UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION AND VOCATIONAL TRAINING

PHYSICS ACADEMIC SYLLABUS FOR DIPLOMA IN SECONDARY EDUCATION

2009

Designed and prepared by:
Tanzania Institute of Education
P.O. Box 35094
Dar -es -Salaam
Tanzania

Tel: +255 222 773006, 2774420
Fax: +255 22 2774420
E-mail: director.tie@tie.go.tz

DECLARATION

The Secondary Education Diploma course is a two year course which has been designed to prepare professional teachers who will teach in ordinary level secondary schools. A student teacher shall be recognized as a teacher when he/she successfully completes a secondary education diploma course for two years within which he/she successfully performed teaching practice.

This document is hereby declared as the **Physics Academic syllabus for Diploma in Secondary Education** course of 2009.

Approved by ..CHARLES PHILEMON.....

Signature..C.W.Philemon.....

Date:.....14th September,..... 2009

Commissioner for Education
Ministry of Education and Vocational Training
P.O. Box 9121
Dar es Salaam

Tel : +255 222 110150, 110179, 11046
Fax : +255 222 113271
Website : www.moe.go.tz

TABLE OF CONTENTS

Introduction

This Academic syllabus for Physics diploma course in secondary education is a revised version for the 2007 syllabus. It has been developed to prepare confident and competent student teachers equipped with academic competences to handle the ordinary level syllabus and continue with further education.

Subject Description

The physics academic course has been reviewed to be covered in two years. The reviewed syllabus places more emphasis on knowledge, skills and attitudes to be developed by student teacher. The syllabus has content pertinent to the current requirements such as practical skills technological innovations and academic advancement. The physics academic course will be taught for 64 weeks (128 hours) for the whole span period of two years.

Rationale for the Review of the Course Syllabus

The physics academic course syllabus has been reviewed in order to equip the student teacher with laws, theories, practice and experiences about physics. The syllabus puts emphasis on the development of numeracy, literacy, and scientific skills development among the student teachers.

Goals of the Physics academic course

The goals of the Physics academic course are to:

a) Develop mastery of knowledge and skills in Physics
b) Promote use of scientific and technological skills in daily life
c) Enable student teacher to apply Physics knowledge to deal with social economical changes.

Competences to be developed

By the end of the two years training, the student teacher will have the ability to:-

a) Demonstrate mastery of Physics academic content
b) Conduct Physics experiments
c) Manage technological appliances relevant to Physics

d) Relate of Physics concepts, principles, laws and theories with daily life experiences.
e) Apply Physics knowledge and skills in dealing with cross-cutting issues.

Course Objectives

By the end of two years the student teacher should be able to:

a) pursue further studies in physics;
b) Use scientific and practical skills to perform Physics experiments;
c) develop manipulative skills in using various technological appliances;
d) develop an understanding of Physics concepts, principle, laws and theories;
e) Understanding cross-cutting issues and how to integrate them in Physics subject course.

Course Syllabus description and Organization

The academic physics course emphasizes on the acquisition of competences. Eight topics have been selected. These are: Measurement, Mechanics, Waves, Heat, Current Electricity, Atomic Physics, Electronics and Geophysics. The specific objectives provided establish the boundary of flexibility to the teaching and learning process.

The teaching and learning strategies and resources are suggested to help the tutor in planning lessons such that the student teacher becomes responsible teacher for one's learning. However, the tutor may use other resources available in the immediate environment. A number of assessment procedures have been suggested. The tutor is strongly advised to use the strategies, resources and assessments indicated in the syllabus in order to develop the desired competences. The academic course will be covered in 64 weeks (128 hours) during the whole course period of two years.

The syllabus is arranged in linear form so as to give the tutor enough freedom and flexibility to plan and execute classroom instructions.

Assessment for the physics Course

Formative and summative assessments shall be geared towards mastery of the knowledge, skills and attitudes developed within the course. It is proposed that

continuous assessment shall contribute 50% whereby 25% will be drawn from Academic Content Knowledge (ACK) and 25% from Pedagogy Content Knowledge (PCK) courses. The overall assessment for the final exam shall base on academic and teaching of the physics subject. Thus, the final examination shall comprise of 50%.

The following are proposed procedures for the items to be assessed for continuous assessment and its weight for the physics academic course.

No	Types of Assessment	Frequency	Weight (%)
1.	Tests	4	05
2	Projects	2	05
3	Laboratory practicals	3	05
4	Terminal Exams	3	10
	Total		**25**
	Final Examination ACK)	**1**	**25**

In a more summarized form, continuous and final assessment during the two years of the physics course shall be:

Continuous Assessment	50%
Final Exam	50%
Block Teaching Practice (BTP)	Graded

Commissioner for Education,
Ministry of Education and Vocational Training
P.O. Box 9121
Dar es Salaam

Tel : +255 22 2113139, 2110150, 2110179
Fax: +255 222113271
Website: www.moe.go.tz

1.0 MEASUREMENTS

1.1 Physical Quantities of Measurement

Estimated Time:

Specific Objectives

By the end of this sub-topic, the Student-teacher should be able to:

a) Describe seven fundamental quantities of measurements;
b) Distinguish between fundamental and derived physical quantities
c) Derive the relationship between physical quantities;
d) Use appropriate instruments for measuring fundamental quantities.

Teaching and Learning Strategies

a) Group discussion
b) Gallery walk.
c) Demonstration on the appropriate uses of the basic measuring instruments used in Physics.

Teaching and Learning Resources

Metre rule, vernier caliper, micrometer screw gauge, stopwatch, thermometers, ammeters and beam balance.

Assessment Procedures

a) Anecdotal records
b) Observation schedule on the use of instrument.
c) Written reports.

1.2 Dimensional Analysis

Estimated Time: 4 hours

Specific Objectives

Student teacher should be able to:

a) Describe the method of dimensional analysis;
b) Explain the limitations of using the method of dimensional analysis;
c) Derive the formulae of a physical quantities by using dimensions;
d) Examine the dimensional homogeneity in a given formula.

Teaching and Learning Strategies

a) Deductive inquiry to derive formula.
b) Group discussion and presentation.

Teaching and Learning Resources

Flip chart, manila sheets and charts with physical quantities.

Assessment Procedures

a) Written exercise
b) Anecdotal records

1.3 Errors Analysis

Estimated Time: 4 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe concepts of errors.
b) Determine errors in measurement and from graph.
c) Estimate errors of derived physical quantities.
d) Distinguish between accuracy and precision.
e) Relate the concept of error with life experiences.

Teaching and Learning Strategies

a) questions and answers
b) group discussion.
c) demonstration in computing errors.
d) deductive inquiry.

Teaching and Learning Resources

Metre rule, Ammeter, voltmeter, Battery, connecting wire, spring balance, mass, measuring cylinder water, graph paper.

Assessment Procedures

a) Rating scales
b) Quiz.
c) Written exercises
d) Observation records.
e) Portfolio.

2.0 MECHANICS

2.1 Newton's Laws of Motion

Estimated Time: 6 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Determine equilibrant forces;
b) Determine the reaction forces;
c) Describe the principle of conservation of momentum;
d) Describe the motion under gravity;
e) Apply Newton's Laws of motion in real life.

Teaching and Learning Strategies

a) brainstorming.
b) discussion.
c) demonstration on verification of Newton's 1^{st}, 2^{nd} and 3^{rd} Laws of motion.
d) demonstration on motion of bodies, sliding on horizontal and inclined planes.
e) experiment to measure the acceleration due to gravity g.

Teaching and Learning Resources

Car toy, dramatic trolley, weights, pulley, coin, piece of card, ticker tape and stopwatch, metre rule, pendulum bob, string and graph paper.

Assessment Procedures

a) Observation schedule
b) Written reports
c) Quiz and exercise

2. 2 Projectile Motion.

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of projectile motion;
b) Derive equations for a projectile motion; and
c) Determine the application of a projectile motion in daily life.

Teaching and Learning Strategies

a) Discussion
b) Library or internet search on projectile motion.
c) Deductive inquiry.
d) Field trip or invited guest from places where projectile motion is experienced.

Teaching and Learning Resources:

Catapult, footballs, arrows and bow, bullets, stone and spear.

Suggested Assessment Procedures

a) Anecdotal records.
b) Quiz.
c) Written report
d) Project on Projectile motion

2. 3. Gravitation

Estimated Time: 5hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe Kepler's Laws of planetary motion;
b) Deduce Newton's law of Universal gravitational from Kepler's 3rd law;
c) Determine mass and density of the earth;
d) Explain the terms parking orbit , velocity of escape and weightlessness.
e) Calculate the gravitational potential.
f) Show the impact of gravitation to real life.

Teaching and Learning Strategy

a) Question and answer
b) Deductive inquiry
c) Reciprocal teaching
d) Demonstration to verify Kepler's Laws.

Teaching and Learning Resources

Flipchart, masking tape, string, board and drawing pins.

Assessment Procedures

a) Written reports.
b) Quiz
c) Test

2.4 Simple Harmonic Motion (SHM)

Estimated Time: 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:-

a) Derive restoring force of Simple Harmonic Motion and its period;
b) Sketch graphs for Simple Harmonic Motion.
c) Solve Simple Harmonic Motion problems;
d) Relate application of simple harmonic motion in daily life.

Teaching and Learning Strategies

a) Discussion
b) Experiment to derive the restoring force and period of SHM.
c) Simple project
d) presentation
e) Problem solving

Teaching and Learning Resources

Helical spring, weights, U-tube, floating cork, stopwatch, simple pendulum, graph paper, compound pendulum, tortional pendulum, metre rule and string.

Assessment Procedures

a) Observation schedule
b) Rating scale
c) Written report
d) Written exercise
e) Tests and examinations.

2.5 Fluid Mechanics

Estimated time: 5 hours

Specific Objectives

By the end of this sub-topic, the student teacher should be able to:-

a) Explain the concept of fluid motion;
b) Derive continuity equation and Bernoullis principle;
c) Deduce Newton's Poiseulle's and Stoke's formulae of fluid flow;
d) Determine factors affecting body moving in fluids;
e) Describe the applications of viscosity in daily life.

Teaching and Learning Strategies

a) Question and answer
b) Jig saw classroom
c) Demonstration of flow of fluids with different viscosity.
d) Performing experiment to determine the coefficient of viscosity of fluid.

Teaching and Learning Resources

Measuring cylinder, water, honey, glyceline, bearing balls, stopwatch, venture tube, spray pumps, aerosol sprays.

Assessment Procedures

a) Anecdotal record
b) Written exercise
c) Observation schedule

3.0 PROPERTIES OF MATTER

3.1 Surface tension

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe surface tension in terms of the molecular theory;

b) Analyze surface tension in terms of surface energy;

c) Determine the coefficient of surface tension of a liquid;

d) Explain factors affecting surface tension.

Teaching and Learning Strategies

a) Think pair share

b) Discussion

c) Deductive inquiry

d) Dibrary research

e) Presentation

Teaching and Learning Resources

Water, Mercury, Beaker, Computer simulation, various liquid, Funnel, Beaker, Measuring cylinder

Assessment Procedures

a) Individual assignment.

b) Quiz

3.2 Elasticity

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the concept of elasticity of a material;

b) Show the relationship between tensile stress and strain;

c) Explain the concept of Young's modulus of elasticity;
d) Derive the expression for potential energy in extending or compressing materials;
e) Determine brittle and ductile materials.

Teaching and Learning Strategies

a) demonstration on the elasticity of material.
b) experiment on stress and strain of material.
c) deductive inquiry
d) library research
e) presentation

Teaching and Learning Resources

Rubber bands, pieces of wires, glass material, pieces of chalk, metre rule, vernier callipers, slotted weights, micrometer screw gauge, and graph paper.

Assessment Procedures

a) Individual assignment.
b) Observation schedule
c) Test
d) Portfolio

3.3 Kinetic theory of gases

Estimated Time: 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Interpret the assumptions of the Kinetic theory of gases;
b) Obtain expression for pressure of a gas;
c) Deduce the *rms* speed of a gas;
d) Establish the relationship between kinetic energy and temperature of a gas.

Teaching and Learning Strategies

a) Demonstration on the elasticity of material.
b) Experiment on stress and strain of material.
c) Deductive inquiry
d) Library research
e) Presentation

Teaching and Learning Resources

Charts, Computer simulations and Manila sheets

Assessment Procedures

a) Individual assignment.
b) Observation schedule
c) test

4.0 WAVES

4.1 Mechanical Vibrations

Estimated Time: 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Demonstrate the production and propagation of mechanical waves;
b) Distinguish between free, forced and damped vibrations;
c) Interpret the general formula for progressive waves;
d) Verify the principles of superposition of waves;
e) Derive the equations for stationary waves.

Teaching and Learning Strategies

a) Brainstorming
b) Group discussion
c) Demonstration on production and propagation of mechanical waves.
d) Experiments on free, forced and damped vibrations.

Teaching and Learning Resources

Ripple tank, slink spring, helical spring, coupled pendulum and string.

Assessment Procedures

a) Written report.
b) Quizzes
c) Observation schedule
d) Written test

4.2 Sound Waves

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Derive the velocity of sound in materials;
b) Determine the velocity of sound in air;
c) Describe the applications of mechanical vibrations and waves.

Teaching and Learning Strategies

a) Deductive inquiry
b) Group discussion
c) Demonstration
d) Perform an experiment to measure the velocity of sound in air.

Teaching and Learning Resources

Manila sheets, Turning fork, Glass tube, Water and Glass jar

Assessment Procedures

a) Quizzes
b) Observation schedule
c) Written report.
d) Portfolio

4.3 Properties of Waves

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain necessary conditions for interference of lights;
b) Determine wavelength of a monochromatic light by interference method;
c) Describe necessary conditions for diffraction of light to occur;
d) Determine the wavelength of monochromatic light by diffraction method;
e) Identify applications of interference and diffraction of light

Teaching and Learning Strategies

a) Gallery walk
b) Demonstration on occurrence of interference and diffraction of waves.
c) Group discussion
d) Using deductive inquiry to derive $n=\frac{ay}{D}$ and $\mathbf{m\lambda = d\sin\theta}$

Teaching and Learning Resources

Ripple tank, ray box, source of white light, sheet of glass, vibrator, two metal strips, and diffraction gratings.

Assessment Procedures

a) Anecdotal record on reflection and refractions of mechanical waves.
b) Rating scale an interference of light.
c) Observation schedule
d) Written report

5.0 HEAT

5.1 Thermometry

Estimated Time: 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of thermometry and thermal expansion ;
b) Describe the mode of action of different types of thermometers
c) Compare the thermal expansion of different liquids;
d) Explain different types of thermometers together with their temperature;
e) Solve problems in thermometers.

Teaching and Learning Strategies

a) Brainstorming
b) Experiment on thermal expansion of liquids.
c) Question and answers
d) Presentation.

Teaching and Learning Resources

Six thermometers, mercury in glass thermometer, thermocouple, liquid in glass thermometer.

Assessment Procedures

a) Written exercises.
b) Observation checklist on the experiment

5.2 Thermal Conduction

Estimated Time: 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of thermal conduction in terms of kinetic theory of matter;
b) Compare thermal conductivity of different metal bars;

c) Verify temperature distribution along lagged and unlagged metal rod;

d) Derive an expression $H=\frac{KA}{L}(\theta_2 - \theta_1)$; and

e) Determine thermal conductivity of a good and bad conductor.

Teaching and Learning Strategies

a) Jig-saw classroom

b) questions and answers

c) Experiment on verification of temperature distribution along lagged and unlagged metal conductors.

Teaching and Learning Resources

Unlagged metal conductor, insulated metal conductor, source of heat, metal rod, cotton wool, thermometer, stopwatch, graph paper.

Assessment Procedures

a) Written report

b) Observation schedules

c) Quiz.

5.3 Thermal Convection

Estimated Time: 5hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the concept of thermal convection in terms of the kinetic theory of matter;

b) Verify Newton's law of cooling; and

c) Construct a cooling system using locally available materials.

d) Describe the application of Newton's law of cooling.

e) Apply the knowledge of thermal convection in domestic and industrial activities.

Teaching and Learning Strategies

a) Group discussion.
b) Simulation
c) Experiment to verify Newton's law of cooling; and
d) Project on the construction of the cooling system and its application .

Teaching and Learning Resources

Liquids, stopwatch, calorimeter, Napthalene, source of heat, thermometer, stirrer, beaker and graph paper.

Assessment Procedures

a) quiz
b) Observation schedules
c) Portfolio

5.4 Thermal Radiation

Estimated Time – 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of radiation;
b) Compare radiant energy of different surfaces;
c) Demonstrate absorption by radiation;
d) Differentiate Wien's Law from Stefan's law;
e) Explain Prevost's theory of heat exchange and
f) Relate concept of thermal expansion to real life.

Teaching and Learning Strategies

a) Brainstorming
b) Think- Pair- Share.
c) Questions and answers
d) Library search
e) Experiment to demonstrate absorption by radiation.

Teaching and Learning Resources

Sources of heat, polished plate, dull black plate, Leslie's cube, candle wax, cork, vacuum flask and flipchart.

Assessment Procedures

a) Anecdotal records.
b) Test
c) Observation schedule
d) Written report.

6.0 CURRENT ELECTRICITY

6.1 Simple Electric Circuit

Estimated Time: 4 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Identify electric circuit components;
b) Explain concept of current, voltage and resistance;
c) Connect simple electric circuit ;
d) Verify Ohm's law;
e) Determine resistance of a wire.

Teaching and Learning Strategies

a) Discussion
b) Presentation
c) Demonstration
d) Simulation
e) Experiments to verify Ohm's law

Teaching and Learning Resources

Battery, connecting wires, switch, voltmeter, rheostat, ammeter, graph paper and resistor.

Assessment Procedures

a) Project
b) Anecdotal record
c) Observation schedules
d) Written report

6.2 Electric Conduction in Metals

Estimated Time: 5 hours

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the mechanism of electric conduction in metals;
b) Determine the resistivity of a conductor;

c) Investigate the temperature coefficient of resistance;
d) Apply Kirchhoff's laws to electrical networks;
e) Perform experiments to determine resistivity of a wire;

Teaching and Learning Strategy

a) Group discussion and presentation
b) Think-Pair -Share.
c) Problem solving.
d) Experiments to determine unknown resistors and resistivity of a wire.

Teaching and Learning Resources

Galvanometer, wheatstone bridge, cells, resistors, nichrome wire, constant an wire, metre rule, micrometer screw gauge.

Assessment Procedures

a) Quiz.
b) Portfolio.
c) Observation checklist.
d) Written reports experiment

6.3 Electric Conduction in Electrolytes

Estimated Time – 4 hours

Specific Objective

By the end of this sub-topic, the student-teacher should be able to:

a) Investigate the conductance of some electrotytes;
b) Measure back e.m.f of voltameters; and
c) Interpret graph of voltage against current for water and copper voltameters.

Teaching and Learning Strategies

a) Group discussion
b) Question and answers
c) Experiment to investigate the conductance of some electroytes.

Teaching and Learning Resources

Water voltameter, copper voltameter, silver voltameter, pontential meter, flipchart, marker pen, masking tape.

Assessment Procedures

a) Rating scales on student teachers interaction on group work.
b) Observation checklist
c) Written reports on experiment
d) Exercises
e) Tests and examinations

6.4 Electric Conduction in Gases

Estimated Time – 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the mode of action of the fluorescent tube;
b) Investigate the electric conduction in gases;
c) Determine optical spectra for gases; and
d) Outline the applications of optical spectra of gases in daily life.

Teaching and Learning Strategies

a) Think pair share
b) Gallery-walk
c) Information search
d) Practical investigate electric conduction in gases.

Teaching and Learning Resources

Fluorescent tube, flip chart, marker pen, masking tapes.

Assessment Procedures

a) quiz
b) rating scale
c) written report on practical
d) observation schedule.

6.5 Electric Power

Estimated Time: 4hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of electric power;
b) Interpret power rating;
c) Describe mode of operation of *kwhr* meter and LUKU meter
d) Relate the mode of operation of *kwhr* with LUKU meters .

Teaching and Learning Strategies

a) Simulation
b) Discussion
c) Guest speaker on operation of *kwhr* and LUKU meters.

Teaching and Learning Resources

Kwhr meter, LUKU meter, Manila card, Marker pen, computer

Assessment Procedures

a) Test
b) Written essay
c) Written Report on operation of *kwhr* and LUKU meters.

7.0 ATOMIC PHYSICS

7.1 Thermionic Emission

Estimated Time- 5 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of thermionic emission;
b) Describe the production of Cathode Rays and X-rays
c) Outline the properties of cathode rays and X-rays;
d) Describe the application of cathode ray tubes in daily life
e) Use the cathode ray oscilloscope (C.R.O).

Teaching and Learning Strategies

a) Reciprocal teaching
b) Group discussion and presentation
c) Experiment on production of X-rays by induction coil
d) Study-tour on application of cathode rays and X-rays.

Teaching and Learning Resources

C.R.O, step down transformer, power supply, diode, resistor, connecting wires, switch inverter.

Assessment Procedures

a) Observation schedule.
b) Written exercise.
c) Written report on applications of cathode rays and X-rays

7.2 Radioactivity

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Compare and contrast Thompson atom with Rutherford atom;
b) Distinguish between alpha, beta and gamma rays;
c) Determine the half-life of radioactive elements ;

d) Distinguish between radioactive fission and fusion as energy sources;
e) Describe uses and hazards of radioisotopes

Teaching and Learning Strategies

a) KWL
b) Reciprocal teaching
c) Library search
d) Participatory lecture
e) Question and answer
f) Demonstration

Teaching and Learning Resources

Geiger-Muller counter, Wilson cloud chamber, spark chamber, radioactive materials, source of electric current and magnetic field.

Assessment Procedures

a) Portfolios on radioactivity.
b) Written reports.
c) Observation schedule.
d) Exercises
e) Tests and examinations

8.0 ELECTRONICS

8.1 Capacitors

Estimated Time– 3 hour

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain concept of capacitance
b) Show the mode of action of capacitors
c) Construct an air capacitor
d) Determine the equivalence capacitance of a combination of capacitors.

Teaching and Learning Strategies

a) Simulations
b) Experiment on capacitors.
c) Project

Teaching and Learning Resources

Air capacitor, different types of capacitor, drycells, connecting wires.

Assessment Procedures

a) Written reports
b) Written Exercise.
c) Observation Schedule.

8.2 Semiconductors

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Distinguish between intrinsic and extrinsic semiconductors;
b) Describe the mechanism of dropping intrinsic semiconductors.
c) Describe the construction and mode of action of a p-n junction in a diode;
d) Use the p-n junction in rectification.

Teaching and Learning Strategies

a) Brainstorming
b) Discussion
c) Project on mode of action of p-n junction diode.
d) Internet search.

Teaching and Learning Resources

Conductors, Insulators, Galvanometer, silicon and germanium crystals and periodic table.

Assessment Procedures

a) Rating scales
b) Written exercise.
c) Portfolio
d) Tests and examinations

8.3 Transistors

Estimated Time – 3 hour

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the mode of operation of a pnp and npn junctions;
b) Investigate transistor characteristics;
c) Determine the amplification and power gain in transistor circuits**;**
d) Design and construct basic transistor switching circuits.

Teaching and Learning Strategies

a) KWL
b) Discussion
c) Experiment on transistor characteristics.
d) Project on design and construction of basic transistors switching circuits.

Teaching and Learning Resources

npn and pnp transistors, battery resistors, ammeters, voltmeter, connecting wires, switch and CRO.

Assessment Procedures

a) Quiz
b) Observation schedule.
c) Written assignment.
d) Tests and examinations
e) exercises

8.4 Integrated Circuit

Estimated Time- 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Explain the concept of logic gates and operational amplifier;
b) Describe structures of logic gates and operational amplifier;
c) Derive the truth tables for various logic gates;
d) Identify application of logic gates and operational amplifier.

Teaching and Learning Strategies

a) Brainstorming
b) Question and answer.
c) Group discussion.
d) Library /internet search.

Teaching and Learning Resources

Battery, switches, transistors, flip charts, marker pen, masking tapes, thermistors heater and operational amplifiers.

Assessment Procedures

a) Rating scale.
b) Written report
c) Portfolio

d) Observation schedule.

e) Tests and examinations

9.0 GEOPHYSICS

9.1 The Atmosphere

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Classify particulate matter in the atmosphere.
b) Explain the importance of various layers of the atmosphere.
c) Identify sources and types of pollutant in the environment.
d) Describe the effects of pollution in the atmosphere

Teaching and Learning Strategies

a) Discussion
b) Gallery walk.
c) Library search
d) Field visit

Teaching and learning Resources

Globe, chart of the structure of the atmosphere, library, internet facilities, relevant textbooks/literature.

Assessment Procedure

a) Rating scales
b) Written reports.
c) Individual assignment
d) Written exercise

9.2 Earthquakes and Volcanoes

Estimated time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the effects of volcanoes and earthquakes;
b) Explain the mechanical waves due to earthquakes;

c) Describe measurement of the intensity of earthquakes;

d) Examine precaution against earthquake hazards.

Teaching and Learning strategies

a) Brainstorming

b) Think –pair- share.

c) Study visit

d) Participatory lecture

Teaching and Learning Resources

Chart of the earth's structure, volcanoes and earthquakes, library, internet facilities, relevant books/literature.

Assessment Procedure

a) Written exercise

b) portfolio

c) Anecdotal records.

9.3 Magnetic Field of the Earth

Estimated Time: 3 hours

Specific Objectives

By the end of this sub-topic, the student-teacher should be able to:

a) Describe the origin of the eccentric magnetic dipole of the earth;

b) Explain long and short term variations of the earth's magnetic field;

c) Explain the magnetic parameters of the earth;

d) Measure the magnetic parameters at a place; and

e) Describe the application of magnetic field in daily life.

Teaching and Learning Strategies

a) Think-pair-share;

b) Group discussion and presentation; and

c) Demonstration on how to measure magnetic parameters at a place.

.

Teaching and Learning Resources

Manila sheet, earth inductor, dip circle, bar magnet,

Assessment Procedures

a) Individual assignment
b) Written report
c) Observation
d) Tests and examinations

SUGGESTED READING LIST AND WEB SITES

Abbott, F (1989) **Ordinary Level Physics, Heineman Educational, London, U.K.**

Bennet. G, (1970), **Electricity and Modern Physics**, ELBS and Edward Arnold Ltd., London, U.K.

Halliday D.,Resnick R. and Krane K,(1992) **Physics** , John Wiley & Sons Inc. N.Y. Canada.

James .B, (1989), **Basic Electronics for Scientists**, McGraw-Hill, N.Y. New York.

John .A, (1989), **The World of Physics**, Nelson, Surrey UK.

Keith. J, (1996), **Physics for You**, New National Curriculum Edition for GCE Stanley Thornes Ltd. England.

Nelkon .M, and Parker.P, (1995), **Advanced Level Physics**, Heinemann / CBS Publishers,New Delhi, India.

Paul. L, and Dale, C (1986) Electromagnetic Fields and waves CBS, Jain Bhawa, Delhi, India.

Sears, .F. .Zemansky, M. and Young, H. (1976), **University Physics**, Addison Wesley, Canada.

T.I.E (1997) Physics for Secondary Schools Book I-IV, . Dar es Salaam, Tanzania.

Tom, D. and Kenneth, H. (2001). **GCSE Physics** John Murray, London, U.K.

http://www.gcse.com/energy/conduction2.htm

http://en.wikipedia.org/wiki/Kirchhoff%27s_circuit_laws

http://www.physicsworld.com/cws/article/print914

http://www.frontiernet/-imaging/play_a piano.html

http://en.wikipedia.org/wiki/Portal:Energy

http://www.st-andrews.ac.uk/-www_pa/Scots_Guide/experiment/itro.html

http://www.bustertests.co.uk/

http://home.howstuffworks.com/

http://www.seed.slb.com/en/scictr/lab/index_virtual.htm

http://sabchurchill.com/index.html

http://schoolscience.couk/