****

**THE REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**GEOPHYSICAL EXPLORATION TECHNOLOGY**

**LEVEL 6**

|  |  |
| --- | --- |
| TVET CDACC  P.O. BOX 15745-00100  NAIROBI | KABETE NATIONAL POLYTECHNIC  P.O BOX 29010-00625  NAIROBI |

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# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and the mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the Extractives sector’s growth and sustainable development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) in conjunction with Extractive Sector Skills Advisory Committee (SSAC) and Kabete National Polytechnic have developed this curriculum.

This curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee’s achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council Members, Council Secretariat, Extractives SSAC, Kabete National Polytechnic, expert workers and all those who participated in the development of this curriculum.

**CHAIRPERSON, TVET CDACC**

# ACKNOWLEDGMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organisations.

I appreciate Kabete National Polytechnic for the collaboration that enabled the development of this curriculum. I recognize with appreciation the role of the Extractives Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Extractives sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that workers in extractives sector acquire competencies that will enable them to perform their work more efficiently.

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

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# ABBREVIATIONS AND ACRONYMS

BC Basic Competency

CBET Competency Based Education and Training

CC Common Competency

CDACC Curriculum Development, Assessment and Certification Council

CR Core Competency

CU Curriculum

EMCA Environment Management and Coordination Act

EXT Extractives

GIS Geographical Information Systems

GPE Geophysical Exploration

GPR Ground Penetrating Radar

GPS Global Positioning System

ICT Information Communication Technology

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualifications Authority

LCD Liquid Crystal Display

OSH Occupation Safety and Health

OSHA Occupation Safety and Health Act

PPE Personal Protective Equipment

SSAC Sector Skills Advisory Committee

TV Television

TVET Technical and Vocational Education and Training

TVETA Technical and Vocational Education and Training Authority

# KEY TO UNIT CODE

**EXT /CU/GPE/BC/01/ 6/A**

Industry or sector

Curriculum

Occupational area

Type of competency

Competency number

Competency level

Version control

# COURSE OVERVIEW

Geophysical Exploration Technology Level 6 qualification consists of competencies that an individual must achieve to provide geophysical exploration services. This involves surveying area geology, gravity, magnetism, seismicity, resistivity, conduct geophysical well logging and geophysical research. It also entails geophysical survey data interpretation.

The units of learning for Geophysical Exploration Technology level 6 qualification include the following:

**Basic Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit Factor** |
| EXT/CU/GPE/BC/01/6/A | Communication skills | 40 | 4.0 |
| EXT/CU/GPE/BC/01/6/A | Numeracy skills | 60 | 6.0 |
| EXT/CU/GPE/BC/02/6/A | Digital literacy | 60 | 6.0 |
| EXT/CU/GPE/BC/03/6/A | Entrepreneurial skills | 100 | 10.0 |
| EXT/CU/GPE/BC/04/6/A | Employability skills | 80 | 8.0 |
| EXT/CU/GPE/BC/05/6/A | Environmental literacy | 40 | 4.0 |
| EXT/CU/GPE/BC/06/6/A | Occupational safety and health practices | 40 | 4.0 |
| **Total** | | **420** | **4.2** |

**Common units of learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit factor** |
| EXT/CU/GPE/CC/01/6/A | Mathematics for geophysical exploration | 150 | 15.0 |
| EXT/CU/GPE/CC/02/6/A | Chemistry for geophysical exploration | 120 | 12.0 |
| EXT/CU/GPE/CC/03/6/A | Physics for geophysical exploration | 240 | 24.0 |
| **Total** | | **510** | **51.0** |

**Core Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Duration in Hours** | **Credit factor** |
| EXT/CU/GPE/CR/01/6/A | Area geology | 240 | 24.0 |
| EXT/CU/GPE/CR/02/6/A | Gravity survey | 120 | 12.0 |
| EXT/CU/GPE/CR/03/6/A | Magnetic survey | 120 | 12.0 |
| EXT/CU/GPE/CR/04/6/A | Seismic survey | 120 | 12.0 |
| EXT/CU/GPE/CR/05/6/A | Resistivity survey | 180 | 18.0 |
| EXT/CU/GPE/CR/06/6/A | Geophysical well logging | 90 | 9.0 |
| EXT/CU/GPE/CR/07/6/A | Geophysical data interpretation | 90 | 9.0 |
| EXT/CU/GPE/CR/08/6/A | Research methodology | 60 | 6.0 |
| EXT/CU/GPE/CR/09/6/A | Geophysical trade project | 60 | 6.0 |
|  | Industrial attachment | 480 | 48.0 |
| **Total** | | **1560** | **156.0** |
| **GRAND TOTAL** | | **2430** | **243.0** |

The total duration of the course is 2430 hours.

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (KCSE) mean grade C- (minus)

**Or**

1. Craft Certificate in Geophysical Exploration Technology Level 5

**Or**

1. Any other qualifications as determined by Kenya National Qualifications Authority (KNQA)

**Field attachment**

An individual enrolled in this course will undergo a field attachment for a period of 480 hours in the extractives sector.

**Trainer qualification**

A trainer for this course should have a higher qualification than the level of this course

**Assessment**

The course will be assessed at two levels:

1. **Internal assessment**: conducted continuously by the trainer (internal assessor) who is monitored by an accredited internal verifier.
2. **External assessment:** conducted by an accredited external assessor who is monitored by an accredited external verifier.

The assessors and verifiers are registered by TVET CDACC which also coordinates external assessment.

**Certification**

An individual will be awarded a Certificate of Competency on demonstration of competence in a unit of competency. To be awarded Certificate in Geophysical Exploration Technology Level 6, an individual must demonstrate competence in all the units of competency in the qualification pack.

These certificates will be awarded by TVET CDACC in conjunction with Kabete National Polytechnic.

# BASIC UNITS OF LEARNING

# COMMUNICATION SKILLS

**UNIT CODE:** EXT/CU/GPE/BC/01/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Communication Skills

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers the competencies required to demonstrate communication skills .It involves, meeting communication needs of clients and colleagues; developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

**Summary of Learning Outcomes**

1. Meet communication needs of clients and colleagues
2. Develop communication strategies
3. Establish and maintain communication pathways
4. Promote use of communication strategies
5. Conduct interview
6. Facilitate group discussion
7. Represent the organization

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Meet communication needs of clients and colleagues | * Communication process * Modes of communication * Medium of communication * Effective communication * Barriers to communication * Flow of communication * Sources of information * Organizational policies * Organization requirements for written and electronic communication methods * Report writing * Effective questioning techniques (clarifying and probing) * Workplace etiquette * Ethical work practices in handling communication * Active listening * Feedback * Interpretation * Flexibility in communication * Types of communication strategies * Elements of communication strategy | * Interview * Written texts |
| 1. Develop communication strategies | * Dynamics of groups * Styles of group leadership * Openness and flexibility in communication * Communication skills relevant to client groups | * Interview * Written texts |
| 1. Establish and maintain communication pathways | * Types of communication pathways | * Interview * Written texts |
| 1. Promote use of communication strategies | * Application of elements of communication strategies * Effective communication techniques | * Interview * Written texts |
| 1. Conduct interview | * Types of interview * Establishing rapport * Facilitating resolution of issues * Developing action plans | * Interview * Written texts |
| 1. Facilitate group discussion | * Identification of communication needs * Dynamics of groups * Styles of group leadership * Presentation of information * Encouraging group members participation * Evaluating group communication strategies | * Interview * Written texts |
| 1. Represent the organization | * Presentation techniques * Development of a presentation * Multi-media utilization in presentation * Communication skills relevant to client groups | * Interview * Written texts |

**Suggested Methods of Instruction**

* Discussion
* Role playing
* Simulation
* Direct instruction

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone

# NUMERACY SKILLS

**UNIT CODE:** EXT/CU/GPE/BC/02/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Numeracy Skills.

**Duration of Unit:** 60 hours

**Unit Description**

This unit describes the competencies required to demonstrate numeracy skills. It involves applying a wide range of mathematical calculations for work; applying ratios, rates and proportions to solve problems; estimating, measuring and calculating measurement for work; using detailed maps to plan travel routes for work; using geometry to draw and construct 2D and 3D shapes for work; collecting, organizing and interpreting statistical data; using routine formula and algebraic expressions for work and using common functions of a scientific calculator.

**Summary of Learning Outcomes**

1. Apply a wide range of mathematical calculations for work
2. Apply ratios, rates and proportions to solve problems
3. Estimate, measure and calculate measurement for work
4. Use detailed maps to plan travel routes for work
5. Use geometry to draw and construct 2D and 3D shapes for work
6. Collect, organize and interpret statistical data
7. Use routine formula and algebraic expressions for work
8. Use common functions of a scientific calculator

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Apply a wide range of mathematical calculations for work | * Fundamentals of mathematics * Addition, subtraction, multiplication and division of positive and negative numbers * Algebraic expressions manipulation * Forms of fractions, decimals and percentages * Expression of numbers as powers and roots | * Written tests * Assignments * Supervised exercises |
| 1. Apply ratios, rates and proportions to solve problems | * Rates, ratios and proportions * Meaning * Conversions into percentages * Direct and inverse proportions determination * Performing calculations * Construction of graphs, charts and tables * Recording of information | * Written tests * Assignments * Supervised exercises |
| 1. Estimate, measure and calculate measurement for work | * Units of measurements and their symbols * Identification and selection of measuring equipment * Conversion of units of measurement * Perimeters of regular figures * Areas of regular figures * Volumes of regular figures * Carrying out measurements * Recording of information | * Assignments * Supervised exercises * Written tests |
| 1. Use detailed maps to plan travel routes for work | * Identification of features in routine maps and plans * Symbols and keys used in routine maps and plans * Identification and interpretation of orientation of map to North * Demonstrate understanding of direction and location * Apply simple scale to estimate length of objects, or distance to location or object * Give and receive directions using both formal and informal language * Planning of routes * Calculation of distance, speed and time | * Written * Practical test |
| 1. Use geometry to draw and construct 2D and 3D shapes for work | * Identify two dimensional shapes and routine three dimensional shapes in everyday objects and in different orientations * Explain the use and application of shapes * Use formal and informal mathematical language and symbols to describe and compare the features of two dimensional shapes and routine three dimensional shapes * Identify common angles * Estimate common angles in everyday objects * Evaluation of unknown angles * Use formal and informal mathematical language to describe and compare common angles * Symmetry and similarity * Use common geometric instruments to draw two dimensional shapes * Construct routine three dimensional objects from given nets |  |
| 1. Collect, organize and interpret statistical data | * + Classification of data * Grouped data * Ungrouped data   + Data collection * Observation * Recording   + Distinguishing between sampling and census   + Importance of sampling   + Errors in sampling   + Types of sampling and their limitations e.g. * Stratified random * Cluster * Judgmental   + Tabulation of data * Class intervals * Class boundaries * Frequency tables * Cumulative frequency   + Diagrammatic and graphical presentation of data e.g. * Histograms * Frequency polygons * Bar charts * Pie charts * Cumulative frequency curves * Interpretation of data | * Assignments * Supervised exercises * Written tests |
| 1. Use routine formula and algebraic expressions for work | * + Solving linear equations   + Linear graphs * Plotting * Interpretation * Applications of linear graphs * Curves of first and second degree * Plotting * Interpretation | * Assignments * Supervised exercises * Written tests |
| 8. Use common functions of a scientific calculator | * Identify and use keys for common functions on a calculator * Calculate using whole numbers, money and routine decimals and percentages * Calculate with routine fractions and percentages * Apply order of operations to solve multi-step calculations * Interpret display and record result | * Written * Practical test |

**Suggested Methods of Instruction**

* Group discussions
* Demonstration by trainer
* Practical work by trainee
* Exercises

**Recommended Resources**

* Calculators
* Rulers, pencils, erasers
* Charts with presentations of data
* Graph books
* Dice

# DIGITAL LITERACY

**UNIT CODE:** EXT/CU/GPE/BC/03/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

**Duration of Unit:** 60 hours

**Unit Description**

This unit describes competencies required to demonstrate digital literacy. It involves in identifying computer software and hardware, applying security measures to data, hardware, software in automated environment, computer software in solving task, internet and email in communication at workplace, desktop publishing in official assignments and preparing presentation packages.

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify computer hardware and software | * Concepts of ICT * Functions of ICT * History of computers * Components of a computer * Classification of computers | * Written tests * Oral presentation |
| 1. Apply security measures to data, hardware, software in automated environment | * Data security and control * Security threats and control measures * Types of computer crimes * Detection and protection against computer crimes * Laws governing protection of ICT | * Written tests * Oral presentation * Project |
| 1. Apply computer software in solving tasks | * Operating system * Word processing * Spread sheets * Data base design and manipulation * Data manipulation, storage and retrieval | * Oral questioning * Project |
| 1. Apply internet and email in communication at workplace | * Computer networks * Network configurations * Uses of internet * Electronic mail (e-mail) concept | * Oral questioning * Written report |
| 1. Apply desktop publishing in official assignments | * Concept of desktop publishing * Opening publication window * Identifying different tools and tool bars * Determining page layout * Opening, saving and closing files * Drawing various shapes using DTP * Using colour pellets to enhance a document * Inserting text frames * Importing and exporting text * Object linking and embedding * Designing of various publications * Printing of various publications | * Oral questioning * Written report * Project |
| 1. Prepare presentation packages | * Types of presentation packages * Procedure of creating slides * Formatting slides * Presentation of slides * Procedure for editing objects | * Oral questioning * Written report * Project |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Project
* Group discussions

**Recommended Resources**

* Computers
* Printers
* Storage devices
* Internet access

# ENTREPRENEURIAL SKILLS

**UNIT CODE:** EXT/CU/GPE/BC/04/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Entrepreneurial Skills

**Duration of unit:** 100 hours

**Unit Description**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

**Summary of Learning Outcomes**

* 1. Demonstrate understanding of who an entrepreneur
  2. Demonstrate knowledge of entrepreneurship and self-employment
  3. Identify entrepreneurship opportunities
  4. Create entrepreneurial awareness
  5. Apply entrepreneurial motivation
  6. Develop business innovative strategies
  7. Develop Business plan

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Demonstrate knowledge of entrepreneurship and self-employment | * Importance of self-employment * Requirements for entry into self-employment * Role of an Entrepreneur in business * Contributions of Entrepreneurs to National development * Entrepreneurship culture in Kenya * Born or made entrepreneurs | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report |
| 1. Identify entrepreneurship opportunities | * Business ideas and opportunities * Sources of business ideas * Business life cycle * Legal aspects of business * Assessment of product demand * Business environment * Factors to consider when evaluating business environment * Technology in business | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Create entrepreneurial awareness | * Forms of businesses * Sources of business finance * Factors in selecting source of business finance * Governing policies on Small Scale Enterprises (SSEs) * Problems of starting and operating SSEs | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Apply entrepreneurial motivation | * Internal and external motivation * Motivational theories * Self-assessment * Entrepreneurial orientation * Effective communications in entrepreneurship * Principles of communication * Entrepreneurial motivation | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Develop business innovative strategies | * Innovation in business * Small business Strategic Plan * Creativity in business development * Linkages with other entrepreneurs * ICT in business growth and development | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 6. Develop Business Plan | * Business description * Marketing plan * Organizational/Management * plan * Production/operation plan * Financial plan * Executive summary * Presentation of Business Plan | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Project
* Case studies
* Field trips
* Discussions
* Demonstration
* Question and answer
* Problem solving
* Experiential
* Team training

**Recommended Resources**

* Case studies
* Business plan templates
* Computers
* Overhead projectors
* Internet
* Mobile phone
* Video clips
* Films
* Newspapers and Handouts
* Business Journals
* Writing materials

# EMPLOYABILITY SKILLS

**UNIT CODE:** EXT/CU/GPE/05/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Employability Skills

**Duration of Unit:** 80 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**Summary of Learning Outcomes**

1. Conduct self-management
2. Demonstrate interpersonal communication
3. Demonstrate critical safe work habits
4. Lead a workplace team
5. Plan and organize work
6. Maintain professional growth and development
7. Demonstrate workplace learning
8. Demonstrate problem solving skills
9. Manage ethical performance

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct self-management | * Self-awareness * Formulating personal vision, mission and goals * Strategies for overcoming life challenges * Managing emotions * Emotional intelligence * Assertiveness versus aggressiveness * Expressing personal thoughts, feelings and beliefs * Developing and maintaining high self-esteem * Developing and maintaining positive self-image * Setting performance targets * Monitoring and evaluating performance * Articulating ideas and aspirations * Accountability and responsibility * Good work habits * Self-awareness * Values and beliefs * Self-development * Financial literacy * Healthy lifestyle practices * Adopting safety practices | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate interpersonal communication | * Meaning of interpersonal communication * Listening skills * Types of audience * Public speaking * Writing skills * Negotiation skills * Reading skills * Meaning of empathy * Understanding customers’ needs * Establishing communication networks * Assertiveness * Sharing information | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate critical safe work habits | * Stress and stress management * Time concept * Punctuality and time consciousness * Leisure * Integratingpersonal objectives into organizational objectives * Resources mobilization * Resources utilization * Setting work priorities * Developing healthy relationships * HIV and AIDS * Drug and substance abuse * Managing emerging issues | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Lead a workplace team | * Leadership qualities * Power and authority * Team building * Determination of team roles and objectives * Team parameters and relationships * Individual responsibilities in a team * Forms of communication * Complementing team activities * Gender and gender mainstreaming * Human rights * Developing healthy relationships * Maintaining relationships * Conflicts and conflict resolution * Coaching and mentoring skills | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Plan and organize work | * Functions of management * Planning * Organizing * Time management * Decision making concept * Task allocation * Developing work plans * Developing work goals/objectives and deliverables * Monitoring work activities * Evaluating work activities * Resource mobilization * Resource allocation * Resource utilization * Proactive planning * Risk evaluation * Problem solving * Collecting, analysing and organising information * Negotiation | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Maintain professional growth and development | * Avenues for professional growth * Training and career opportunities * Assessing training needs * Mobilizing training resources * Licenses and certifications for professional growth and development * Pursuing personal and organizational goals * Managing work priorities and commitments * Recognizing career advancement | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate workplace learning | * Managing own learning * Mentoring * Coaching * Contributing to the learning community at the workplace * Cultural aspects of work * Networking * Variety of learning context * Application of learning * Safe use of technology * Taking initiative/proactivity * Flexibility * Identifying opportunities * Generating new ideas * Workplace innovation * Performance improvement * Managing emerging issues * Future trends and concerns in learning | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate problem solving skills | * Critical thinking process * Data analysis tools * Decision making * Creative thinking * Development of creative, innovative and practical solutions * Independence in identifying and solving problems * Solving problems in teams * Application of problem-solving strategies * Testing assumptions * Resolving customer concerns | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Manage ethical performance | * Meaning of ethics * Ethical perspectives * Principles of ethics * Ethical standards * Organization code of ethics * Common ethical dilemmas * Organization culture * Corruption, bribery and conflict of interest * Privacy and data protection * Diversity, harassment and mutual respect * Financial responsibility/accountability * Etiquette * Personal and professional integrity * Commitment to jurisdictional laws * Emerging issues in ethics | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |

**Suggested Methods of Instruction**

* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Assignments
* Q&A

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors

# ENVIRONMENTAL LITERACY

**UNIT CODE**:EXT/CU/GPE/BC/06/6/A

**Relationship to Occupational Standards**:

This unit addresses the Unit of Competency: Demonstrate Environmental Literacy

**Duration of Unit:** 40 hours

**Unit Description**

This unit describes the competencies required demonstrate environmental literacy.it involves controlling environmental hazard, controlling environmental pollution, complying with workplace sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/programs, analysing resource use and developing resource conservation plans.

**Summary of Learning Outcomes**

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs
8. Analyze resource use
9. Develop resource conservation plans

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Control environmental hazard | * Purposes and content of Environmental Management and Coordination Act 1999 * Storage methods for environmentally hazardous materials * Disposal methods of hazardous wastes * Types and uses of PPE in line with environmental regulations * Occupational Safety and Health Standards (OSHS) | * Written questions * Oral questions |
| 1. Control environmental Pollution control | * Types of pollution * Environmental pollution control measures * Types of solid wastes * Procedures for solid waste management * Different types of noise pollution * Methods for minimizing noise pollution | * Written questions * Oral questions * Role play |
| 1. Demonstrate sustainable resource use | * Types of resources * Techniques in measuring current usage of resources * Calculating current usage of resources * Methods for minimizing wastage * Waste management procedures * Principles of 3Rs (Reduce, Reuse, Recycle) * Methods for economizing or reducing resource consumption | * Written questions * Oral questions * Role play |
| 1. Evaluate current practices in relation to resource usage | * Collection of information on environmental and resource efficiency systems and procedures, * Measurement and recording of current resource usage * Analysis and recording of current purchasing strategies. * Analysis of current work processes to access information and data * Identification of areas for improvement | * Written questions * Oral questions * Role play |
| 1. Identify Environmental legislations/conventions for environmental concerns | * Environmental issues/concerns * Environmental legislations /conventions and local ordinances * Industrial standard /environmental practices * International Environmental Protocols (Montreal, Kyoto) * Features of an environmental strategy | * Written questions * Oral questions |
| 1. Implement specific environmental programs | * Community needs and expectations * Resource availability * 5s of good housekeeping * Identification of programs/Activities * Setting of individual roles /responsibilities * Resolving problems /constraints encountered * Consultation with stakeholders | * Written questions * Oral questions * Role play |
| 1. Monitor activities on Environmental protection/Programs | * Periodic monitoring and Evaluation of activities * Gathering feedback from stakeholders * Analyzing data gathered * Documentation of recommendations and submission * Setting of management support systems to sustain and enhance the program * Monitoring and reporting of environmental incidents to concerned /proper authorities | * Oral questions * Written tests * Practical test |
| 1. Analyze resource use | * Identification of resource consuming processes * Determination of quantity and nature of resource consumed * Analysis of resource flow through different parts of the process. * Classification of wastes for possible source of resources. | * Written tests * Oral questions * Practical test |
| 1. Develop resource Conservation plans | * Determination of efficiency of use/conversion of resources * Causes of low efficiency of use of resources * Plans for increasing the efficiency of resource use | * Written tests * Oral questions * Practical test |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees
* Observations and comments and corrections by trainers

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Environmental Management and Coordination Act 1999
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)
* ISO standards
* Company environmental management systems (EMS)
* Montreal Protocol
* Kyoto Protocol

# OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** EXT/CU/GPE/BC/07/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Occupational Safety and Health Practices

**Duration of Unit:** 40 hours

**Unit Description**

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risk, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

**Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Control OSH hazards
3. Implement OSH programs

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify workplace hazards and risks | * Identification of hazards in the workplace and/or the indicators of their presence * Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace * Gathering of OSH issues and/or concerns | * Oral questions * Written tests * Portfolio of evidence * Third party report |
| 1. Control OSH hazards | * Prevention and control measures e.g. use of PPE * Risk assessment * Contingency measures | * Oral questions * Written tests * Portfolio of evidence * Third party report |
| 1. Implement OSH   programs | * Company OSH program, evaluation and review * Implementation of OSH programs * Training of team members and advice on OSH standards and procedures * Implementation of procedures for maintaining OSH-related records | * Oral questions * Written tests * Portfolio of evidence * Third party report |

**Suggested Methods of Instruction**

* Assigments
* Discussion
* Q&A
* Role play
* Viewing of related videos

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE) e.g.
* Mask
* Face mask/shield
* Safety boots
* Safety harness
* Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest

# COMMON UNITS OF LEARNING

# MATHEMATICS FOR GEOPHYSICAL EXPLORATION

**UNIT CODE: EXT/CU/GPE/CC/01/6/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: apply technician mathematics

**Duration of Unit:** 150 hours

**UNIT DESCRIPTION**

This unit describes the competencies required to apply Technician mathematics. It involves applying: algebra, trigonometry and hyperbolic functions, complex numbers, co-ordinate geometry and carry out binomial expansion. It also entails calculus, solving ordinary differential equations, carry out mensuration, power series, statistics, numerical methods, vector theory and matrices.

**Summary of Learning Outcomes**

1. Apply Algebra
2. Apply Trigonometry and hyperbolic functions
3. Apply complex numbers
4. Apply Coordinate Geometry
5. Carry out Binomial Expansion
6. Apply Calculus
7. Solve Ordinary differential equations
8. Carry out Mensuration
9. Apply Power Series
10. Apply Statistics
11. Apply Numerical methods
12. Apply Vector theory
13. Apply Matrix

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| * 1. Apply Algebra | * Indices * Logarithms * Solving mathematical problems * Simultaneous equations * Quadratic equations | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Trigonometry and hyperbolic functions | * Trigonometric rules * Hyperbolic functions | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply complex numbers | * Complex numbers * Argand diagrams * Calculations and functions * De Moivre’s Theorem | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Coordinate Geometry | * Polar equations * Graphs * Normals and tangents | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Carry out Binomial Expansion | * Roots of numbers * Errors and small changes | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Calculus | * Derivatives   + Algebraic functions   + Hyperbolic functions   + Inverse trigonometric functions * Rate of change and small change * stationery points of functions * Integrals   + Algebraic functions   + Trigonometric functions   + Logarithmic functions   + Hyperbolic and inverse functions | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Solve Ordinary differential equations | * First and second order differential equations   + Undetermined coefficients   + Boundary conditions | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Carry out Mensuration | * Perimeter and areas of figures * Volume and of Surface area of solids * Area of irregular figures * Pappus Theorem | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Power Series | * Taylor’s Theorem * McLaurin’s Theorem | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Statistics | * Measures of central tendency and dispersion * Laws of probability * Probability distributions * Data analysis * Sampling distribution, T-distribution and Estimation * Confidence intervals | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Numerical methods | * Roots of polynomials * Iterations * Interpolation and extrapolation | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Vector theory | * Vectors and scalar * Operations on vectors * Position of vectors * Resolution of vectors | * Written tests * Observation * Oral questions * Third party report * Interviews |
| * 1. Apply Matrix | * Determinant and inverse * Solutions of simultaneous equations * Eigen values and Eigen vectors | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer
* Modelling

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Scientific calculators
* Internet

# CHEMISTRY FOR GEOPHYSICAL EXPLORATION

**UNIT CODE: EXT/CU/GPE/CC/02/6/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: apply chemistry principles

**Duration of Unit:** 120 hours

**UNIT DESCRIPTION**

This unit covers the competencies required by a geophysical exploration technician in order to apply inorganic chemistry, organic chemistry, analytical and physical chemistry in the workplace.

**Summary of Learning Outcomes**

1. Apply inorganic chemistry
2. Apply organic chemistry
3. Apply physical chemistry
4. Apply analytical chemistry

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Apply inorganic chemistry | * Geochemical Fundamentals * Matter * Isotope Geochemistry * Atomic Structure And Bonding * The Periodic Table * Chemistry of Transition Elements * Minerals and Ores * Radioactivity and Nuclear Chemistry | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply organic chemistry | * Organic compounds * Organic compounds Classifications and their nomenclature * Biologically important organic compounds * Organic compounds and living organisms * Distribution of organic compounds in water and soils * Geochemical properties of organic compounds and their role as complexing agents and adsorbent * Sedimentary Organic Matter and Coal and Oil Formation * Carbon cycles and climate | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply physical chemistry | * Chemical and Ionic Equilibrium * Acids and Bases * Redox Potential and its Application. * Aqueous chemistry | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply analytical chemistry | * Geochemical analytical techniques * Separation Methods * Bulk (whole rock) chemical techniques | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer
* Modelling

**Recommended Resources**

* Chemistry laboratory
* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Chemicals
* Apparatus
* Equipment
* Reagents
* Laboratory manual
* Standard operating procedure
* Fire fighting equipment
* First aid kit
* PPES
  + - Gloves
    - Gas mask
    - Lab coat
    - Closed leather shoes
    - Goggles

# PHYSICS FOR GEOPHYSICAL EXPLORATION

**UNIT CODE: EXT/CU/GPE/CC/03/6/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: apply physics principles

**Duration of Unit:** 240 hours

**UNIT DESCRIPTION**

This unit describes the competencies required by a geophysical exploration technician in order to apply a wide range of physics principles in their work. It includes applying principles of: the concept of basic quantities of measurement, mechanics, acoustics, thermodynamics, optics, electromagnetism, current electricity, basic electronics and modern physics

**Summary of Learning Outcomes**

1. Apply the concept of basic quantities of measurement
2. Apply principles of mechanics
3. Apply principles of thermodynamics
4. Apply principles of optics
5. Apply principles of electromagnetic theory
6. Apply principles of current electricity
7. Apply principles of basic electronics
8. Apply principles of modern physics

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Apply the concept of basic quantities of measurement | * Phases of matter * Dimensions of space * Nature and properties of matter * Parameters of measurement * Concept of time | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of mechanics | * Vectors and forces * Statics * Kinematics * Machines * Acoustics and waves | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of thermodynamics | * Temperature scales * Modes and rates of heat transfer * Laws of thermodynamics | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of optics | * Production and nature of light * Ray optics * Wave aspects of light * Absorption, transmission and polarization of light | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of electromagnetic theory | * Electrostatics * Magnetism * Electromagnetism * Maxwell’s equations * Electromagnetic waves and spectrum | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of current electricity | * Sources of electromotive force * Basic electric circuits * Direct Current (D.C.) transients * Alternating Current (A.C) * Basic electrical appliances | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of basic electronics | * Semiconductor materials and the band theory * Types of conduction * Doping * Semiconductor chips * Biasing principles. | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Apply principles of modern physics | * Principles of relativity * Atomic and nuclear physics * Wave mechanics * Schrödinger equations * Principles of Particle physics | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer
* Modelling

**Recommended Resources**

* Physics laboratory
* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Chemicals
* Apparatus
* Equipment
* Reagents
* Laboratory manual
* Standard operating procedure
* Fire fighting equipment
* First aid kit
* PPES
  + - Gloves
    - Gas mask
    - Lab coat
    - Closed leather shoes
    - Goggles

# CORE UNITS OF LEARNING

# AREA GEOLOGY

**UNIT CODE: EXT/CU/GPE/CR/01/6/A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Study area geology

**Duration of Unit:** 240 hours

**UNIT DESCRIPTION**

This unit covers the competencies required to study area physical geology. It involves locating geological survey area, conducting area geological survey, conducting area structural survey, conducting area petrological study, conducting ground fluids survey, and preparing area geological survey report.

**Summary of Learning Outcomes**

1. Locate geological survey area
2. Conduct area geological survey
3. Conduct structural geological survey
4. Conduct Petrological study
5. Conduct ground fluids survey
6. Prepare geological survey report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Locate geological survey area | * Physical geology terms and concepts * Geological and demographic area data review * Data and information collection and organization * Climatic patterns * Map reading and interpretation * Topographical survey * Satellite image interpretation * GPS operation techniques * Planning for reconnaissance * Identification, use and care of geological survey tools * Conducting a reconnaissance survey * Safety and security * Host community relations * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Conduct area geological survey | * Geological terms and concepts * Geological, GIS and remote sensing survey tools * Rock units spatial data * Physical features * Rock units * Types of rocks * Types of minerals * Texture of rocks * Land cover * Geological measurements * Geological measurements plotting * Data analysis, processing and interpretation * Geological model | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Conduct structural geological survey | * Geological structural terms and concepts * Structural, GIS and remote sensing survey tools * Structural spatial data * Earth processes * Geological structures spatial data * Types of geological structures * Geological structure measurements * Data analysis, processing and interpretation * Geological structural model | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Conduct Petrological study | * Types of minerals * Properties of minerals * Mineral composition * Petrographic microscope | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Conduct ground fluids survey | * Reservoir parameters * Fluid occurrence * Fluid flow * Fluid chemistry and standards | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare survey report | * Geological data keeping and management * Components of a geological survey report * Technical report writing * Data and information presentation * Preparation of geological survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters
* Publications
* Video clips
* LCD projector
* GPS
* Compass
* Clinometer
* Geological hammer
* Magnetic pencils
* Reagents
* Hardness kit
* Hand lens
* Geological maps and reports
* Satellite images
* Remote sensing data
* Bore hole records
* Aerial photos and images
* Petrographic microscope
* Lapidary laboratory
* Augur
* Oscilloscope
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet
* Overall

# GRAVITY SURVEY

**UNIT CODE: EXT/CU/GPE/CR/02/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Survey area density

**Duration of Unit:** 120 hours

**UNIT DESCRIPTION**

This unit covers the competencies required to survey area gravity. It involves locating gravity survey area, surveying subsurface density variation, monitoring geo-hazards, processing and analysing area gravity survey data and preparing gravity survey report.

**Summary of Learning Outcomes**

1. Locate gravity survey area
2. Survey subsurface density variation
3. Monitor geo-hazards
4. Interpret gravity survey data
5. Prepare gravity survey report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Locate gravity survey area | * Gravitation terms and concepts * Geological and demographic area data review * Data and information collection and organization * Climatic patterns * Gravity map reading and interpretation * Topographical survey * Satellite image interpretation * GPS operation techniques * Planning for reconnaissance * Identification, use and care of gravity survey tools * Conducting a reconnaissance survey * Safety and security * Host community relations * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Survey subsurface density variation | * Force of gravity * Laws of gravity * Identification, use and care of density variation survey tools * Mechanical properties of geo-materials * Physical properties of geo-materials * Rock types, rock structures and their relationship to gravity * Density variation * Factors affecting geo-material density variation * Factors influencing gravity variation * Gravity survey procedure * Calibration of gravity equipment * Gravity data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Monitor geo-hazards | * Types of geo-hazards and their causes * Identification, use and care of geo-hazards monitoring tools * Process of monitoring geo-hazards * Monitoring of geo-hazards * Monitoring of ground subsidence and uplift * Mitigation of geo-hazards * Mitigation of ground subsidence and uplift | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Interpret gravity survey data | * Software for gravity data analysis, processing and interpretation * Operation of gravity software * Gravity data reduction procedures * Development of gravity models * Interpretation of gravity models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare gravity survey report | * Gravity data keeping and management * Components of a gravity survey report * Technical report writing * Data and information presentation * Preparation of a gravity survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Gravimeter
* GPS
* Differential GPS
* Compass
* Gravity software
* PPES
  + - Exploration boots
    - Snake boots
    - Gloves
    - Rain coat
    - Hat
    - Dust mask
    - Reflective jacket
    - Helmet
    - Overall

# MAGNETIC SURVEY

**UNIT CODE: EXT/CU/GPE/CR/03/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Survey area magnetism

**Duration of Unit:** 120 hours

This unit covers the competencies required to survey area magnetism. It involves locating magnetic survey area, surveying magnetic properties, developing and interpreting magnetic models and preparing magnetic survey report

**Summary of Learning Outcomes**

1. Locate magnetic survey area
2. Survey magnetic properties
3. Develop and Interpret magnetic survey data
4. Prepare magnetic survey report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Locate magnetic survey area | * Magnetic terms and concepts * Geological and demographic area data review * Data and information collection and organization * Climatic patterns * Magnetic map reading and interpretation * Topographical survey * Satellite image interpretation * GPS operation techniques * Planning for reconnaissance * Identification, use and care of magnetic survey tools * Conducting a reconnaissance survey * Safety and security * Host community relations * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Survey magnetic properties | * Earth magnetism * Magnetic properties of Geo-materials * Physical properties of Geo-materials * Magnetic variation * Rock types, structures and their relationship to magnetism * Factors affecting geomagnetism * Factors influencing magnetic variation * Magnetic survey procedure * Calibration of magnetometer * Magnetic data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Develop and Interpret magnetic survey data | * Software for magnetic data analysis, processing and interpretation * Operation of magnetic software * Magnetic data reduction procedures * Development of magnetic models * Interpretation of magnetic models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare magnetic survey report | * Record keeping and management of magnetic data * Components of a magnetic survey report * Technical report writing * Presentation of magnetic data and findings * Preparation of a magnetic survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters
* Publications
* Video clips
* LCD projector
* Magnetometer
* GPS
* Compass
* Magnetic software
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet
* Overall

# SEISMIC SURVEY

**UNIT CODE: EXT/CU/GPE/CR/04/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Survey area elasticity

**Duration of Unit:** 120 hours

**UNIT DESCRIPTION**

This unit covers the competencies required to survey area elasticity. It involves locating seismic survey area, surveying subsurface elasticity variation, monitoring subsurface reservoirs and geo-hazards, developing and interpreting area seismic models and preparing seismic survey report.

**Summary of Learning Outcomes**

1. Locate seismic survey area
2. Survey seismic elastic properties
3. Monitor subsurface reservoirs
4. Monitor geo-hazards
5. Develop and Interpret seismic models
6. Prepare seismic survey report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. **Locate seismic survey area** | * Seismic terms and concepts * Geological and demographic area data review * Topographical survey * Climatic patterns * Satellite image interpretation * Identification, use and care of seismic survey tools * GPS operation techniques * Seismic map reading and interpretation * Data and information collection and organization * Planning for reconnaissance * Safety and security * Host community relations * Conducting a reconnaissance survey * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Survey seismic elastic properties | * Terms and concepts of oscillation and wave theory * Types and propagation of waves * Seismic methods * Seismic survey Procedure * Elasticity variation * Factors affecting geo-material elasticity * Factors influencing elasticity variation * Physical properties of geo-materials * Mechanical properties of geo-materials * Rock types, structures and their relationship to seismic waves * Calibration of seismic equipment * Seismic data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Monitor sub-surface reservoir | * Identification, use and care of seismic reservoir monitoring tools * Seismic procedure and process of monitoring discontinuities | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Monitor geo-hazards | * Types of geo-hazards and their causes * Identification, use and care of geo-hazards monitoring tools * Procedure and process of monitoring geo-hazards * Calibration with existing data * Monitoring of geo-hazards * Zoning and correlation with existing data * Mitigation of geo-hazards | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Develop and Interpret seismic models | * Software for seismic data analysis, processing and interpretation * Operation of seismic software * seismic data reduction procedures * Development of seismic models * Interpretation of seismic models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare seismic survey report | * Record keeping and management * Components of a seismic survey report * Technical report writing * Data and information presentation * Preparation of a seismic survey report. | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters
* Publications
* Video clips
* LCD projector
* Seismometer
* GPS
* Compass
* Existing data and information
* Seismic software
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet
* Overall

# RESISTIVITY SURVEY

**UNIT CODE: EXT/CU/GPE/CR/05/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: survey area resistivity

**Duration of Unit:** 180 hours

**Unit Description**

This unit covers the competencies required to survey area resistivity. It involves locating resistivity survey area, surveying resistivity properties, developing and interpreting resistivity models and preparing resistivity survey report

**Summary of Learning Outcomes**

1. Locate resistivity survey area
2. Survey resistivity properties
3. Develop and Interpret resistivity models
4. Prepare resistivity survey report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Locate resistivity survey area | * Electrical terms and concepts associated with Ohm’s law * Geological and demographic area data review * Climatic patterns * Topographical survey * Satellite image interpretation * Identification, use and care of resistivity survey tools * GPS operation techniques * Resistivity map reading and interpretation * Data and information collection and organization * Planning for reconnaissance * Safety and security * Host community relations * Conducting a reconnaissance survey * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Survey resistivity properties | * Electrical theory and principles * Resistivity properties of geo-materials * Physical properties of geo-materials * Mechanical properties of geo-materials * Resistivity variation * Factors affecting subsurface resistivity * Factors influencing resistivity variation * Rock types, structures and their relationship to resistivity * Resistivity survey procedure * Calibration of resistivity equipment * Resistivity data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Develop and Interpret resistivity models | * Software for resistivity data analysis, processing and interpretation * Operation of resistivity software * Development of resistivity models * Interpretation of resistivity models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare resistivity survey report | * Record keeping and management of resistivity data * Components of a resistivity survey report * Technical report writing * Preparation of a resistivity survey report * Dissemination of resistivity data and findings | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Resistivity meter
* GPS
* Compass
* Existing data and information
* Resistivity software
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet
* Overall

# GEOPHYSICAL WELL LOGGING

**UNIT CODE: EXT/CU/GPE/CR/06/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: conduct geophysical well logging

**Duration of Unit:** 90 hours

**Unit Description**

This unit covers the competencies required to conduct geophysical well logging. It involves locating the well, preparing the well for logging, logging the well, developing and interpreting log models and preparing log report.

**Summary of Learning Outcomes**

1. locate the well
2. prepare the well for logging
3. Log the well
4. Develop and interpret log models
5. Prepare log report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Locate the well | * Logging terms and concepts * Geological and demographic area data review * Climatic patterns * Topographical survey * Identification, use and care of geophysical logging tools * GPS operation techniques * Logging graph reading and interpretation * Data collection and organization * Planning for reconnaissance * Safety and security * Host community relations * Conducting a reconnaissance survey * Preparation of a reconnaissance survey report | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare the well for logging | * Required Conditions of the well during geophysical logging * Procedure for evaluating the well condition before logging * Procedure for preparing the well for geophysical logging | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Log the well | * Electrical theory and principles * Acoustic theory and principles * Radiation theory and principles * Thermal gradient principles * Physical properties of geo-materials * Physical properties variation * Factors affecting physical properties * Geophysical logging procedure * Calibration of geophysical logging equipment * Geophysical logging data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Develop and Interpret log models | * Software for geophysical log analysis, processing and interpretation * Operation of geophysical log software * Development of geophysical log models * Interpretation of geophysical log models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare log report | * Record keeping and management of geophysical log * Components of a geophysical log report * Technical report writing * Preparation of a geophysical log report * Dissemination of geophysical log and findings | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Resistivity meter
* Calliper
* Potentiometer
* Gamma logger tool
* Open Hole Calliper
* Acoustic log tool
* Kuster Pressure/Temperature Tools
* Geophysical log interpretation software
* GPS
* Compass
* Existing data and information
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet
* Overall

# GEOPHYSICAL DATA INTERPRETATION

**UNIT CODE: EXT/CU/GPE/CR/07/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Interpret geophysical data

**Duration of Unit:** 90 hours

**Unit Description**

This unit covers the competencies required to interpret geophysical data. It involves preparing geophysical data, producing and interpreting geophysical models and preparing geophysical data interpretation report.

**Summary of Learning Outcomes**

1. Prepare geophysical data
2. Produce and interpret geophysical models
3. Prepare geophysical data interpretation report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Prepare geophysical data | * Terms and concepts of geophysical data interpretation * Computer applications * Identification, use and care of geophysical data preparation tools * Procedure for geophysical data cleaning * Procedures for geophysical data retrieval, importation and conversion | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Produce and interpret geophysical models | * Software for geophysical data analysis, processing and interpretation * Operation of geophysical software * Geophysical data reduction procedures * Development of geophysical models * Interpretation of geophysical models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare geophysical data interpretation report | * Record keeping and management of geophysical data * Components of a geophysical data interpretation report * Scientific report writing * Preparation of a geophysical data interpretation report * Dissemination of geophysical data interpretation and findings | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Resistivity software
* Gravity software
* Magnetic software
* Seismic software
* Geophysical logging software
* Dust coat

# RESEARCH METHODOLOGY

**UNIT CODE: EXT/CU/GPE/CR/08/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Conduct research

**Duration of Unit:** 60 hours

**Unit Description**

This unit covers the competencies required to conduct research. It involves developing research proposal, collecting research data, analysing research data and preparing research report.

**Summary of Learning Outcomes**

1. Develop research proposal
2. Collect research data
3. Analyse research data
4. Prepare research report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcomes** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Develop research proposal | * Terms and concepts * Historical background of research * Importance of research * Ethics in research * Scientific research process * Types of research * Importance of research proposal * Types of research proposal * Format of academic research proposal * Sources of research problem * Qualities of a good research problem * Identification of research problem * Formulation of research title * Research proposal writing   + Background information of the study   + Formulation of research objectives   + Research questions   + Research hypothesis   + Statement of research problem   + Purpose of research study   + Significance of research study   + Limitation of research study   + Scope of research study   + Definition of terms   + Abbreviations and acronyms * Review of related literature   + Purpose of review   + Sources of literature   + Style of presentation * Research methodology   + Research design   + Population of study   + Sample and sampling techniques   + Types of data collection tools   + Development of data collection tools   + Procedure for data collection   + Data analysis plan   + Research study work plan   + Research budget | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Collect research data | * Piloting of data collection tools * Collection of data * Collation of data | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Analyse research data | * Data analysis   + Quantitative   + Qualitative * Data processing   + Validation   + Editing   + Coding   + Tabulation * Data presentation and interpretation * Conclusion and recommendations | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare research report | * Compiling and writing of Research report * Editing research report * Sharing of research report * Dissemination of research finding | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Internet connectivity
* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector

# GEOPHYSICAL TRADE PROJECT

**UNIT CODE: EXT/CU/GPE/CR/09/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Perform geophysical trade project

**Duration of Unit:** 60 hours

**Unit Description**

This unit covers the competencies required to perform geophysical trade project. It involves formulating geophysical project problem, developing geophysical trade project proposal, collecting geophysical project data, developing and interpreting geophysical project models and presenting geophysical project findings.

**Summary of Learning Outcomes**

1. Develop project proposal
2. Collect project data
3. Develop and interpret project models
4. Prepare trade project report

**Learning Outcomes, Content and Methods of Assessment**

| **Learning Outcome** | **Content** | **Methods of Assessment** |
| --- | --- | --- |
| 1. Develop geophysical project proposal | * Identification of project problem * Formulation of project title * Project proposal writing * Project background information * Review of related literature * Project methodology * Project budget * Project work plan * Preparation of data collection | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Collect project data | * Reconnaissance study * Piloting of data collection tools * Collection of data * Collation of data | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare geophysical data for analysis | * Use and maintenance of geophysical data preparation tools * Procedure for geophysical data cleaning * Procedures for geophysical data retrieval, importation and conversion | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Produce and interpret geophysical models | * Operation of geophysical software * Geophysical data reduction procedures * Development of geophysical models * Interpretation of geophysical models | * Written tests * Observation * Oral questions * Third party report * Interviews |
| 1. Prepare trade project report | * Record keeping and management of geophysical data * Components of a geophysical trade project report * Technical report writing * Dissemination of geophysical trade project report and findings | * Written tests * Observation * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Demonstrations
* Group discussion
* Presentations
* Videos
* Assignments
* Role play
* Question and answer

**Recommended Resources**

* Computers
* Stationery
* Charts/posters/
* Publications
* Video clips
* LCD projector
* Resistivity meter
* Gravimeter
* Seismometer
* Magnetometer
* GPS
* Compass
* Resistivity software
* Gravity software
* Magnetic software
* Seismic software
* Geophysical logging software
* PPES
* Exploration boots
* Snake boots
* Gloves
* Rain coat
* Hat
* Dust mask
* Reflective jacket
* Helmet