**BAYERO UNIVERSITY, KANO**

**FACULTY OF EDUCATION**

**DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION**

**B. SC. (ED) CHEMISTRY**

**CCMAS 30% CONTENT**

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| --- | --- | --- | --- | --- | --- |
| LEVEL ONE |  |  |  |  |  |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK-STE 101 | Foundation of Education II | 2 | Core | 30 | - |
| BUK-STE 107 | Basic Physics II | 2 | Core | 30 | - |
| TOTAL | - | 4 | - | 60 | - |
|  |  |  |  |  |  |
| LEVEL TWO |  |  |  |  |  |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK-STE 201 | Introduction to research methods | 2 | Core | 30 | - |
| BUK-STE 202 | Basic Educational Statistics | 2 | Core | 30 | - |
| BUK-STE-203 | Chemistry Methods I | 2 | Core | 15 | 45 |
| BUK-STE-204 | Ethnomathematics | 2 | Core | 30 |  |
| BUK-STE-205 | Computer programming, I | 3 | Core | 30 | 45 |
| TOTAL | - | 11 | - | 135 | 90 |

**LEVEL THREE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 301 | Educational Technology | 2 | C | 30 | - |
| BUK-STE 302 | Industrial chemical process | 3 | C | 45 | - |
| TOTAL | - | 5 | - | 75 | - |

**LEVEL FOUR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 401 | Educational Structure, Administration and Planning | 2 | C | 30 | - |
| BUK–STE 402 | Guidance and Counselling in Science Education | 2 | C | 30 | - |
| BUK-STE 403 | Information and Communication Technology (ICT) in Science and Technology Education | 2 | C | 30 | - |
| BUK-STE-409 | Applied Electrochemistry | 2 | C | 15 | 45 |
| BUK-STE-410 | Statistical thermodynamics | 2 | C | 30 | - |
| BUK-STE-411 | Nuclear and Radiation Chemistry | 2 | C | 30 | - |
| BUK-STE-412 | Industrial Chemical Technology | 2 | C | 30 | - |
| BUK-STE-413 | Physical Organic Chemistry | 2 | C | 30 | - |
| BUK-STE-414 | Organometallic Chemistry | 2 | C | 30 | - |
| TOTAL | - | 18 | - | 255 | 45 |

**COURSE CONTENT AND LEARNING OUTCOMES**

**Level 100**

**BUK STE 101 (Foundation of education II) Credit Units (2), Status (Core) LH = 30**

**Senate-Approved Relevance**

Coursework in foundation of education II is perhaps the most paramount and critical in the teacher education and training. It is in this course that student-teachers are taught the psychology and sociology of learner and learning, the trends of curriculum development and design, and the historical antecedents of education systems from the indigenous system, missionary to the present. Teacher education needs to avail the students with what, when and how of Nigeria education system so as to prepare them on the task of imparting knowledge, skills and improving students’ attitude and emotions. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

This course provides a survey of the psychology, sociology, history and philosophy of education with emphasis on current problems in education, on significant educational innovations, and on the school as a social institution. The course is secondary to EDU 101 Introduction to Teaching and Foundations of Education and lays more emphasis on Intelligence, motivation, Remembering and forgetting, Transfer of learning, Education and Culture, social stratification and education, School as an organization, educational development since 1950, The development and current structure of the Nigeria curriculum. Therefore, the course provides an overview of the cultural, sociological, political, curriculum and historical underpinnings of the Nigeria education system as a requisite for teacher training. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The objectives of the course are to.

1. Explain the concept of intelligence
2. Describe the influence of heredity and environment on intelligence
3. Discuss the term motivation
4. List and explain theories of motivation
5. Define Memory
6. List and explain stages and agents of socialization;
7. Explain the influence of social stratification on education
8. Discuss equality of educational opportunity.
9. Give the history of educational development since 1950.
10. Explain the development and current structure of the Nigeria curriculum

**Learning Outcomes**

At the end of this course students should ne able to;

1. Define intelligence
2. Explain the influence of heredity and environment on intelligence
3. Define motivation
4. List and explain five theories of motivation
5. Define Memory
6. List and explain three stages and agents of socialization;
7. Explain the influence of social stratification on education
8. Discuss equality of educational opportunity.
9. Give the history of educational development since 1950 to date
10. Describe the development and current structure of the Nigeria curriculum

**Course Contents**

Intelligence; definition; influence of heredity and environment; development and use of IQ tests; limitations of testing;' Introduction to motivation and its relation to learning; basic concepts; theories of motivation; educational implications; Remembering and forgetting: stages of memory; recognition; recall; relearning; causes of forgetting; factors affecting retention; implications for teaching; Transfer of learning: importance of transfer; learning sets; learning to learn; teaching for transfer. Education and Culture: Stages and agents of socialization; social stratification and education, equality of educational opportunity; education and social mobility; Social functions of education: The uses of literacy in society; education for democracy; education for leadership selection in education; School as an organization: Definitions and theoretical models; bureaucratization and professionalization of schooling. *Educational development since 1950.* The development and current structure of the Nigeria curriculum. Historical background: Pre-Islamic and pre-Christian curricula; The curriculum of Islamic education; the Christian mission curriculum; Colonial government schools and their changing curriculum; Post-colonial developments. Current Structure:

**BUK STE 107 (Basic Physics II) Credit Units (2), Status (Core) LH = 30**

**Senate - Approved Relevance**

The course is committed to train students in the principle tenets of Physics through structured inquiry and opportunities for individualized experiential learning. It is committed to teaching ethical behavior in experimental design and practice to the students. The course strives to provide the best educational opportunities possible for students to attain their academic goals in physics and to facilitate faculty in scholarship in an atmosphere that encourages free exchange of ideas.

**Overview**

Electricity and magnetism will make students to have basic ideas on concepts of electrostatic forces and properties of simple charge distribution using Coulomb’s and Gauss laws. Electricity and magnetism help student to understand the influence of magnetic field on moving charges, the magnetic properties of simple current distributions using Biot-Savart and Ampere’s law.

The students will have basic idea on electromagnetic induction and make simple calculations using Faraday’s and Lenz’s laws, and explain the significance of Maxwell’s equations. The students can use DC circuit to determine electrical properties and characteristics of AC voltage, currents in resistors, capacitors and inductors.

**Learning Objectives**

The objectives of the course are to;

1. Define the electric and potential fields for stationary objects
2. Solve problems on electrostatic properties of simple charge distributions using Coulomb’s law, Gauss’s law and electric potential;
3. Explain and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere’s law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz’s laws;
6. explain the basic physical of Maxwell’s equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors

**Learning Outcomes**

At the end of this course, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;

2. calculate electrostatic properties of simple charge distributions using Coulomb’s law, Gauss’s law and electric potential;

3. describe and determine the magnetic field for steady and moving charges;

4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere’s law;

5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz’s laws;

6. explain the basic physical of Maxwell’s equations in integral form;

7. evaluate DC circuits to determine the electrical parameters; and

8. determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors

**Course Content**

Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb’s law and superposition. electric field and potential. Gauss’s law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm’s law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère’s laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz’s laws. Step up and step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations

**BUK-STE 201 Basic Educational Statistics (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in educational statistics which is concern with analysis of data for diagnosis of learning and educational problems, students’ promotion and evaluation of success or otherwise of an instruction or entire educational program. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

Educational statistics is designed to acquaint students with statical knowledge of data analysis and results interpretation. The students will be exposed to the rudiment of descriptive and inferential statistics for data summary and drawing statistical inferences. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The students are expected to be able to:

1. Understand the concept of Educational Statistics
2. Identify types of data and scales of measurement.
3. Describe the various methods of organising and summarising data.
4. Calculate mean, median and mode of a given set of distributions
5. Understand and use measures of dispersion or variability.
6. Describe the methods of estimating relationship between two sets of a given distributions
7. Develop and test hypotheses using appropriate statistics.

**Learning Outcomes**

At the end of the course, students should be able to:

1. Define educational statistics
2. List and explain three types of data
3. Describe the methods of organising and summarising data
4. Calculate mean, median and mode of a given set of distributions
5. Calculate deviation and standard deviation of a given set of distributions
6. Compute relationship between two set of scores
7. Develop three null hypotheses and test them using appropriate statistics.

**Course Contents**

Introduction to Educational Statistics, Descriptive statistics, frequency distribution, measures of central tendency, measures of variability, percentiles, standard scores, norms. Inferential statistics; rationale for statistical inference, selection of appropriate statistical tests; parametric tests, t-tests, ANOVA, Pearson Product Moment Correlation. Non-parametric tests, chi-square, Spearman Rank-order Correlation.

**BUK-STE 202 Introduction to Research Methods in Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in conducting educational research and providing solutions on problems in the area teaching, learning and educational management. This course research methods in education was design in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond. The course was meant to train student-teachers with the requisite knowledge of identifying educational problem, developing appropriate design in search for the cause/effect of the problem, conducting the study and recommending the ways out of the problem for educational development.

**Overview**

Research methods in education is designed to acquaint students with the knowledge of identifying educational problem, investigating the problem and providing solutions to the identified problem. The students will be exposed to the concept and types of educational research, sources of educational problems, techniques of literature review, research design, types of data collection instruments, validity and reliability of data collection instruments, and writing research proposal. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives of the course are for the students to:

1. Understand the concept of educational research
2. Describe the different types of educational research
3. Identify a research problem
4. Formulate research hypotheses
5. Develop a research proposal

**Learning Outcomes**

At the end of the course, students should be able to:

* + - 1. Define educational research
      2. Differentiate between three types of research
      3. Identify a research problem in their area of specialization
      4. Develop a research proposal
      5. Formulate three testable null hypotheses
      6. Write a research proposal

**Course Contents**

Topics include: Nature and purpose of research; Categories of research activities; descriptive, historical, experimental; Writing a research proposal; selecting a topic; contents and organization of the proposal; Literature review; its role; methods of citing literature; Research bias; political, religious and social bias in research; objectivity; cross- cultural applications; Ethical issues in research; subjects' understanding and co-operation with the researcher; confidentiality and publication; misinterpretation and misuse of research findings; Hypotheses and research questions; nature and use of hypotheses and research findings; Sampling procedures; rational and procedures; advantages and disadvantages of sampling procedures; Data collection techniques; questionnaires, interviews, observations, case studies, tests, government statistics, documentary analysis; Research validity and reliability’ Writing the research report; Review of the role of research in education.

**BUK-STE- 203 Chemistry Methods I (2 Credits, Core, LH = 15, PH= 45)**

**Senate-Approved Relevance**

Due to the significance of chemistry subject as a requirement for many sciences related programmes, and medical courses, as well as its applications to many industrial activities, it is compulsory to put more emphasis on the way it’s been taught in our classrooms. with this, the Goals, Aims and Objectives of chemistry as well as its relevance need to be inculcated to the students, thereby equipping them with contemporary methods of its teaching as well as learning improvisation of instructional materials.

**Overview**

Chemistry method is designed to acquaint students with the effective techniques or methods of teaching and learning chemistry subject, and to be able to differentiate between the Aims, Goals and Objectives of chemistry in particular and science teaching in general. It is also targeted to prepare students to do lesson planning and preparation and to acquire basic techniques of improvisation of instructional materials.

**Learning Objectives**

The learning objectives of the course are for the students to:

1. Be able to differentiate between the Aims Goals and objectives of science teaching
2. Describe the relevance of Chemistry teaching in schools
3. Give the critical analysis of the SSS chemistry curriculum
4. Do the Lesson planning and preparation
5. Explain the contemporary methods of teaching chemistry
6. Do the improvisation of instructional materials
7. Organize micro-teaching sessions for the demonstration of teaching skills and teaching methods learnt.

**Learning Outcomes**

At the end of this course, the students should be able to:

1. distinguish among aims, goals and objectives in science education;

2. briefly trace the history and development of chemistry education in schools;

3. justify the relevance of the study of chemistry;

4. describe the layout, guiding principles, organization and the contents of the SSS chemistry curriculum;

5. define and explain the concepts of pre-active and interactive teaching and how these contribute to teaching effectiveness;

6. write lessons plans on chemistry concepts;

7. state the roles of the laboratory in effective chemistry education;

8. use a variety of contemporary methods to teach chemistry;

9. define basic terms used in the evaluation of “students” chemistry learning;

10. list and use resources for chemistry teaching and learning;

11. improvise instructional materials required for chemistry teaching;

12. discuss challenges of science teaching generally and the problems confronting chemistry education in Nigeria specifically; and

13. participate in micro-teaching sessions for the demonstration of teaching skills and teaching methods

**Course Contents**

Aims, goals and objectives in science teaching. The teaching of chemistry in schools and the relevance of the subject. Critical analysis of the SSS chemistry curriculum. Pre-active and interactive teaching in chemistry. Lesson planning and preparation. Laboratory innovations in chemistry teaching. Contemporary methods of teaching chemistry. Test, measurement and evaluation of chemistry learning. Resources for chemistry teaching and learning. Improvisation of instructional materials. Challenges of science teaching and problems confronting chemistry education in Nigeria. Micro-teaching sessions for the demonstration of teaching skills and teaching methods learnt.

**BUK-STE 204 Ethnomathematics in the classroom (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

The importance of mathematics in human life cannot be over-emphasized. For quite some time mathematics suffered as the most detested and hated subject among the sciences. Consequently, low achievement in school mathematics has been increasing and shows no sign of this reversion. So many reasons have been given for this state of affairs, but most important of all, is the cultural arrogance implicit in the conventional mathematics. This has been found recently to inhibit creativity. Therefore, this course is aimed to wipe away the fear of mathematics in the minds of many learners and to provide practical tools to foster understanding of difficult mathematical concepts.

**Overview**

Ethnomathematics as a course is aimed to acquaint students with the basic knowledge of ways, modes, practices and intellectual tools; which are mathematics and use them in the teaching of modern Mathematics for postering effective understanding of the subject. It is also aimed to give Mathematics and self-esteem along with providing remarks on the historiography of science and mathematics in addition to reviewing political considerations

**Learning Objectives**

The objective of this course, therefore, is to;

1. Explore ways, modes, practices, intellectual tools (which are mathematical), for explaining, understanding, learning about and managing indeed coping with our natural and socio-cultural environment and use them in the teaching of modern Mathematics.
2. Give Historical overview; Building-up ideas and institutions from the generation to the diffusion of knowledge; Mathematics and self-esteem;
3. State the socio-political dimension: Reflections on the conquest and colonization; Teachers and the curriculum.
4. Mention the *Historical and epistemological dimension:* Institutionalization of knowledge; Ethnomathematics (way, mode, practices of explaining, and understanding of the environment);
5. Explain the cultural context; Remarks on the historiography of science and mathematics;
6. Reviewing political considerations; Ethnomathematics in history and pedagogy and its relations

**Learning outcomes**

At the end of this course, the students should be able to:

1. Find out and explore ways, modes, practices, intellectual tools (which are mathematical), for explaining, understanding, learning about and mawaysnaging indeed coping with our natural and socio-cultural environment and use them in the teaching of modern Mathematics.
2. Give Historical overview; Building-up ideas and institutions from the generation to the diffusion of knowledge; Mathematics and self-esteem;
3. State the socio-political dimension: Reflections on the conquest and colonization; Teachers and the curriculum.
4. Mention the *Historical and epistemological dimension:* Institutionalization of knowledge; Ethnomathematics (way, mode, practices of explaining, and understanding of the environment);
5. Explain the cultural context; Remarks on the historiography of science and mathematics;
6. Reviewing political considerations; Ethnomathematics in history and pedagogy and its relations

**Course Contents**

The basic idea; *The cultural and psycho-emotional dimension:* Historical overview; Building-up ideas and institutions from the generation to the diffusion of knowledge; Mathematics and self-esteem; A new role for the teacher.  *The socio-political dimension:* Reflections on the conquest and colonization; Teachers and the curriculum. *Historical and epistemological dimension:* Institutionalization of knowledge; Ethnomathematics (way, mode, practices of explaining, and understanding of the environment); The cultural context; Remarks on the historiography of science and mathematics; Reviewing political considerations; Ethnomathematics in history and pedagogy and its relations.

**BUK-STE-205 Computer Programming I (3 Credits, Core, LH = 30, PH= 45)**

**Senate-Approved Relevance**

Computer studies has become a language for every subject to be taught smoothly most especially at this 21st century, therefore effective teaching and learning of chemistry subject will become more efficient when contents are designed and programmed in such a way that it brings ease of understanding to learners.

**Overview**

As a course, Computer programming is designed to acquaint learners with basic knowledge of functional, declarative and logic programming thereby helping them to scripting languages. It also introduces the students to object-orientation as a technique for modelling computation. Students are also introduced to typical object-oriented language, such as Java. Basic data types, variables, expressions, assignment statements and operators which will be directly applied to basic chemistry knowledge.

**Learning objectives**

The objective of this course, therefore, is to;

1. Guide the students to identify different programming paradigms and their approaches to programming;

2.Assist the learners to write programmes using basic data types and strings;

3.Allow the students to design and implement programming problems using selection;

4.Support the learners to design and implement programming problems using loops;

5. Direct the students to use and implement classes as data abstractions in an object-oriented approach;

6. implement simple exception handling in programmes;

7. develop programmes with input/output from text files; and

8. design and implement programming problems involving arrays.

**Learning outcomes**

At the end of this course, students should be able to

1. identify different programming paradigms and their approaches to programming;

2. write programmes using basic data types and strings;

3. design and implement programming problems using selection;

4. design and implement programming problems using loops;

5. use and implement classes as data abstractions in an object-oriented approach;

6. implement simple exception handling in programmes;

7. develop programmes with input/output from text files; and

8. design and implement programming problems involving arrays.

**Course contents**

Introduction to computer programming. Functional programming; Declarative programming; Logic programming; Scripting languages. Introduction to object-orientation as a technique for modelling computation. Introduction of a typical object-oriented language, such as Java. Basic data types, variables, expressions, assignment statements and operators. Basic objectoriented concepts: abstraction; objects; classes; methods; parameter passing; encapsulation. Introduction to Strings and string processing; Simple I/O; control structures; Arrays; Simple recursive algorithms; inheritance; polymorphism.

Lab work: Programming assignments involving hands-on practice in the design and implementation of simple algorithms such as finding the average, standard deviation, searching and sorting. Practice in developing and tracing simple recursive algorithms. Developing programmes involving inheritance and polymorphism.

**BUK-STE 301 Educational Technology (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in selecting appropriate and systemic use of techniques, strategies, processes, procedures and instructional materials that enhance teacher instructional delivery an students learning. This course was designed to educate student-teachers on the appropriate and systematic use of hardware, software, processes and procedures in order to enhance teaching and learning, and achieve learning outcomes. This is line with the BUK’s mission of producing high quality human resources in the area of teaching required for the promotion of the educational development. The course was meant to educate student-teachers the knowledge of careful and systematic, preparation, planning and implementation of an instruction.

**Overview**

Educational Technology as a course was designed to acquaint students with the knowledge of educational aims and objectives, developing scheme of work, lesson planning and lesson notes, selecting and using appreciate instructional materials and teaching as communication. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives of the course are for the students to.

1. Explain the concept of educational technology
2. Describe educational objectives as cornerstone of educational technology
3. Explain the different types of instructional materials for classroom teaching
4. List and explain the factors that affect selection and use of instructional materials
5. Explain the concept of teaching as communication
6. Discuss the purpose of educational field trip.

**Learning Outcomes**

At the end of the course, students should be able to:

1. Define educational technology
2. List and explain the three domains of educational objectives
3. Differentiate between projected and non-projected instructional media.
4. List and explain five factors that affect selection and use of instructional materials
5. Explain the concept of teaching as communication
6. Discuss the purpose of educational field trip.

**Course Contents**

This course will introduce students to the concept of Educational Technology and will continue with the familiarization of students with different types of Audio- Visual materials, their operations and uses. Educational technology: teaching as communication; educational objectives. Varieties of education media; non-projected visuals for classroom teaching; audio media for class teaching; still-projected and motion projected media. Field trips; their purpose and organization; sources of A-V materials. Practical for audio, still, and motion projected media.

**BUK-STE-302** **Industrial Chemical Processes (3 Units: LH 45)**

**Senate-Approved Relevance**

Chemistry has a lot of industrial applications, which makes it essential to explore learners to the preparation and production of different organic and inorganic chemicals such as Polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavorings agents and pharmaceuticals which are required for day-to-day life activities. The importance of the course lies at training the students to acquire the process of manufacture of some heavy inorganic chemicals, inorganic fertilizers, cement and binding materials.

**Overview**

Industrial chemical process as a course will enable students to acquire knowledge on how to prepare and produce important organic and inorganic chemicals, which are beneficial to our day life activities.

**Learning Objectives**

The learning objectives of the course are for the students to.

1. Carryout production of primary intermediates and synthesis of industrial organic chemicals; Polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavorings agents and pharmaceuticals.
2. Perform fermentation process and chemical processing of minerals.
3. Prepare metallurgy, hydrometallurgical processes and industrial electrochemistry.
4. Acquire the process of manufacture of some heavy inorganic chemicals, cement and binding materials.
5. Discuss and acquire knowledge on inorganic fertilizers

**Learning Outcomes**

At the end of the course, students should be able to:

1. Discuss the production of primary intermediates and synthesis of industrial organic chemicals; Polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavorings agents and pharmaceuticals.
2. Conduct the fermentation process and chemical processing of minerals.
3. Explain and prepare metallurgy, hydrometallurgical processes and industrial electrochemistry.
4. State the process of manufacture of some heavy inorganic chemicals, cement and binding materials.
5. Discuss the nature of inorganic fertilizers

**Course contents**

Production of primary intermediates and synthesis of industrial organic chemicals; Polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavorings agents and pharmaceuticals. Fermentation process. Chemical processing of minerals. Metallurgy and hydrometallurgical processes. Industrial electrochemistry. Manufacture of some heavy inorganic chemicals. Cement and binding materials. Inorganic fertilizers

**BUK-STE 401** **Educational Structure, Administration and Planning (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Educational Structure, Administration and Planning coincides with the BUK’s mission of producing high-quality graduates and the need to move forward the frontiers of human knowledge by providing excellent undergraduate and high-quality human resources. The course is meant to produce high-quality professional teachers who are managers of educational instructions. It is meant to educate student-teachers on structure of education as an organisation, processes and procedures for effective planning and administration of human and material resources in educational institutions.

**Overview**

Educational structure, administration and planning as a course was designed to acquaint students with the knowledge of educational structure, educational planning and educational administration. The course helps in producing high-quality educational managers. This is in line with provision of high-quality education as enshrine in sustainable development goals (SDGs).

**Learning Objectives**

The objectives of the course are to.

1. Understand the concept of educational administration and planning.
2. Explain the principles of organization
3. Explain the various forms of records within an organization
4. Discuss the purpose and characteristics of educational planning
5. Explain the organizational structure of national education system
6. Describe the structure of federal and state ministry of education

**Learning Outcomes**

At the end of the course, students should be able to:

1. Define educational administration and planning
2. Explain at least four principles of organization
3. Explain the six different forms of records within an organization
4. Discuss the three purpose and characteristics of educational planning
5. Explain the organizational structure of national education system
6. Describe the structure of federal and state ministry of education

**Course Contents**

Educational administration; meaning and emergence; principles of organization and administration; communication in organizations; organizing schools for effective management; school records and procedure; time-table management; the nature and scope of educational planning definitions and characteristics of education planning; emergence of educational planning in world and Nigerian perspectives; reasons for the growth of interest in planning, objectives of education planning in Nigeria; constraints on educational planning in Nigeria. Organizational structure of the national education system and the operation of administrative policy relationships. The evaluation of the national education system, organization of Nigerian education, the federal ministry of education, the state ministry of education and related agencies such as NUC, NTI, JAMB, etc.

**BUK-STE 402 Guidance and Counseling in Science Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in the field of educational guidance and counselling. The student-teachers need to be educated on educational guidance, vocational guidance, personal guidance and counselling practices. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

Guidance and counselling in science education is meant to acquaint students with expertise educational, vocational and persono-social guidance and counselling practices. The students will be exposed to the rudiment of principles, scope and practice of guidance and counseling, role of guidance and counseling in learning and teaching, vocational guidance, counselling theories, guidance services in Nigerian primary and secondary schools; the role of the school counselor in the Nigerian educational system.The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives are for the students to.

1. Understand and define the concept of guidance and counselling
2. Explain the principles and practice of guidance and counselling
3. Describe types of guidance and counselling
4. Discuss the counselling theories
5. Mention the roles of guidance and counseling in learning and teaching

**Learning Outcomes**

At the end of the course, students should be able to:

1. Define the concept of guidance and counselling
2. Explain three principles and practice of guidance and counselling
3. Describe the three types of guidance and counselling
4. Discuss at least three counselling theories
5. State the roles of guidance and counseling in learning and teaching

**Course Contents**

Introduction to the principles, scope and practice of guidance and counseling; role of guidance and counseling in learning and teaching; vocational guidance and prominent career theories; guidance services in Nigerian primary and secondary schools; the role of the school counselor in the Ni

**BUK-STE 403 ICT in Science and Technology Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

The 21st century student-teachers needs to be acquainted with knowledge, skills and competencies of using Information and Communication Technology in research, teaching and learning. The National Policy on Education (2013) has stressed the need to employ educational technology to improve the quality of education. ICT in Science and Technology Education will expose the student-teachers on how ICT can be used to improve **students engagement, performance and retention.** This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond

**Overview**

ICT in science and Technology Education as a course was designed to acquaint students with the knowledge of ICT and its application in teaching and learning of science and technology subjects, computer and its components, internet and other technological tools and resources that are being used in education. This is in line with provision of high-quality education as enshrine in sustainable development goals (SDGs).

**Learning Objectives**

The objectives of the course are for the students to.

1. Understand and explain the meaning of Information and Communication Technology (ICT).
2. List and explain areas of application of ICT in Science and Technology Teaching
3. Examine computer application in learning.
4. Give overview of ICT Policy in education
5. Describe synchronous and asynchronous packaging of instruction.
6. Outline basic programming languages and stages
7. Identify factors influencing the use of ICT in teaching and learning
8. Outline the problems, prospects and challenges of application of ICT in Science and Technology education in developing world.

**Learning Outcomes**

At the end of this course students should be able to;

1. Clearly define and explain the meaning of Information and Communication Technology (ICT).
2. List and explain three broad areas of application of ICT in teaching Science and Technology.
3. Give overview of ICT Policy in education
4. Describe synchronous and asynchronous packaging of instruction.
5. Outline six programming languages
6. Identify five factors influencing the use of ICT in teaching and learning
7. Outline the five problems, prospects and challenges of application of ICT in science and Technology education in developing world.

**Course Contents**

Concept of ICT, Categories of ICT, ICT in Science and Technology Education, Areas of Application of ICT in Science and Technology Education, Factors influencing the use of ICT in teaching and learning, ICT Policy in education. the problems, prospects and challenges of application of ICT in education in developing world., Computer in Science and Technology Education, Internet in Science and Technology Education, Synchronous and Asynchronous packaging of instruction, Computer programming

**BUK-STE 409 Electrochemistry (2 Credits, Core, LH = 15; PH 45)**

**Senate-Approved Relevance**

As an important field of inorganic chemistry, electrochemistry needs to be taught at undergraduates’ level in order to equip students with basic knowledge of electrons, their nature and structure as the constituents of all atoms.

**Overview**

Electrochemistry as a course, is designed to train learners with the basic knowledge of electrons nature, polarisable and non-polarisable interface, mass transport, concentration polarisation, Fick’s Laws, Levich equation. Electrodics. Polarography. Corrosion – types and prevention

**Learning Objectives**

The objectives of the course are for the students to.

1. Explain and differentiate between the electrical double layer, potential at zero charge, polarisable and non-polarisable interface,
2. Define mass transport and concentration polarisation
3. State Fick’s Laws, Levich equation. And relate with eElectrodics. Polarography.
4. Discuss corrosion and its types
5. Mention the preventive measures of corrosion

**Learning Outcomes**

At the end of this course students should be able to;

1. Differentiate and explain between the electrical double layer, potential at zero charge, polarisable and non-polarisable interface,
2. Explain the concept of mass transport and concentration polarisation
3. State Fick’s Laws, Levich equation. And relate with eElectrodics. Polarography.
4. Define corrosion and its types
5. List out the preventive measures of corrosion

**Course Contents**

Electrical double layer, potential at zero charge, polarisable and non-polarisable interface, mass transport, concentration polarisation, Fick’s Laws, Levich equation. Electrodics. Polarography. Corrosion – types and prevention

**BUK-STE 410 Statistical Thermodynamics (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Statistical thermodynamics is relevant and significant to undergraduate studies as it serves as an integral part of advance physical chemistry, where students can learn the statistical thermodynamics of gases, statistical thermodynamics of monoatomic solids and the rest

**Overview**

As a course, statistical thermodynamics is designed to equip students with basic knowledge of probability and distribution functions; the Boltzmann distribution; statistical thermodynamics of gases; the calculation of thermodynamic equilibrium constant from partition function; statistical thermodynamics of monatomic solids; and-Einstein statistics.

**Learning Objectives**

The objectives of the course are for the students to.

1. Define and explain the Microstates and randomness; ensembles; probability and distribution functions
2. Explain the Boltzmann distribution;
3. State and discuss the statistical thermodynamics of gases;
4. Do the calculation of thermodynamic equilibrium constant from partition function;
5. Discuss the statistical thermodynamics of monatomic solids
6. Drive the Fermi-Dirac and Dose-Einstein statistics.

**Learning Outcomes**

At the end of this course students should be able to;

1. Explain the Microstates and randomness; ensembles; probability and distribution functions
2. Discuss the Boltzmann distribution;
3. State and explain the statistical thermodynamics of gases;
4. Do the calculation of thermodynamic equilibrium constant from partition function;
5. Discuss the statistical thermodynamics of monatomic solids
6. Explain and drive the Fermi-Dirac and Dose-Einstein statistics.

**Course Contents**

Microstates and randomness; ensembles; probability and distribution functions; the Boltzmann distribution; statistical thermodynamics of gases; the calculation of thermodynamic equilibrium constant from partition function; statistical thermodynamics of monatomic solids; introduction to Fermi-Dirac and Dose-Einstein statistics.

**BUK-STE 411 Nuclear and Radiation Chemistry (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Radioactivity entails the study and nature of radioactive elements; therefore, Nuclear and radiation chemistry involves studying all element that emits radiation, its applications and hazards or problems

**Overview**

Nuclear and radiation chemistry is designed to equip learners with knowledge on Natural radiations/radioactivity, fusion, fission, decay processes, nature of radiation. Nuclear models, science of nuclear reaction. Principles and measurement of radioactivity. Applications of radioactivity and Radiation hazards.

**Learning Objectives**

The objectives of the course are for the students to.

1. Define and explain the natural radiations/radioactivity, fusion, fission, decay processes, nature of radiation
2. State the Nuclear models, science of nuclear reaction
3. Discuss the Principles and measurement of radioactivity
4. Explain the Applications of radioactivity.
5. List out and explain the Radiation hazards.

**Learning Outcomes**

At the end of this course students should be able to;

1. Discuss the natural radiations/radioactivity, fusion, fission, decay processes, nature of radiation
2. Describe the Nuclear models, science of nuclear reaction
3. Elucidate the Principles and measurement of radioactivity
4. States the Applications of radioactivity.
5. List out and explain the Radiation hazards.

**Course Contents**

Natural radiations/radioactivity, fusion, fission, decay processes, nature of radiation. Nuclear models, science of nuclear reaction. Principles and measurement of radioactivity. Applications of radioactivity. Radiation hazards.

**BUK-STE 412 Industrial Chemical Technology (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

This course is a prerequisite to industrial chemical process, in which students are guided to acquire knowledge on Chemical industrial applications, whereby a lot of industrial organic substances are learnt and discus

**Overview**

The course is organized in such away it trains learners to learn chemical technology equipment. Hydrogen and carbon monoxide synthesis; gas, oxo-process, water gas, source of hydrogen and its application. Industrial organic materials, raw materials. Technical and economic principles of processes and product routes. Flow diagrams. Selected oils and fats, soaps and detergents, sugar, varnishes, plastics, wood-pulp and paper and issues on environmental pollution

**Learning Objectives**

The objectives of the course are for the students to.

1. State the Heat transfer and mass transfer processes.
2. Describe the Unit operations. Chemical technology equipment. Hydrogen and carbon monoxide synthesis; gas, oxo-process,
3. State the source of hydrogen and its application.
4. List and explain the Industrial organic materials, raw materials
5. Explain the technical and economic principles of processes and product routes
6. Draw the Flow diagrams. Selected oils and fats, soaps and detergents, sugar, varnishes, plastics, wood-pulp and paper
7. Discuss the issue of Environmental pollution

**Learning Outcomes**

At the end of this course students should be able to;

1. Define the Heat transfer and mass transfer processes.
2. Designate the Unit operations. Chemical technology equipment. Hydrogen and carbon monoxide synthesis; gas, oxo-process,
3. State the source of hydrogen and its application.
4. List and explain the Industrial organic materials, raw materials
5. Elucidate the technical and economic principles of processes and product routes
6. Draw the Flow diagrams. Selected oils and fats, soaps and detergents, sugar, varnishes, plastics, wood-pulp and paper
7. Deliberate the issue of Environmental pollution

**Course Contents**

Heat transfer and mass transfer processes. Unit operations. Chemical technology equipment. Hydrogen and carbon monoxide synthesis; gas, oxo-process, water gas, source of hydrogen and its application. Industrial organic materials, raw materials. Technical and economic principles of processes and product routes. Flow diagrams. Selected oils and fats, soaps and detergents, sugar, varnishes, plastics, wood-pulp and paper. Environmental pollution

**BUK-STE 413 Physical Organic Chemistry (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Physical organic chemistry is relevant and significance as it merges some of the physical chemistry aspects as well as organic chemistry content in order to expose learners to advance aspect of the two fields of chemistry.

**Overview**

The course is designed to acquaint students with the basic knowledge of Preparation and reactions of stereoisomers, stereoselectivity, neighboring group effects, and conformational Analysis.

**Learning Objectives**

The objectives of the course are for the students to.

1. Perform the Preparation and reactions of stereoisomers
2. State and explain the stereoselectivity, neighboring group effects, and
3. Draw and explain conformational analysis

**Learning Outcomes**

At the end of this course students should be able to;

1. Explain and perform the Preparation and reactions of stereoisomers
2. State and explain the stereoselectivity, neighboring group effects, and
3. Draw and explain conformational analysis

**Course Contents**

Preparation and reactions of stereoisomers, stereoselectivity, neighboring group effects, and a few special topics in Physical Organic Chemistry. Conformational Analysis

**BUK-STE 414 Organometallic Chemistry (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Organometallic chemistry, as a field of organic chemistry, is important because it prepares learners to learn the nature and structure of organometallic compounds, their applications and synthesis in organic chemistry

**Overview**

The course is designed to acquaint students with the basic knowledge of classification of organometallic compounds. Preparation, structure and reactions including abnormal science of organometallic compounds. Synthetic utility of organometallics. Classification of ligands, electron rule, bonding, preparation of organic transition metal compounds. Reaction and structures of organometallic compounds of transition elements. The organic chemistry of ferrocene and related compounds. The role of organometallic compounds in some catalytic reaction.

**Learning Objectives**

The objectives of the course are for the students to.

1. Explain the Classification of organometallic compounds.
2. Conduct the Preparation, structure and reactions including abnormal science of organometallic compounds
3. State the Synthetic utility of organometallics.
4. Describe the nature of organometallic compounds of the transition elements.
5. List out the Classification of ligands, electron rule, bonding, preparation of organic transition metal compounds.
6. Explain the organic chemistry of ferrocene and related compounds.
7. Discuss the role of organometallic compounds in some catalytic reaction.

**Learning Outcomes**

At the end of this course students should be able to;

1. Elucidate the Classification of organometallic compounds.
2. Conduct the Preparation, structure and reactions including abnormal science of organometallic compounds
3. State the Synthetic utility of organometallics.
4. Define the nature of organometallic compounds of the transition elements.
5. List out the Classification of ligands, electron rule, bonding, preparation of organic transition metal compounds.
6. Clarify the organic chemistry of ferrocene and related compounds.
7. Deliberate the role of organometallic compounds in some catalytic reaction.

**Course Contents**

Classification of organometallic compounds. Preparation, structure and reactions including abnormal science of organometallic compounds. Synthetic utility of organometallics. Introduction to organometallic compounds of the transition elements. Classification of ligands, electron rule, bonding, preparation of organic transition metal compounds. Reaction and structures of organometallic compounds of transition elements. The organic chemistry of ferrocene and related compounds. The role of organometallic compounds in some catalytic reaction.