventive measures for 3.3 above 5. Explain personal safety considerations, working practice and hazards associated with the following: a. Personal protection	1. Discuss the importance of an effective safety policy 2. Enumerate causes of work place accident, physical injuries and occupational illness 3. Mention personal protective apparels using mines, quarries and mills 4. Highlight the importance of safety management policy 5. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

	equipment. b. Fire and explosion hazards c. Special safety measures 3.6 Explain the role of management, supervisors, safety officers and operators in safety enforcement and compliance 7. Enumerate sources of information and materials needed in case of emergency. 8. Explain rescue techniques.					

	General Objective 4.0: Understand accident reporting and investigation					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Classify accidents. 2. State the procedure for reporting accidents to appropriate authorities. 3. List the main elements of oral and written reports of accidents and their purpose. 4. Use the reports of accidents in generating statistical data for prevention and control of accident (e.g. frequency rate).	1. Classify accidents 2. State the procedure for reporting accidents 3. List the main elements of oral and written reports of accidents and their purposes.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 5.0: Understand environmental control in the Mining industry					

	1. List the main sources of pollution in the mining, petroleum and mineral processing industry. 2. Describe disposal methods for liquid, solid and gaseous wastes from mining, petroleum and mineral processing industries. 3. Outline preventive methods adopted in the mining, petroleum and mineral processing Industries to check pollution 4. Outline the importance of Environmental Impact Assessment 5. Outline the main provision of relevant legislations (e.g. NESRIA Act, Mineral Act,	1. Explain the value of environmental control 2. Explain proper process of waste disposal system 3. Demonstrate how preventive methods in mining and minerals processing methods control pollution 4. Cite relevant areas from mining and mineral processing Act and latest mining regulations concerning effect of mining on the environment 5. Assess the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.			

	Petroleum Act, etc) on environmental control.					

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Department/Programme: NID Gemology and Goldsmithing Technology	**Course Code: MPE 209**		**Contact Hours:**
	Subject/Course: Mining Methods			**Theoretical: hours/week**
	Year: NID 2 Semester: 1st	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1.0 Understand the basic elements of open pit operations

2.0 Understand quarrying and glory-holing

3.0 Know materials handling methods in surface mining

4.0 Understand underground mine developments

5.0 Know the underground mining of metalliferrous

6.0Know the underground mining of stratified deposits

7.0 Understand the underground mining equipment for stratified deposits

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING						
Course: Mining Methods	**CODE: MPE 209**	**CONTACT HOURS: HRS/WK**				
Course Specification: THEORITICAL CONTENT		**PRACTICAL CONTENT**				
Week	**General Objective 1.0: Understand the basic elements of open pit operations**					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**Teacher Activities**	**Resources**

	1. Define open-pit mine. 2. Explain with illustration the following features of 1.1 above. - Pit floor - Toe - Bench (height and width) - Pit face - Better or slope angle, etc. 3. Enumerate factors that influence open pit operation e.g. nature of overburden, depth of overburden, machinery available, size of deposit, labour availability, proximity of market, etc). 4. Describe the following methods of developing: - open-pit mine - Box-cut - Benching - Stripping 5. Describe briefly the application of the following machineries in open-pit operation: (i) Tractor shovel	1. Develop instructional manual for teaching this course. 2. Define and enumerate factors that influence open pit mine 3. Describe factors that dictate the approach to be used for mine development 4. Explain the use of mine machineries for mining of deposit using open-pit method	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

	(front-End-Loader) (ii) Bulldozer ripper (iii) Scrapers (iv) Bucket-wheel excavators (v) Bucket chain excavators (vi) Power shovels (vii) Draglines (viii) Trucks. 6. Explain how the equipment in 1.5 above are used in extracting the Ore-body.					

	General Objective 2.0: Understand quarrying and glory-holing					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Classify quarrying into: (i) Rock breaking using explosive and without explosive (saving). (ii) Scooping of gravels from river beds or lakes 2. Describe the general operation of a quarry. 3. Draw and label a flow diagram showing various quarry-works from pit to final product. 4. Describe glory-hole mining and compare with quarrying.	1. Describe quarrying operation 2. Illustrate diagrammatically quarry works depicting all the features	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
	General Objective 3.0: Know materials handling methods in surface mining					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Describe the following modes of transportation: -Locomotives - Belt conveyors - Skip haulage - Aerial Ropeways - Aerial cableways - Trucks - Loader. 2. Explain how two or more modes of transportation in 3.1 above may be combined to form a transportation system. 3. Itemize the storage facilities used in surface mining	1. Describe the modes of transportation 2. Give reasons for using more than one mode of transportation system in mining 3. Explain the operations of storage facilities used in surface mining 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
	General Objective 4.0: Understand underground mine developments.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Describe the following features of mine development: shaft, adit, declines, inclines, sub-inclines, solution mining. 2. Compare the features in 4.1 above. *3.* Explain the following factors determining choice of mode of entry and development: size of equipment, economic factors, dip of the Ore-body, nature of arrangement 4. Explain the factors governing the number of entries and their location in the following aspects: - Ventilation and safety -Required output - 'Costs - Mode of formation of Ore bodies - Method of underground haulage 5. Describe the methods of drifting, cross-cutting, raising,	1. Describe the following features of mine develop 2. Explain the factors determining choice of mode of entry and development: size of equipment, economic factors, dip of the Ore-body, nature of arrangement 3. Describe the methods of drifting, cross-cutting, drilling patterns, and mucking operations in development and production	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

	winze, shaft sinking, etc, (Conventional methods, TBM and Raise Borers). 6. Describe the following drilling patterns in soft and' hand rock mining. - Burn cut - Draw cut - Wedge cut - V - cut - Pyramid cut - fan cut 7. Describe mucking operation in development and production.					

	General Objective 5.0: Know the underground mining of metallic ferrous					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Outline factors determining choice of underground mining methods (e.g. shape, size, regularity, dip of ore-body, mineralogical and physical characteristics, distribution of Ore-body, value of Ore, relationship of deposit to surface and other deposits, type and availability of equipment. 2. Explain the effect of the factors in 5.1 on choice of underground method of mining. 3. Describe the following underground metalliferrous mining methods: (a) Open stopes (Underhand and overhand stopes) . (b) Shrinkage stopes (c) Square set stopes (d) Cut-and-fill stopes (e) Caved	1. State factors determining choice of underground mining methods (e.g. shape, size, regularity, dip of ore-body, mineralogical and physical characteristics, distribution of Ore-body, value of Ore, and relationship of deposit to surface and other deposits, type and availability of equipment.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

	stopes(block and sub-level caving) (f) Breast stoping. 4. Classify the methods in 5.3 from wall support point of view. 5. Illustrate the methods in 5.4 with sectional and plan diagrams.					

	General Objective 6.0: Understand underground mining of stratified deposits.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Describe the following methods of mining: (a) Room-and-Pillar (b) Short wall (c) Long wall (d) Advancing (e) Retreating. 2. Explain the following factors influencing choice of method: (a) nature of roof and floor (b) depth of seam (c) thickness of seam (d) geological and physical conditions of seam (e) current local practices (f) Presence of explosive gases and dust. (g) product desired. 3. Enumerate factors determining width of headings and size of pillars. 4. Explain panel and conventional systems. 5. List the advantages of panel system over conventional system.	Describe mining methods and the factors influencing the choice of mining method. Sketch a typical layout of plan and section of each method for stratified deposit	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

	6. Compare Long wall advancing with long wall retreating method.					

	General Objective 7.0: Understand underground mining of stratified deposits.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Describe the principal constructional features of cutting machineries. 2. List the types of cutters and picks (eg. carbon steel, satellite tipped, carbide insert, etc). 3. Describe the pick sequences and cutting pattern 4. Describe the following types of loaders and state their applications: - Slushier." - Gathering arm - Rocker arm" - Load-haul-Dump (LHD)	1. Explain the principal features of cutting machineries, and list the types of cutting tools. 2. describe the types of loaders and state their applications. 3. Evaluation the students.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

FORTH SEMESTER

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing	**Course Code: GGT 222**		**Contact Hours:**
	Subject/Course: Principles of Gemology II			**Theoretical: hours/week**
	Year: NID 2 Semester: 2nd	**Pre-requisite:**	**-**	**Practical: hours/week**

General Objectives

1. Understand the physical and Optical characteristics of Gem
2. Know the Identification of Gem
3. Understand the Internal feature of Gem
4. Understand the synthetic Gem
5. Understand the treatment of Gem

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING

	Course: Principles of Gemology II		**Course Code: GGT 222**		**Contact Hours:**	
					Theoretical: hours/week	
	Year: NID 2 Semester: 2nd		**Pre-requisite:**	**-**	**Practical: hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know the physical and Optical characteristics of Gem					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Discuss the chemical properties of natural Gem 2. Explain how to measure the chemical property of Gem through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture 3. Explain how to measure physical property of Gem through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	- Discuss the chemical and physical property of natural Gem	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	- Demonstrate how to measure Gem properties through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	- Guide on how to Demonstrate the measurement Gem properties through the following: - Light dispersion - Hardness - Density - Cleavage - Fracture	

	General Objective 2.0: Know the Identification of Gem					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	2.1 Discuss the instruments used in Gem identification 2. Explain the operational procedure of the instruments 3. Discuss the following terms: - Inclusion - Blemishing - Magnification 4. Discuss the following Gem identification methods: - Darkfield Illumination - Reflected lighting - Diffused lighting - Polarized lighting	3. Discuss the methods and procedures of Gem identification	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	- Identify Gem using the appropriate instruments - Identify Gem using the following methods: - Darkfield Illumination - Reflected lighting - Diffused lighting - Polarized lighting	- Demonstrate how to identify Gem using an appropriate instruments and methods	
	General Objective: 3.0 Understand the Internal features of Gem					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Explain the condition in which Gem is formed 2. Explain the effect of temperature and pressure on Gem formation 3. Discuss the geological features that may have been associated with its formation 4. Discuss the geographical features that may have been associated with its formation	Explain in details the internal features of Gem				
	General Objective:4.0 Understand the synthetic Gem					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. List the methods of growing Gem in the laboratory 2. Discuss the process of growing Gem in the laboratory 3. Discuss the following processes: • Vapour growth • Chemical vapour deposition • Melt growth (Verneulli techniques or flame fussion) • Solution growth	5. Explain the process in growing Gem in the laboratory	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Grow Gem through the following processes: • Vapour growth • Chemical vapour deposition • Melt growth (Verneulli techniques or flame fussion) • Solution growth	Demonstrate how to Grow Gem through the following processes: • Vapour growth • Chemical vapour deposition • Melt growth (Verneulli techniques or flame fussion) • Solution growth	
	General Objective: 5.0 Know the treatment of Gem					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

	1. Define the term treatment of Gem
	2. List the advantage of Gem treatment
	3. List the disadvantage of Gem treatment
	4. List the methods of Gem treatment
	5. Discuss the following method of Gem treatment:
	  Heating
	  Dyes
	  Radiation
	  diffusion
		Describe the crystalline structure of Gem	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate the Gem treatment using the following methods:
				  Heating
				  Dyes
				  Radiation
				  diffusion
					Guide to demonstrate the Gem treatment using the following methods:
					  Heating
					  Dyes
					  Radiation
					  diffusion	

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOGY AND GOLDSMITHING TECHNOLOGY

	Department/Programme: NID Gemology and Goldsmithing Technology	**Course Code: GGT 223**		**Contact Hours: 5**
	Subject/Course: Practice of Geology I			**Theoretical: 2 hours/week**
	Year: ND 2 Semester: 4th	**Pre-requisite:**	**-**	**Practical: 3 hours/week**

General Objectives:

1. Understand stress and strain
2. Understand fracturing of rocks
3. Appreciate folds
4. Know Geological maps, sections and field work

PROGRAMME: NATIONAL INNOVATION DIPLOMA IN GEMOLOHY AND GOLDSMITHING TECHNOLOGY

Course: Practice of Geology I	**Course Code: GGT 223**	**Contact Hours HRS/WEEK**			
Course Specification: THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objective 1.0: Understand stress and strain**				
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	1. Define stress and strain 2. Give examples of various types of stress and strain (e.g. tensile, compressive, shear). 3. Describe and illustrate the response of rock to stress (ductile and brittle behavior). 4. Define strike and dip. 5. Illustrate strike and dip with a compass and clinometers	1. Develop instructional manual for teaching this course. 2. Define stress and strain and give examples 3. Describe and illustrate the response of rock of stress 4. Illustrate strike and dip with compass and clinometers	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
	General Objective 2.0:Understand fracturing of rocks					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Define faults and joints 2. Differentiate between faults and joints. 3. Identify various forms of fractures (joints, faults). 4. Classify with illustration fractures and joints 5. List mineral deposits associated with faults and joints, (including local examples). 6. Explain Cleavage. 7. Explain structural control of Ore formation and emplacement. 8. Explain the importance of these fractures in Mining (joint systems in blasting patterns, faults in mine	1. Define faults and joints 2. Differentiate between faults and joints 3. Illustrate fractures and joints 4. List minerals associated with faults and joints.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			

	development, etc).					
	General Objective 3.0: Appreciate folds					

Week	Specific Learning Outcome:	Teachers Activities	Resources	Specific Learning Outcome:	Teachers Activities	Resources
	1. Define folds 2. Classify folds (anticlines, synclines) 3. Describe fold formation. . 4. Illustrate fold elements (e.g. axial plane, fold axis, plunges etc. 5. List minerals associated with fold, e.g. Salt	1. Define folds 1. Classify folds 2. describe fold formation 3. illustrate fold elements and list minerals associated with fold 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.			
	General Objective 4.0: Know Geological maps, sections and field work					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	

	1. Identify the use of different types of scales (statement scales, linear scales) 2. Distinguish between topographical maps and geological maps.	Explain 4.1 – 4.2	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Whiteboard, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	1. Construct geological sections from contoured geo. logical maps. 2. Interpret geological sections and maps involving horizontal and dipping strata, faults, folds and un conformities. 3. Solve three-point problems. 4. Identify structures from aerial photographs	1. Develop practical manual for laboratory/workshop exercises in this course. 2. Prepare practical as indicated in the manual. 3. Guide the students on 4.1 to 4.6 4. Identify and discuss different types of geological maps and scales. 5. Asses the students work.	Practical Manual. Drawing paper, pencils, ink, eraser, drawing board, tempo writers (assorted colours), reference chart of the earth's structure Safety helmets, safety boots, first aid facilities, field vehicle, GPS, geological hammer, sample bags, topographic maps, clinometers, Measuring Tapes

LIST OF PHYSICAL FACILITIES REQUIRED TO MOUNT THE PROGRAMME

LABORATORIES/WORKSHOPS/STUDIOS REQUIRED FOR NID GEMOLOGY ABD GOLDSMITHING TECHNOLOGY

LABORATORIES	WORKSHOPS	STUDIOS
Gemology/ Goldsmithing	Gemology /Goldsmithing	Drawing
	Machine/Fabrication	Computer

Such as gemological binocular microscope, jeweler's loupe, Refractometer, jemeter, polariscope, dichroscope, chelse filter, master colored grading set, spectroscope, specific gravity liquid, electronic scales electronic metal tester, leveridge gauge, pitch bowl for engraving chasing, bowl pad, texturing hammer, tube cutter set, jeweler's dapping block set metal forming tools, disc cutter puncher, chasing hammer, etc.