MINISTRY OF EDUCATION

REPUBLIC OF GHANA

TEACHING SYLLABUS FOR CERAMICS
(SENIOR HIGH SCHOOL 1 - 3)

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TEACHING SYLLABUS FOR CERAMICS
(SENIOR HIGH SCHOOL)

RATIONALE FOR TEACHING CERAMICS

Ceramics as a component of Visual Arts embraces all art activities that result in two-dimensional and three dimensional visual forms. A society achieves its cultural significance through its production in the visual arts and as a people we are identified through our art works. To develop pride and patriotism, it is important that the country's young people acquire love for the cultural and aesthetic values in Ghanaian art. The impact of Ceramics is presently felt on education, health and communication and, in fact, on the total lifestyle of societies of the nation. Ceramics has contributed to the advances in art and technology. Ceramics has consequently, made tremendous impact of the socio-economic development of nations and improved the quality of life in most parts of the world. In Ghana, the combined energy of Ceramics, Science and Technology reinforces the people's survival and development. To this end, it is important to help the young people develop artistic skills and capabilities in Ceramics, not only to enable them contribute to the development and significance of Ghanaian art forms but also as a source of employment for themselves. The content of the Ceramics syllabus has been designed in such a way as to provide adequate foundation for students who will pursue further education in visual arts. The course also offers enough knowledge and skills to students terminating their education at the end of Senior High School and who would want to enter ceramic vocations.

GENERAL AIMS

The syllabus is designed to help students to:

1. appreciate Ceramics as an integral part of life and industrial development.
2. develop self-esteem, pride, confidence and patriotism through appreciation of their own products.
3. develop the capacity for creativity using indigenous and contemporary tools and materials in Ceramics.
4. develop efficient, manipulative, aesthetic and technical skills using tools and materials to make Ceramic products.
5. acquire perceptual and analytical skills through the processes of self-expression and communication.
6. develop critical thinking and practical skills in the artistic field.
7. be aware of the variety of vocations available in the field of Ceramics and be guided to make a rational choice.

SCOPE OF CONTENT

This course covers the history, principles and practice of Ceramics as a vocation. It has enough activities to equip the learner with problem-solving skills that will be useful throughout life. It also provides suggestions for art appreciation and evaluation of ceramic art works.

PRE-REQUISITE SKILLS AND ALLIED SUBJECTS

Successful performance in Basic Design and Technology offered at the Junior High School will be helpful to students who select Ceramics as an elective. Students offering this elective should have acquired satisfactory literacy and numeracy skills including basic skills in drawing and designing, as well as knowledge in social studies at the Junior High School level. The syllabus consists of nine major subjects namely General Knowledge in Art (compulsory) and the following electives:

Group A	Group B
Graphic design	Basketry
Painting	Ceramics
Textile	Leatherwork
	Jewellery
	Sculpture

A school may offer as many Visual Arts subjects as possible for which teachers and resources are available. This will provide the student with greater variety of art subjects to choose from. Each student of Visual Arts is expected to choose THREE art subjects: General Knowledge in Art (compulsory) and TWO other art subjects, ONE from **Group A** and the other ONE from **Group B** listed above.

ORGANISATION OF THE SYLLABUS

The Ceramics syllabus has been structured to cover three years of Senior High School. The structure and organization of the Ceramics syllabus is presented on the next page.

TIME ALLOCATION

Ceramics is allocated four (6) periods a week on the time table. Teaching elective Ceramics will start in the first term of SHS 1.

SUGGESTIONS FOR TEACHING THE SYLLABUS

General Objectives

General Objectives have been listed at the beginning of each section of the syllabus, that is, just below the theme of the section. The general objectives flow from the general aims for teaching Ceramics listed on page (iv) of this syllabus. The general objectives form the basis for the selection and organization of the unit topics. Read the general objectives very carefully before you start teaching. After teaching all the units, go back and read the general aims and general objectives again to be sure you have covered both of them adequately in the course of your teaching.

Sections and Units: Each section of the syllabus is divided into units, where a unit consists of a body of knowledge and skills that form a logical aspect of the section.

Column I - Units: The Units in Column 1 provide the major topics of the section. You are expected to follow the unit topics according to the linear order in which they have been presented. However, if you find at some point that teaching and learning of a unit will be more effective if you skipped to another unit before coming back to the unit in the sequence you are encouraged to do so.

Column 2 - Specific Objectives: Column 2 shows the Specific Objectives for each unit. The specific objectives begin with numbers such as 1.2.2 or 2.2.1. These numbers are referred to as "Syllabus Reference Numbers. The first digit in the syllabus reference number refers to the section; the second digit refers to the unit, while the third digit refers to the rank order of the specific objective. For instance, 1.2.2 means: Section 1, Unit 2 (of Section 1) and Specific Objective 2. In other words, 1.2.2 refers to Specific Objective 2 of Unit 2 of Section 1. Similarly, the syllabus reference number 2.2.1 simply means Specific Objective number 1, of Unit 2 of Section 2.

You will note also that specific objectives have been stated in terms of the students i.e. "*what the student will be able to do after instruction and learning in the unit.* Each specific objective hence starts with the following: "The student will be able to." This in effect, means that you have to address the learning problems of each individual student. It means individualizing your instruction as much as possible such that the majority of students will be able to master the objectives of each unit of the syllabus.

As has been said already, the order in which the unit topics appear should not necessarily be the teaching order. There should however, be a linkage in the order in which the units and specific objectives are treated. The teacher will have to study the syllabus carefully and plan ahead the activities the students will carry out during a particular lesson. Knowing the requirements of a lesson, the teacher should assemble the tools and materials required for the activities well in advance. The collection of tools and materials must be done by both the teacher and students. Other regular materials may be continually collected and stored to be used when needed. When materials are not available in the school or in the immediate environment, the teacher should try to contact persons in other institutions and in the community for help.

As students begin work on activities of each lesson, the teacher should serve as a facilitator and motivate the students in various ways to sustain their interest. As much as possible, resource persons may be invited to carry out demonstrations and talk about their work to the class. Field trips may be organized to other ceramic establishment.

Column 3 - Content: The "content" in the third column of the syllabus presents a selected body of information that you will need to use in teaching the particular unit. In some cases, the content presented is quite exhaustive. In some other cases, you could add more information to the content presented. In any case, try to find more information through reading and personal investigations, to add to the content provided. The use of resource persons will in many cases, help to provide your class with more information and skills. The column also suggests tools and materials that can be used for the unit or lesson.

Column 4 -Teaching and Learning Activities (T/LA): T/LA that will ensure maximum student participation in the lessons is presented in Column 4. The teaching of this subject should be activity oriented. The major portion of class work and other assignments should emphasize practice. Group work and other participatory methods should be emphasized in the teaching and learning process. In this particular subject, students are expected to acquire valuable basic practical skills to serve as a foundation for further skill development. Observe and also ensure that students exhibit skills and values in their behaviour and in creative activities.
Column 5 - Evaluation: Suggestions and exercises for evaluating the lessons of each unit are indicated in Column 5. Evaluation exercises can be in the form of oral questions, quizzes, class assignments, project work; etc. Try to ask questions and set tasks and assignments that will challenge your students to apply their knowledge to issues and problems, and that will engage them in creating new and original items, and developing positive attitudes as a result of having undergone instruction in this subject. Evaluation should also include observation of processes students go through in performing various activities, and the products students make. Processes and products are both equally important and need observation and correction. The suggested evaluation tasks are not exhaustive. You are encouraged to develop other creative evaluation tasks to ensure that students have mastered the instruction and behaviours implied in the specific objectives of each unit.
Lastly, bear in mind that the syllabus cannot be taken as a substitute for lesson plans. It is therefore necessary that you develop a scheme of work and lesson plans for teaching the units of this syllabus.

PROFILE DIMENSIONS

Profile dimensions describe the underlying behaviours or abilities students are expected to acquire as a result of having gone through a period of instruction. Each of the specific objectives in this syllabus contains an action verb that specifies the type of learning or skill that the student should acquire by the end of the instructional period. A specific objective as follows: The student will be able to describe …etc. contains an action verb "describe" that indicates what the student will be able to do after teaching and learning have taken place. Being able to "describe" something after the instruction has been completed means that the student has acquired "knowledge". Being able to explain, summarise, give examples, etc. means that the student has understood the lesson taught. Similarly, being able to develop, plan, construct, etc. means that the student can "apply" or use the knowledge acquired in some new context. Each of the action verbs in the specific objectives of the syllabus describes the behaviour the student will be able to demonstrate after the instruction. "Knowledge", "Application", etc. are dimensions that should be the prime focus of teaching, learning and assessment in schools.

As already stated, profile dimensions describe the underlying behaviours for teaching, learning and assessment. Ceramics is a practical subject and the learning required is best achieved by practical application of skills learnt. The profile dimensions specified in this subject and their respective weights are as follows:

Knowledge and Understanding	15**%**
Application of Knowledge	25**%**
Practical Skills	60%

Each of the dimensions has been given a percentage weight that should be reflected in teaching, learning and testing. The weights, indicated on the right of the dimensions, show the relative emphasis that the teacher should give in the teaching, learning and testing processes. Combining the three dimensions in the teaching and learning process will ensure that Ceramics is taught and studied not only at the cognitive level, but will also lead to the acquisition of practical skills in the subject.

The explanation and words involved in each of the dimensions are as follows:

Knowledge and Understanding (KU)

Knowledge	The ability to: remember, recall, identify, define, describe, list, name, match, state principles, facts and concepts. Knowledge is simply the ability to remember or recall material already learned and constitutes the lowest level of learning.
Understanding	The ability to: explain, summarize, translate, rewrite, paraphrase, give examples, generalize, estimate or predict consequences based upon a trend. Understanding is generally the ability to grasp the meaning of some material that may be verbal, pictorial, or symbolic.

Application of Knowledge (AK)

Ability to use knowledge or apply knowledge, as implied in this syllabus, has a number of learning/behaviour levels. These levels include application, analysis, synthesis, and evaluation. These may be considered and taught separately, paying attention to reflect each of them equally in your teaching. The dimension "Use of Knowledge" is a summary dimension for all four learning levels. Details of each of the four sub-levels are as follows:

Application	The ability to: apply rules, methods, principles, theories, etc. to concrete situations that are new and unfamiliar. It also involves the ability to produce, solve, operate, plan, demonstrate, discover etc.
Analysis	The ability to: Break down materials into its component parts; to differentiate, compare, distinguish, outline, separate, identify significant points etc, recognize unstated assumptions and logical facilities, recognize inferences from facts etc.
Synthesis	The ability to: Put parts together to form a new whole. It involves the ability to combine, compile, compose, devise, plan, revise, design, organize, create, generate, discuss etc.
Evaluation	The ability to: appraise, compare features of different things and make comments or judgments, contrast, criticize, justify, support, discuss, conclude, make recommendations etc. Evaluation refers to the ability to judge the worth or value of some materials based on some criteria.

Practical Skills (PS)

Practical skills involve demonstration of manipulative skills using tools/equipment and materials to carry out practical operations, pre-imaging to solve practical problems, and produce items. The teaching and assessment of practical skills should involve projects, case studies and creative practical tasks.

Skills required for effective practical work are the following:

1. Handling Tools/Equipment/Materials
2. Observation
3. Craftsmanship/Draftsmanship
4. Perception
5. Creativity
6. Communication

Tools/Equipment/Material Handling: Students should be able to handle and use tools/equipment/materials properly for practical work to acquire the needed manual skills.

Observation: The student should be able to use his/her senses to make accurate observation of skills and techniques during demonstrations. The student in this case should be able to imitate the techniques he/she has observed for performing other tasks.

Craftsmanship/Draftsmanship: This involves the skilful and efficient handling of materials and tools for accomplishing specific tasks according to the level of the student.

Perception: The student should be able to respond to his/her environment using all the senses i.e. seeing, hearing, smelling, touching and tasting. The student should be encouraged to apply these senses to every project he/she undertakes.

Originality/Creativity Students should be encouraged to be creative or original and be able to use new methods in carrying out projects. Encourage them to be original in making works of art and not copy existing work. You can help them to be creative and original by encouraging any little creative effort, technique and product they may develop.
Communication: Students should be guided to develop effective oral and written communication skills necessary for group work, reporting and appreciation etc.
The action verbs provided under the various profile dimensions should help you to structure your teaching such as to achieve the set objectives. Select from the action verbs provided for your teaching, in evaluating learning before, during and after the instruction.

FORM OF ASSESSMENT

Ceramics is a practical subject and the learning required is best achieved by practical application of skills learnt. The profile dimensions required in this subject and their respective weights are as follows:

Knowledge and understanding	15%
Application of knowledge	25%
Practical Skills	60%

"Practical Skills" is given 60 per cent of the teaching and learning time to emphasize the point that Ceramics is more toward the acquisition of practical skills at the SHS level. The remaining 40 per cent should be used for theoretical aspect of the subject such as observing, listening, responding, talking, reporting, describing, brainstorming and discussion.

Ceramics will be assessed by practical projects at the end of each term. Assessment of the products/artefacts will follow these guidelines:

Originality	20%
Design	20%
Suitability	20%
Craftsmanship	40%

Knowledge and Competence in Core Skills and Options

In marking project work, note that for a student to earn Grade A, the project output must show a combination of knowledge and skill in the student's selected option and in at least one of the other two options. Grade A should therefore be reserved for only outstanding work that combines knowledge and skill in at least two of the optional areas.

Practical activities should be used in School-Based Assessment (SBA) and for end-of- term examination. The practical assessment should cover:

(a) Processes
(b) Products

Assessment of processes: Look for creative and critical thinking, originality of ideas in the work; the design, correct handling and use of tools, materials and equipment. The degree of involvement, attitude to the work (including group work), understanding of the process, procedure, techniques and problem solving ability of the students must also be assessed.

Assessment of end product: The following preliminary question will be helpful when assessing an end product as a requirement for a lesson, task, activity/exercise: Is the student able to compose, develop, perform, stitch, draw and paint as required by the objectives? Assessment of finished products or performance also includes the students' verbal response or discussion/comments about the work/performance.

Theory and Practicals: Assessment of the theory and practical aspects of each option should be weighted 40:60 to reflect the importance of the practical nature of the options.

GUIDELINES FOR SCHOOL-BASED ASSESSMENT (SBA)

School Based Assessment (SBA) system, formerly referred as continuous assessment will be introduced into the Senior High School from September, 2010. SBA is a very effective system for teaching and learning if carried out properly. The new SBA system is designed to provide schools with an internal assessment system that will help schools to achieve the following purposes:

- Standardize the practice of internal school-based assessment in all schools in the country
- Provide reduced assessment tasks for subjects studied at each of the school levels
- Provide teachers with guidelines for constructing assessment items/questions and other assessment tasks
- Introduce standards of achievement in each subject and in each class of the school system
- Provide guidance in marking and grading of test items/questions and other assessment tasks
- Introduce a system of moderation that will ensure accuracy and reliability of teachers' marks
- Provide teachers with advice on how to conduct remedial instruction on difficult areas of the syllabus to improve class performance.

The arrangements for School Based Assessment may be grouped in categories as follows: Projects, Class Tests, homework and Terminal Test.

1. Projects: These are tasks assigned to students to be completed over an extended time.

These will include the following:

i) practical work
ii) experiments
iii) investigative study (including case study)

A report must be written for each project undertaken.

2. Class Tests These will essentially consist of written assignments covering topics/units completed at some specific period within the term.

3. Home Work: This is an assignment to be completed within a day or a couple of days. Homework may consist of essays, summaries, and other problems to be solved.

4. End –of –Term Examination:

The end –of-term examination is a summative assessment system and should consist of the knowledge and skills students have acquired in the term. The end-of-term test for Term 3 should be composed of items/questions based on the specific objectives studied over the three terms, using a different weighting system such as to reflect the importance of the work done in each term in appropriate proportions. For example, a teacher may build an end-of-term test in such a way that it would consist of the 20% of the objectives studied in Term 1, 20% of objectives studied in Term 2 and 60% of objectives studied in Term 3.

Combining SBA marks and End –of –Term Examination Marks

The new SBA system is important in raising student's school performance. For this reason, the 150 marks for SBA is scaled to 50. The total marks for end –of- term test will also be scaled down 50 before adding the SBA marks and end-of-term examination marks to determine students' end of term results. SBA and end-of-term marks will hence be combined in equal proportions of 50:50. The equal proportions will affect only assessment in the school based system. It will not affect the SBA mark proportion of 30% used by WAEC for determining examination results at the WASSCE.

GRADING PROCEDURE

To improve assessment and grading and also introduce uniformity in schools, it is recommended that schools adopt the following grade boundaries for assigning grades on students' test results.

Grade A:	80 - 100%	-	Excellent
Grade B:	70 - 79%	-	Very Good
Grade C:	60 - 69%	-	Good
Grade D:	45 - 59%	-	Credit (Satisfactory)
Grade E:	35 - 44%	-	Pass
Grade F:	34% and below	-	Fail

In marking your class examination scripts, it is very important that you develop a marking scheme. A marking scheme consists of the points for the best answer you expect for each question, and the marks allocated for each point raised by the student as well as the total marks for the question. For instance, if a question carries 20 marks, and you expect 6 points in the best answer, you could allocate 3 marks or part of it (depending upon the quality of the points raised by the student) to each point, hence totaling 18 marks, and then give the remaining 2 marks or part of it for organization of answer. For objective test papers you may develop an answer key to speed up the marking.

In assigning grades to students' test results, you may apply the above grade boundaries and the descriptors which indicate the meaning of each grade. The grade boundaries are also referred to as grade cut-off scores. For instance, the grade cut-off score for a B grade is 65% in the example. When you adopt a fixed cut-off score grading system as in this example, you are using the criterion-referenced grading system. By this system a student must make a specified score to be awarded the requisite grade. This system of grading challenges students to study harder to earn better grades. It is hence a very useful system for grading achievement tests.

SENIOR HIGH SCHOOL - YEAR 1

SECTION 1

CERAMICS AS A VOCATION

General Objectives: The student will be able to:

1. understand the meaning of the term 'Ceramics'.
2. appreciate the history and contribution of ceramics to the socio-economic development of Ghana and other parts of the world.
3. recognise the contributions of some Ghanaian ceramic establishments and entrepreneurs to the development of the nation.
4. recognise career opportunities, competencies, attitude and behaviour of the ceramic student for employment and customers.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1	The student will be able to:			
RATIONALE AND HISTORY OF CERAMICS	1.1.1 explain the term Ceramics.	**Explanation of ceramics:** - it is the art and science of making clay objects and subjecting them to high temperatures; - product of clay and allied materials which have gone through a temperature range to make them permanent; - clay objects made permanent by heat;	Guide students to brainstorm, discuss, and come out with suitable explanations.	Student to demonstrate understanding of the term ceramics by giving his / her meaning verbally or in writing.
Types of Ceramics	1.1.2 differentiate among various types of Ceramic products.	*Scope and Different Types of Ceramics • Pottery: Table wares, Vases, Flower Pots, Decorative wares, Garden Sculpture, etc. • Sanitary wares: e.g. water closets, sinks, urinal pots, etc. • Structural clay products: e.g. Bricks & Tiles of all types • Technical ceramics: e.g. Electrical Insulators, Dental ceramics, High fired ceramics tiles used on space shuttle aircraft, spark plugs, computer memory chips, etc. • Glasswares; Enamels; • Abrasives, Cement, etc.	Put students into groups identify, discuss and compose types of Ceramics under the headings provided in the Content.	Students make a table of types of Ceramics indicating their differences.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **RATIONALE AND HISTORY OF CERAMICS**	The student will be able to: 1.1.3 explain the rationale for studying Ceramics.	**Rationale for studying Ceramics** Ceramic materials are abundant in every region of the country, • Products are used to solve societal problems e.g. Bricks and Tiles for the construction industry. • Crockery for domestic use. • Refractories to support the steel and iron industries.	Group students to discuss the rationale for studying Ceramics.	Groups to report on rationale for studying Ceramics for class discussion.
History (indigenous & contemporary)	1.1.4 evaluate the role of Ceramics in early Chinese, Greek and Roman cultures.	• Ceramics helps the transmission of artistic and cultural heritage. • An avenue for creativity and self expression; employment opportunities, etc. The role of Ceramics in the three cultures under the following headings: Form, Style and Function **<u>Form and Style</u>** e.g. Chinese produced oval forms, Figurines and High Temperature Ceramics (Stoneware and Porcelain). Greeks made vases with high foot. Tall, two–handled vases painted with slip depicting daily scene. Romans produced glassware shining red pot (terra sigillata) – bricks and tiles. **Function:** e.g. Chinese urns for burial and domestic usage • Greeks: Storage and Trophies at games • Romans: Crockery, Funerary objects, Construction of roads and buildings	* Discuss the contribution of Ceramics in the three cultures with the students. Guide students to discuss, design criteria and use them to evaluate the role / contribution of ceramics	Students form groups and debate on: • The roles of ceramics in the three cultures in terms of social and economic development. • Impact of Chinese, Greek and Roman ceramics on Ghana's socio-economic development.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **HISTORY (INDIGENOUS & CONTEMPORARY)**	The student will be able to: 1.1.5 trace and analyze the history and development of indigenous pottery in Ghana.	**Historical development of indigenous pottery** <u>Beginning</u> Explaining gender stereotypes, Myths, Stories, Superstitions and Taboos, etc. in relation to indigenous pottery. Raw materials – collection and preparation. Production techniques Decorative techniques Drying, firing, Smoking Marketing <u>Some indigenous pottery products and their functions</u> Ahina/tsikuze (waterpot) Abusua kuruwa (urn for keeping the ashes of a dead relative Apotoyiwa/Nutugba – grinding bowl, etc. Akatakyiwa (palmwine pot) Fufu bowls	Assist students to discuss the history of indigenous pottery under topics listed in the content. Organise student to analyse the historical development critically for discussions/ Debates / Seminars, on the strengths, weaknesses and challenges. **Debate Topic:** Taboos, Superstitions and tradition have contributed to the development of Ghana. Students brainstorm and make a list of indigenous pottery items. Students to relate the names of pottery items to their functions and compare/contrast with contemporary uses. **Note:** the unique features of these products and how they relate to their functions.	The student to: Analyse indigenous pottery to determine strength, weakness (impact) on modern times. (i) List and explain indigenous pottery forms and their functions. (ii) compare and differentiate between indigenous uses and contemporary uses of pottery items . (iii) Identify and analyse areas of indigenous pottery which require improvement.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **HISTORY (INDIGENOUS & CONTEMPORARY)**	The student will be able to: 1.1.6 trace and analyse the history and development of contemporary ceramics in Ghana.	**Historical development of contemporary ceramics.** Trace the historical development under the following: - establishment of art school at Achimota in the 1950s - movement of the school to the then College of Technology now KNUST – Kumasi - movement of the teacher training component to Winneba - establishment of brick and tile industries in the country e.g. Mallam Brick and Tile, Prampram Brick and Tile, etc. - establishment of a number of small scale ceramic factories and the Saltpond Ceramic in the 1970s. - introduction of Pottery and Ceramics as a vocational elective subject in the mainstream education under the 1987 Education Reform - the collapse of many of the brick and tile and the ceramics factories in the 80s and 90s.	Assist students to discuss the history of contemporary pottery and ceramics under the topics in the content. Guide students to note the periods of growth and decline of the industry and causes responsible for growth and decline.	The student to: Find out specific challenges industries in their communities/districts face and suggest possible solutions.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **THE CERAMIC INDUSTRY IN GHANA**	The students will be able to: 1.2.1 identify and describe Ceramic Establishments in Ghana.	Ceramic establishments in Ghana. * Clay Products Limited at Alajo, * Saltpond Ceramics at Saltpond, * Mbroh Tiles at Winneba * Ekem Art Pottery at Winneba * Tamakloe Ceramica, Accra * Ash Bricks Ltd. Afari * Unique Ceramics, Okponglo * Vume Pottery Centre * Mfensi Pottery Centre - Ash * Afari Pottery Centre - Ash * Pankrono Pottery Centre * Centres for National Culture, Accra & Kumasi ***Research & Educational Institutions**: KNUST, CSIR, UEW, OIC,T.Poly, Other Pottery Centres: Zaare in Bolgatanga, Kukuo in Tamale, Nkaw kaw in Kwahu. Bodada-Buem and Kpando in the Volta Region.	*Guide students to locate and discuss pottery establishments in Ghana as in the Content. Organize visits to Pottery establishments in the locality for students to study. Discuss how the industry could be sustained with the proliferation of plastic wares and ceramic products from other countries – China, etc. **Note**: Let them understand that the new programme in SHS for ceramics is also aimed at sustaining the industry in Ghana.	Students to: • Student to report after visit to pottery establishment for class discussion and assessment in terms of - Personnel - Location - items produced - Plans for sustainability etc. • Identify strengths and weaknesses in indigenous pottery production vis-à-vis modern ceramic technology applications. • Suggest/propose ways of improving ceramics in Ghana
	1.2.2 identify and describe Contemporary Ghanaian Educationist and Artists contributions and their works.	<u>Some Contemporary Ghanaian Ceramic artists:</u> Daniel Coblah, David Zigah, W.C. Owusu, A. K. Akyeampong , R.C. Ekem, Mbroh, J.K. Amoah, K.K .Broni, Kofi Asante, Ofori-Duodu, Peter Tamakloe, Happy Kufeh, Samuel Lovi, etc. Prof. N.K. Kokroko, A.E. Quarm, Asante Adu-Darko, Dr. Buadi, P.S. Kwawukume, J.K. Nsiah, I.K.Oteng, David Tetteh	Guide students to discuss contemporary ceramics artists and educationists under the following headings: • Educational background • Style • Themes • Notable works • Their contribution to the world of ceramics	
UNIT 3 **CAREER OPPORTUNITIES**	1.3.1 describe careers in Ceramics.	<u>Careers in Ceramics:</u> Studio Potter, Ceramic Artist, Ceramic Designer, Ceramic Technologist, Material Scientist. Teaching, Interior Decorator, Ceramic Sculptor, Brick and Tile Manufacturing, Mould making etc.	Students brainstorm, discuss and write down various careers in ceramics. e.g. Teaching, Interior Decoration, Ceramic Sculptor, Brick & Tile Manufacturing, etc.	Students list and describe six careers in Ceramics in terms of:. • Resources • Functions (socio-economic)

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 **COMPETENCIES ATTITUDE AND BEHAVIOUR OF THE STUDENT/ LEARNER FOR EMPLOYMENT AND CUSTOMERS**	The student will be able to: 1.5.1 analyse the competencies, attitude and behaviourial skills required of a student/learner for education, training, self or paid employment and customers.	Competencies attitude and type of behaviour required of a student/learner for education and employment, examples: - ability to observe, use memory and imagination to derive and develop ideas, pre-image/ visualize and make designs of items. - ability to translate ideas and paper designs into three-dimensional items to solve a problems or satisfy an identified need using the Design and Technology process. - dexterity and creative use of a tools, equipment and a variety of materials. - application of knowledge and understanding to constant practice for proficiency and perfection. - creativity, originality in thinking and end products - ability to respond to an art work by using knowledge and skills in perception, appreciation criticism, judgement, evaluation and aesthetics - critical thinking and problem-solving skills, healthy competition, good human relations, etc. - demonstration of human and moral behaviour in thinking, feeling and acting e.g. honesty, commitment, self-discipline/respect, diligence, patience, tolerance, teamwork, etc. - communication skills, portfolio of works - ability to perform tasks with little or no supervision, etc. - self-learning/evaluation for improvement, perseverance - time-management, work ethics, self-confidence, communication skills, etc.	Guide students to: - identify, discuss and analyse the skills, attitude, competencies and other requirements of a student/learner for (a) learning, training/education. (b) self or paid employment and (c) clients/customers **NOTE:** Guide, support, observe and encourage students to acquire the skills and competencies as well as inculcate the human and moral values; and demonstrate them in the performing various tasks in class, school or life. Guide students to lay down rules, regulations and sections for class activities and moral behaviour. Include observation of their behaviour in assessment.	The student to: - find out, analyse and write an essay on the requirement, competencies and behaviour expected of a student or learner in any of the areas. - self employment in basketry. - further education in basketry. - senior high school. .

SECTION 2

INTRODUCTION TO CERAMIC TOOLS, EQUIPMENT AND RAW MATERIALS

General Objectives: The student will be able to:

1. recognise the array of tools available for use in prospecting ,processing and forming in ceramic production.
2. develop responsible maintenance culture for tools and equipment.
3. develop their own tools and equipment.
4. acquire knowledge and skills about the formation, types, properties and preparation of clay.
5. discuss and apply methods of prospecting clay in the environment.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **PROSPECTING, PROCESSING AND FORMING TOOLS**	The student will be able to: 2.1.1 classify tools suitable for ceramics according to their functions.	**Classification of Tools for Ceramics** <u>Prospecting Tools and Equipment</u>: Underground Mining: Employing heavy equipment, Excavators, Tractors, Tipper Trucks etc. Surface Mining: Using light equipment, Pick axe, Hoe, Cutlass Mattock, Shovel, Wheel Barrow, Head Pan etc. <u>Processing tools and Equipment</u> Blunger, Pug Mill, Ball Mill, Jaw Crushers, Filter press, Shovels Sieves , Troughs for drying, Pales, Buckets, Bowls, Tables for Kneading, Clay drying Boxes, Polythene Sheets for storage. <u>Forming Tools and Equipment:</u> Moulds, modeling tools, Potters Wheels Jigger Jolleying machine, Slab Rollers, Rolling Pin, Sack Board, Guard Sticks, Knife, Scraper, Dip Stick(dipper) , Pricker, Cutting Wire, Kidney Lifter, Banding Wheel, Rag, Corn Cob, Straight Edge, Hard Seed, Pebble, Spoon, Surform Turning tool, Scooping Tool, Weighing Scale, Spray Booth, Hack Saw Blade, Comb.	Guide students to identify, discuss and classify Prospecting, processing and Forming tools under the following: Names, Types, Parts and Functions Draw and label some prospecting, processing and forming tools.	Organise a visit to a near-by ceramic establishment to study tools and equipment and report for class discussion. Students write report and make a table of ceramic tools/equipment.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **CARE, MAINTENANCE AND STORAGE OF TOOLS AND EQUIPMENT**	The student will be able to: 2.2.1 demonstrate responsible ways of caring, maintaining and storing ceramic tools and equipment.	<u>Care, Maintenance, and Storing Tools and Equipment</u> - Familiarization with tools - Use of right tools for the right purpose - Sharpening some tools - Thorough Cleaning of tools - Constant maintenance and repair of tools and equipment by greasing, oiling and painting etc. - Good storage – keeping tools in boxes and covering them.	Discuss safety measures, responsible use, maintenance and storage of ceramic tools and equipment. Guide students to create a table on the topic **Note:** Teacher should monitor, observe and ensure that students value and develop tools and equipment maintenance culture.	Students to: Take active part in the discussion and report to class. Create a table on tools, using the following guide: Type, uses, care and maintenance, and storage
UNIT 3 **FABRICATION OF LOCAL TOOLS AND EQUIPMENT**	2.3.1 design and make simple tools for ceramic production.	**Designing and Making tools** <u>Materials for making personal tools;</u> Scrap metal, Plastics, Wood, Bamboo, Metal Band, Seeds, Glue, String etc. <u>Tools and Methods:</u>- Hack saw, Hand saw, Hammer, pen knife, etc. Measuring, Cutting, Shaping, tying Welding, Joining, etc.	Students study and discuss existing tools for inspiration to create their own. Guide students to make their own tools to suit specific production methods. Students to experiment and test tools for efficiency by performing appropriate tasks with them **<u>NB</u>**: Students could work in groups and consult technical skills staff for assistance where necessary. Students should avoid relying solely on imported tools and consider locally – made ones as equally good but not inferior Tool making is a skill and occupation /industry as well.	Design and make their own tools and assess their efficacy.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 **CLAY: MEANING AND FORMATION**	The student will be able to: 2.4.1 explain the meaning of clay and describe its formation.	**Meaning of clay** Clay is the fine - grained earthy material that contains a considerable amount of the mineral kaolinite. Formation of clays Clay composition Physical and Chemical properties of clay Classification of clay: *Primary clays e.g. kaolin - formed around parent rock - non plastic and often pure *Secondary clays e.g.ball clay - formed away from parent rock plastic and often contaminated with impurities.	Guide students to explain the composition of clay and discuss the basic formation and properties of clays. Discuss the difference between primary and secondary clays, showing their characteristics. Show samples of clay to students for identification. The teacher should inspect the notebooks of students and assess.	Students read around the topic in the library and make notes. Inspect students' notes.
Types And Characteristics Of Clays	2.4.2 describe types of clays their characteristics and uses.	**Types of clays their Characteristics and Uses** Types of Clays Earthenware clay Stone ware clay Fire clay Ball clay Bentonite Slip clay, etc. Characteristics of types of clays e.g. Earthenware clay: fires low and it is usually plastic. Stoneware clay: - fires in middle range to higher temperatures and it is generally plastic.	Group students and guide them to search for more information into characteristics of types of clays. Information could be sought from the Internet, Libraries and Practitioners, Geological Surveys Department, Technology Consultancy Centre etc. Group students and guide them to research into characteristics of types of clay.	Students group to present research results for discussion and comparison.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 5 **CLAY PROSPECTING AND PROCESSING**	The student will be able to: 2.5.1 locate and evaluate clay deposits in Ghana.	<u>Locating and evaluating clay deposits in Ghana</u> Deposits in the various regions in Ghana Clay deposits in students' locality.	Students identify and discuss various clay deposits on the map of Ghana provided by the teacher. Students to discuss the socio-economic importance of the deposits, constraints and challenges.	Students to find out the nature of clay deposits in their localities and its significance to the development of the locality and report in class.
PROSPECTING	2.5.2 explore the environment with various tools for clay.	<u>Exploring the environment for types of clay</u> • scout for clay • dig clay • field testing of clays • laboratory testing of clays <u>Possible areas of clay deposits</u> • river banks • valleys • swampy areas • construction sites • areas where wells are dug	Guide students to explore the environment for different types of clays using appropriate tools. Lead students to collect types of clay and conduct tests on plasticity. -moisture content -shrinkage (dry/fired) -porosity, etc. -maturing temperature **<u>NOTE:</u>** Note should be taken of possible environmental degradation and discuss how land could be reclaimed e.g. filling clay pits and Afforestation.	Organise a field trip to possible clay sites. Assemble results of tests discuss and compare clay types.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 5 (CONT.) CLAY PROCESSING	The student will be able to: 2.5.3 outline the stages of clay preparation.	**<u>Stages of clay preparation:</u>** • Digging/Winning/Mining clay • Collecting and transporting • Soaking/Pounding • Sieving • Drying <u>Preparation of plastic clay for studio work</u> • Wedging • Kneading • Weighing (where appropriate) <u>Industrial preparation of clay :</u> • Mining • Grinding (crushing and milling where appropriate) • Blunging • Filter pressing	Assist students to outline stages of clay preparation and discuss each stage. Help them to describe the use of tools and equipment for the process. With demonstrations and illustrations (TLMs) Guide students to understand the processes for studio as well as industrial preparation of clay. Refer to Section 2 – Introduction to Ceramic Tools and Equipment. Assign students various tasks and projects to apply knowledge and understanding of the unit	Students to: List seven major stages of clay preparation and describe three of the stages. Observe and report on how any practitioner prepares clay for work to cover : • Tools • Materials • Stages • Constraints • Challenges and • Solutions
	2.5.4 prepare clay for ceramic production.	<u>Preparing Clay for Ceramic Production Tools/Equipment:</u> (refer to Section 2) Apply information in objective 2.5.3.	Assist students to apply knowledge and skills in clay processing to prepare clay on their own. Students work in groups and individually. Test Prepared clays for various qualities. Teacher assists students to set criteria for well prepared clay. **<u>NOTE</u>** Encourage: • regular hand washing to prevent worm infestation. • proper handling of tools to prevent injury.	Prepare clay mined from previous exercise.

SENIOR HIGH SCHOOL - YEAR 1

SECTION 3

DRAWING, DESIGNING AND CREATING OBJECTS WITH CLAY

General Objectives: The student will be able to:

1. derive more complex shapes from studying the environment to develop ceramic forms using manual and computer – aided techniques.
2. acquire basic freehand and throwing techniques
3. produce simple ceramic wares using the skills acquired to solve personal and community problems
4. evaluate the production processes as well as items made in clay

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **SLABBING**	The student will be able to: 3.1.1 design and produce an item by slab method.	**<u>The slab method</u>** - Roll clay into slab. Either shape object in the plastic state or leave slab to leather hard. - Cut into shapes and join with clay slip using appropriate tools - Use appropriate decoration to finish item made. **Needs/Problem areas** Domestic, individual, etc. <u>Tools for slab work</u> Rolling-pin, sack board, guide sticks, measuring instruments, cutting knife, etc.	Discuss and demonstrate the slab method of making clay items for students to observe and study. Students practice the slab methods. Guide students to identify a need and use the design and technology process to solve a problem in slab building.	**<u>Assignment</u>** Students to undertake an assignment in slab work e.g. design and make an item to solve a problem in the community e.g. • Planter, • Desk organizer, • Jewellery Box etc.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **MODELLING (BUILDING)**	The student will be able to: 3.2.1 design and produce an item by modeling (building).	<u>Modelling</u> (solid or hollow building) - additive method of forming in ceramics - soft clay is added on in bits, - shaping is done by gently pressing and turning parts to get the desired form. **<u>Note</u>** - Clay bits must be well compacted when wet to prevent cracking of finished product.	Discuss and demonstrate the modeling (building) procedure of making clay items for students to observe and study. Guide them to discuss a need and use the technology process to model a pre-imaged item. Students assess the quality of item according to its function, beauty and finishing. **Note**: -Large pieces require groggy clay -they should be cut into parts and scooped at leather hard stage -parts are joined together after edges are scored and coated with slip -finished item is left to dry gradually.	Students to execute a project work based on the needs discussed under the TLA, employing the various forming methods.

18UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 **INTRODUCTION TO WHEEL WORK**	The student will be able to: 3.3.1 demonstrate basic skills in throwing on a potters wheel.	**Throwing** **Types of potters' wheel** • the kick wheel-potters' wheel operated by foot. Some kick-wheels depend on the momentum of a large fly-wheel while treadle wheels use foot power to swing a lever attached. • hand turning wheel – operated manually with an assistant turning wheel by hand. • electric wheel – power -driven. **Stages of throwing** • centering • opening • pulling • shaping • cutting	Discuss types of potters' wheel with students. Demonstrate the throwing process for students to observe and practise. Assist students to practise the stages of throwing as indicated in the content:- Students practise throwing on their own Assess progress of students throwing skills. **NOTE** Note should be taken of good posture: • work should be done on raised surfaces i.e., working tables and banding wheels etc. • bending over the body should be avoided • care should be taken when lifting heavy weights e.g. wood, clay and water.	Students to: Demonstrate throwing and turning processes for teacher to assess competencies in centering, opening, pulling, shaping, cutting and lifting according to criteria.

SECTION 4

DRYING AND FIRING

General objectives: The student will be able to:

1. recognise the importance of drying and firing in ceramics.
2. appreciate conditions for drying and firing.
3. apply appropriate procedures in drying and firing.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **DRYING PROCESS**	The students will be able to: 4.1.1 explain the meaning of drying.	Drying • a process of removing water from a ceramic material (the pottery body). • it is also the establishment of equilibrium moisture content between a ceramic object and air.	Discuss the drying concept with students taking note of the processes. **Note**: Use student's works for demonstration and explanation where appropriate.	Students to give the meaning of Drying in his/her own words
	4.1.2 describe and use correct methods of drying clay ware.	The drying methods: • drying through radiation – heat from a firing chamber is diverted to the next chamber to dry objects. • drying through convection-drying in the natural environment. • drying through conduction- transfer of heat flow from a higher temperature to a lower temperature of a solid.	Assist students to discuss and understand the need to dry clay wares gradually to avoid warping and cracking. **Note**: Explain to students that wet air around clay delays the drying process, however, during the dry season, the air around the clay can be wetted to prevent cracking of green ware. Students to take necessary measures to prevent rapid drying of clay.	Students test various drying conditions with wares produced by modelling, pinching, coiling and throwing.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **DRYING PROCESS**	The student will be able to:	**<u>The three stages of clay in the drying process</u>** plastic leather hard bone dry **<u>The drying process</u>** - thin layers of water separate clay particles in the plastic state - the surface water evaporates by agents of drying - the layers of water from inside the clay travel to the surface by seeping - again, the surface water evaporates in the presence of the agents of drying – air, heat and wind - the particles then pull together and the volume of piece decreases. - the presence of heat and strong air speed up the process of evaporation, hence the drying process	Guide students to discuss and understand methods and conditions of the ware at each stage during drying, and the treatment to be given at every stage. **<u>HINTS TO THE TEACHER</u>** - Proper drying is vital to the production of ceramic ware - Avoid placing work where there is strong draft which may dry one part of the piece faster - Control drying by placing paper bag or plastic sheet over piece to slow down the process - Place the work on thin strips of wood to allow air to move under the piece for even drying - If shape permits, place work upside down to allow even drying, etc. The teacher should collect students' note books for inspection and assessment.	Students to: • describe the conditions of clay ware through the drying process. • practise how to dry clay and report findings for class discussions Is the student able to dry clay ware properly and describe the process? Present their note books for inspection and assessment.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **THE FIRING PROCESS**	The student will be able to: 4.2.1 describe changes that occur in clay during firing.	**Changes In Clay during Firing** Firing is a process of making ceramic objects permanent through heat. <u>Changes occurring in clay during firing (Effect of Heat on ceramic objects)</u> 1. O^oC-120^oC - physical water evaporates. 2. 120^oC-200^oC – organic. matter burns away. 3. 450^oC-600^oC chemical water in pure clay (Kaolinite) is released.– the release of the chemical water causes a weight loss of 14%. 4. the Kaolinite crystals are permanently changed. This is called the ceramic change in which the clay loses its plasticity forever. 6. 375^oC-573^oC reversible quartz inversion. 7. (600^oC and above) physical change – shrinkage.	Discuss firing with students using their works for demonstration when necessary. Students compare the changes in clay during stages of firing.	Is the student able to observe and describe the changes that occurred in clay during firing? Students to find out how the changes occur in clay during firing.
Open - Firing	4.2.2 fire clay successfully by the open firing procedure.	<u>Open firing</u> 1. dig a shallow pit 2. line the pit with dried leaves, grass, twigs, etc. 3. arrange pots in rows - larger pots below, smaller ones on top (leaves and grass are arranged in-between rows) 4. shards of broken pottery are used to cover the packed pots 5. the heap is then covered with leaves, grass and firewood 6. set fire and leave to burn completely (the firing process lasts between 45 minutes to 2 hours).	Discuss and demonstrate the open firing process for students to observe. Students in group fire clay by open fining. Students to brainstorm, discuss and develop a criteria to determine a successful firing of ceramic wares. Organize the class to arrange and fire ceramic objects/items. Students to observe and report on the open firing process.	Are students able to fire clay successfully? Is the student able to determine : • How long did the firing last? • Are the wares well fired? • How does the ceramist determine a well fired ware from an open firing?

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) **COOLING**	The student will be able to: 4.2.3 assess reasons for gradual withdrawal of heat after firing.	**Reasons/Need for Cooling** COOLING: (The withdrawal of heat). When the correct temperature is reached, firing ceases and cooling takes place. The cooling process needs to be carefully controlled.	Guide students to discuss and assess the need for gradual cooling after firing. e.g. too rapid cooling will cause cracking of wares.	The student to: determine the extend of breakages in the firing and possible causes.

SENIOR HIGH SCHOOL – YEAR 1

SECTION FIVE

BASIC ENTREPRENEURIAL SKILLS AND PRACTICES

General Objectives: The student will:

1 develop the healthy studio practices and right professional attitude .
2 be aware of the relevance of portfolio building
3 develop a business plan, brochure, card and review it periodically.
4 apply knowledge and skills to manage and operate a ceramics enterprise I a sustainable and environmental friendly manner.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **HEALTHY STUDIO PRACTICES**	The student will be able to: 5.1.1 state reasons for observing healthy studio practices	**The need for healthy studio practices:** There is therefore the need for visual arts teachers and students to become aware of the potential hazards in using art materials. There are three ways in which such chemicals can enter the body: i. ***Absorption*** – hazardous chemical are absorbed through the skin from cuts or scrapes, resulting in burns or rashes, etc ii. ***Inhalation*** – chemical irritants can be inhaled, causing lung problems like bronchitis, etc. iii. ***Ingestion*** – chemicals can be ingested by touching the mouth with the hands or fingers while working with supplies or unconsciously placing tools like paint brushes in or near the mouth.	Guide students to brainstorm and discuss the need for healthy studio practices. Students visit the studio of a practicing artist and interact with him/her on what healthy studio practices he/she employs and write a report on their findings for class discussion.	Students to: - present their reports on the need for healthy studio practices for assessment. - visit the internet to research into the need for healthy studio practices.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **BUILDING A PORTFOLIO OF WORKS** **i)Meaning and Importance**	The student will be able to: 5.2.1 determine the requirements and qualities of a relevant portfolio of works.	Portfolio: - a collection of hard or soft copy collection of works. <u>Importance:</u> As a collection of works, it is needed or required for employment, further education, occupational training employment or business promotion as evidence of educational qualification, creative ability, achievement, technical proficiency, etc. Types: slides, samples, transparencies CDs, DVDs, Videos, stored, packed or contained in e.g. files, envelopes, folders, albums. Determining the requirement and qualities of a relevant portfolio of works. Criteria/checklist to determine whether it is relevant for the purpose e.g. 1. Does the portfolio reflect your best work? 2. Does it communicate well? 3. Is your craftsmanship faultless? 4. Are your personal strengths Apparent, etc?	Guide students to: - discuss the meaning, importance and types of portfolio. - compare types of portfolio to determine advantages and disadvantages, similarities and differences. - discuss and go through a checklist for determining the qualities and requirement for relevant portfolio of works.	Students to: - write a well researched paper on the importance and qualities of relevant portfolio in graphic design for a school, seminar and entrepreneurial skills.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **APPRECIATION AND CRITICISM**	The student will be able to: 3.1.1 respond to ceramic objects through appreciation.	**Appreciation of Ceramics** **Explaining appreciation** Talking intelligently about ceramic objects e.g. • creative arrangement of elements and principles of design • good finishing functions of ceramic items • cultural and other meanings of finished products • contextual dimensions of ceramic items.	Display ceramic works of students and guide them to discuss the good qualities in the works. **Note:** Apply procedure in appreciation and discuss the importance of appreciation. Assemble some other ceramic items available and guide students to appreciate.	**<u>Assignment</u>** Students to write an appreciation on identified ceramic items for a ceramic journal/school magazine.
	3.1.2 critique their own ceramic objects.	**Critiquing Ceramic Objects** 1. appreciation – talking about good qualities 2. value judgement and applying understanding and skills in analysis, interpretation, evaluation as well as theories, terms and criteria in visual art and ceramics.	Draw the awareness of students to the need for self assessment. Lead them to critically study their own works and evaluate them. They should say whatever should be done to improve them. **<u>Value and work ethics</u>** Self assessment, endurance, assertiveness and value judgement.	Critically study selected ceramic objects and write report on them.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **I) Develop a Business Plan.**	The student will be able to 5.3.1 prepare a business plan for an enterprise in ceramics	A business plan for ceramics: Purpose -controls direction of the enterprise Key points -executive summary -identify a problem to solve -establish what to achieve Usefulness -for monitoring and evaluating -as a collateral to seek financial assistance	Guide students to: -brainstorm and discuss the purpose of a business plan -discuss the relevant key points in preparing a business plan. - apply the knowledge and skills in exhibition to participate willingly in organising and mounting artworks. their knowledge, skills to prepare a business plan.	Students to: - write out a business plan for a ceramics enterprise
ii)Designing a Business Brochure and Card	5.3.2 design and make an artist brochure and card	Artist Brochure and Card: -An artist's brochure is a printed document, booklet or a small book that gives information about an artist and his/her works. -Purpose To create public awareness of what he/she does and can do. -key points The name of the artist. The artist's statement Contact: email, telephone numbers.etc Location of studio -Usefulness Record of previous exhibitions.	-brainstorm and suggest ways by which an artists can create public awareness of what he/she can do and present report for class discussion -discuss the purpose, key points and usefulness of an artist's brochure and cards. -discuss and demonstrate ways of preparing designing and producing an artist's brochure with words and images.	-write an essay on how to design and make an effective brochure or card. **PROJECT** Design and make samples of artist brochure and call card using appropriate skills and technology

SENIOR HIGH SCHOOL - YEAR 2

SECTION 1

OTHER CERAMIC RAW MATERIALS

General objectives: The student will be able to:

1. recognise that ceramic raw materials are abundant and readily available in the country.
2. develop the competency to use some of these materials to compose ceramic glazes and clay slips to satisfy ceramic needs of the country.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **FLUXING MINERALS, REFRACTORY OXIDES AND TEMPORARY RAW MATERIALS**	The student will be able to: 1.1.1 categorise the various raw materials according to their characteristics source and use.	**Categorisation of other Ceramic Raw Materials** **<u>Fluxing Minerals</u>** They are minerals that lower the temperature of other ceramic materials. **Examples** Lithium Oxide (Li_2 O) Potassium Oxide (K_2O) Sodium Oxide (Na_2O) Calcium Oxide (CaO) Magnesium Oxide (MgO) Lead Oxide (PbO) Boric Oxide (B_2O_3) Nepheline Syenite - (K_2O. $3Na_2O$. $4Al_2O_3$. $9SiO_2$) **Refractory Oxides** Are materials that can withstand very high temperatures? Alumina (Al_2O_3) Kaolin (Al_2O_3. $2SiO_2$. $2H_2O$) Fire clay Zirconium silicate or zircon -($ZrSiO_4$) Silica (SiO_2)	Assist students to discuss and categorize other ceramic raw materials under the following headings: Type, Characteristics, Source and Use. Discuss these factors with students Guide students to locate some ceramic raw materials on the map of Ghana. Students find out whether some of the materials can be found in their locality.	**Assignment** 1. Student to: make a table of the ceramic raw materials according to their functions and uses. 2. draw the map of Ghana and locate centres where ceramic raw materials can be found.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **FLUXING MINERALS, REFRACTORY OXIDES AND TEMPORARY RAW MATERIALS** **UNIT 2**	The student will be able to:	**Temporary Raw Materials** They are auxiliary materials used in ceramics but do not form part of the end product, though they are vital in ceramic manufacturing. E.g. Water – H_2O Organic binders – glue, corn flour, gum Arabic, wax emulsion, glycerine, alcohol, etc. **Importance of Temporary Raw Materials** Organic binders improve plasticity and mechanical strength of articles prior to firing, etc. Water-serves as a lubricant, an agent of suspensions and aids in slurry consistency, etc.		Students to: i. Explore the environment for ceramic raw materials.

CLAY BODIES	1.2.1 explain the meaning and importance of clay bodies.	**Meaning and Importance of Clay Bodies**
		Clay body is explained as: e.g.
		A mixture of clays or clay and allied ceramic materials which are blended to achieve a specific ceramic purpose.
		
		Importance of clay bodies
		• to ensure uniformity.
		• increase or decrease plasticity.
		• to improve drying and firing.
		• It helps to check and reduce shrinkage and warping, and unnecessary cracking during drying and firing.
		• it helps to improve upon maturity by increasing or lowering temperature of wares.
		• helps to increase strength and fit of glazes.
		• provides colour and texture in clays and glazes.
			Lead students to discuss:
			• The meaning and importance of clay bodies using examples
			• How to compose and prepare clay bodies to satisfy ceramic needs by the following methods:
			  • Refractory body
			  • Insulating Body
			  • Body with special colour etc.
				Group students to find out from relevant sources and report for class discussions on the following:
				• Socio-economic importance of composing and preparing clay bodies for the ceramic industry in Ghana.
				• Advantages and disadvantages in composing clay bodies.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) **CLAY BODIES**	The student will be able to: 1.2.2 compose clay bodies suitable for specific purposes.	**Composing Clay Bodies** **<u>Clay body constituents</u>** Clays, fluxes, openers and hardeners **Examples of clay bodies** Throwing body Modeling clay body Casting clay body Jiggering and pressing clay body Raku body Earthenware body Stoneware body Porcelain body Refractory body Flame proof and oven ware bodies etc. <u>Example of clay body recipe</u> Earthenware clay…… 90 Kaolin…… 10 100	Demonstrate and guide students to discuss and compose clay bodies for preparation to meet a need in ceramics. Students to prepare clay bodies test the bodies and assemble data for comparison and discussions in class. Students use their clay bodies to produce designed items to solve community problems.	Students to: i. Experiment with the raw materials and compose different kinds of clay bodies. ii Find out and provide further information on the following: • Items produced by various clay bodies • constraints/problems and solutions in composing and preparing clay bodies.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 **CERAMIC PRODUCTION AND SUSTAINABLE ENVIRONMEN-TAL ISSUES**	The student will be able to: 1.3.1 identify and explain ceramic practices that degrade the environment.	**Practices that degrade the Environment** 1. indiscriminate felling of trees for firewood. 2. discharging poisonous and hazardous materials (irresponsibly e.g. into water bodies, throwing waste about, etc). 3. Siting ceramic industries in residential areas possible fire outbreak, pollution, emission of poisonous gases, etc. 4. indiscriminate winning of ceramic raw materials such as clay and sand. **Good practices that sustain the environment** Siting factories away from residential areas. Afforestation to replenish degraded forests. Proper disposal of hazardous, toxic and poisonous chemicals to protect water bodies. Seeking technical assistance from responsible agencies, e.g. EPA, Lands Commission, District/Metro Assemblies, Minerals Commission, CSIR.etc. Encourage responsible studio and industrial practices e.g. use of protective clothing. Restoring damaged wares, recycling of ceramic materials. Energy conservation	Lead students to brainstorm and come out with practices that degrade the environment and discuss their effects on humans and socio-economic development. . Organise a field trip to clay or sand winning sites in your locality for students to study and discuss the effect on the environment.	**Assignment** Students write an essay on the effects of negative ceramic practices on their immediate environment and suggest possible solutions.

31UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D)	The student will be able to:			
	1.3.2 suggest possible ways of reclaiming the environment.	**Sustaining Ceramic Practices** • Research, resourcefulness and commitment • Sustainable use of materials • Enforcement and practise of work ethics • Capacity building • Vigorous marketing strategies • Sensitization and advocacy/publication • Roles of associations ,government and financiers • Production of tools ,materials and equipment	Put students into groups to explore new ways and materials for environmentally friendly ceramic production, and report in class. Organise field trips with students to institutions and organizations to investigate sound environmental resource management practices.	Visit industrial set-ups and observe their instituted environmental protection measures. Students to • find out modalities, guidelines for setting up and running ceramic workshops • standards in production for domestic use and export
CERAMIC PRODUCTION AND SUSTAINABLE ENVIRONMEN-TAL ISSUES	1.3.3 suggest and show by behavior how to sustain ceramic practices in Ghana.		Group students to debate on topics concerning sound environmental practices.	

SECTION 2

FORMING METHODS IN CERAMICS

General objectives: The student will be able to:

1. acquire knowledge and skills in ceramic forming methods.
2. develop and use acquired knowledge and skills in designing and forming methods to solve community and national problems.
3. understand the use of ICT practicing ceramics.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1	The student will be able to:			Students to:
ADVANCED WHEEL WORK	2.1.1 demonstrate adequate skills in throwing.	**Throwing** (refer to studies of throwing in the objectives 5.5.1) in year 2 syllabus).	Revise with students throwing processes started in 2nd year. Guide students to practise the stages of throwing stated in the content. Guide students to develop and discuss criteria for assessment. Students practise throwing on their own Assess progress of students throwing skills.	Demonstrate throwing process for teacher to assess competencies in centering opening, pulling, shaping, cutting, lifting according to criteria set.
	2.1.2 throw and turn cylinders of at least 20cm in height.	**Turning** Stages of turning • centering/trimming/ turning • finishing	Help students to discuss and practice turning using the appropriate tools 2.1.1.	Is the student able to: • throw and turn cylinders skillfully and proficiently?
	2.1.3 design and fix appendages.	**Designing and Fixing of Appendages** Types of Appendages • handles • spouts • knobs, etc.	Demonstrate and assist students to produce handles, knobs, spouts, etc. and fix appropriately.	Design and fix appendages to fit aesthetically and functionally

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **ADVANCED MODELLING**	The student will be able to: 2.2.1 design and model Composite forms to solve problems in the community.	**Design and Modelling of Composite** **Some problem areas in the community** e.g. lighting the streets and homes, parks and gardens, chiefs palace, the school, etc. **Organic and Inorganic Forms for Designing as sources for ideas and inspiration** E.g. animals, plants, cars, radios, etc. **Modelling Tools and materials**: **Skills** Pinching, modeling, cutting, Scooping, joining, etc.	Lead students to brainstorm and discuss some community problems that can be solved through ceramic modelling. Guide students to pre-image solutions to a need identified. Students design the pre-imaged item and produce it by modeling. Guide students to evaluate functions of items produced. Students assemble models for assessment.	Teacher to assess weight, wall-thickness, function and aesthetic qualities of objects produced.
UNIT 3 **OTHER FORMING METHODS**	2.3.1 describe extrusion, pressing, jiggering and jolleying forms of forming.	**Additional Forming Methods** **Extrusion** It is a method mainly used for making bricks by pressing clay through a machine. The bricks are cut into sizes, as the clay is forced through a specially designed device called the die orifice. **Pressing** It is another method used mainly in forming flat wares by means of a press. The material may be pressed wet or dry.	Discuss the additional forming methods as listed in content with the help of illustration, audio visuals, TLMs. Students to discuss and compare the forming methods to identify social and economic values, similarities, differences, advantages and disadvantages in design and production.	Students to find out more information about forming methods and report for class discussion. Information could be sought from the library, internet and ceramic establishments.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) **OTHER FORMING METHODS**	The student will be able to:	**Jiggering and Jolleying** Jiggering and Jolleying are methods used in producing plates and cups. Usually, a hard plaster mould is provided on a revolving disc, while a stationery tool shapes the outside or inside of the object. With jiggering the stationery tool shapes the outside of plate. The inside takes the shape of the convex mould. On the other hand, in jolleying, the stationery tool shapes the inside of cup while the outside takes the shape of the hollow mould.	Show photographs of non-available equipment for students to observe and discuss them.	Students to find aesthetic and functional values of these forming methods and report for class discussion.
	2.3.2 design and make items by casting to solve a national needs.	**Design and Casting of Items** Casting – a method of producing ceramic item by pouring clay-slip into a mould for the item to be formed to satisfy a national need, e.g. Crockery, figurines, electrical insulators, etc. **Types of casting** • press moulding • slip casting **Press Moulding** A ceramic forming method in which a plastic clay is rolled into slab and pressed inside a mould or draped outside it.	Assist students to discuss types of casting and press moulding. Help them to discuss a national need. Assist them to design simple items and apply casting techniques to produce them to meet a need. **NB.** Encourage students to apply computer skills in designing articles.	Student to pre-image a solution to a national need. Is the student able to design and make an item to solve a national need?

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) **OTHER FORMING METHODS**	The student will be able to:	**Slip casting** • Pour slip into porous mould mainly made of POP **NOTE:** • Water from the slip is absorbed by the POP allowing the clay particles to form a thin wall along the mould • Drain excess slip after a fixed time • Remove the mould and dry the cast. **Examples of cast items** Sinks and sanitary ware, fine china, figurines, insulators and structural ceramics of various shapes.	Collect samples of cast items and allow students to differentiate between slip casts and pressed pieces. Students discuss the characteristics of both methods. Students design simple items such as animal forms for decoration, flower vases, planters, etc. Help the students to cast the forms. Students assemble casts for appreciation and evaluation.	Students to make a table of slip cast and pressed items and relate them to their characteristics. **PROJECT** Students to design and cast simple forms to satisfy a national need in groups.

SENIOR HIGH SCHOOL - YEAR 2

SECTION 3

DECORATION AND FINISHING TECHNIQUES IN CERAMICS

General objectives: The student will be able to:

1. acquire knowledge and skills in decorating ceramic items.
2. adopt finishing techniques that will improve quality of ceramic items.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **DECORATIVE TECHNIQUES**	The student will be able to: 3.1.1 categorize appropriate decoration techniques in ceramics.	**Categorization of Decoration Techniques** Soft and plastic state**:** e.g. altering shape, twisting, pinching, beads attachment, stamping, etc. Leatherhard state: e.g. Incision, slip-trailing, carving, modelling, stamping, sprigging, slip transfer, in-lay, sgraffito, painting, etc. Dry state: e.g. Burnishing, engobes, and oxides, etc. Bisque state: e.g. Engobe, colouring oxides, Underglaze, use of decorative pencils and crayons, wax, glaze in-lay, etc. Glaze decorations: e.g. Underglaze, overglaze, stenciling ceramic transfers.	Assist students to identify, list and discuss various ceramic decoration techniques. Demonstrate and explain the various techniques showing examples where appropriate. Use real ceramic wares as much as possible. Guide students to describe, compare and categorize the decoration techniques according to : • Techniques • State of ware • Materials, tools	Students to: • List types of decorations. • Describe various techniques of decorations • Categorize the techniques according to the content and TLA.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **DECORATIVE TECHNIQUES** **UNIT 2**	The student will be able to: 3.1.2 decorate ceramic wares using appropriate techniques.	**Decoration of Ceramic Wares Using Appropriate Techniques** **Methods** As listed in content of 3.1.1 **Tools** e.g. syringe, cutter, stamp, stencil, etc	Demonstrate ceramic decoration techniques for students to observe and practice.	Students to explore materials and tools to create their own decorative techniques.
FINISHING TECHNIQUES IN CERAMICS	3.2.1 describe finishing techniques in ceramics.	**Meaning of finishing** finishing in ceramic could be explained as measures taken in the ceramic process to ensure a good quality work.	Assist students to explain the meaning of finishing in ceramics and guide them to identify finishing techniques at various stages of production. Stress the importance of finishing in ceramic production.	Students to employ relevant finishing techniques on a project to be assigned.
	3.2.2 finish a ceramic ware applying appropriate finishing techniques.	**Finishing Ceramic Wares** **Types of finishing** burnishing turning sticking-up fettling cutting and trimming sponging surface grinding blanking and punching **Criteria for standard setting** e.g. protecting turned wares from scratches - rounding sharp edges Joints of appendages and seams should be smoothly sealed, etc.	Demonstrate various finishing techniques for students to study and practice. Students apply appropriate finishing techniques to their wares. Lead students to develop and approve a criteria and standard for finishing. Assess the quality of students' works based on good finishing.	Students to set standards for quality work. Find out from Ghana Export Promotions Council for standards for production and finishing of ceramic wares and report for class discussions.

SENIOR HIGH SCHOOL - YEAR 2

SECTION 4

INTRODUCTION TO GLAZES

General objectives: The student will be able to:

1. be familiar with materials available for glaze production.
2. recognise the importance of glazing ceramic ware.
3. understand and apply glazing techniques to ceramic works.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **MEANING AND TYPES OF GLAZES**	The student will be able to: 4.1.1 analyse the meaning, importance and types of glazes.	**Meaning, Importance and Types of Glazes** <u>Meaning of Glaze</u>: A thin layer of glass coating that is fused on a ceramic ware by firing. <u>Importance of glazing</u> - decorates ware - provides impervious coating (in case of a porous body) - makes ware more hygienic. - makes ware more resistant to chemicals and acids - add strength to the ware - easy to clean - adds colour to ware <u>Types of glazes</u> Earthenware glaze, Stoneware and porcelain Glazes, Bristol glaze, Majolica glaze, Crystalline glaze, Ash glaze, Salt glaze.	Discuss and help students to demonstrate understanding of glazes. Assist students to describe, compare and differentiate various types of glazes. Collect samples of glazed wares and display for students to study, observe and appreciate. Students make individual comments about works displayed.	Students to: Analyse the importance of glazing ceramic wares. Differentiate between various types of glazes.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONTD) **GLAZE COMPONENTS**	The student will be able to: 4.1.2 classify glaze components/ chemicals according to characteristics and functions in glaze compositions. .	**Classification of Glaze Components** (a) <u>Fluxes (Bases)</u> **Low Temperature** PbO(lead oxide) Na_2O (Sodium oxide) K_2O(Potassium oxide) **Medium Temperature** ZnO(Zinc oxide) Li_2O(Lithum oxide) **High Temperature** CaO(calcium oxide) BaO(Barium oxide) MgO(Magnesium oxide) (b) <u>Stabilizers (Neutrals)</u> Al_2O_3 (Alumina) (c) <u>Glass Formers (Acids)</u> SiO_2 (Silica)	Discuss glaze components and characteristics with students. Assist them to describe the functions of each component in glaze formulation **Note** The characteristics of each material – sources melting point effects in glaze Show samples to students.	Students to: Classify the following chemicals according to their function in glaze compositions: silica, zinc oxide, barium oxide, potassium oxide and alumina, etc.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONTD) **GLAZE COMPONENTS**	The student will be able to:	**<u>The following materials provide colours in clay and glazes</u>** Iron oxide (FeO) – Red& Brown Manganese oxide (MnO) – Black Cobalt oxide (CoO) – Blue Tin oxide (SnO) – White Copper oxide (CuO) – Green Chromium (Cr_2O_3) – Green Rutile (T_1O_2) – Browns Zirconium (Z_1O_2) – White Zinc oxide (ZnO) – Milky white, Zircopax Z_1O_2 – 64.88 T_1O_2 – 0.22 S_1O_2 – 34.28 (White)	Discuss the various oxides that provide colours with students. Show samples of raw colours.	Students to: Identify and match the following oxides with the colours they produce: Chromium, chrome, zinc oxide, copper, rutile and cobalt, etc.
	4.1.3. produce and apply glaze through exploration and experimentation.	**Production and Exploration of Glazes** Possible Materials: Wood Ash, Bone Ash, Feldspars obtained locally, Silica, Clays	Assist students to explore the possibilities of obtaining local raw materials for the production of colour in glazes and clay bodies.	Present documented report on attempt to prepare glaze with local raw materials to include: • Materials • Methods used • Results • Limitations • Suggestions

SECTION 5

INTRODUCTION TO KILNS AND KILN CONSTRUCTION

General objectives: The student will be able to:

1. appreciate the history of kilns
2. be aware of types and functions of kilns in relation to different kinds of fuel used in firing.
3. understand that suitable materials for kiln construction are available in their community.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **HISTORY AND DEVELOPMENT OF KILNS**	The student will be able to: 5.1.1 trace the development of kilns	**History of early Kilns:** Structure, features, firing temperature, advantages and disadvantages	Discuss the history and development of early kilns	Students to:
TYPES OF KILNS	5.1.2 describe types of features and characteristics of kilns.	**Types, Features and Characteristics of Kilns** <u>Explaining the meaning of kiln</u> Special structure in which ceramic items are fired. <u>Types of kiln:</u> (i) <u>by draft</u> (ii) <u>by fuel used</u> - updraft - firewood kiln - downdraft - gas kiln - crossdraft - oil kiln - electric kiln - other solid fuels – cow dung, palm kernel, rice chaff, saw dust, coal, artificial dung (iii) <u>Other types</u> - intermittent/periodic - tunnel/continuous	Assist students to brainstorm and discuss the meaning of kiln and types according to their draught/draft movement and fuel used. Guide students to discuss and describe features of a kiln. Visits to ceramic centres are recommended. **NOTE:** Information, such as composing artificial dung (which comprises sawdust, flour and bentonite) should encourage students to explore raw materials available for kiln firing. Discuss other modern industrial types e.g. intermittent and continuous kilns.	i. Select one type of kiln and describe its features. ii. List energy sources suitable for firing kilns in their localities and elsewhere.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **TYPES OF KILNS**	The student will be able to:	<u>Features of a kiln</u> • Ware/kiln chamber • Chimney • Ash pit/hole • Flues • Bag wall/baffle wall • Damper • Air vents/spyhole • Fire box/combustion chamber • Kiln door	Lead students to discuss specific functions of the features listed under content.	**<u>Assignment</u>** Draw a down draught/draft kiln and label parts and describe their functions.
	5.1.3 compare and determine the advantages of the down draft/draught kiln over other.	<u>Advantages of the downdraft /draught kiln</u> - More efficient because the hot gas travels twice as far within the chamber. - There is more uniform heating of the chamber, therefore there is more control of firing cycle. - It is possible to have more control over the kiln atmosphere.	Organise students to brainstorm, discuss and analyse down draft/draught kilns and determine their advantages.	Students to compare the up draft and the down draft kilns to determine their advantages and disadvantages.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **MATERIALS FOR KILN CONSTRUCTION**	**The student will be able to:** 5.2.1 identify suitable materials for preparing fire bricks.	**<u>Materials for kiln construction</u>** Solid bricks Insulating bricks <u>Some materials for preparing bricks</u> Kaolin Bauxite Zircon Talc Cordierite Mullite Alumina, etc	Assist students to brainstorm, discuss and understand that the main material for kiln construction is bricks that can stand various pressures. Strong bricks can be composed from other clays.	Students to prepare clay bodies and make types of bricks in groups.
	5.2.2 make bricks for kiln construction through explorationof clay bodies.	**Making Bricks for Kiln Construction** <u>Possible firebrick clay recipe</u> 1. Stoneware clay -70 Kaolin -30 2. Stoneware clay -60 Kaolin -30 Kaolin grog -10 3. Kaolin -80 Plastic earthenware clay -20 <u>Insulating brick</u> 1. Clay - 60 Saw dust - 40 2. Clay - 40 Sawdust - 60 The clay could be fire clay.	Guide students to explore clays and other materials within the locality and help them to prepare different clay bodies for brick production. **NOTE:** Testing the clays. Some institutions could be contacted to assist e.g. CSIR, Geological Survey Department.	Group students to explore experiment and prepare clay bodies for kiln construction, for class discussion and assessment.
		<u>Importance of insulating bricks in kiln construction</u> Heat retention properties, etc.	Lead students to discuss the importance of insulating bricks in the ceramic industry.	Students to evaluate the functions of insulating bricks in the ceramic industry.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 **KILN CONSTRUCTION AND FIRING**	5.3.1 design and construct a kiln for Test firing ceramic items	**Principles underlying kiln construction** • simple shape for efficient heat circulation • ample burners or fire boxes • adequate flues • economy of fuel • sufficiently large and tall chimney • use insulating/ refractory Bricks	Assist students to design simple kiln taking into consideration various types of kiln e.g. updraft, down draft, gas/firewood, kiln, etc. Group work is more appropriate for this project. Guide students to select one good design and build a simple kiln. (Resource persons may be invited to assist in bricks lying).	In groups, students design and make a simple kiln for firing ceramic items. (Students use bricks produced in previous projects)
	5.3.2 pack and unpack a kiln effectively.	**Packing and Unpacking** • to fully utilize kiln space, a wide selection of sizes and shapes of wares need to be made. • unglazed ware can be stacked on top of, and inside each other. • cups, bowls and pitchers should be placed rim to rim and base to base • tiles, saucers and flat ware are best packed in vertical position • wares with lids should be fired with lids in place. • after firing and cooling, the item should be unpacked carefully.	Lead students to discuss general principles in kiln firing. Discuss packing and unpacking of wares in the kiln before and after firing, and kiln temperature determinants. Group students to practice packing and unpacking and discuss problems and solutions	Have the students: encountered any problems in packing the smaller and larger items? Solved the problems without supervision?

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 (CONT'D) **KILN FIRING**	5.3.3 fire to bisque temperature successfully.	**Bisque firing** The first firing in ceramics is normally done to facilitate glaze application for items that need glazing. **The Firing process** Preheating/water smoking. - Vents open Full blast/top temperature kiln regulation is set to the maximum. - Vents are closed Cooling is very critical and must be very slow to avoid cracking. **Determining the Kiln Temperature:** - Pyrometric Cones - Pyrometers - Colour - Time - Test Draw	Guide students to understand the term bisque firing. Discuss the bisque firing process with students taking note of appropriate kiln control. Lead students through the bisque firing process. Organise students to apply knowledge and understanding to fire and report for class discussion **Values and Work Ethics:** patience, tolerance, critical study, teamwork and cooperation. Discuss various temperature determinants and adopt available means of determining temperature in the kiln.	Students record their observations in field work books/notebooks/log book and discuss data. Students work individually and in groups.

SENIOR HIGH SCHOOL - YEAR 2

SECTION 6

SUSTAINABLE DEVELOPMENT AND ENTREPRENEURAL SKILLS

General objectives: The student will be able to:

1. be aware of various factors which determine the costing and pricing of ceramic products.
2. acquire knowledge and skills in costing, pricing and marketing ceramic products.
3. acquire the role of packaging in adding value to ceramic objects.
4. apply skill in planning and mounting exhibitions of ceramic items.
5. acquire knowledge and skills to manage and operate ceramics enterprise in a sustainable and environmentally manner.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONTD) **COSTING AND PRICING**	The student will be able to: 6.1.1 identify production and fixed Cost.	<u>Variable Cost (Direct cost or Production Cost)</u> This consists of the cost of raw materials and wages. Variable costs are the direct costs of making the product. They are called "variable" because the cost of materials for producing ten items a day is different from the cost for producing twenty items a day. The cost varies. <u>Fixed Cost</u> Consist of rent , lighting , cost, taxes, cost of adverts, depreciation cost of tools and equipment, telephone cost, transportation, postage, salaries, etc. fixed costs are also known as "Indirect Costs" or "Overheads"		Students to: Differentiate between Direct and Indirect costs.
Pricing	6.1.2 explain factors that determine the price of a ceramic product.	Price is generally determined by the market forces of supply and demand. Factors to be taken into account in pricing a product generally consist of • Cost of the product (total production cost). • Profit margin.	Guide students to discuss the various factors which determine the pricing of products. Lead students to discuss the factors that influence the pricing of ceramics products.	State four factors that determine the price of a ceramic product and discuss two of the factors.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **COSTING AND PRICING** **Pricing**	The student will be able to:	The two are combined in various price-setting ways such as: • Introductory price (also called market penetration price that is pricing below the actual market price to attract market share). This is only temporary pricing to get market share. • Using "going price" system that is charging the same price as other suppliers of the same product are charging. • Using the "cost plus" system – adding a percentage to total cost as profit. • Using the price discrimination system known as "what the market can bear" pricing system e.g. selling at a higher price in say Accra than in a smaller town. Selling at different prices in different areas of a town depending upon the income levels of the different areas.		Students to determine the profit margin of one ceramic product the class has produced.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 (CONT'D) **COSTING AND PRICING** **Pricing**	The student will be able to:	• Using the "price differentiation system" that is selling the same thing but using cheaper packaging for some, serving less vegetable with food and charging less, etc. The same product may be backaged differently or combined differently with other additives and priced differently. Pricing ceramic items: cups, mugs, bowls, tea cups, tea sets, decorative items, bricks, etc. **<u>Objective of Pricing</u>** • To meet the pocket of the average income earner. • To cope with competition • To capture greater percentage of the market. • To maximize profit.	Through questions and answers, students should discuss how to set prices for items produced in a village and items produced in a big town.	Students to cost and price other ceramic item.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 CONT'D	The student will be able to:			Students to:
COSTING AND PRICING	61.3 explain the meaning of "Marketing".	**Concept of Marketing** The art of offering a product for sale by using the skills of advertising and supplying.	Assist pupils to explain the meaning and purpose of marketing.	
Marketing	6.1.4 describe the basic strategies for efficient marketing.	**Basic Marketing strategies** • Advertising - by radio, TV, posters, handbills banners, word of mouth. • Exhibitions. • Bazaars. • Fairs. • Effective decoration and finishing. • Packaging – attractive Packaging. • Cost of the product (Total production cost).	Lead students to discuss in groups the different ways of marketing products (see content).	What is advertising? Explain two ways of advertising a ceramic product.
	6.1.5 describe the strategies for selling ceramic products.	**Selling may be done by:** • Wholesale – selling by large quantities (with quality discount) • Retailing items in smaller quantities. • Door to door selling Mail or export.	Guide students to discuss the strategies for selling ceramic products.	Write an essay of not more than 180 words describing three marketing strategies in the ceramic industry.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **PACKAGING IN CERAMICS**	The student will be able to: 6.2.1 explain the meaning and purpose/function of packaging in ceramics.	**<u>Meaning and Purpose/Functions of Packaging in Ceramics</u>** Packaging in ceramics explained as e.g. making container that holds a ceramic product and makes it possible for easy handling. **<u>Types of Packages</u>** Primary package Secondary package Tertiary package **<u>Importance/Functions of Packages</u>** e.g. identification, protection, information, convenience, attraction, value addition, etc. **<u>Characteristics of Materials suitable for Packaging in Ceramics</u>** e.g. weight, thickness, texture, strength, etc. **<u>Qualities of a good package</u>** e.g. attractiveness.	Guide students to brainstorm and come out with meaningful explanation of packaging and its purpose/function in ceramics. Lead them to: • Identify common packages, e.g. cartons, bottles, crates, wrappers, labels, etc. • Collect different packages and discuss them according to: a. types b. importance c. materials suitable for packaging in ceramics d. qualities of a good package e. packaging for local and export markets. Students collect various materials, such as grass, sponge, foam, wood, paper shavings, tailor's off-cuts, card board, Styrofoam, discuss and compare their functions and suitability for packaging in ceramics. **<u>NB:</u>** Discussion could take the form of group work. **<u>Attitudes</u>** Critical study and accuracy.	**<u>Assignment</u>** Students to visit shops in town and collect different types of packages for discussion in class. Students make group presentation on packaging in relation to: • types. • suitability of materials for packaging in ceramics, etc. Compare the three types of packaging with regards to their functions.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) **PACKAGING IN CERAMICS**	The student will be able to: 6.2.2 design and construct packages to meet national and global ceramic needs.	**<u>Designing and constructing packages to meet national and global ceramic needs</u>** Tools for designing e.g. computer, etc. **<u>Tools:</u>** e.g. hacksaw, craft-knife, etc. **<u>Materials:</u>** e.g. straw, wood, etc. **<u>Techniques:</u>** e.g. cutting, gluing, twisting, etc.	Assist students to brainstorm on national and global ceramic packaging needs. Guide students to design appropriate packages using the design process e.g. pre-imaging, etc. Students take into consideration characteristics of good packaging as stated in the content under objective 5.2.1. Encourage students to apply: • conventional signs and typography • cultural element and • technical skills in designing their packages Students construct packages individually and in groups using appropriate tools and materials to solve identified needs. Students assemble their packages for appreciation and assessment. **<u>Attitudes</u>** Responsible use of materials and care for the environment.	Students to explore the environment for new ideas and motifs to be used in designing their packages. **<u>Projects</u>** Students to design and produce suitable packages for exporting ceramic products in groups.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3 **EXHIBITION** **Meaning, Types and Importance** **UNIT 4** **PLANNING AND PREPARATION**	The student will be able to: 6.4.1 explain the meaning, types and purpose of exhibitions. 6.4.2 plan an exhibition.	Exhibition is a public display of products, such as manufactured goods, food, ceramic items and other artefacts in order to attract viewers and buyers. **Importance:-** - It offers avenue for sale of products. - Serves as an advertisement for Products, etc. **Types of exhibitions**: General and Specialised. i) General: attracts all kinds of exhibits and could be called bazaar, fair or exhibition. ii) Specialised: attracts specific products and accessories, tools/equipment and materials. (Art exhibition etc.) Planning an exhibition Consider: - type of exhibition - what to exhibit - Where to exhibit (location): exhibition could be held at school, district, regional and national levels - cost involved - publicity – poster, banners – invitation cards - expected number of guests/visitors - duration/time e.g. opening and closing - mounting of exhibits, e.g. fixing on a support or frame/display tables - general layout or space arrangement - security - visitors book	Students to explain the meaning of "exhibition" Guide students to discuss the purpose for holding exhibitions and describe the different types of exhibitions. Guide students to discuss the stages involved in the planning and preparation of an exhibition. In small groups, students plan for a school exhibition. **Note** Specific tasks should be assigned to each group. Each group selects a leader. The class should then nominate a co-ordinator for the entire exhibition.	Students to write an essay on the two types of exhibition.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 4 **THE SIGNIFICANCE OF SUSTAINABLE DEVELOPMENT TO THE SOCIETY AND THE GRAPHIC DESIGN INDUSTRY**	The student will be able to: 6.4.1. suggest strategies to sustain and maintain the environment and other inputs for the graphic design industry.	Sustainable use of graphic design resources; Resourcefulness Ingenuity Self-reliance.etc	Guide students to: identify the resources and discuss how to acquire and use in a sustainable manner.	Students to: - suggest the strategies for maintaining the resources.

SENIOR HIGH SCHOOL - YEAR 3

SECTION 1

DRAWING, DESIGNING AND ADVANCED TECHNIQUES IN HANDBUILDING

General objectives: The student will be able to:

1. explore and use the environment to derive ideas to create ceramic and sculptural forms.
2. develop ceramic forms using computer aided designs.
3. demonstrate adequate skills in throwing and hand building to produce ceramic forms of functional, aesthetic and cultural values.
4. acquire knowledge and skills in brick and tile production to meet housing needs of the community.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **OBJECT DRAWING AND DESIGNIG**	The student will be able to: 1.1.1 apply idea development and preliminary designing to their work. 1.1.2 draw and design varied shapes by hand and with the aid of computer.	Application of Idea Development **Preliminary designing** • Series of sketches are drawn. • One sketch is selected and developed. Final design made in form and colour retaining part of the original, etc. **Drawing Varied Shapes with the aid of Computer** Combination of forms in drawing and designing e.g. animal and plant forms, plants and mineral forms, mineral and animal forms, animal, plant and mineral forms. Forms from man-made objects. Needs: e.g. • Designing containers for Domestic, and Industrial use. • Designing items for interior decoration, e.g. Lamp Shades and vases etc.	Guide students to: • Explore and use the environment as source of inspiration Analyse indigenous designs, forms and motifs and use them as source of inspiration. Students brainstorm about a need. They use various techniques acquired in previous lesson to develop ideas. **Note** Students are encouraged to apply the computer in designing their work. They display their designs for critiquing. **Note:** Periodic inspection of sketch books (monthly checks) should be done by teacher. Ensure that cultural elements in indigenous motifs and concepts are incorporated in the designs. **Work ethics** Hard work, consistency and responsibility. •	**Assignment** Students to make series of sketches and develop them into ceramic forms.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **COMBINED TECHNIQUES**	The student will be able to: 1.2.1 demonstrate proficiency in throwing.	**Throwing** Students throw tall, flat, wide, narrow forms. **Skills: e.g.** centering, opening, pulling, shaping, turning, joining, trimming **Tools: e.g.** dipper, straight edge, sponge, pin, cutting wire, kidney.	Demonstrate throwing of tall, flat, wide and narrow forms. Guide students to throw these forms.	Has the students improved upon the throwing skills?
	1.2.2 design and make functional and aesthetic items to solve problems by combining two or more forms and techniques.	**Other forming methods to be employed** Slab work, coiling pressing, casting, pinching, modelling. **Combined techniques** Pinching / modelling / coiling, slabbing / coiling, etc. **Composite forms** Combine parts e.g. by joining, tying together, hanging on, etc. (mixed media technique may be used).	Set tasks about community needs and guide students to use various forming techniques to solve. Guide students to combine thrown pieces, slabs, coils wares to create animal, human, plant and other natural and man-made forms in the environment. Students apply the design process. **NB:** Encourage students to motorize their projects where necessary e.g. clock, fountain, etc. Students design and make ceramic items with attachments. Different materials are attached to the wares e.g.cane, kente, beads, etc.	**Assignment** Students to design and make a composite item of height not below 30cm, using combined ceramic forming techniques. Students to design and make ceramic items with attachments.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 **BRICK AND TILE PRODUCTION**	The student will be able to: 1.3.1 design and make moulds for bricks and tiles production.	**Materials for mould making** Hard wood Nails **Standard size moulds** 9½ x 4½ x 2½ - standard - solid bricks	Students design and test moulds for bricks and tile production. **Note:** Allowance is made for shrinkage.	
	1.3.2 design and produce bricks and tiles to meet a community need.	**Design and Production of Bricks** **Types of bricks** e.g. solid bricks, hollow bricks, perforated bricks, facing bricks, pavement bricks, etc. **Types of tiles** Pavement tiles, roofing tiles, wall tiles, floor tiles, murals, etc. **Clay for brick making** * Surface clay of about 10% - 15% plasticity • Mixing • Moulding • Drying on racks or boards • Clamp Firing	Show types of bricks and tiles to students for discussion. (pictures from books and drawings could be used to enhance the discussion.) Assist them to analyse the role of bricks and tiles in the socio-economic development of Ghana. Students to design and make bricks to satisfy an individual/school/community need. Guide students to prepare clay, mould bricks and fire. Students assemble their brick and tiles for evaluation and assessment.	**PROJECT 1** In groups, students design and make standard bricks to be used in kiln construction in subsequent class. **PROJECT 2** Students to design and make facing bricks covering an area of 90cm x 60cm for the chief's palace, etc.

SENIOR HIGH SCHOOL - YEAR 3

SECTION 2

GLAZE FORMULATION AND APPLICATION

General objective: The student will be able to:

1. understand simple glaze chemistry.
2. formulate recipes, prepare and use glazes in finishing their ceramic objects.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **GLAZE FORMULATION AND PREPARATION**	The student will be able to: 2.1.1 compose simple glaze recipes.	**Composing simple glaze recipe** Use the Seger formula to calculate a simple glaze recipe from a given formula. e.g. PbO 1.0 AlO 0.1 SiO_2 1.5 Sample recipe from given formula – Litharge (PbO) - 68% Kaolin - 8% Quartz(silica) - 24% 100%	Help students to calculate simple formulae for glaze recipes. Guide students to explore glaze calculation software programmes. **Note:** Encourage experimentation and use of local raw materials for glazes. Link up with research institutions e.g. CSIR and Geological Survey etc. for assistance. **Sample recipes for Trial** **Recipe I** / **Recipe II** Potash Feldspar 40.4 Potash 47 Ball clay 6.9 Whiting 10 Kaolin 12.0 Kaolin 12 Talc 3.3 Flint 31 Whiting 20.4 Total 100 Total 100	Check the effects of glazes on test samples. Encourage students to experiment with various materials and formulate their recipes.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1(CONT.) **GLAZE FORMULATION AND PREPARATION**			Manganese Red iron oxide 0.5 oxide 0.5 Bentonite 1.0 Iron oxide 0.5 Epson salt 0.15 Epson salt 0.15	

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONTD) **GLAZE FORMULATION AND PREPARATION**	The student will be able to:		**Recipe III** Potash Feldspar 49 Silica 22 Kaolin 6 Talc 6 Whiting 7 Bone ash 10 100	
	2.1.2 prepare sample glazes.	**Glaze Preparation** • Mix with right amount of water to form a slurry. • Sieve and leave solution for particles to settle and apply on bisque wares.	Experiment and do practical activities with students in glaze preparation. Test students' glazes.	Students to prepare their own glaze in groups and individually.
GLAZE APPLICATION	2.2.1 demonstrate three or more methods of glaze application effectively on ceramic wares.	**Methods of Application** Powdered, methods Liquid, methods Gaseous, methods **Studio** - dipping, pouring, painting, spraying. **Industrial** Waterfall, electrostatic glazing, fluidized bed dry glazing etc. These are mechanized methods used in the large industries. **Some glaze decorations** Underglaze painting Screen printing Transfer/decals Stenciling	Discuss glaze application with students including studio and industrial methods. Apply studio methods on students' wares. Employ various glaze decoration methods. Guide students to apply various glaze decoration techniques to their wares. **Note:** Ensure that each student participates in the exercise. Find out which type of application interests the students most and why?	Students to demonstrate more than three glaze applications effectively.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONTD) **GLAZE APPLICATION** **Glaze Defects And Solutions**	The student will be able to: 2.2.2 identify glaze defects and suggest possible solutions.	**Defects caused by clay body** e.g. cracks as a result of under fired body. i. under fired body will cause cracks. ii. excessive water in the body will cause pinholes and beads. **Defects of Application** i. applying glaze too thickly will cause glaze run. ii. dust or oil on clay surface will cause crawling/pinholes. **Defects in firing** i. fast cooling will cause crazing and dunting. ii. over firing will cause glaze to run. iii. under firing will cause the glaze to be matt/milky. **Defects in glaze composition** i. glazes ground too finely will develop pinholes. ii. incompatibility between glaze and body will cause crazing.	Collect some ceramic items and guide students to identify glaze defects and describe them. Students suggest possible causes and solutions to the defects. Assist students to make a table of glazes, defects and solutions.	Are the students able to identify glaze/defects? Students to differentiate between various defects.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONTD) **GLAZE APPLICATION** **UNIT 3** **GLAZE FIRING**	The student will be able to: 2.3.1 fire glazed wares successfully.	**Possible solutions to Glaze Defects** With application, the thickness of the glaze could be controlled as well as washing and cleaning bisque wares before glazing. To check defects in firing, the firing and cooling must be controlled e.g. process of cooling must be gradual. With glaze composition clay body and glaze should be worked at similarly, the particle size of glaze materials need to be controlled. **Glost Firing (Glaze Firing)** • batts and props need to be washed with kaolin. • feet of items and bottoms must be cleaned of glaze (dry footing). • glazed pots should be Placed, roughly 3mm – 5mm apart to prevent sticking together (kissing), etc. **Firing stages** Drying - 120^{o}C Ceramic change/decomposition - 350 ^{o}C – 700 ^{o}C Fusion – 600 ^{o}C – 1000 ^{o}C Vitrification – 1050 ^{o}C and above Integration – Interface Cooling – withdrawal of heat	Guide students to discuss glost firing process and attendant controls. Observe the firing, note and record findings in a log book. Lead students to discuss data on firing for use in future firings. Discuss and organise glost firing (where possible)	Student to: Note significant changes he/she has detected about the firing? Record findings in detail in a kiln log book for future comparison.

SENIOR HIGH SCHOOL - YEAR 3

SECTION 3

ENTERPRENEURIAL SKILLS

1. become aware of basic entrepreneurial skills in setting up and managing ceramics enterprise.
2. recognise agencies for financial and technical assistance.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **ESTABLISHING SMALL SCALE CERAMIC INDUSTRY** **Factors To Consider**	The student will be able to: 6.1.1 explain the factors to consider in setting up a small scale ceramic enterprise.	Factors to consider when setting up a small scale ceramic enterprise. (a) Capital: capital is of two Types • Start-up capital and working capital. Start-up capital is money used to purchase tools, equipment and materials to start the business operation. • Working capital is needed to buy new materials to keep the business running, to pay for transportation, salaries, utility bills e.g. Telephone, electricity, rent. Much of the operation costs is paid from the working capital.	Discuss the important factors to consider when setting up a ceramic enterprise. Discuss where and how to obtain start up and working capital and stress reasons why working capital is an important factor to consider in keeping business running. Discuss the differences between skilled and unskilled labour and their roles in the ceramic establishment.	Students to write the factors to consider when setting up a ceramics enterprise. Students to answer quizzes on the lesson.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1 **ESTABLISHING SMALL SCALE CERAMIC INDUSTRY**	The student will be able to:	(b) Room or space for workshop. (c) Labour (Skilled and unskilled) (d) Availability and nearness of raw materials. (e) Nearness to market or Customers. (f) Reliable transportation and communication. (g) Selecting a business. (h) Business Registration requirements.		Students to:
Setting Up	6.1.2 determine whether there is market for the intended product before setting up.	Conducting a market survey to determine whether there will be a market niches for the product e.g. whether the enterprise will be profitable at all.	Through questioning, guide the students discuss pre-requisites in setting up the enterprise in specific area of production.	Find out and determine the market potential of ceramics in their locality in terms of: - types of products - places where products are required - compare prices - packaging and presentation of finished products
Agencies For Financial Assistance	6.1.3 identify agencies that provide financial assistance for small scale industries.	Agencies providing assistance and financial support to small scale enterprises: National Board for Small Scale Industries (NBSSI) Export Promotion Council Aid to Artisans Ghana Export Trade (GETRADE) The Banks	Assist students to identify and discuss the duties of agencies that provide financial assistance to small scale industries. Invite resource persons to give a talk and brief the students on the conditions under which financial assistance may be given to small scale enterprises.	List four (4) organisations and establishments which offer financial assistance to small scale businesses. They should explain how the assistance could be obtained.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1	The student will be able to:			Students to:
ESTABLISHING SMALL SCALE CERAMIC INDUSTRY **Where To Get Technical Help**	6.1.4 identify various agencies which provide technical assistance to small scale businesses.	Agencies providing technical assistance to small scale enterprises include: • GRATIS - Ghana Regional Appropriate Technology and Industrial Services. • GETRADE – Ghana Export Trade • NBSSI – National Board for Small Scale Industries • District Assemblies • EMPRETEC	Guide students to discuss the role of agencies listed in content and any others in your local areas in providing technical assistance to small scale businesses indicating the type of technical assistance they offer.	Contact an agency and find out how it supports Visual Art entrepreneurs in terms of finance, marketing, management, design and production.
UNIT 2				
MANAGING A CERAMICS ENTERPRISE	6.2.1 explain the concept of management in the Ceramic Enterprise.	Management is the process of ensuring efficient execution of all activities of an enterprise through working with people. All production factors need to be brought together and organized before they become productive. The entrepreneur bears the risks of production. He is the one who controls the operation of the enterprise.	Let students name any successful manager they know and talk about him and his works.	Visit an organization in town and for students to interact with management on managerial practices e.g. the bank, etc.
Functions Of The Manager	6.2.2 describe the functions of manager.	The manager is the one who undertakes production with a view to earn profit. The management process involves:	Assist students to define the concept of"Manager".	

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (Cont'd) **MANAGING A CERAMICS ENTERPRISE**	The student will be able to:	• <u>Planning the enterprise</u> - Determining the market profitability – to find out if a product will sell. - Location of workshop. - Employ labour. - Types of products to produce, how to produce, when to produce and for whom to produce (market). - Capital required. • <u>Organising</u>: Putting together the capital, labour and other resources to start the business, setting up the business structures and the authority structure i.e. who reports to whom. • <u>Directing:</u> Directing means the leadership style adopted to ensure effectiveness. It implies establishing policies, co-ordinating the work of staff, staff development training. Motivating staff and assigning duties in the enterprise, etc. • <u>Controlling:</u> - Controlling means measuring performance against standards of the enterprise. It involves setting standards.	Guide students to discuss each of the steps in the management process and how each step will help in the management process. Group students for various discussions. Teacher assesses group reports and discusses feedback with students. Guide students to discuss the additional skills required for managing an enterprise successfully by a manager. **Note:** The additional skills include: • Budgeting • Temperament • Computer skills • Perseverance • Commitment • Courage to take risks. • The need to absorb shocks must be stressed. • Plan each day's activities properly.	Students to: Describe four (4) functions of the manager. Give practical examples.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2 (CONT'D) **MANAGING A CERAMICS ENTERPRISE**	The student will be able to:	• Checking production on daily, weekly, monthly and yearly basis to ensure the business reaches its targets. • Monitoring expenses for production, transport and communication, checking expenses against revenue to ensure the enterprise is healthy, and giving feedback to management and staff to improve work quality and standard – (Quality Control) customer relations is the art of dealing with the customer to make him feel welcome and appreciative.		Students to:
	6.2.3 identify and explain good customer relationship.	Consider the following: • Be nice to the customer (He/she has the money to buy today, tomorrow or another time. Make sure he/she comes back again. Do not be rude to him/her). • The customer is always right. (Do not earn a bad name for your enterprise by arguing and quarrelling with customers. • The customer is a guest of the enterprise and must be well treated.	Assist students to explain "good customer relations" and discuss its impact on the ceramic enterprise. Invite a resource person to give a lecture on management practices of a good ceramic enterprise.	Report on good management practices discussed in their groups. Act a sketch to illustrate "good customer relations".

CERAMICS TOOLS AND EQUIPMENT

1	Pick axe	**17**	Sieves
2	Hoe	**18**	Spraying booth
3	Cutlass	**19**	Kneading Tables
4	Mattock	**20**	Drying pits
5	Shovel	**21**	Storage bins
6	Wheelbarrow	**22**	Plastic containers
7	Head pan	**23**	Potter's wheels
8	Sackboard	**24**	Banding wheels
9	Rolling pins	**25**	Jaw/ball mills
10	Guide sticks	**26**	Blunger
11	Turning tools	**27**	Pugmill
12	Throwing tools	**28**	Test Kiln
13	Scooping tools	**29**	Kiln
14	Modelling tools	**30**	Computers
15	Weighing scales	**31**	**Software** 3D Max, Cinema 4 – D Macromeda,, Poser, Rhino, Corel Draw
16	Banding Wheel (Turn-Table)		

CERAMICS MATERIALS

1	Clays
2	Feldspar
3	Silica
4	Kaolin
5	Glaze materials
6	Colouring oxides
7	Colouring stains
8	Plaster of Paris

REFERENCE BOOKS

1	**Borensohn, Palus** (1972), Finding ones way with clay, New York : Simon and Schuster
2	**Clark, Kenneth** (1972), Practical Pottery and Ceramics, New York: Vilgin Press Inc.
3	**Cadew, Michael** (1969) Pioneer Pottery, New York : St. Martins Press
4	**Fournier, Robert** (1977) Electric Kiln Construction for Potters, New York: Van Norstand Reinhold Co.
5	Geological Survery of Ghana Bulletin, No.42 (1965) Chemical Analysis of Ghana's Rocks, Ore and Minerals, Accra, Ghana
6	**Hammer, F.** (1975) The Potter's Dictionary of Materials and techniques, London, Pitman Publishing
7	**Jonez, I.T & Berard M.F.** (1972) Ceramics Industrial Processing and Testing. The IOWA State University Press, Ames, IOWA
8	**Nelson, G.C. & Burkett R**. (2002) Ceramics – A Potter's Handbook
9	**Nelson, G.C.** (1971) Ceramics 2nd Edition, New York, Hott, Rienhart, E Winson
10	**Norker, A & Danisch, J.** (1991) Forming Techniques for Self-Reliant Potter, GATE/Vieweg
11	**Norker, A & Danisch, J.** (1990) Clay Materials for the Self-reliant GATE/Vieweg
12	**Norker, A. & Danisch, J.** (1987) The Self-Reliant Potter; Refractories and Kilns, GATE/Vieweg
13	**Rado, P.** (1974) Introduction to the Technology of Pottery 2nd Edition, Oxford, Pergamon Press
14	**Rhodes, D.** (1969) Kilns : Design, Construction and Operation, Philadelphia, Chilton Press

GLOSSARY

Terminologies in Ceramics

Acid: - One of the three groups of chemicals that makes up or constitutes a glaze.

The other two are known as *Bases* and *Intermediates* or *Neutrals*.

The acid group is symbolized by the radical $R0_2$. The most important acid is Silica ($Si0_2$).

Alkali: - These comprise the base compounds of Sodium (Na) and Potassium (K).

Alumina (Al_20_3): - A major ingredient found in all clays and glazes. It is the chief oxide in the neutral group.

Ash: Generally, the ashes of trees, straw, leave etc. The ashes provide fluxing and other oxides.

Bag Wall (*Baffle*): - A baffle wall in the kiln, which separates the chamber from the combustion area. It protects the wares from direct contact with flames, fumes, and gases.

Ball Clay: - It is extremely fine-grained plastic sedimentary (secondary) clay. It contains much organic matter yet fires white or near white in colour.

Ball Mill (*Pebble Mill*): - A grinding mill used for the fine grinding of glazes and glaze materials.

It consists of a porcelain jar filled with flint or porcelain pebbles and rotated with either a wet or dry charge of chemicals.

Batt *(Bat or Batten)*: - A disk or slab of Plaster of Paris on which pottery is formed or dried.

Bat Wash: - A slurry of refractory material – flint, Alumina, Kaolin or Whiting used on kiln furniture to prevent pots from sticking on shelves.

Bentonite: - A highly plastic clay formed by the decomposition of volcanic ash. It is extremely fine or plastic.

Binders: Various materials like gums added to glaze slops to increase glaze adherence, (Gum Arabic, CMC Gum etc).

Bisque-Biscuit: - First firing of ceramic wares or, unglazed fired pottery.

It makes wares harder and easier to handle for glazing.

Bisque Fire: - Preliminary firing to harden the ceramic bodies prior to glazing and subsequent glost or glaze firing.

Blunger: - An equipment used to prepare large quantities of clay slip or glaze.

Body:- A clay for a special purpose. It is created by blending different clays or by adding minerals to clays, such as fluxes, Hardeners, or openers.

Bung:- A pile of saggers in a kiln.

Burnishing:- Polishing leather-hard clay by rubbing with a hard, smooth object like a pebble or the back of a spoon etc.

Calcine:- To heat a ceramic material to purify it or to heat a ceramic materials or mixture to the temperature necessary to drive off the chemical water, carbon dioxide and other volatile gases such as the production of plaster of Paris and Portland cement and ceramic stains.

Casting (***Slip Casting***): - A reproductive pottery-forming process whereby clay slips is poured into hollow plaster moulds.

Casting Slip: - A Clay plus water plus Defloculant suspension, which is used in the process of slip casting.

Celadon: - A gray-green stoneware glaze – the result of firing Iron Oxide in a reduction atmosphere. Celadon ware was of Chinese origin.

Ceramics: - This word is derived from the Greek word ***Keramos*** which means “potter’s earth” or "burned stuff". Ceramics simply means Clay objects made permanent by heat. A broad definition includes all useful or ornamental objects made from clay or other earthy materials and hardened by fire to a temperature of 600^{o}C and above. Ceramics may also be defined as the art and science of forming or making objects out of clay or other earthy materials and making them permanent by heat treatment.

Ceramist:- One who works with clay and glazes in an objective way.

Chequer:- The pierced floor of a kiln through which the flames reach the chamber. A chequer must be built before the kiln can be set so that the flames can penetrate to the back and be distributed evenly across the setting.

China Clay:- Kaolin the purest natural clay with a chemical formula of $Al_20_3.2Si0_2.2H_20$.

China clay is high in alumina and average in silica content. It is therefore a refractory clay with very little plasticity.

Clay: - A natural, fine-grained, earth-like material containing a large amount of the mineral Kaolinite. It is the product of the geologic weathering of Feldspathic rocks on the surface of the earth. The root of the word clay is “sticky soil”. Clay is the backbone of ceramics.

Chuck (***Chum***):- A thrown and or turned clay form which is centered and stuck onto the wheel head where it is used to hold a pot for turning. The chuck should be in a fairly soft cheesehard condition in which it is slightly sticky and thus grips the pot. When not in use, a chuck is stored to keep it in cheesehard state. Wrapping it in polythene to exclude the air is excellent.

Coiling: A hand method of forming pottery by building up walls with rope-like rolls of clay and then smoothing over the joints,

Combing:- A method of decoration developed by dragging a coarse comb over two contrasting layers of wet clay slip or glaze.

Cones (*Pyrometric Cones*) Small clay rods or elongated three-sided pyramids one to three inches tall, which are placed inside a kiln during firing to measure, indicate or determine the temperature inside the kiln.

Cottle:- (*Cockling, Cockle*): An expendable wall of card, plastic clay or wood set in place around a model when plaster of Paris is to be poured over it. It remains in position until the plaster is set.

Crack:- Unwanted break in a piece of pottery or ceramic ware during drying and firing. Cracks are caused by physical stress resulting from the expansion, contraction and shrinkage, which pots experience during drying and firing. Cracks occur when the stress is greater than the pot can withstand.

Crackle Glaze: A special glaze containing minute cracks in the surface.

Crawling: (*Creeping, Rolling Ruckling*):- Separation of a glaze coating from the clay body during firing. This may be caused by too heavy glaze application.

Crazing: - A glaze defect characterized by a network of fine cracks which appear on the surface of a glazed ware.

Overfiring glaze wares may cause crazing. Poor glaze application may also cause crazing.

Crucibles: Heat resistant containers that are used directly over heat. They are used by metal smiths (gold and silver smiths) and the steel and mining industries to melt metal and contain molten metal.

Damp box: - A box, usually zinc-lined for keeping work moist, or where unfinished clay objects are stored to prevent then from drying.

Damper:- An adjusting device which cuts down or increases the amount of hot exhaust gases entering the chimney.

Decant:- To pour off liquid gently without disturbing the solid material which has settled.

Defloculant:- A soluble material, which is added to clay suspensions (slips) to increase fluidity.

Dipping:- A method of glazing ceramic object by immersing it in a large pan of glaze.

Dry Footing (*Dry Foot*):- To clean the bottom rim of a glazed piece before firing, so that it can be fired standing on a kiln shelf and without stilts.

Draw:- To unpack a kiln after firing.

Dunting:- Cracking of fired ware in a cooling kiln.

Earthenware:- Low fired pottery. Pottery fired below 1050^0C or 1100^0C.

Enamel:- A soft-melting glaze used to decorate pottery, metal or glass.

Engobe:- Coloured clay slip especially for decoration. It is used to cover clay. It is applied by brushing, spraying, or dipping.

Eutectic:- The lowest melting point of the mixture of two or more materials composing a glaze.

Fat Clay:- A very plastic clay.

Fettling:- The trimming away of excess clay either at leather hard or dry state.

Filler: A non plastic material such as sand, grog, flint, etc, added to clay bodies to help drying and control shrinkage.

Fire Box:- Combustion chamber of a gas, oil or wood-fired kiln, usually direct below the kiln chamber.

Flux:- A substance which melts and causes other substances to melt at much lower temperature than their melting temperature.

Flue:- Passageways around the kiln chamber through which the heating gases pass from the fire box to the chimney. Channel for conveying hot air, smoke, flame, gases etc.

Foot:- The ring-like base of a ceramic piece usually formed by trimming excess clay.

Fusion:- To melt under the action of heat.

Frit (*Fritt*):- Part of a glaze recipe that has been melted and re-ground.

Its purpose is to eliminate the toxic effect of Lead or the solubility of such compounds as Borax etc.

Glaze:- A thin layer of glass which is fused into place on a pottery body.

Glaze Firing (*Glost Fiinge*):- A firing cycle to the temperature at which the glaze materials will melt to form a glasslike surface coating.

Glaze Fit:- Harmony of glaze and ceramic body.

Greenware:- Ceramic ware which has not been bisque fired .

Grog (*Chamotte*): - Hard fired clay or bisqued clay that has been ground into powder of various particle sizes (fine or course).

Kaolin (**$Al_20_3.2Si0_2.2H_20$**), Kaolinite: - The ideal or pure clay also known as *China Clay*.

It is used in glaze and porcelain bodies and fires to a pure white.

Kaolinization:- The process of decomposition whereby igneous and metamorphic and feldspathic rocks are changed. The important new mineral which emerges is Kaolinite, the pure clay crystal.

Kiln:- A structure built to conserve heat. A furnace made of refractory clay materials for firing ceramic products.

Kiln Furniture:- Moveable refractory kiln fittings which include shelves, Props or posts etc. upon which ceramic wares are placed while being fired in the kiln. They are made of refractory materials.

Kiln Wash:- A mixture of china clay and Flint with enough water added to make it brushable. It is used to protect kiln shelves from glazes that may fall on them during firing.

Kneading:- A method of preparing plastic clay for use:-It involves the rolling of plastic clay with the fingers and the heel of the palm in a rocking, spiral motion. By kneading, a ball of clay is thoroughly mixed and develops a uniform texture. Kneading forces out trapped air pockets from the clay. Air bubbles are thus removed by kneading. Kneading makes clay smooth, uniform, homogeneous and ready for any plastic forming processes.

Lean Clay: - Clay of low plasticity. Also called *short clay*.

Leather Hard: The condition of the raw ware when most of the moisture has left the body but when it is still plastic enough to be carved or joined.

Lid: - A hygienic cover for pots which adds beauty to the pot shape.

Lifting:- A slip and glaze defect in which there is loss of adhesion before firing. They flake off.

Luster:- Metallic surfaces on glazes.

Luting:- A process of joining two pieces of clay in the leatherhard condition with a slip or slurry. It involves the Scoring, Applying clay slip and Pressing the joints together.

Majolica (*Maiolica*): - Decorated tin-glazed earthenware or Earthenware covered with a soft tin-lead glaze, often with a luster decoration, (Delft, Faience).

Mat:- Dull surfaced. Not shiny.

Matured Temperature: - is the temperature a body or glaze reaches or attains to improve its quality or to reach its correct strength .

- $950^{o}C – 1150^{o}C$ = Earthenware (low)
- $1150^{o}C -1250^{o}C$ = Stone ware (medium to high)
- $1250^{o}C –1350^{o}C$ = Porcelain (very high)

Maturing temperatures are different for different clays or glazes.

Mould (*Mold*): - A form or box usually made of plaster of Paris containing hollow negative shape into which clay slip is poured for casting.

Muffle:- A thin-walled refractory box in a kiln to protect ware from direct contact with flame or
A chamber in a kiln that protects ware from contact with the direct flame.

Onglaze (*Overglaze*):- Decoration applied with overglaze colours on glazed and fired ware. The overglaze or onglaze decoration is then re-fired at a lower temperature.

Organic Matter:- Vegetable or animal material sometimes present in natural clay.

Ovenware:- Pottery used for oven cooking.

Overburden:- In digging clay or other raw materials. There is often a layer of soil or decomposed rock on top of the desired material.
This has first to be removed before winning can proceed.

Overfiring:- Firing higher than the required temperature and thus creating defects in the ware.

Oxidation (*Oxidizing Fire*):- A fire during which the kiln chamber retains an ample supply of oxygen.
An electric kiln always gives an oxidizing fire or atmosphere.

Peeling:- Separation of engobe or glaze from the body or
A defect in which portions of a glaze or an engobe separates from the ware. It is also known as shelling.

Peep Hole:- A hole placed in the kiln – Fire box, wall, Door, etc. through which one can observe the cones or firing process or combustion.

Pinholes:- A glaze defect caused by too rapid firing or by tiny air holes in the clay.

Pinching:- Forming a pot by the compression action of fingers and the thumb. The pot is built by pressing the ball of clay between the fingers and the thumb to form the wall.

Plaster of Paris (*P.O.P.*): - Semi-hydrated Calcium Sulphate. A white powder prepared by calcining Gypsium. P.O.P. is used extensively for mould making.

Plasticity:- The quality of clay that allows it to be manipulated, deformed or changed in shape and still maintain its given shape when the deforming force is withdrawn without cracking or sagging.

Porosity:- The ability of a fired body (clay) to soak up water.

Pre-Heating (*Water Sm*oking):- Process of warming-up prior to the firing of clay.

Pressing (*Press-moulding*):- A method of forming pots or shaping clay by pressing plastic clay slabs onto and into absorbent plaster or bisque-fired moulds.

Primary clay (*Residual Clay*): - A clay found in its place of origin or at the bottom of the parent rock. A best example is Kaolin.

Pug Mill: - An equipment for mixing and compressing plastic clay. It usually has a vacuum attached to remove air bubbles from the clay – a process known as de- airing.

Quartz Inversion:- The changing of the crystalline structure of quartz (Silica) during firing, between 375^0C and 573^0C. This change is reversible during cooling.

Raku:- A Japanese earthenware used in the tea ceremony. It is rough with dark crackled glaze.

Reduction Fire:- A firing using insufficient oxygen by introducing combustible materials to develop carbon monoxide combining with oxygen from the body to form carbon dioxide.

Refractory: Resistance to heat; High-fire. Refractory is the quality of a material to retain its strength at high temperatures.

Relief Decoration:- Decoration achieved by modelling on the surface of the pot by adding pieces of clay like sprigging etc., or by pushing clay from one side of " the pot to another.

Rib:- . It is also called Kidney.

Running (*Glaze Run*):- The amount by which a glaze moves under gravity during its fluid state in the firing. If the glaze application is thick and the pot is overfired the glaze is likely to run down vertical walls and ruin the base of the pot and the top of the slab.

Saggar (*Sagger*): - A box made of fire clay in which glazed ware is placed for protection from the flames and gases in the fuel kiln during firing.

Salt Glazing:- A method of glazing ware (usually stone ware) by throwing common salt into the firebox of the kiln when the temperature is at its highest point.

Sgraffito:- A method of decorating by scratching through a coating of coloured engobe, slip or glaze to show or expose the contrasting body colour beneath.

Setting:- Kiln packing or loading.

Shivering:- A glaze defect in which sections or shivers of glaze lift off the piece.

Shard (*Sherd*):- A piece of broken pottery.

Short Clay (*Lean Clay*):- Clay that is not plastic.

Shrinkage:- Decrease or reduction in size of a ceramic object due to drying and firing.

Slab Construction: A hand building method in which forms are created by joining flat sheets or pieces of clay. The sheet or pieces are thinned and flattened with a rolling pin or slab roller on a slab board or (sack board).

Slip (*Slop*):- A clay in liquid suspension or clay mixed with water.

Slip Ware:- Earthenware pottery decorated with coloured slip under a transparent lead glaze. The slip coating can be finger – combed, sgraffitoed or slip trailed.

Slug:- A length of clay from a pug mill.

Slurry:- Clay of paste-like consistency.

Spraying:- A method of applying glazes with a spray gun..

Spout:- A projection on a pot to assist pouring.

Sprigging:- A relief decoration pressed in a sprig mould and attached to the ware with slip.

Stacking (*Setting*):- Packing or Loading a kiln.

Stilt:- Porcelain tripods on which glazed ware is placed in the kiln.

Stoneware:- High-fired vitreous ware with slight or no absorbency. Firing is between 1150^0C and 1250^0C.

Teapot:- A lidded pot with a spout and handle for serving tea.

Temperature:- A means of describing heat.

Template:- A pattern for shaping the profile of a piece.

Terra Cotta:- Low fire earthenware, usually red, often containing grog, and is used for sculpture.

Terra Sigillata:- A surface treatment developed by the Romans using a red slip glaze that gives pottery a hard, semi-glossy surface. It was made by spraying on an engobe of extremely fine particles.

Thermal Shock:- The stress created within a ceramic object by sudden temperature change. Thermal shock is responsible for the occurrence of cracks in ceramics.

Throwing:- Forming plastic clay on the potters' wheel.

Trailing:- Using a tube to apply a line of slip on clay surface.

Turning (*Trimming-Shaving-Tooling*):- A process of shaping a leather-hard clay or Removing unwanted clay from a thrown piece to achieve a particular form and to provide the pot with a foot.

Turntable (*Banding Wheel*):- A rotating platform on which work may be turned for modelling, decorating or spraying.

Underglaze:- Coloured decoration usually applied to the bisque ware and covered with a transparent glaze.

Vent:- A small, circular or square sectional opening through the kiln wall or usually the door, by which the kiln chamber is ventilated.

The stiffness of the liquid glaze created by the friction amongst its particles and molecules.

Vitrification:- The act of becoming vitreous - hard, glassy, and non-absorbent. It is the furthest stage to which a body can be fired without deformation.

Volatiles:- Elements and compounds which vaporize during firing.

Ware:- Pottery or Porcelain in the raw, bisque or glazed state, such as greenware, ovenware, flatware, stoneware, whiteware etc.

Water Smoking:- Pre-heating in bisque firing – The first portion of the firing cycle during which physical water is driven from the clay. The drying of clay during the early stages of firing.

Warping:- The deformation or distortion of the shape especially rims of pots, cups and plates, in the course of their production or during drying or firing.

Weathering:- The exposure of raw clay or the earth crust to the action of rain, sun and freezing weather, which breaks down the particle size and renders the clay more plastic.

Wedging:- The act of kneading or mixing plastic clay by cutting or slicing the clay into halves and slamming them together.

Whiteware:- Pottery or china ware with a white or light cream-coloured body.

Winning:- The process of digging or mining materials especially clay and transporting it to be processed.

Workability:- The character of clay that is a combination of strength and plasticity.