UNIVERSITY OF GHANA

LEGON

HANDBOOK FOR GRADUATE STUDIES

COURSE DESCRIPTIONS OF PROGRAMMES
IN THE COLLEGES OF BASIC AND APPLIED SCIENCES
AND HEALTH SCIENCE

School of Graduate Studies

VOLUME 2

COURSE DESCRIPTIONS OF PROGRAMMES IN THE HUMANITIES

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UNIVERSITY OF GHANA
LEGON

(Motto: Integri Procedamus)

Established: A.D. 1948

THE ARMS OF THE UNIVERSITY

Blue shield with three “AYA” standing
Upright in top half and “DWENINMENTOASO”
In the middle of bottom half – all embossed
in gold. (Designed by A.M. Opoku)

THE UNIVERSITY OF GHANA
GENERAL INFORMATION

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	-	Lexcom Associates Legal Practitioners and Consultants P. O. Box 11428, Accra-North
Bankers	-	Ghana Commercial Bank, Legon Branch, Ghana
	-	Standard Chartered Bank, Legon Branch, Ghana
	-	ECOBANK Legon Branch, Ghana
	-	Ghana International Bank, Plc 69 Cheapside, London EC.2, England.
	-	Citibank, N.A. 046 P.O. 5870 Grand Central Station New York, NY 10163 USA
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THE REGISTRAR
UNIVERSITY OF GHANA
P.O. Box LG 25
Legon, Ghana

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Mr. Edward Effah	-	Chairman, Council of College of Health Sciences
Mr. Ken Ofori-Atta	-	Chairman, Council of College of Agriculture and Consumer Sciences
Mr. R.O. Boapea	-	Director, Finance Directorate
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ESTABLISHMENT OF THE UNIVERSITY

THE UNIVERSITY OF GHANA was founded in 1948 as the University College of the Gold Coast on the recommendation of the Asquith Commission on Higher Education in the then British colonies. The Asquith Commission, which was set up in 1943 to investigate Higher Education, recommended among other things, the setting up of University Colleges in association with the University of London. This was followed up by a number of separate Commissions in different regions. The West Africa Commission was under the Chairmanship of the Rt. Hon. Walter Elliot. The Elliot Commission published a majority report which recommended the establishment of two University Colleges in the Gold Coast (Ghana) and Nigeria, and a minority report which held that only one University College for the whole of British West Africa was feasible. The British Government at first accepted the minority report of the Elliot Commission and decided that a University College for the whole of British West Africa should be established at Ibadan in Nigeria. But the people of the Gold Coast could not accept this recommendation. Led by the scholar and politician, the late Dr. J.B. Danquah, they urged the Gold Coast Government to inform the British Government that the Gold Coast could support a University College. The British Government accordingly reviewed its decision and agreed to the establishment of the University College of the Gold Coast.

The University College of the Gold Coast was founded by Ordinance on August 11, 1948 ***for the purpose of providing for and promoting university education, learning and research***. Its first Principal was the late Mr. David Mowbray Balme. Mr. Balme was farsighted, courageous and dedicated to the promotion of scholarship. By his vision, industry and single-mindedness of purpose, he built a college and laid the foundations for a sound University which is now a source of pride. In his ten years of principalship, he created an institution whose key-note was orderly living with dignity in a community of scholars. One of the recommendations of the Asquith Commission was that the British Government should set up an Inter-Universities Council to advise on all matters relating to Higher Education in the new British Colonies. The Inter-Universities Council served the new University College of the Gold Coast in an advisory capacity, but it approved all academic appointments. This arrangement helped the College to maintain the high academic standards associated with the Universities in Britain. Also, it enabled the College to seek the support of the Council in obtaining funds from the United Kingdom Government sources.

From its inception, the University College of the Gold Coast was admitted to the Scheme of Special Relationship extended by the University of London to certain English and overseas University Colleges. Under this scheme, the University College was allowed to teach for the external degree examinations of London University. It also allowed the College to modify the London syllabuses to suit local conditions and to take part in the setting and marking of examinations. But London University gave final approval for courses and examinations since the degrees given were those of the University of London. For thirteen years, therefore, the University College looked up to two separate institutions in Great Britain: to the Inter-Universities Council for guidance on its broad policy, and to the University of London for approval and control of details of degree regulations. The University College benefitted greatly from this arrangement which certainly helped to maintain its high academic standards.

In the 1960-61 academic year, the College Council made a request to the Government of Ghana for legislation to constitute the University College into a University with the power to award its

own degrees. The Government appointed an International Commission to examine the problem. On the recommendations of that Commission, the University of Ghana was set up by an Act of Parliament on October 1, 1961 (Act 79). The then President of the Republic of Ghana, Dr. Kwame Nkrumah, became the first Chancellor of the University, with Nana Kobina Nketsia IV, Omanhene of Essikado, as the (Interim) Vice Chancellor.

VISITATION OF THE UNIVERSITY: The University Council, in 2007, appointed a Visitation Panel to review the University's academic programmes, infrastructure, resources, administrative and governance structures. The Panel submitted a comprehensive report with recommendations on ways in which the structures of the University can be improved, with a view to enhancing efficiency. It is expected that the far-reaching changes in the undergraduate programmes, course credit and grading systems, which are being introduced as from the 2010/2011 academic year, and which are the outcome of the recommendations of the Visitation Panel, will go a long way towards improving the quality of graduates produced by the University. Recommendations on infrastructural resources, administrative and governance structures are at various stages of implementation.

ENROLMENT STATISTICS: With a current student population of 35,683 (representing a male/female ratio of about 3:2) the University of Ghana is the oldest and largest of the six public Universities in Ghana. The total number of students includes 4,437 at the Accra City Campus and 4,532 undertaking their studies by the Distance Mode. Also included in this number are 3,196 post-graduate students and 3,596 students on modular or sandwich programmes.

ASSOCIATIONS AND LINKS: The University of Ghana is a member of the International Association of Universities (IAU), the Association of Commonwealth Universities (ACU) and the Association of African Universities (AAU). The University is also a member the League of World Universities (which comprises 47 renowned research universities all over the world). The University has also established academic and research links with several Universities and Research Institutions worldwide. In addition, the University has been linked to the Norwegian Universities' Committee for Development Research and Education (NUFU), the Council for International Educational Exchange (CIEE) based in New York, International Student Exchange Programmes (ISEP) and the Commonwealth Universities Student Exchange Consortium (CUSAC), among others.

INSTITUTIONAL AFFILIATIONS: There are currently a number of institutes/colleges locally which hold affiliations with the University of Ghana for the purpose of enrolment, teaching and award of degrees and diplomas of the University. These affiliations cover non-degree, Bachelor's degree and post-graduate degree programmes. Institutes/Colleges which currently hold affiliation status with the University are as follows:

1.	St. Peter's Seminary	-	Diploma/Bachelor of Arts
2.	St. Paul's Seminary	-	Bachelor of Arts
3.	St. Victor's Seminary	-	Diploma/Bachelor of Arts
4.	Christian Service University College	-	Diploma/Bachelor of Arts
5.	National Film and Television Institute	-	Bachelor of Arts
6.	Ghana Institute of Journalism	-	Bachelor of Arts
7.	Regional Maritime University	-	Master of Arts
8.	Ghana Armed Forces Command and	-	Master of Arts

	Staff College		
9.	Ghana Institute of Languages	-	Bachelor of Arts
10.	Islamic University College	-	Bachelor of Arts/Business Administration
11.	Pentecost University College Administration	-	Diploma/ Bachelor of Arts/Business
12.	Catholic University College	-	Bachelor of Arts/Bachelor of Science
13.	Methodist University College	-	Diploma/Bachelor of Arts/Business Administration
14.	Wisconsin University College, Ghana	-	Bachelor of Arts/Master of Arts
15.	Institute of Accountancy Training	-	Diploma
16.	Nursing Training Colleges	-	Diploma
17.	Presbyterian University College	-	Bachelor of Arts
18.	Narh-Bita School of Nursing	-	Diploma
19.	African University College of Communications	-	Bachelor of Arts

PRECINCTS

The campus of the University lies about 13 kilometres north-east of Accra, the capital of Ghana, at an altitude of between 90and 100 metres. From the Main University Gate on the Dodowa Road, the University Avenue extends to Commonwealth Hall on Legon Hill.

Along it are grouped other Halls of Residence, Departments, lecture theatres and laboratories. Mid-way, an open space - the University Square - with an ornamental pool is over-looked by the Balme Library (named after David Mowbray Balme, the first Principal of the University College). Across from the University Square are sports fields, a Central Cafeteria and halls of residence. Behind Commonwealth Hall is an open-air theatre with a Grecian style auditorium built into the slope of Legon Hill. On the summit of Legon Hill is the Convocation Group of Buildings which houses the University's administration offices, the Great Hall, with a seating capacity of 1,500 and a Tower donated by the Government of Ghana in 1959 to commemorate Ghana's Independence. On the southern side of the campus are residential accommodation for staff, the University Basic Schools, the Noguchi Memorial Institute for Medical Research, School of Public Health, the Sports Stadium, a night market, supermarket and student hostels; while on the Northern side are more teaching departments, lecture theatres and laboratories. Across the Accra-Dodowa road from the Main University Gate is a Police Station, a University Hospital and housing for Junior Staff of the University.

The College of Health Sciences has its administration as well as the Medical/Dental /Allied Health Sciences and Pharmacy Schools located at the Korle-Bu Teaching Hospital, which is about three kilometres west of the centre of Accra, and about 18 kilometres from the main University campus.

The Accra City Campus of the University, located close to the business district of the nation's capital, was established to provide part-time education for mature persons and for persons who prefer not to study full time.

DEPARTMENT OF AGRICULTURAL ECONOMICS & AGRIBUSINESS

The Department offers the following programmes:

1. Master in Agricultural Administration (MAA)
2. M.Phil Agricultural Administration
3. M.Phil Agribusiness
4. M.Phil. Agricultural Economics
5. M.Agric. with Specialization in Agricultural Economics
6. Ph.D. Agricultural Economics

The areas of specialization in the M.Phil. Agricultural Economics and Ph.D. Agricultural Economics Programmes are the following:

a. Marketing
b. Farm Management and Production Economics
c. Economic Development and the Environment

Departmental Requirements:

(i) Computer literacy is required of all postgraduate students in the Department

(ii) In Ph.D. programmes, relevant remedial courses will be prescribed for candidates. All Ph.D candidates are required to pass a written Ph.D qualifying examination.

M.A. AGRICULTURAL ADMINISTRATION

This is a one-year programme of course work plus a dissertation.

Core Courses		**Credits**
ADMN 603	Economics	3
ADMN 684	Human Resource Management	3
AGEC 603	Research Methodology and Statistics	3
AGEC 604	Computer Applications	3
AGEC 607	Theories and Management of Agricultural Development	3
AGEC 615	Agricultural Finance	
AGEC 621	Agricultural Institutions	3
AGEC 622	Project Analysis and Management	3

ELECTIVES

Elective courses may be taken from within or outside the Department (for example, MBA courses offered by the University of Ghana Business School) in consultation with the Department Advisory Committee, the Graduate Studies Committee and the Head of Department.

Seminar and Dissertation

	AGEC 600 Dissertation	12
AGEC 610	Seminar	3

M.PHIL AGRICULTURAL ADMINISTRATION

This is a two-year programme of course work plus a thesis

YEAR I

Core Courses		**Credits**
ADMN 603	Economics	3
ADMN 684	Human Resource Management	3
AGEC 603	Research Methodology and Statistics	3
AGEC 604	Computer Applications	3
AGEC 607	Theories and Management of Agricultural Development	3
AGEC 610	Seminar I	3
AGEC 615	Agricultural Finance	3
AGEC 621	Agricultural Institutions	3
	AGEC 622 Project Analysis and Management	3

ELECTIVES

Elective courses may be taken from within or outside the Department (for example, MBA courses offered by the School of Administration) in consultation with the Department Advisory Committee, the Graduate Studies Committee and the Head of Department.

YEAR II

AGEC 660	Thesis	30
AGEC 620	Seminar II	3

M.PHIL AGRIBUSINESS

This is a two-year programme of course work plus a thesis

YEAR I

Core Courses		**Credits**
ADMN 603	Economics	3
ADMN 684	Human Resource Management	3
AGEC 604	Computer Applications	3
AGEC 610	Seminar I	3
AGEC 611	Farm Business Management I	3
AGEC 612	Farm Business Management II	3
AGEC 613	Agricultural Trade I: Internal	3
AGEC 615	Agricultural Finance	3
AGEC 622	Project Analysis and Management	3

AGEC 625	Domestic Agro-Industrial Management	3
AGEC 626	International Agro-Industrial Management	3
AGEC 627	Quantitative Methods for Business	3
AGEC 628	Agricultural Law	3

ELECTIVES

Candidates may select from the following courses in consultation with the Department Advisory Committee, the Graduate Studies Committee and the Head of Department:

		CREDITS
AGEC 616	Production Economics	3
AGEC 623	Operations Research I	3
AGEC 624	Operations Research II	3
AGEC 629	Foreign Language	3
AGEC 631	Special Study I	3
AGEC 632	Special Study II	3

YEAR II

AGEC 660	Thesis	30
AGEC 620	Seminar II	3

INTERNSHIP SCHEME

Candidates in the M.Phil. Agricultural Administration and M.Phil. Agribusiness Programmes undergo internship for three months.

M.PHIL. AGRICULTURAL ECONOMICS

This is a two-year programme of course work plus a thesis

YEAR I

Core Courses		**Credits**
AGEC 601	Advanced Mathematical Methods	3
AGEC 602	Econometrics	3
AGEC 603	Research Methodology and Statistics	3
AGEC 604	Computer Applications	3
AGEC 616	Production Economics	3
ECON 601	Microeconomics I	3
ECON 606	Microeconomics II	3
ECON 603	Macroeconomics I	3
ECON 604	Macroeconomics II	3

Depending on the option chosen, a candidate may select from the following elective courses within or outside the Department in consultation with the Department Advisory Committee, the Graduate Studies Committee and the Head of Department.

ELECTIVES

AGEC 605	Agriculture and Economic Development I: Policy	3
AGEC 606	Agriculture and Economic Development II: Planning	3
AGEC 610	Seminar I	3
AGEC 611	Farm Business Management I	3
AGEC 612	Farm Business Management II	3
AGEC 613	Agricultural Trade I: Internal	3
AGEC 614	Agricultural Trade II: International	3
AGEC 615	Agricultural Finance	3
AGEC 617	Resource Economics	3
AGEC 618	Environmental Economics	3
AGEC 622	Project Analysis and Management	3
AGEC 623	Operations Research I	3
AGEC 624	Operations Research II	3
AGEC 628	Agricultural Law	3
AGEC 629	Foreign Language	3
AGEC 631	Special Study I	2-5
AGEC 632	Special Study II	2-5

YEAR II

AGEC 660	Thesis	30
AGEC 620	Seminar II	3

M.AGRIC. WITH SPECIALIZATION IN AGRICULTURAL ECONOMICS

This is a twelve-month demand driven programme of course work plus a long essay.

COURSES

Courses are selected from the M.Phil. Courses. In addition, Graduate Special Study courses (2-5 credits per semester) may be selected each semester. The content of each of these special study courses is made flexible to cater for the specific needs of the candidate. The courses are selected with the approval of the relevant Department Advisory Committee, the Graduate Studies Committee, the Head of Department and the organisation which sponsored the candidate.

Ph.D. AGRICULTURAL ECONOMICS

This is a three-year programme of research plus a thesis. All candidates are expected to pass a Ph.D qualifying examination.

Ph.D. Qualifying Examinations

The qualifying written examination shall consist of the following graduate level papers:

1. Economic Theory Examination, which combines the following:
    - Microeconomic Theory

- Macroeconomic Theory
- Research Methodology and Quantitative Methods (mathematical methods and econometrics)

2. Candidate's Field of Specialization (any of the following):
   - Marketing
   - Farm Management and Production Economics
   - Economic Development and the Environment

The Ph.D. qualifying examination shall be written by the candidate not later than one year after registration for the programme. The Graduate Studies Committee in consultation with the Supervisory Committee shall prescribe remedial courses for the candidate, in order to facilitate the candidate's preparation for the qualifying examination and to further prepare the candidate to write a thesis which shall have the highest likelihood of contributing significantly to knowledge.

A candidate shall have two chances to pass the Ph.D. qualifying examination. The second attempt shall be made six months after the date of the declaration of the results of the first attempt at the examination. A pass mark for all qualifying examinations shall be a grade B (i.e. 50%) or better. There shall be a Ph.D Examination Committee of at least three (3) Senior Members selected by the department for a 3-year period. Qualifying examinations shall be conducted by the department two times each year.

Ph.D. Research and Thesis Preparation

The candidate's Supervisory Committee in consultation with the Graduate Studies Committee shall agree on the candidate's thesis area and topic.

COURSE DESCRIPTIONS

AGEC 601 ADVANCED MATHEMATICAL METHODS

Calculus Techniques of Optimization: Theory of Functions. Overview of Multivariate Calculus. Matrix Calculus. Unconstrained Optimization in many Variables. Constrained Optimization with Equality Constraint (the Case of Optimization in n Variables Subject to m Constraints). Optimization Under Uncertainty. Structure and Solution of Single Difference and Differential Equations. Simultaneous Difference and Differential Equations. Calculus of Variations. Optimal Control Theory. The Hamiltonian Functions, State and Costate Equations and Pontryagin's Maximum Principle. Saddle Points and Economic Dynamics. Optimal Control Under Uncertainty. Applications of Control Theory to Economics. Direct Search and Gradient Methods of Optimisation. Liapunov's Second Method. Nonlinear Dynamics. Bifurcation Theory. Chaos and Complex Dynamics. Game Theory and Game Theoretic Models.

AGEC 602 ECONOMETRICS

Principles of Econometric Modelling. Overview of the Traditional and Modern Econometric Methodology. The General Classical Linear Regression Model: Statistical Inference in the Standard Linear Regression Model. Derivation of OLS Estimator and its Statistical Properties

(BLUE). Construction of Confidence Intervals and Hypothesis Testing. Prediction. Maximum Likelihood Estimation (MLE). Generalised Method of Moment (GMM). Disequilibria Econometrics Models. Restricted Least Squares Estimation and Test of Linear Restrictions. Testing Restrictions: Likelihood Ratio Test, Langrage Multiple Test and Least Squares Estimation and Test of Linear Restrictions. Testing Restrictions: Likelihood Ratio Test, Langrage Multiple Test and Wald Test. Violations of the Assumption of the General Classical Linear Regression Model: Nature, Consequences, Tests and Remedies for Multicollinearity, Heteroskedasticity and Autocorrelation. Generalised Least Squares. Non-Normality and Zero mean. Stochastic Regressors. Further Problems in Multiple Regression: Specification Error, Error of Measurement and Instrumental Variables. Estimation, Quantitative Regressors and Dummy Variables, Structural Breaks. Formulation and Estimation of Special Models: Distributed Lag Models, Koyck and Almon Polynomial Lags. ADL and ARIMA. Quantal Choice Models: Models with Qualitative Dependent Variables: Truncated, Censored, Tobit and Related Approaches (Probit and Logit Models). Simultaneous Equation Models: Identifiably. Estimation Approaches including Indirect Least Squares (ILS), Two-Stage Least Squares, Three Stage Least Squares. Full and Limited Information Maximum Likelihood Estimation. Econometric Analysis of Time Series.

AGEC 603 RESEARCH METHODOLOGY AND STATISTICS

Nature of Research. Nature of Methodology. Nature of Knowledge. Common Sense Approach to Enquiry. History and Philosophy of Science. Pure and Applied Research. The Scientific Research process. Drafting Research Proposals. Design of Questionnaire. Implementing Research proposal. Research Report Writing. Dissemination of Research Results. Research and Policy Interdependence for Sustainable Development in Twenty-First Century Ghana. Advice to the Young Scientist. Nature of Statistics. Time Series and Cross-Sectional Data. Sources of Scientist. Relevant Time Series Data on Ghana. Sources of Relevant Cross-Sectional Data on Ghana. Sampling Techniques. Single and Multivariate Continuous and Discrete probability Density Functions. Cumulative Distribution Functions. Types of Stochastic Distributions. Joint, Marginal and Conditional Distributions. Expectations of a Stochastic Function. Mean of a Stochastic Function. Variance of a Stochastic of a Function. Moments of a Distribution. Moments of Stochastic Function. Moment Generating Function. Overview of Quantal Choice Modelling. Overview of Methodology of Traditional Econometrics: Nature and Limitations. The Modern Econometric Methodology. Stochastic Processes. Stationarity, Statistical Integration, Cointegration and Error Correction Modelling. Dynamic Generalised least Squares. COMFAC Modelling.

AGEC 604 COMPUTER APPLICATIONS

This course deals with computer operating systems, construction and use of flow charts and algorithms to solve problems. It also deals with the nature and uses of various spreadsheet software, word processing, data management, graphics, statistical and econometric software. Hands-on assignments are emphasized. Participants in the course are expected to use the computer to prepare and present thesis research output.

AGEC 605 AGRICULTURE AND ECONOMIC DEVELOPMENT I: POLICY

Part I: Overview of Theories. Models and Issues of General Economic and Agricultural Development. Evolution of the Concept of Development: Aristotle, Fichte, Hegel, Marx, Colonial British Economic Historians, Immediate Post-War View, Other Post-War Views, UNRISD View, Recent UNDP View, Concept of Sustainable Development. Measures of Development: Per Capita

Income, UNRISD General Index, UNDP Human Development Index, The Tobin-Nordhaus Measures of Development: Economic Welfare and Other Measures of Development. Measures of Sustainable Development.

Part II: Measures of Economic Growth. Measurement of Sectoral Growth, Measurement of Agricultural Growth, Measurement of Industrial Growth. Quantifying the Share of a Given Sector in Economic Growth: Two Sector, Three-Sector and N-Sector Cases. Economic Growth Accounting: Sources of General Economic Growth, Sources of Agricultural and Industrial Growth. Classical, Neo-Classical and Modern (Endogenous) Growth: Theory and Empirical Evidence. The Role of Agriculture in the Macroeconomy: Theory and Empirical Evidence. The Roles of Industry and Services. Inter-Sectoral Linkages. Structural Transformation. Applications to Post Independence Ghana.

Part III: Economic Policy: Determinants, Targets and Instruments of Economic Policy. Macroeconomic Policy. Sectoral Policy. Sub-Sectoral Policy. Commodity Policy. Monetary Policy. Government Tax Policy. Public Expenditure Policy. Exchange Rate Policy. Foreign Trade Policy. Food Policy. Agricultural Policy. Agricultural Technology Policy. Industrial Policy. Services Policy. Infrastructure Policy. Energy Policy. Resource and Environmental Policy. Social Policies. Effects of Stabilization and Structural Adjustment Policies on the Macroeconomy, Agriculture, Industry, and Other Sectors. Nature, Causes and Measures of Poverty. Accelerated Growth and Development with Poverty Reduction in Ghana. The HIPC programme and Ghana's Poverty Reduction Strategy. Applications to Post-Independence Ghana.

AGEC 606 AGRICULTLURE AND ECONOMIC DEVELOPMENT II: PLANNING

Meaning, essentials, types and objectives of planning: Review of the objectives of Various Development Plans in Ghana. Linking Agricultural Plans to Overall National Plans. The Need for Regional Planning. Preparing and Implementing an Agricultural Plan The design of development: elements of development policy, essentials of programming, public and private investment agricultural planning: methodology, procedures, demand analysis and target setting and resource allocation: macro and micro levels. Agricultural Development Strategies. Organizational and implementation requirements. Policy and Policy Instruments. Selected management tools for monitoring and evaluation: flow charts, forecasting, appraisal methods and criteria, PPB, network analysis, logical framework, monitoring and evaluation, Case Studies and Exercises.

AGEC 607 THEORIES AND MANAGEMENT OF AGRICULTURAL DEVELOPMENT

Part I: Theories and Models

Overview of Theories, Models and Issues of General Economic and Agricultural Development. Evolution of Theories of Development: Aristotle to Modern Views. Models of Agricultural Development. The Role of Agriculture in General Economic Development. Structural Transformation and Sustainable Development. Overview of Development Strategies in Ghana from the Colonial Era to Date. Stabilization and Structural Adjustment Issues. Accelerated Growth and Development with Poverty Reduction in Ghana.

Part II: Planning and Management.

Practical issues in planning and managing agricultural development: inter-sectoral linkages; design of agricultural plan; diagnostic survey; setting targets; strategies and policy instruments.

Planning and projects: integration within sector and with other sectors in the national plan. Organisation, financing agricultural plans. Monitoring, reporting and control.

Public service: research, extension, education, infrastructure, etc., tools for managing change: appraisal, network, M & F, etc. Case studies and exercises.

AGEC 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

AGEC 611 FARM BUSINESS MANAGEMENT I

The planning environment and managerial process. Financial and Management accounts as sources of information. Composition of financial accounts, analysis of financial accounts, and indicators of financial progress. Whole farm accounts. Comparative analysis and standardisation of financial accounts. Management amounts for planning, control and price setting; full cost accounts and gross margin accounts. Procedures in planning enterprise combination, budgeting and the whole farm framework; partial budgeting,; linear programming; methods of enterprise analysis. Alternative methods of accounting.

AGEC 612 FARM BUSINESS MANAGEMENT II

Methods of Farm Management Investigations, farm business survey, measures of farm income and factors affecting farm income, methods of production. Cost analysis, estimating machinery costs, and planning efficient use of machinery. Course includes a series of farm business case studies and exercises for practical experience in the preparation of budgets, cash flow statements, investment appraisals, etc. Farm office procedures. Strategic Business Policy and Planning of Farm Business. Farm Management Research for small Farmer Development.

AGEC 613 AGRICULTURAL TRADE I: INTERNAL

Concept of marketing. Nature of agricultural products and markets. Pricing Policy and Determination. Channels of distribution. Cooperative Marketing in Ghana. Marketing boards. Forecasting future consumption and production. Seasonal price variations and effects. Agricultural marketing institutions. Finance and credit for agricultural marketing, e.g. inventory credit. Marketing information systems. Food procurement and distribution.

AGEC 614 AGRICULTURAL TRADE II: INTERNATIONAL

Theory and methodology of international trade. The basis of trade. The theory of comparative costs advantage. Equilibrium in international trade. Effect of international trade on factors of production. Economic growth and international trade. Regional integration: ECOWAS, SADCC, UDEAC, etc. Lome IV agreements, World trade agreements, WTO (GATT). EUREP-GAP and AGOA. Special topics in international trade.

AGEC 615 AGRICULTURAL FINANCE

Part I: Issues of financing the agricultural sector; financial management on farms, including savings mobilization, liquidity management, financial evaluation of agricultural investment; credit

appraisal and management, financial reporting, domestic and foreign lending policies, agricultural credit institutions and rural finance institutions; characteristics of agriculture in relation to its financing: costs, risks and returns in agricultural finance, organization and practice of agricultural credit institutions.

Part II: Monetary issues at the national and international levels which relate more directly to agriculture and the problems of financing a rural economic development. Special attention is paid to the determinants of savings and investment; the role of credit institutions in both developed and developing countries; ownership and business forms; taxation and tax planning.

AGEC 616 PRODUCTION ECONOMICS

Overview of neoclassical production theory, including agricultural production functions; homogeneity of production functions; elasticity of substitution and response to relative input prices; cost and supply functions; production through time and economic aspects of durable inputs; economies of size and their implications for farms; production under risk and uncertainty; the new farm household economics. A typology of farm household models. Application of Production Economics to the management of Agro-industries in Ghana.

AGEC 617 RESOURCE ECONOMICS

Overview of Resource Economics. Description of Resources for Development. Optimal Allocation of Resources. Economics of Non-renewable Resources. Economics of Renewable Resources. Multidimensionality of Externality Issues. Dynamics of Optimal Resource Use Under Certainty an Uncertainty. Innovation, Induced Adoption of Technology, Techological Change and Resource Use. Diseases and Pest Control Agrochemial Use. Integrated Pest Management. Optimal Management of Land and Soil Resources, Human Resources, Timber and Other Forest Resources, Wild Life, Marine and Freshwater Resources and Biodiversity, Surface Water and Ground Water, Minerals and Fossil Fuels. National and Global Resource Policy. Macroeconomic Policy and Resource use Efficiency. Economic Policy Reforms and Resource Depletion. Resource Use Issues in the Twenty-First Century. Application of Resource Economics to the Effective Management of Resources in Ghana Technology Policy and National Resource Management in Ghana.

AGEC 618 ENVIRONMENTAL ECONOMICS

Overview of Environmental Economics. The Contributions of Classical, Neoclassical and Welfare Economics to the Evolution of Environmental Economics. Concept of the Environment. Materials Balance Model of Economy-Environment Linkages. The Laws of Thermodynamics and the Environment. Market failure. The Origin and Effects of Externalities. Overview of the Effects of Pollution Tax, Quota and Trading of Pollution Rights on Efficiency of Resource Use. Pollution Damage Cost, Abatement and Benefit Functions. Stock and Flow of Pollution. Statics and Dynamics of Optimal Level of Polution. Transboundary Pollution Problems. Policy Instruments for Pollution Control. Game Theoretic Models for dealing with Transboundary Environmental Problems. Welfare Measurement. Concepts of Willingness to Pay and Accept. Economics of Environmental Regulation. Social and Private Cost and Benefits. Optimal Choice of Pollution (Water, Air, Soil and Noise) Control Under Certainty and Uncertainty. Valuation of Environmental Quality Under Certainty and uncertainty. General Equilibrium Approach to Environmental Quality Regulation. Economics of Conservation. Formulation, Implementation, Monitoring and Evaluation of Environmental Policy. Mechanisms for Enforcing Environmental Policies. The Environment and Property Rights Issues. The Environment and Inter-generational

Choice. Neoclassical Economic Growth Theory and Sustainable Development. Trade and the Environmental. Local and Global Environment Change. Macroeconomic Policy and the Environmental Action Plan. Ghana's Environmental Laws. Environmental Impact Assessment in Ghana.

AGEC 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

AGEC 621 AGRICULTURAL INSTITUTIONS

Institution building for development: theories, concepts and issues. Review of Institutions-building experiences in developing countries type and function: finance, cooperation, marketing, land, human resources, etc. Managing development programmes and projects; interventions to enhance management capacities; lessons from case studies. International institutions in agriculture.

AGEC 622 PROJECT ANALYSIS AND MANAGEMENT

General project framework and welfare theory; the project cycle; aspects of project preparation and analysis; problems of agricultural project analysis; identification of costs and benefits and measurement problems; financial analysis; measures of project worth; guidelines for project report preparation; project implementation, control and management; project case studies/project visits.

AGEC 623 OPERATIONS RESEARCH I

The Origin and Nature of Operations Research. Overview of the Operations Research Modelling Approach. Linear Programming: Theory and Applications of the Simplex method. Duality Theory. Transportation Problem. The Trans-shipment Problem. The Assignment Problem. Multidivisional Problems. Goal Programming. Algorithms for Linear Programming. The Upper Bound Technique, The Dual Simplex Method, Parametric Linear Programming. Dynamic Programming: Deterministic Dynamic Programming, Probabilistic Dynamic Programming. Game Theory. Integer Programming. Nonlinear Programming. Nature of Nonlinear Programming Problems, Multi-Variable Unconstrained Optimization. Constrained Optimization; the Karush-Kuhn-Tucker (KKT) Conditions. Quadratic Programming, Separable Programming and Convex Programming. Applications to problems in Ghana.

AGEC 624 OPERATIONS RESEARCH II

Stochastic Process, Markov Chains, Chapman-Kolmogorov Equations. Queuing Theory and Applications. Components of Inventory Models. Deterministic and Stochastic Inventory Models. Forecasting techniques. Systems Reliability Issues. Decision Making without Experimentation, Decision Making with Experimentation, Decision Trees and Utility Function. Simulation. Network Analysis. Applications to selected problems in Ghana.

AGEC 625 DOMESTIC AGRO-INDUSTRIAL MANAGEMENT

The Nature of Agribusiness. Overview of the Agribusiness Sector in Ghana. Management Philosophy. How Companies are Organized in Ghana. Management Philosophy. How Companies are Organised in Ghana. Effective Management of People. Analysis of Financial Statements,

Control of Finances and Financial Strategy. Effective Domestic Sales and Marketing of Products. Stock and Production Control, Logistics and Operations Management, Warehousing Systems and Leasing. The Working of Corporations and the Formulation and Implementation of Firm Growth Strategies. Information Technology for Business Management. Loan Procurement and Management. Domestic Macroeconomic Environment. Domestic Investment Policy and Laws. Strategic Business Policy. Preparation of Business Plans in the Domestic Environment. Entrepreneurship Development. Ethics of Business.

AGEC 626 INTERNATIONAL AGRO-INDUSTRIAL MANAGEMENT

The Nature of International Agribusiness. Overview of the Global Agribusiness Industry. Multi-National Corporations. Managing Agribusiness Firms in a Global Context. Sourcing Funds in International Financial Markets. International Financial Institutions. Domestic Foreign Exchange Markets. Loan Negotiation Skills. Sourcing Raw materials Locally and from International Markets. Contract Negotiations. International Commodity Market. Futures markets. Effective Sales and marketing of Products in Global Markets. International Competitiveness and Comparative Advantage. Advertising in Global markets. International Competitiveness and Comparative Advantage. Advertising in Global Markets Packaging and Presentation in Global Markets. Efficient Foreign Investment. Risk Management in a Global Context. Domestic Trade and Investment Policies. International Trade Agreements. Regional Integration. Information Technology for International Agribusiness. Preparation of Business Plans for Agro-industry in a Global Context. Ethics of International Agribusiness

AGEC 627 QUANTITATIVE METHODS FOR BUSINESS

The Scientific Method of Enquiry. Principles of the Science of Decision Making. The Role of Mathematics and Statistics in Business Decision Making. The Role Computers in Decision Making. Experimental Outcomes and Probability. Random Variables and Probability Distributions. Formulation and Solution of Single-Channel and Multiple-Channel Waiting Line Problems. Utility and Decision Making Under Uncertainty. Business Forecasting with Time Series Data. Inventory Management Methods. Application of Programming Methods to Business (Linear, Integer and Goal). Sampling Techniques for Effective Project Management. This course emphasises computer-based practical applications of the methods and real world case studies

AGEC 628 AGRICULTURAL LAW

Contract Law. Agricultural Labour Law. Land Tenure. Tort. Conveyancy. Commercial Law. Loan Negotiations. Loan Administration. Procurement of Agricultural Goods and Services. Disbursement of Loans. Crop and livestock insurance. Environmental Law.

AGEC 629 FOREIGN LANGUAGE

AGEC 631 SPECIAL STUDY I (The content depends on the special needs of the candidate).

AGEC 632 SPECIAL STUDY II (The content depends on the special needs of the candidate).

DEPARTMENT OF AGRICULTURAL EXTENSION

The Department offers M.Phil., M. Agric. and Ph.D. programmes in Agricultural Extension

YEAR I

Core Courses		**Credits**
AGEX 601	Theoretical foundation of Extension	3
AGEX 602	Statistics for Development	3
AGEX 603	Extension Programme Development	3
AGEX 604	Management and Organizations in Development	3
AGEX 605	Research Methods	3
AGEX 607	Extension Methods	3
AGEX 608	Comparative Extension Systems	3
AGEX 609	Communication in Extension	3
AGEX 610	Seminar I	3
AGEX 614	Rural Sociology	3

ELECTIVE COURSES 9 - 12 Credits to be selected from under-listed courses in consultation with the Departmental Advisory Committee and Head of Department

AGEX 606	Education and Training	3
AGEX 611	Design and production of media for extension training.	3
AGEX 612	Topical Issues in Extension and rural Development	3
AGEX 615	Rural Development	3
AGEX 616	Gender Planning and Development	3
AGEX 617	Micro-finance and Micro-enterprise Development	3

YEAR II

AGEX 660	Thesis	30
AGEX 620	Seminar II	3

M.AGRIC. WITH SPECIALISATION IN AGRICULTURAL EXTENSION

This is a twelve to fifteen month demand-driven programme of course work plus a long essay. Courses are selected from the existing M.Phil. courses. The courses are selected with the approval of the student's Advisory Committee, Head of Department and the organization sponsoring the student and will cater for the specific needs of the student.

COURSE DESCRIPTIONS

AGEX 601 THEORETICAL FOUNDATION OF EXTENSION

Philosophical foundations of extension; Theoretical approaches to human behaviour and implications for extension; Anthropology/sociology and extension; Psychology and extension: Overview of the Cognitive Processes, Knowledge, communication and action, memory structures and processes, social learning and the life cycle, dimensions of small group structure and processes, attitude change and rural extension. Economics of extension - cost and benefits of extension interventions and approaches. Choice of alternate technologies for extension; Politics of development - concept of development, modernisation theory, dependency theory, transfer of technology approaches, participatory approaches. Population pressure as a motor for technological innovation. Role of the State in Rural Development, Social Class Analysis - the Peasantry in the Political Process; strategies of agrarian change.

AGEX 602 STATISTICS FOR DEVELOPMENT

Basic concept in descriptive statistics: What is statistics? notion of central tendency, dispersion, correlation and causation, concepts in inferential statistics, ideas on population and sampling. Accessing, handling and managing quantifiable data; types of data for statistics, variability and types of variables, data collection methods, quantifying qualitative data (categorization, coding, scale development etc.).

Statistical testing and analysis; variability of scores, choice of statistical test, levels of significance, sampling distribution and sample size, the decision to accept or reject, reliability and validity issues in measurement and testing. Determining relationships and associations: Non-parametric tests, parametric tests, one- sample case, two-sample case, k-sample case, related or matched samples, independent samples, nominal/categorical, ordinal/ordered, interval/ ratio variables. Presentation and interpretation of statistical results and findings: Data entry and use of statistical programmes, descriptive statistics, tables, plots and bar charts, pie charts, graphs etc., cross-tabulations, correlation etc.

AGEX 603 EXTENSION PROGRAMME DEVELOPMENT

Directive and Non-Directive Approaches to Extension Programme Development. Influence of Policy on Extension Programmes. Types and forms of Extension Programmes; Goals of

Extension; Programmes: economic growth, empowerment, rural development, integrated development, agricultural development; renewable natural resources management. Characteristics of extension programmes; Stages of Extension Programmes; Extension Programmes and the Project Cycle; Projects and activities as components of Extension Programmes; Extension Programme implementation; Monitoring and Evaluating Extension Programmes. Types and approaches to Evaluation of Extension Programmes; Uses of Evaluation of Extension Programmes.

AGEX 604 MANAGEMENT AND ORGANIZATIONS IN DEVELOPMENT

Approaches to organisation theory and behaviour, and external factors influencing organizational growth and development, Concept of organisation renewal. Organizational Development; Issues in organization structures and design: Centralization. Decentralization, complexity/Control; Span of control; Bureaucracy/Adhocracy, Measures of organisational effectiveness; Review of functions and tasks of managers or management staff; Leadership, power, authority, and communication in organisation; Planning to meet clients; needs; Goals and needs; Motivation and performance; Organisational learning - Single loop and Double loop; Stress and conflict management.

AGEX 605 RESEARCH METHODS

Nature and importance of Social Science research; Principles and theories of Social Research: Approaches to Social Research; Designing social Research; problem identification, topic selection, research questions. Qualitative and Quantitative Research; Validity and Reliability in Social Research; Research Methodologies: data collection, analysis, measurement, interpretation, application; Participatory Research Methodologies; Research report writing; Ethics of social research. Thesis as a research report

AGEX 606 EDUCATION AND TRAINING

The Concepts of education and training; Differences between general education and training in agriculture; Traditional versus modern education; The concept of Learning and education; Theories of learning and teaching; Principles of adult learning. Historical perspectives on adult learning; Continuity of human experience, impact of individual educators and others, impact of institutions and organisations, Socialization process, Participatory training, Participatory Learning and Action.

Agricultural education in Ghana: - characteristics and actors influencing agricultural education and training development in Ghana, different levels of agricultural training and their roles in agricultural development.

Curriculum process: - defining needs, setting objectives, selecting content and methods, evaluation; Management of agricultural education and training institutions and programmes; Intellectual investment into the agricultural industry.

AGEX 607 EXTENSION METHODS

Classification of extension methods; analysis and comparison of different extension methods; selecting extension methods - adoption process and the suitability of different methods for each stage, suitability of methods for the nature of message; selection of extension methods physical possibilities, spatial distances, timeliness/urgency, resource availability to the extension agency; educational campaigns and extension methods. Individual Extension Methods; Group Extension

methods - theory of group dynamics and use of groups in extension activities. Mass Extension Methods. Issues in diffusion methodology. Participatory methodologies. Contemporary Extension Approaches. The use of extension methods in different Extension approaches. The T&V system and review of issues, experiences and adaptation of the basic approaches. Adaptation of the basic T&V model to regional country specific situations; Farming Systems Research. Adaptive research; Participatory research - origins, methods, achievements. Implications of extension approaches and organizational structure of extension systems.

AGEX 608 COMPARATIVE EXTENSION SYSTEMS

Comparative analysis and its objectives and importance; Historical background to development of extension. Contribution of Agricultural Extension to Agricultural and Rural Development; Potential of Agricultural Extension in Developing countries. Major problems and issues in improving extension effectiveness. Main characteristics of different extension Approaches:- the general agricultural extension, commodity specific system, Training and Visit, participatory approach, project approach, farming systems development approach, educational institution approach. Cost sharing/recovery in extension; Problems in comparative analysis: the changing concept and meaning of extension; Inter-dependency of the agricultural development sub-systems, multiplicity of systems, complexity of internal and external factors that influence extension success, lack of available data; Establishing criteria for comparative analysis.

The Historical Development of the Extension systems in Ghana from the Colonial period to the present: The Extension in the Colonial Era in Ghana, Extension in the immediate post independent Era in Ghana - 1956-1970, Extension Era of 1971-1987, establishment of Department of Agricultural Extension Services - 1988-1992; The National Agricultural Extension Project, Current State of Extension Service in Ghana; Emphasis on how philosophical, political, social and economic forces influence the function, structure and development extension in Ghana. The future of extension in Ghana.

AGEX 609 COMMUNICATION IN EXTENSION

Importance of Communication in extension activities; Human communication and the implications for extension work; Theories and models of communication; Relevance of these concepts to (1) individual face-to-face, (2) individual to group/mass, (3) individuals within a group (4) within sub-systems in an organisation; communication situations; communication strategies for extension and rural development; Public Relations; Role of Media in society - the theoretical perspectives; Media use in rural extension - principles of media production; Audience needs and topic research; Systems of production; Media design and pre-testing; Planning communication support for extension and social development programmes; Importance of traditional communication processes in the transmission of new knowledge; Language issues in communication: Presentation skills.

AGEX 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

AGEX 611 DESIGN AND PRODUCTION OF MEDIA FOR EXTENSION TRAINING

Introduction to group project. Media analysis in relation to audience characteristics and needs. Audience and topic research: discussion with topic specialists and other relevant sources. Designing draft media, presentation of draft media; pre-testing, multiplication and distribution.

AGEX 612 TOPICAL ISSUES IN EXTENSION AND RURAL DEVELOPMENT

Design to provide in-depth study of topical problems in extension practice selected from the areas of current concern to practitioners in extension.

AGEX 614 RURAL SOCIOLOGY

Sociological influences in decision-making. Application of sociological theory to extension activities. The nature of rural sociology and social anthropology. The nature of social organisation. The rural/farm family; the rural household. The rural community. Social typology, Economics of rural communities. Processes involved in rural and farming change. Social change and the peasantry. Importance of rural sociology in situational analysis, Diffusion processes and related factors. Sociological factors and technology development and transfer.

AGEX 615 RURAL DEVELOPMENT

Concept and theories of Development; Characteristics of rural communities; The nature of rural problems and points of intervention; Approaches to rural Development; the role of extension in rural development; Government policies and rural development; Case study of rural Development in Ghana.

AGEX 616 GENDER PLANNING AND DEVELOPMENT

Gender roles. Approaches to gender and development, Practical and strategic gender needs and the state. Policy approaches to women in development. Policy and planning. Gender Planning. Training strategies for gender planning. Importance of women's organisations. Gender planning and development.

AGEX 617 MICRO-FINANCE AND MICRO-ENTERPRISE DEVELOPMENT

Micro-Finance and Enterprise Development Evolution and overview of the Micro Finance Industry. Theories of Rural Financial Markets and Policy Implications, Micro finance Methodologies, Contextual Factors Affecting the Supply of Micro-finance, Designing Financial Products: Credit Products Design; Savings Products Design, Assessing Impact of Micro Finance, Tracking financial and Operational Performance in MFIs, Planning for Operational sustainability, Institutional financial self-sustainability; Ownership and Governance of MFIs, Small Enterprise Development, Entrepreneurship concepts, Steps in setting up small enterprise and Small enterprise launching, and management.

AGEX 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her

Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

DEPARTMENT OF ANIMAL SCIENCE

The Department offers M.Phil., M.Agric. and Ph.D. programmes in the following areas:

Animal Breeding

Meat Science and Technology
Microbiology and Immunology
Nutrition
Physiology, and
Pasture and Range Management

YEAR I

ANIMAL BREEDING

Core Courses		**Credits**
ANIM 617	Quantitative Genetics	4
ANIM 618	Statistical Genetics	4
ANIM 620	Experimental Design	4
ANIM 623	Population Genetics	4
ANIM 630	Advanced Biometry	4
ANIM 640	Seminar I	3

ELECTIVES
4 – 14 Credits from:

CROP 613	Molecular Genetics	3
CROP 616	Principles of Genetic Manipulation	3
ANIM 609	Biotechnology in Animal Science	4
ANIM 610	Independent Study	4

MEAT SCIENCE AND TECHNOLOGY

Core Courses		
ANIM 607	Nutritional Physiology	4
ANIM 611	General Microbiology	4
ANIM 619	Special Anatomy	4
ANIM 620	Experimental Design	4
ANIM 622	Meat Science & Technology	4
ANIM 640	Seminar I	3

ELECTIVES (4 – 16 Credits From)

ANIM 603	Cardiovascular and Digestive Physiology	4
ANIM 609	Biotechnology in Animal Science	4
ANIM 610	Independent Study	4
ANIM 624	Growth and Development	4
ANIM 630	Advanced Biometry	4

MICROBIOLOGY AND IMMUNOLOGY

Core Courses		
ANIM 611	General Microbiology	4

ANIM 612	Special Microbiology	4
ANIM 613	General Immunology	4
ANIM 614	Special Immunology	4
ANIM 620	Experimental Design	4
ANIM 640	Seminar I	3

ELECTIVE COURSES

4 – 16 Credits From:

ANIM 604	Endocrinology and Reproductive Physiology	4
ANIM 609	Biotechnology in Animal Science	4
ANIM 610	Independent Study	4
ANIM 630	Advanced Biometry	

NUTRITION

Core Courses		**Credits**
ANIM 607	Nutritional Physiology	4
ANIM 608	Applied Animal Nutrition	4
ANIM 615	Advanced Pasture Management	4
ANIM 620	Experimental Design	4
ANIM 640	Seminar I	3

ELECTIVE COURSES

8 – 16 Credits from:

ANIM 603	Cardiovascular & Digestive Physiology	4
ANIM 609	Biotechnology in Animal Science	4
ANIM 610	Independent Study	4
ANIM 616	Rangeland Ecology	4
ANIM 622	Meat Science and Technology	4
ANIM 630	Advanced Biometry	4

PHYSIOLOGY

Core Courses

ANIM 603	Cardiovascular and Digestive Physiology	4
ANIM 604	Endocrinology & Reproductive Physiology	4
ANIM 605	Sexual Behaviour & Adaptative Physiology	3
ANIM 606	Respiratory and Renal Physiology	3
ANIM 619	Special Anatomy	3
ANIM 620	Experimental Design	4
ANIM 640	Seminar I	3

ELECTIVE COURSES

4 – 16 Credits From:

ANIM 607	Nutritional Physiology	4

ANIM 609	Biotechnology in Animal Science	4
ANIM 610	Independent Study	4
ANIM 624	Growth and Development	4
ANIM 630	Advanced Biometry	4

PASTURE AND RANGE MANGEMENT

Core Courses

ANIM 607	Nutritional Physiology	4
ANIM 608	Applied Animal Nutrition	4
ANIM 615	Advanced Pasture Management	4
ANIM 616	Rangeland Ecology	4
ANIM 620	Experimental Design	4
ANIM 640	Seminar I	3

ELECTIVE COURSES

4 – 16 Credits from:

CROP 603	Environmental Plant Physiology	3
GEOG 604	Remote Sensing & Geographical Information System	3
BOT 614	Population Ecology	4
ANIM 610	Independent Study	4
ANIM 621	Livestock in Agroforestry	4
ANIM 630	Advanced Biometry	4

YEAR II

ANIM 600	Thesis	30
ANIM 650	Seminar II	3

M.AGRIC. WITH SPECIALIZATION IN ANIMAL SCIENCE

This is a twelve-month demand-driven programme of course work plus a long essay

Courses are selected from the existing M.Phil courses. The courses are selected with the approval of the student's Advisory committee, Head of Department and the organization which sponsored the student and will cater for the specific needs of the student.

COURSE DESCRIPTIONS

ANIM 603 CARDIOVASCULAR AND DIGESTIVE PHYSIOLOGY

Pre-requisite: ANIM 308 or Equivalent

Description: Composition and functions of blood, Haemostatic mechanisms; Heart and circulation; Physiologic anatomy of the digestive systems of Ruminants and Monogastrics; motility and secretions of the GI tract; digestion and absorption of carbohydrates, proteins and fats. Digestive system of the chicken.

ANIM 604 **ENDOCRINOLOGY AND REPRODUCTIVE PHYSIOLOGY**

Pre-requisite: ANIM 409 or Equivalent

Description: Hypothalamus and releasing factors; Pituitary hormones;Thyroid gland and its secretions; Parathyroid and calcium regulation; Hormones of the adrenal glands; Pancreatic hormones; male and female reproductive organs of live-stock; spermatogenesis and oogenesis; pregnancy and parturition; mammary glands and lactation; puberty.

ANIM 605 **SEXUAL BEHAVIOUR AND ADAPTATIVE PHYSIOLOGY**

Re-requisite: ANIM409 or Equivalent

Description: Courtship behaviour in livestock; signs of heat; measurements of intensity of sexual behaviour; Hormonal control of sexual behaviour; effects of high and low ambient temperatures on livestock; response of livestock to heat and cold; Heat tolerance tests; effects of photoperiod on livestock.

ANIM 606 **RESPIRATORY AND RENAL PHYSIOLOGY**

Pre-requisite: ANIM 308 and ANIM 409 or Equivalent

Description: Physiologic anatomy of the respiratory system; Pulmonary mechanics; Gas transport and exchange; regulation of respiration; Hypoxia; physiologic anatomy of the Urinary system, plasma clearance; formation of urine; water balance; Acid-base balance.

ANIM 607 **NUTRITIONAL PHYSIOLOGY**

Pre-requisite: ANIM 405

Description: Metabolism in the adipose cells, liver cells and skeletal muscles. Regulation of protein synthesis. Proteolysis, anatomy of the ruminant stomach, growth and development, Salivary production and function, Passage of digesta through the Gastro-Intestinal Tract, Fermentation in the rumen. Rumen microbiology and metabolism. Rumen metabolism and nutrient requirements of rumen microbes. Taste, appetite and regulation of feed intake. Nutrition of the young ruminant. Effect of stress on nutritional physiology. Metabolic problems peculiar to ruminants.

ANIM 608 **APPLIED ANIMAL NUTRITION**

Pre-requisite: ANIM 405

Description: Animal response to protein and energy intake. Response of the growing pig to energy and amino acid intake. Mineral requirements of pigs. Effect of high ambient temperature on animal production. Nutrient requirements of pigs, and poultry. Ruminant nutrition. Combining feeds together. Improving nutritive value of low-quality diets. Sustainable dry-season feeding of ruminants. In vivo and in vitro assessment of protein value of diets of ruminants. Alternative systems for assessing nutritive value of dietary protein.

ANIM 609 **BIOTECHNOLOGY IN ANIMAL SCIENCE**

Pre-requisite: Level 600 Standing in Animal Science or Zoology.

Description: Theory and practice of biotechnology techniques in animal production.

ANIM 610 **INDEPENDENT STUDY:**

Pre-requisite: Level 600 Standing in Agriculture or Science, or consent of Head of Department in consultation with the Department's Graduate Advisory Committee.

Description: Directed library research on a specific area in Animal Science.

ANIM 611 **GENERAL MICROBIOLOGY:**

Pre-requisite: ANIM 206

Description: Introduction to General Microbiology. History and development of microbiology. Germ theory of disease; microbial nutrition and growth. Cultivation, Propagation and Classification of microbes. General biology of viruses, bacteria, fungi, mycoplasma, rickettsia protozoa: distinguishing characteristics of important microbes. Sterilisation and Disinfection. Important RNA and DNA viruses of man and animals. Virus replication/propagation; virus infection of cells. Practicals: diagnostic microbiology.

ANIM 612 **SPECIAL MICROBILOGY:**

Pre-requisite: ANIM 206

Description: Host-parasite relationships.Infection, disease and pathogenicity: determinants of microbial pathogenicity.Important pathogenic bacteria, protozoa, rickettsia, viruses and mycoplasma, and common diseases in animals and man.Clinical and pathologic manifestations of viruses, bacteria, protozoa, fungi, etc. Zoonotic diseases and microbial aetiology.Microbes in agriculture, food processing and medicine. Microbes and biotechnology. Recent advances and developments in microbiology. Special essays in applied microbiology.

ANIM 613 **GENERAL IMMUNOLOGY**

Pre-requisite: ANIM 206

Description: Innate and acquired immunity; cellular interactions in the immune response; antigens, antigen recognition and the immune response. Immunity, immune response and immuno-deficiency disease. Immunoglobulins - structural and biological functions. Theories of antibody production - clonal selection theory, etc. Significance of antigen antibody interactions; Serology – precipitation in gels; agglutination reactions, complement-fixation, etc.; sero-diagnosis and immuno-prophylaxis. Complement, complement activation and the immune response. Hypersensitivity and the immunological basis of allergy; tissue damage by immunological mechanisms. Immunotherapy and immuno-control; vaccine and principles of vaccine production.

ANIM 614 **SPECIAL IMMUNOLOGY:**

Pre-requisite: ANIM 206

Description : Overview of innate and acquired immunity. The cellular, chemical and humoral basis of the immune response. Humoral and cell-mediated immunity; cellular cooperation in the immune response; cellular and soluble mediators (cytokines) of the immune response – interferon, interleukins,

tumour necrosis factors, etc. Mitogens and T-cell activation. The genetic basis of antibody diversity. Microbes and parasites in the immunized host, - various mechanisms of survival. Immunity to microbial and parasitic diseases – immuno-deficiency and autoimmune diseases. Transplantation and tissue/organ/graft rejection. Recent Immunodiagnostic methods in parasitic and microbial infections; immunodiagnosis and immunopathogenis of microbial diseases/infections. Monoclonal antibody production; monoclonal antibody – based immuno-assays. Recent developments and advances in immunology.

ANIM 615: ADVANCED PASTURE/RANGE MANAGEMENT

Pre-requisite: ANIM 406

Description: An overview of the history of pasture science. Botany of Gramineae and Leguminosae. Forage seed production, Pasture establishment. Deleterious principles in herbage. Hay and silage making. Measurement of pasture productivity. Grazing management systems. Pasture management and improvement practices.

ANIM 616 RANGELAND ECOLOGY

Pre-requisite ANIM 405

Description : Biotic relationships. Spatial patterns. Diversity of species. Classification of climate for characterizing environmental zones. Grassland Biomes of the World. Evolutionary and ecological interrelations among grasses herbivores and man. Effect of the environment on the pasture crop as a primary producer. Rangeland and inventory and analysis. Advanced rangeland monitoring.

ANIM 617 QUANTITATIVE GENETICS

Pre-requisite: ANIM 410 and 413 or equivalent Statistical course for 413.

Description: Quantitative genetic theory in Animal Breeding. Population genetics, Hardy-Weinberg law and effects on sex-linkage and linkage disequilibrium, effects of selection etc. on finite population size. Interaction of quantitative traits that are jointly influenced by the environment, simultaneous segregation of many genes.

ANIM 618 STATISTICAL GENETICS

Pre-requisite: ANIM 601, ANIM 617, plus computer literacy.

Description: Advanced training in mathematical aspects of quantitative genetic theory as applied to animal breeding, linear models, [estimation of] genetic evaluation of livestock. These will be aided by appropriate computer programmes and statistical packages.

ANIM 619 SPECIAL ANATOMY

Pre-requisite: ANIM 308 or Equivalent

Description: Anatomy of endocrine glands, pituitary, thyroid, parathyroid, pancreas and adrenal glands, microanatomy of muscles; gross anatomy and structure of the heart and blood vessels; the digestive system of ruminants and non-ruminants, respiratory system, renal system and the reproductive system; the digestive respiratory, renal and reproductive systems of the chicken.

ANIM 620 **EXPERIMENTAL DESIGN**

Pre-requisite: ANIM 413 or Equivalent

Description: Principles of Experimental Design. CRD, RCBD, latin square, BIBD, Split-plot and repeated measures. Confounding and fractional replication of factorial experiments. Planned and unplanned treatment comparison, orthogonal Polynomials. Components of variance. Analysis of unbalanced data.

ANIM 621 **LIVESTOCK IN AGROFORESTRY**

Pre-requisite: 600 Level standing in Agriculture or Science.

Description: History and Principles of Agroforestry, livestock husbandry problems associated with Agroforestry.

ANIM 622 **MEAT SCIENCE AND TECHNOLOGY**

Pre-requisite: ANIM 414 or Equivalent.

Description: Muscle growth and development, factors regulating muscle growth, fat development, muscle composition and contraction. Conversion of Muscle to meat, factors influencing post mortem changes, properties of fresh meat, storage and preservation of meat.

ANIM 623 **POPULATION GENETICS**

Pre-requisite: ANIM 306

Description: Models of population Growth. Random matings versus inbred populations. Population in approximate equilibrium. Properties of finite population. Causes of evolution changes in population.

ANIM 624 **GROWTH AND DEVELOPMENT**

Pre-requisite: ANIM 308, ANIM 412 or Equivalent.

Description: Growth of cells, hyperplasia and hypertrophy; foetal and postnatal growths; growth curves; genetic influence on growth; environmental factors affecting growth. Role of hormones in growth.

ANIM 630 **ADVANCED BIOMETRY**

Pre-requisite: ANIM 413 or Equivalent

Course will emphasize statistics as related to Life Sciences. Non-parametric statistics, statistical inference. Correlation and applied Regression analysis: General regression model building – linear and non linear models : analysis of residuals.

ANIM 640 **SEMINAR 1**

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

ANIM 650 **SEMINAR II**

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

DEPARTMENT OF CROP SCIENCE

The Department offers M.Phil. (Crop Science), M. Agric. (Crop Science) and Ph.D. programmes in the following areas of specialization

Agronomy
Genetics & Plant Breeding
Crop Protection
Plant Pathology
Entomology*

YEAR I

AGRONOMY

Core Courses

CROP 601	Advanced Agronomy	3
CROP 602	Plant Nutrition	3
CROP 603	Environmental Plant Physiology	3
CROP 604	Plant Growth & Development	3
CROP 650	Seminar I	3
CROP 691	Research Methods	3
CROP 692	Biometry	3

GENETICS & PLANT BREEDING

Core Courses

CROP 611	Quantitative Genetics	3
CROP 612	Crop Improvement	3
CROP 613	Molecular Genetics	3
CROP 650	Seminar I	3
CROP 691	Research Methods	3
CROP 692	Biometry	3

CROP PROTECTION

Core Courses

ENTO 602	Agricultural pests	3
ENTO 604	Insecticide Science	3
ENTO 612	Insect Pests & Vector Management	3
CROP 621	Vertebrate Pests	3
CROP 623	Advanced Weed Science	3
CROP 631	Plant Pathogens	3
CROP 632	Advanced Plant Pathology	4
CROP 650	Seminar I	3
CROP 691	Research Methods	3
CROP 692	Biometry	3

PLANT PATHOLOGY

Core Courses

CROP 632	Advanced Plant Pathology	4
CROP 633	Plant Mycology and Fungal Diseases	3
CROP 634	Plant Disease Control	3
CROP 650	Seminar I	3
CROP 691	Research Methods	3
CROP 692	Biometry	3

ENTOMOLOGY (See details in INSECT SCIENCE PROGRAMME)

**The Entomology courses are offered under the Insect Science Programme, an international inter-faculty programme between the College of Agriculture and Consumer Sciences and Faculty of Science with Crop Science and Animal Biology and Conservative Science as collaborating Departments. For details, see Insect Science Programme.

ELECTIVES

Elective courses may be selected in consultation with the Advisory Committee and the Head of Department. These may include courses taught in other Departments not listed here. (N.B. Not all-elective courses may be available in any year)

CROP 614	Population Genetics & Evolution	3
CROP 615	Plant Tissue Culture	3
CROP 616	Principles of Gene Manipulation	3
CROP 622	Weed Ecology	3
CROP 630	Molecular Plant Pathology	3
CROP 635	Seed Pathology	3
CROP 636	Plant Bacteriology and Bacterial Diseases	3
CROP 637	Plant Virology and Viral Diseases	3
CROP 638	Plant Nematology and Nematode Diseases	3
CROP 641	Olericulture	3
CROP 642	Advanced Pomology	3
CROP 642	Floriculture and Landscaping	3
CROP 644	Postharvest Physiology	3
CROP 651	Application of Plant Science to Agroforestry	3
CROP 652	Plants in Agroforestry	3
CROP 653	Agroforestry Systems & Practices	3
ENTO 608	Stored Products Entomology	3

YEAR II

CROP 600	Thesis	30
CROP 660	Seminar II	3

MASTER OF PHILOSOPHY (HORTICULTURE)

The M.Phil (Horticulture) program makes provision for post graduate students to specialize in either production horticulture or environmental horticulture.

YEAR I

PRESCRIBED CORE COURSES

CROP 604	Plant Growth & Development	3
CROP 645	Floriculture	3
CROP 691	Research Methods	2
CROP 692	Biometry	3

PRODUCTION HORTICULTURE

Core Courses		**Credits**
CROP 602	Plant Nutrition	3
CROP 641	Olericulture	3
CROP 642	Advanced Pomology	3
CROP 644	Post-Harvest Physiology	4
CROP 610	Seminar I	3
Electives		
CROP 603	Environmental Physiology	4
CROP 607	Advanced Crop Protection	4
CROP 615	Plant Tissue Culture	3
CROP 616	Principles of Gene Manipulation	3
CROP 648	Nursery Management	3

ENVIROMENTAL HORTICULTURE OPTION

Core Courses

CROP 646	Landscape Horticulture	3
CROP 647	Landscape Design and Construction	4
CROP 648	Nursery Management	3
CROP 649	Landscape Ecology	3
CROP 610	Seminar I	3

Electives

BOTN 612	Environmental Studies	3
BOTN 616	Conservation of Biological Resources	3
CROP 607	Advanced Crop Protection	4
CROP 615	Plant Tissue Culture	3
CROP 616	Principles of Gene Manipulation	3

YEAR II

CROP 600	Thesis	30
CROP 620	Seminar II	3

MASTER OF PHILOSOPHY IN POST-HARVEST TECHNOLOGY (FOUR SEMESTER PROGRAMME)

Core

FAPH 601	Post-harvest Losses & Loss assessment	3
FAPH 602	Post-harvest Physiology of Agricultural Produce	3
FAPH 603	Harvesting, Handling, Transportation &	
	Storage of Agricultural Produce	3
FAPH 604	Quality Assurance	3
FAPH 605	Processing & Preservation of Agricultural Produce	3
FAPH 606	Packaging and Environmental Issues in	3
	Post-harvest. Management	
FAPH 607	Storage Pests, Diseases and their Management	3
FAPH 611	Seminar I	3
CROP 692	Biometry	3

Electives

FAPH 608	Micro enterprise Development	3
F APH 609	Marketing of Agricultural Produce,	3
	Food laws & Legislation	3
AGEC 615	Agricultural Finance	3
AGEC 621	Agricultural Institutions	3
AGEC 622	Project Analysis	3
AGEX 616	Gender Planning for rural development	3

YEAR II

FAPH 600	Research Project	30
FAPH 612	Seminar II	3

M. AGRIC WITH SPECIALIZATION IN CROP SCIENCE

This is a twelve-month demand-driven program of course work plus a long essay.

Courses

Courses are selected from the existing M.Phil courses. This selection is made in consultation with student's Advisory Committee, Head of Department and the Organization sponsoring the student.

COURSE DESCRIPTIONS

CROP 601 ADVANCED AGRONOMY

Farming systems in various parts of the world their development and conditions responsible for their establishment. Large scale mechanized farming systems vs. traditional small scale. Labour intensive systems characteristic of most developing countries. Methods of building up and maintaining soil fertility - rotations, crop sequences, crop combinations, cover cropping, mulching, green manuring, composting, minimum/zero tillage. Soil and water conservation techniques. Chemical and Biofertilizers (uses of Azolla, Mycorrhiza, Rhizobia etc.) Sustainable crop production - short and longterm considerations in establishing annual (arable) and perennial (plantation) crops. Integration of livestock into cropping systems.

CROP 602 PLANT NUTRITION

Recent advances in plant nutritional physiology and soil-root nutrient interactions in relation to plant metabolism and crop yields.

CROP 603 ENVIRONMENTALL PLANT PHYSIOLOGY

Light, temperature and water as factors of the environment and their effect on plant growth and development. Pollutants and their effect on crop growth.

CROP 604 PLANT GROWTH AND DEVELOPMENT

Growth in higher plants including cell division and vacuolation. Apical meristems. Plants growth regulators: their metabolism, mode of action and effect. Physiology of flowering; photoperiodism, vernalisation. Dormancy and reverscence in plant organs and their significance.

CROP 610 INDEPENDENT STUDY

Description: Directed reading assignment in a specific area in Crop Science.

CROP 611 QUANTITATIVE GENETICS

Genetical and Statistical concepts of quantitative variation in Crop Plants. Quantitative genetic principles in plant Breeding. Factors affecting direct and correlated responses to artificial selection. Methods of quantitative genetic research.

CROP 612 CROP IMPROVEMENT

Aims, materials and methods of plant breeding. Processes of Crop Evolution. Evolution of Specific crops. Geographical distribution and conservation of crop genetic resources. Breeding and selection methods. Breeding for resistance to disease and pests. Polyploidy, mutation breeding, interspecific hybridisation.

CROP 613 MOLECULAR GENETICS

The history of molecular cell Biology, Chemical Foundations, Protein structure and function. Nucleic Acids: structure and function. The Genetic Code and Protein Synthesis. The molecular anatony of Genes and chromosomes, Control of gene Expression. Mechanisms of Genetic Change I: Gene Mutation, Mechanisms of Genetic Change II: Recommendation. Mechanisms of Genetic Change III: Transposable Genetic Elements.

CROP 614 POPULATION GENETICS AND EVOLUTION

Darwinian Evolution in Mendelian Populations. Random Genetic Drift. Mutation and the Neutral

Theory. Natural Selection. Inbreeding and other forms of non-random mating. Population subdivision and migration. Evolutionary genetics and quantitative characteristics. Ecological genetics and speciation.

CROP 615 PLANT TISSUE CULTURE

Introduction. Botanical Basis for Tissue Culture. The tissue culture laboratory, location design, equipment and supplies, maintenance, culture media, composition, preparation, choice of media. Initiation and Maintenance of Callus. Choice of explants. Preparation and sterilisation of explants. Callus induction, Subculture and maintenance suspension cultures. Root cultures, meristem cultures, micropropagation in the shoot apex. Embryogenesis, organogenesis and plant regeneration. Isolation, culture genetic manipulation of plant protoplast. Somatic hybridisation. Selection of somatic hybrid plants. Transformation of plants using protoplast systems. Selection of plant cells for desirable characteristics. Haploid cell cultures. Embryo rescue and uses. Secondary metabolites production by cell suspension culture. Cryopreserveation and Storage of Germplasm. Quantification of tissue culture procedures. Tissue culture methods in phytoptahology. Tissue culture business.

CROP 616 PRINCIPLES OF GENE MANIPULATION

Generation of Recombinant DNA. Plasmid vectors; Synthesis of DNA. Construction of DNA library. Analysis of recombinant DNA. Alteration of genes by mutagenesis; expression of foreign proteins in Prokaryotes and Eukaryotes. Applications of DNA technology.

CROP 621 VERTEBRATE PESTS

The concept of vertebrates as pests affecting human welfare. Bioecology and behaviour of major vertebrate pests. Vertebrate pests in agriculture, forestry, human health and recreation. Economic importance, nature of damage and control of rodents, birds, predatory mammals, big game animals and fishes in pest situations.

CROP 623 ADVANCED WEED SCIENCE

Biology of weeds. Economic importance of weeds/loss caused by weeds. Beneficial effects of weeds. Weed management - weed control measures with special emphasis on chemical, biological and integrated weed control practices. Technical principles involved in efficient herbicide usage e.g. calibration of sprayers; herbicide action in plants and in soils. Techniques for the control of specific troublesome weeds of the tropics. Advances in herbicide science and use of biotechnology in the development of herbicide resistant crops.

CROP 630 MOLECULAR PLANT PATHOLOGY

Pathogens and pathogen manipulation - Viruses, Bacteria. Introduction of cloned DNA into plant. RFLP analyses and gene tagging for pathogen identification. Gene transformation in plant pathogenetic fungi. Nucleic acid isolation and hybridization techniques. Analyses of defence mechanisms.

CROP 631 PLANT PATHOGENS

Fungi and their nature; reproduction and classification of fungi with emphasis on basis of classification. Fungi of economic importance, emphasis of those causing plant diseases.

Evolution of fungi, Viruses and their nature; Purification and transmission of viruses. Viral Classification. Phytonematodes, their bionomics and control. Basis of classification of nematodes.

Characteristics of bacteria attacking plants. Some important bacterial plant diseases.

CROP 632 ADVANCED PLANT PATHOLOGY

Host-pathogen interactions. Development of disease in individual plants. Infection processes:

Penetration, pathogenesis - cell wall degradation, action of hormones and toxins. How plants defend themselves against pathogens (Disease resistance). Effect of pathogens on plant physiological functions: photosynthesis, respiration, transport system. Development of diseases in plant populations (Epidemics/Epiphytotics). Characteristics and categories of epiphytotics. Pathogen, host and environmental factors affecting epiphytotics, Plant disease forecasting. This course also covers techniques commonly employed in pathological work, such as diagnosis of plant diseases, collection and preservation of diseased plant materials, isolation, media preparation, inoculation, culturing etc.

CROP 633 PLANT MYCOLOGY AND FUNGAL DISEASES

Introduction - Brief history, emphasis on important landmarks and importance of fungi to man. Fungal structure and modifications and organisation of mycelium. Reproduction in fungi with emphasis on nuclear cycle during reproduction. Basis of Compatibility and Parasexualism. Basis for classification of various fungi to genus level. Evolution of fungi. Important fungal diseases of crops in West Africa.

CROP 634 PLANT DISEASE CONTROL

Principles of plant disease control. Basis for various methods of control of plant diseases, and their inter-relations. Chemical control: Toxicants and their mode of action. Factors affecting the effectiveness of chemical treatments, Evaluation of chemicals - Measurements of fungitoxicity. Using resistant varieties in disease control: varying forms of resistances, variations in pathogens. Biological control: Its implications and advantages. Quarantine measures: merits and demerits.

CROP 635 SEED PATHOLOGY

History of seed pathology. Economic significance of seed-borne diseases. Seed-borne pathogens. Morphology and anatomy of seeds in relation to transmission of pathogens. Entry points in seed infection. Seed-plant transmission. Mechanism of seed transmission, establishment of infection and cause of disease. Seed health testing. Assessment of seed-borne inoculum. Principle of control.

CROP 636 PLANT BACTERIOLOGY AND BACTERIAL DISEASES

Bacterial classification. Historical development of plant bacteriology. Nature of phytopathogenic bacteria: Some basic characteristics, geographic distribution and host range, dissemination, mode of entrance and survival, symptomatology, mechanism of disease induction, general control measures. Identification of phytopathogenic bacteria: Cultural, morphological, stain reactions, physiological and biochemical, infectivity test, Serology, phage typing etc. Some important plant bacterial diseases especially in West Africa: their importance, aetiology and control.

CROP 637 PLANT VIROLOGY AND VIRAL DISEASES

Introduction to viruses, Mechanism and Evolution of plant viruses.Virus purification and

characterisation.Virus classification, Structural organisation of RNAViruses, Structural organisation of DNA Viruses, Expression and Analysis of viral genes.Replication of viruses. Movement of plant Viruses. Transmission of Viruses. Important viral diseases of crop in West Africa.

CROP 638 PLANT NEMATOLOGY AND NEMATODE DISEASES

Introduction, history of plant nematology and distribution of nematodes. Morphology - internal and external. Nervous, excretory, digestive and reproductive systems. Life cycle of nematodes and types of reproduction in nematodes. Survival mechanisms of nematodes during adverse conditions. Spread of nematodes - short and long distances. Responses of plant to nematode attack and symptomatology. Host-parasite relationships and population dynamics. Nematode and the Environments - moisture, temperature, aeration and osmotic pressure. Classification of nematodes. Methods of control of nematodes. Important nematode diseases of Crops in West Africa.

CROP 641 OLERICULTURE

Systematics, ecology and growth, production of major fruiting and leafy vegetable, production of vegetables for export; mushroom production; post harvest handling. Discussion of current problems and research.

CROP 642 ADVANCED POMOLOGY

Fruit crop production and physiology: origin, taxonomy and botany, ecology and growth, fruit quality. Knowledge of production practices for citrus, banana, mango, avocado, pineapple, cashew and minor fruit crops of Ghana. Discussion of current problems, post harvest handling and research.

CROP 643 FLORICULTURE AND LANDSCAPING

Ornamental plants: importance classification; Theory and practice of landscaping Research in floriculture and landscaping. Recent advances in landscaping.

CROP 644 POST HARVEST PHYSIOLOGY

Discussion of the physiological effects on horticultural crops of controlled temperatures and supplemental environments or treatments. Emphasis on current problems.

CROP 650 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

CROP 651 APPLICATION OF PLANT SCIENCE TO AGROFORESTRY

Growth and development of trees. The atmosphere and plant growth. The rhizosphere and plant growth. Micro-organisms associated with plant roots. Interactions among plants grown in association. Allelopathy. Plant strategies for drought tolerance. Reclamation of degraded soil, marshland and weed infested soils etc. Establishment of windbreaks, woodlots. protection of watersheds, case histories.

CROP 652 PLANTS IN AGROFORESTRY

The multipurpose tree concept. Criteria for selection of suitable agroforestry trees. Propagation by cutting seed.Above ground characteristics of plant.Root characteristics of plants.Biomass production and nutrient content.Coppicing ability.Decomposition rate of biomass;Tree establishment, protection and eradication. Examples of successful Agroforestry trees.

CROP 653 AGROFORESTRY SYSTEMS AND PRACTICES

Farming and cropping systems. Shifting cultivation, long-bush fallow, slash and burn agriculture. Alley farming. The Taungya systems. Systems used for upland crops, lowland crops, orchard crops, perennial/orchard crops, Arable crops.

CROP 660 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

CROP 691 RESEARCH METHODS

Scientific writing and research report preparation. Literature search. Research planning and design. Field research including on-station, on-farm, multi-location, multi-season and long-term experiments. Survey research-questionnaire construction and sample selection. Methods and importance of error control in research. Controlled-environment studies. Research grant proposal development.

CROP 692 BIOMETRY

Parametric statistical methods commonly used in agricultural research and experimental biology. Hypothesis testing. Principles of experimental designs. Analysis of simple and complex experiments. Covariance analysis and alternatives. Simple and multiple correlation and regression. Non-parametric methods in lieu of analysis of variance and for character association. Pre-requisite: CROP 413 or equivalent.

DEPARTMENT OF FAMILY AND CONSUMER SCIENCES

The Department of Family and Consumer Sciences offers M.H.S. (Masters in Home Science), M.Phil and Ph.D degrees in Home Science. The programmes are designed to focus on areas of research concerned with the well-being (welfare) of individuals and families and their inter-relationships with the environment.

ENTRY REQUIREMENTS

A candidate wishing to be admitted to a programme leading to the award of the M.Phil M.H.S or Ph.D degree in Home Science must have obtained a good first degree in Home Science (Home Economics) or in a related field from the University of Ghana or any approved University. In the case of PhD, only candidates with a research Masters degree shall be considered for admission.

A candidate who does not have the requisite background but is adjudged suitable, may be admitted. Such a candidate will however, take make-up courses before embarking on the M.Phil, M.H.S or Ph.D programme.

SCHEME OF EXAMINATION

Candidates will be required to take formal courses for two semesters and be examined in a minimum of 12 credits of HOSC courses per semester. The minimum load per semester is 15 credit hours. At the end of the two semesters of course work, however, a candidate should have taken at least 33 credits of graduate courses, 12 (because of HOSC 601, 602, 603 and 630) of which must be compulsory (core) courses and 21 from elective courses.

A. The compulsory (core) courses are:

HOSC 601 Research Methods in Home Science (or any

	other appropriate course (e.g AGEX 605)	3
HOSC 602	Family and Environment	3
HOSC 604	Statistics for Home Scientists or any other appropriate statistics course (e.g AGEX 602)	3
HOSC 630	Seminar I	3
HOSC 640	Seminar II	3

The elective courses will be selected from the area of specialization and from a related area. In addition, candidates will be required to work on a relevant research project and write a thesis on it.

The Areas of Specialization are:

- Food Utilization and Community Nutrition.
- Child and Family Studies.
- Women and Development and Family Welfare.
- Textiles and Clothing.
- Family Resources Development and Management.

YEAR 1

B. FOOD UTILIZATION AND COMMUNITY NUTRITION

Electives

21-42 credits selected from the underlisted courses and from other areas in consultation with the Supervisory Committee and the Head of Department.

Core Courses

HOSC 605	Special Topics Related to Consumer Foods	3
HOSC 606	Nutrition and Human Development	3
HOSC 607	Community Nutrition and Nutrition Education	3
HOSC 608	Food Product Development and Evaluation	3
HOSC 609	Nutrients and their Metabolism	3
HOSC 610	Independent Study	3
HOSC 611	Nutrition in Rehabilitation	3
HOSC 612	Malnutrition, its Assessment and Therapy	3
HOSC 613	Physical Growth and Nutrition	3
HOSC 614	Diet and Diseases	3
HOSC 615	Research Methods in Nutrition	3

C. CHILD AND FAMILY STUDIES

Electives

The elective courses may be selected either from the area of specialization and from a related area. In addition, candidates will be required to work on a relevant research project and write a thesis on it.

HOSC 610	Independent Study	3
HOSC 616	Principles and Theories of Early Child Education	3

HOSC 617	The Study of Children	3
HOSC 618	Research Methods in Child Development	3
HOSC 619	Principles of Child Guidance	3
HOSC 621	Child Guidance Practicum	1
HOSC 622	Child Development Study Tour	1
HOSC 623	Developmental Disabilities in Children and Youth	3
HOSC 624	Cross-Cultural Perspectives on Children	3
HOSC 625	Administration of Early Childhood Development Programme	3
HOSC 626	The Rights of Children and their Welfare	3

D. WOMEN AND DEVELOPMENT AND FAMILY WELFARE

Electives

The elective courses may be selected either from the area of specialization and from a related area. In addition, candidates will be required to work on a relevant research project and write a thesis on it.

HOSC 610	Independent Study	3
HOSC 627	The Role and Status of Women in Various Countries	3
HOSC 628	Issues in Family Welfare	3
HOSC 629	Development Issues and Role of Women	3
HOSC 631	Legislation and Women – Traditional & Modern	3
HOSC 632	Delivery of Services to Women and Families	3
HOSC 633	Family Planning and Population Issues	3
HOSC 634	Family Crises – Analysis of the Processes Involved	3
HOSC 635	Women, Development and Family Welfare	3
HOSC 636	Family Life Education	3

E. TEXTILES AND CLOTHING

Electives

The elective courses may be selected either from the area of specialization and from a related area. In addition, candidates will be required to work on a relevant research project and write a thesis on it.

HOSC 610	Independent Study	3
HOSC 637	Clothing and Textiles Merchandising	3
HOSC 638	Socio-Psychological Bases of Clothing and Textiles	3
HOSC 639	Clothing and Textiles Legislation/Specification	3
HOSC 641	Textile Fibres and Fabrics	3
HOSC 642	Colour and Dyeing	3
HOSC 643	Textiles and Clothing Graduate Seminar	3
HOSC 644	Testing of Textiles and Clothing	3

HOSC 645	Textiles and Clothing Production and Consumption	3
HOSC 646	Advanced Clothing Construction	3
HOSC 647	Advanced Pattern Drafting	3
HOSC 648	Advanced History of Costumes	3

F. FAMILY RESOURCE MANAGEMENT

Electives

The elective courses may be selected either from the area of specialization and from a related area. In addition, candidates will be required to work on a relevant research project and write a thesis on it.

HOSC 610	Independent Study	3
HOSC 649	Home Improvement for Rural Families	3
HOSC 651	Household Equipment for the Ghanaian Home	3
HOSC 652	Family Resources Management	3
HOSC 653	Technology for Small Scale Enterprises	3
HOSC 654	Family Resources and Family Planning	3
HOSC 655	Personal and Family Finance	3
HOSC 656	Income Generation Activities/ Projects	3
HOSC 657	Sources of Income for Rural/Urban Families	3
HOSC 658	Poverty and the Ghanaian Family	3
HOSC 659	Credit and the Modern Family	3

YEAR II

HOSC 600	Thesis	30
HOSC 640	Research Seminar II	3

M. (HOME SCIENCE)

This is a twelve-month demand-driven Programme of course Work plus a long essay.

DESCRIPTION OF COURSES CORE COURSES

HOSC 601 Research Methods in Home Science
(Any other appropriate course. Now it is AGEX 602) 3

HOSC 602 FAMILY AND ENVIRONMENT

A critical examination of family organization, division of labour, categories of households and functions. Interdependence of family unit with other social units in a changing African environment. Consideration of resources available within families and local environment concepts of human and material resources. Ecological principle and their applications to intra and inter-household resource allocation. Management of resources to achieve sustainable development for individuals and families.

HOSC 604 STATISTICS FOR HOME SCIENTISTS

(Any other statistics Course e.g. AGEX 602).

A. FOOD UTILIZATION AND COMMUNITY NUTRITION

HOSC 605 SPECIAL TOPICS RELATED TO CONSUMER FOODS

The course covers selected topics of current concerns regarding food safety issues which are likely to affect consumer health.

HOSC 606 NUTRITION AND HUMAN DEVELOPMENT (3 Credits)

Nutrition as related to human growth requirements throughout the life cycle - from conception to aging years.

HOSC 607 COMMUNITY NUTRITION AND NUTRITION EDUCATION

Concepts and knowledge of nutrition as applied in community and public health nutrition. Examination of current programmes in applied nutrition, local as well as international. Nutrition education to the community, skills in nutrition education, programme planning, management and evaluation.

HOSC 608 FOOD PRODUCT DEVELOPMENT AND EVALUATION

Objective and sensory techniques in the study of quality characteristics of food commodities and products as related to consumer acceptance. Food theory, techniques and technologies appropriate for home and small-scale rural food processing enterprises.

HOSC 609 NUTRIENTS AND THEIR METABOLISM

A detailed discussion of all the essential nutrients with emphasis on chemical composition, absorption, utilization, storage, functions and food sources as well as nutritional deficiency disorders.

HOSC 610 INDEPENDENT STUDY

An individualized course which may include field work or literature search on a topic or topics designed to suit the needs of the student. A term paper is required.

HOSC 611 NUTRITION IN REHABILITATION

Consideration will be given to issues of obesity, cardiovascular diseases and diabetes with emphasis on diagnosis, causes, classification, treatment and prevention.

HOSC 612 MALNUTRITION, ITS ASSESSMENT AND THERAPY

Detailed studies of principles of assessment of nutritional status with emphasis on protein-energy malnutrition: its aetiology and epidemiology, clinical features, biochemical and metabolic disorders and rehabilitation.

HOSC 613 PHYSICAL GROWTH AND NUTRITION

Food and Nutritional needs for optimum development and health is the main thrust of the course. The course will cover the patterns of growth from conception through to adolescence. Other non-nutritional factors which influence physical growth will also be highlighted. The use of

anthropometric indices in determining the nutritional status of children and current programmes for nutrition rehabilitation of malnourished children will be discussed.

HOSC 614 DIET AND DISEASES

Issues of diet in relation to dental caries, alcoholism, HIV/AIDS and other emerging health issues will be covered.

HOSC 615 RESEARCH METHODS IN NUTRITION

Emphasis will be on how to plan small scale nutrition surveys, statistical techniques in food and nutrition research, methods for evaluation of impact of food and nutrition programmes and methods for assessing nutrient composition of food items.

B. CHILD AND FAMILY STUDIES

HOSC 610 INDEPENDENT STUDY

An individualized course including field work or literature search on topics designed to suit the needs of the student. A term paper is required.

HOSC 616 PRINCIPLES AND THEORIES OF EARLY CHILDHOOD EDUCATION

Early childhood education: evolution, theories and principles of current programmes and development of individual philosophy.

HOSC 617 THE STUDY OF CHILDREN

Empirical study of physical, intellectual social and emotional development of children; observation and/or participation in early childhood programmes.

HOSC 618 RESEARCH METHODS IN CHILD DEVELOPMENT

Need for research. Special problems and ethical issues in research for children. Analysis and comparison of various research designs and methodologies, selection of appropriate design and methodologies for specific research problems. Selection of appropriate data analysis procedures; proposal writing.

HOSC 619 PRINCIPLES OF CHILD GUIDANCE

Analyses of different techniques and strategies in child guidance.

HOSC 621 CHILD GUIDANCE PRACTICUM

Supervised participation in early childhood centre; guidance techniques and understanding of children. Prerequisite (HOSC 619).

HOSC 622 CHILD DEVELOPMENT STUDY TOUR

Visit to different early childhood development centres. Visits would be based on current issues. Keep a reflective journal.

HOSC 623 DEVELOPMENTAL DISABILITIES IN CHILDREN AND YOUTH

Definition of exception children. Causes, indicators and educational implications for a child's

exceptional characteristics, Social and environmental factors that affect the child's learning. The role of the family. Services available in Ghana and other countries, assessment centres, special schools and units.

HOSC 624 CROSS-CULTURAL PERSPECTIVES ON CHILDREN

Review of methods and results of cross-cultural research on physical, cognitive/intellection, social/emotional development of children and youth. Cross-cultural variations in child rearing practices.

HOSC 625 ADMINISTRATION OF EARLY CHILDHOOD DEVELOPMENT PROGRAMME

A study of programme organization, programme design, staffing, licensing, certification, classroom arrangements, equipments, and facilities for operating, (Field Trips required).

HOSC 626 RIGHTS OF CHILDREN AND THEIR WELFARE

Identification of children's rights: traditional, modern. Protection of children and their rights (entitlements), Laws in Ghana relating to children. Ways in which children's rights are denied, abused or neglected within the family, school and other concerned social institutions. Awareness of and advocacy for children's rights.

C. WOMEN AND DEVELOPMENT AND FAMILY WELFARE

HOSC 610 INDEPENDENT STUDY

An independent course comprising field work and literature search designed to suit the needs of the student. A term papers is required.

HOSC 627 THE ROLES AND STATUS OF WOMEN IN VARIOUS COUNTRIES

Cross-cultural studies of the roles, work, social status and opportunities for women in Ghana, Guinea, Niger, Central African Republic, Burundi, Senegal, Nigeria, Kenya, India and the Western World. African women's role in the political organization of their societies.

HOSC 628 ISSUES IN FAMILY WELFARE

An examination of the current issues in family welfare including income levels, access to resources, educational opportunities and family reproductive health issues.Family resource allocation and family decision making.

HOSC 629 DEVELOPMENT ISSUES AND ROLE OF WOMEN

Overview of the role of women - The orientation of development programmes. The involvement of women in development programme planning and implementation. Women's contributions to development. Analysis of policies, programmes, projects and development issues that affect women.

HOSC 631 LEGISLATION AND WOMEN (TRADITIONAL AND MODERN)

An analysis of the existing laws and regulations about women and for women. The legal rights

and responsibilities of women. The Dos and Don'ts of being a woman. Taboos in the family. Examination of legal and Quasi-legal services available in a community for family welfare.

HOSC 632 DELIVERY OF SERVICES TO WOMEN AND FAMILIES

Types of Family services in Ghana. Providers of family services. Adequacy of family services in Ghana. Identification of needs for family services organizations (both government; and non-government) involved in providing services for women. Application of knowledge of needs of women and families, education theory in planning and organizing (process of planning)-evaluation of Services. Involvement of local leaders and policy makers.

HOSC 633 FAMILY PLANNING AND CONTRACEPTIVE USE

Definition of Family Planning: need for family planning from the individual, family and national perspectives. The population crisis/problem perspective. Birth control, types of contraceptives, availability and use of contraceptives.

HOSC 634 FAMILY CRISIS – ANALYSIS OF THE PROCESSES INVOLVED

The management of crisis situation in the Family. Consideration of Family disorganization, reorganization and change associated with various crises.

HOSC 635 WOMEN, DEVELOPMENT AND FAMILY WELFARE

Design of development programmes. Review of development of projects and activities to identify effect on women and families. Nature and beneficiaries of development programmes. Funding agents of development activities in Ghana.

HOSC 636 FAMILY LIFE EDUCATION

Boy/Girl relationships – the beginning of the family – the reproductive system. Family planning and family size in relation to resources. Consideration of issues of population and child rearing.

D. TEXTILES AND CLOTHING

HOSC 610 INDEPENDENT STUDY

Field work or library research undertaken by student in consultation with supervisor to form the basis of a term paper.

HOSC 637 TEXTILES AND CLOTHING MERCHANDISING

An interdisciplinary approach to the study of textiles and apparel merchandising with emphasis on the retail market, distribution of goods and merchandising methods used.

HOSC 638 PSYCHOLOGICAL BASES OF CLOTHING AND TEXTILES

A study of the social and psychological bases of clothing behaviour of individuals and social groups. Lecture will be related to social science theories.

HOSC 639 CLOTHING AND TEXTILES SPECIFICATION/ LEGISLATION

A study of buyer and seller interaction before, during and after sale of goods and services.

Emphasis will be on advertising, consumer credit, availability of legal services, warranties and product standards.

HOSC 641 TEXTILE FIBRES AND FABRICS

The chemical and physical characteristics of natural and synthetic fibres, relating fibre structure to fibre properties. Suitability of fibres for consumer textile products. Methods of incorporating desirable consumer properties into fibres and fabrics.

HOSC 642 COLOUR AND DYEING

Importance of colour in product development. Performance properties and methods of attaching dyes to fibres and fabrics. The technology of dyeing and its influence on the final product.

HOSC 643 TEXTILES AND CLOTHING GRADUATE SEMINAR

Preparation and presentation of seminar based on an in-depth analysis of research literature on selected topics. A paper on the seminar topic will be required.

HOSC 644 TESTING OF TEXTILES AND CLOTHING

Comparative testing of textiles and clothing in relation to quality control. Emphasis will be on laboratory experimentation and the interpretation of test data.

HOSC 645 TEXTILES AND CLOTHING PRODUCTION AND CONSUMPTION

A study of basic processes in the production of textiles and clothing.Industry structure, government policy and consumption patterns.

HOSC 646 ADVANCED CLOTHING CONSTRUCTION

Production of knitted, crocheted and woven fabrics and relationship between design, fabric characteristics and production methods for both custom and ready-to-wear clothing. (Pre-requisite: HOSC 647).

HOSC 647 ADVANCED PATTERN DRAFTING

Comparison of design methods and their application to pattern making with emphasis on flat pattern making.

HOSC 648 ADVANCED HISTORY OF COSTUME

History of the evolution of fashion, its significance from ancient times to the present. Cultural and economic factors associated with the development, adoption and abandonment of styles (Selected Cultures will be compared with Ghana).

E. FAMILY RESOURCES DEVELOPMENT AND MANAGEMENT

HOSC 610 INDEPENDENT STUDY

Library work undertaken by student in consultation with supervisor to form the basis of a term paper.

HOSC 649 HOUSEHOLD EQUIPMENT FOR THE GHANAIAN HOME (Pre-requisite: HOSC 403)

An overview and comparison of the state of equipment in the rural home and the urban home in Ghana. Analysis of the factors that influence the type of equipment found in Ghanaian homes. (e.g fuel availability, economic status, tradition and culture, food habits etc). Characteristics and availability of various equipment for basic functions of the family in Ghana. Development of the various household equipment from very simple states to modern ones for food preparation, sewing, laundry and house keeping. Selection, use and care of various household equipment.

HOSC 651 HOME IMPROVEMENT FOR RURAL FAMILIES

An overview of the conditions in various rural homes/ communities. Students will visit several rural communities to observe and study the state of housing, sanitation, equipment other facilities and work organization. Students will be required to work on projects aimed at the development of ideas and items that could be transferred to rural communities to improve on the existing state. Projects must be realistic and practical bearing in mind cost, the culture and needs of the people.

HOSC 652 TECHNOLOGY FOR FAMILIES AND SMALL SCALE ENTERPRISES (APPROPRIATE TECHNOLOGY)

Collaborative strategies for identifying, developing and evaluating technology which is appropriate for needs of households and their small scale enterprises in rural/urban environments. Theories and principles of appropriate technology. Practical application of appropriate technologies. A survey of existing family or small-scale enterprises and identification of technologies in use. Analysis of state of technologies in use and what could be used to facilitate efficiency. Identification of improved technologies developed by appropriate technology centres in Ghana and elsewhere.

The development of information packages which will make information easily available to enterprising Ghanaians to enhance their work. Types of appropriate technology for Food production; Food preservation.

HOSC 653 FAMILY RESOURCES MANAGEMENT

An Advanced course designed to provide students with a good understanding of the theories of Home Management Literature related to Home Management will be reviewed. Values, goals, decision-making and other factors involved in effective development and use of resources available to the family will be discussed.

HOSC 654 FAMILY RESOURCES AND FAMILY PLANNING

Family Planning and Birth Control: Environmental threats to man, the social setting, the need for family planning will be stressed and various methods of contraception will be explored. The link between family size and family resources will clearly be established. trends in family reproductive behaviour would be explored. Rate of population growth in Ghana, Africa and the world will be examined. Relationship between family size and welfare. Review of related literature, case studies of families with large numbers of children and those with few children will also be addressed.

HOSC 655 PERSONAL AND FAMILY FINANCE

A study of the management of family finance: consideration of financial alternatives available to the family and individual finances. Topics to be covered include: budgeting, record-keeping, personal insurance, consumer credit, income tax, lending institutions, factors which influence financial decisions and factors that determine financial security.

HOSC 656 INCOME GENERATING ACTIVITIES/ PROJECTS FOR FAMILIES

An analysis of the various income generating activities of individuals and families at the household level. In depth study of the organization and financing of such activities. Development of a strategy to improve the viability of small-scale income generating activities and entrepreneurial skills.

HOSC 657 SOURCES OF INCOME FOR RURAL/URBAN FAMILIES

A study of the differences between the sources of income for families in the rural/urban areas. Emphasis will be on rural areas: farming, trading, small scale enterprises, wages and salaries. Census data will be analysed to identify income distribution in the society. Availability of various facilities in the rural/urban areas.

HOSC 658 POVERTY AND THE GHANAIAN FAMILY

The concept of poverty. The extent of poverty in the family. Acceptance, denial of poverty-review and analysis of data on poverty studies to understand the factors that contribute to a state poverty studies to understand the factors that contribute to a state of poverty and those that help to alleviate poverty.

HOSC 659 CREDIT AND THE MODERN FAMILY

Credit as a personal and family resource – elastic income. Types of credit available in Ghana; Advantages and disadvantages of using credit; Managing credit; Credit worthiness; Analysis of indigenous credit types.

F. CHILD AND FAMILY STUDIES

HOSC 610 INDEPENDENT STUDY

An individualized course including field work or literature search on topics designed to suit the needs of the student. A term paper is required.

HOSC 615 PRINCIPLES AND THEORIES OF CHILD DEVELOPMENT

Theoretical foundation of child development. Developmental approach to the study of child behaviour. Basic principles, major theories and research.

HOSC 617 STUDY OF INDIVIDUAL CHILD

Understanding of the principles of child behaviour and development, single child. The student will be guided in developing a growth and behaviour profile of a single child (1) By direct observations of the behaviour of the study child (2) By school and home visits and interviews.

HOSC 618 THEORIES AND RESEARCH IN EARLY CHILDHOOD EDUCATION

Analysis of contemporary and historical models, including early intervention programmes. The effect of variables such as, programming, physical environment, and teacher effectiveness on children. Research on teacher-child and teacher-parent interaction in early childhood education programmes.

HOSC 619 DEVELOPMENT AND GUIDANCE IN INFANCY, EARLY CHILDHOOD AND ADOLESCENCE

Developmental characteristics of children from prenatal period to adolescence, with implication for individual guidance within family and group care settings. Directed observations and participation with children.

HOSC 621 ADMINISTRATION AND EVALUATION OF EARLY CHILDHOOD DEVELOPMENT PROGRAMME

Programmes and staff development in early childhood development. Theories and Research related to programme and personnel supervision and evaluation, (development). Models for community involvement and financial resource management including grant.

HOSC 622 CHILD DEVELOPMENT STUDY TOUR OR FIELD WORK

The process and scope of professional development and the scope of professional responsibilities in child development. Study of and visits to programmes that serve children and families with diverse needs.

HOSC 623 DEVELOPMENTAL DISABILITIES IN CHILDREN

Theories, research, and current issues regarding typical development in children with disabilities. Investigation of motor, social, cognitive, and communication development in the context of families and educational programmes.

HOSC 624 CROSS-CULTURAL PERSPECTIVES ON CHILDREN

Review of methods and results of cross-cultural research on physical cognitive, language, social and emotional development of children and youth. Cross-cultural variations in child-rearing practices.

HOSC 625 ADMINISTRATION OF PROGRAMMES FOR CHILDREN

Management principles and techniques involved in programmes for young children, including an introduction to financial management. Emphasis on government regulations concerning child care, personnel management, community relations and child care advocacy.

G. WOMEN IN DEVELOPMENT AND FAMILY WELFARE

HOSC 610 INDEPENDENT STUDY

An independent course comprising field work and literature search designed to suit the needs of the student. A term papers is required.

HOSC 629 THE ROLES AND STATUS OF WOMEN IN VARIOUS COUNTRIES

Cross-cultural studies of the roles, work: social status, and opportunities for women in Ghana, Guinea, Niger, Central African Republic, Burundi, Senegal, Nigeria, Kenya, India and the Western World. African women's role in the political organization of their societies.

HOSC 631 ISSUES IN FAMILY WELFARE

An examination of the current issues in family welfare including income levels, access to resources, educational opportunities and family reproductive health issues. Family resource

allocation and family decision making.

HOSC 632 DEVELOPMENT ISSUES AND ROLE OF WOMEN

Overview of the role of women - The orientation of development programmes. The involvement of women in development programme planning and implementation. Women's contributions to development. Analysis of policies, programmes, projects and development issues that affect women.

HOSC 633 WOMEN, DEVELOPMENT AND FAMILY WELFARE

Design of development programmes. Review of development of projects and activities to identify effect on women and families. Nature and beneficiaries of development programmes. Funding agents of development activities in Ghana.

DEPARTMENT OF SOIL SCIENCE

The Department offers M.Phil, M.Agric. and Ph.D. programmes in the following areas of specialisation:

Soil Chemistry and Fertility
Pedology and Landscape Processes
Soil Physics and Conservation
Soil Microbiology and Biochemistry
Environmental Soil Science

Students offered admission to the Ph.D. programme may be requested to audit some Level 400 undergraduate and graduate (Level 600) courses where necessary. Masters students may also be requested to audit some undergraduate courses where applicable.

YEAR I

SOIL CHEMISTRY AND FERTILITY

Core Courses		**Credits**
SOIL 601	Research Methods	3
SOIL 602	Soil Fertility and Plant Nutrition	3
SOIL 603	Soil Chemistry	3
SOIL 604	Soil Mineralogy	3
SOIL 612	Instrumentation and Methods of Soil/Plant Analysis	3
SOIL 630	Seminar I	3

Electives
9-15 credits to be selected from the underlisted courses or from other areas in consultation with the Supervisory Committee or with the Head of Department.

SOIL 605	Soil Physics	3
SOIL 606	Soil-Plant-Water Relationships	3
SOIL 607	Soil Microbiology	3
SOIL 608	Soil and Water Conservation	3
SOIL 609	Soil Biochemistry	3
SOIL 610	Independent Study	3
SOIL 611	Soil Survey and Classification	3
SOIL 613	Soil Genesis and Morphology	3
SOIL 615	Soil Pollution and Remediation	3
SOIL 617	Agricultural Systems Simulation and Modelling	3

PEDOLOGY AND LANDSCAPE PROCESSES

Core Courses		
SOIL 601	Research Methods	3
SOIL 604	Soil Mineralogy	3
SOIL 611	Soil Survey and Classification	3

SOIL 612	Instrumentation and Methods of Soil Plant Analysis	3
SOIL 613	Soil Genesis and Morphology	3
SOIL 630	Seminar I	3

Electives

SOIL 602	Soil Fertility and Plant Nutrition	3
SOIL 603	Soil Chemistry	3
SOIL 605	Soil Physics	3
SOIL 606	Soil-Plant-Water Relationships	3
SOIL 607	Soil Microbiology	3
SOIL 608	Soil and Water Conservation	3
SOIL 609	Soil Biochemistry	3
SOIL 610	Independent Study	3
SOIL 615	Soil Pollution and Remediation	3
SOIL 617	Agricultural Systems Simulation and Modelling	3

SOIL PHYSICS AND CONSERVATION

Core Courses

SOIL 601	Research Methods	3
SOIL 605	Soil Physics	3
SOIL 606	Soil-Plant-Water Relationships	3
SOIL 608	Soil and Water Conservation	3
SOIL 612	Instrumentation and Methods of Soil/Plant Analysis	3
SOIL 630	Seminar I	3

Electives

SOIL 602	Soil Fertility and Plant Nutrition	3
SOIL 603	Soil Chemistry	3
SOIL 604	Soil Mineralogy	3
SOIL 607	Soil Microbiology	3
SOIL 609	Soil Biochemistry	3
SOIL 610	Independent Study	3
SOIL 611	Soil Survey and Classification	3
SOIL 613	Soil Genesis and Morphology	3
SOIL 614	Advanced Soil Physics	3
SOIL 615	Soil Pollution and Remediation	3
SOIL 617	Agricultural Systems Simulation and Modelling	3

SOIL MICROBIOLOGY AND BIOCHEMISTRY

Core Courses

SOIL 601	Research Methods	3
SOIL 603	Soil Chemistry	3
SOIL 607	Soil Microbiology	3
SOIL 609	Soil Biochemistry	3

SOIL 612	Instrumentation and Methods of Soil/Plant Analysis	3
SOIL 630	Seminar I	3

Electives

SOIL 602	Soil Fertility and Plant Nutrition	3
SOIL 605	Soil Physics	3
SOIL 606	Soil-Plant-Water Relationships	3
SOIL 608	Soil and Water Conservation	3
SOIL 610	Independent Study	3
SOIL 611	Soil Survey and Classification	3
SOIL 613	Soil Genesis and Morphology	3
SOIL 615	Soil Pollution and Remediation	3
SOIL 617	Agricultural Systems Simulation and Modelling	3

ENVIRONMENTAL SOIL SCIENCE

Core Courses

SOIL 601	Research Methods	3
SOIL 603	Soil Chemistry	3
SOIL 605	Soil Physics	3
SOIL 612	Instrumentation and Methods of Soil/Plant Analysis	3
SOIL 615	Soil Pollution and Remediation	3
SOIL 630	Seminar I	3

Electives

SOIL 602	Soil Fertility and Plant Nutrition	3
SOIL 604	Soil Mineralogy	3
SOIL 606	Soil-Plant-Water Relationships	3
SOIL 607	Soil Microbiology	3
SOIL 608	Soil and Water Conservation	3
SOIL 609	Soil Biochemistry	3
SOIL 610	Independent Study	3
SOIL 611	Soil Survey and Classification	3
SOIL 613	Soil Genesis and Morphology	3
SOIL 614	Advanced Soil Physics	3
SOIL 616	Soils, Atmosphere and Global Climate Change	3
SOIL 617	Agricultural Systems Simulation and Modelling	3

YEAR II

SOIL 600	Thesis	30
SOIL 640	Seminar II	3

M. AGRIC. WITH SPECIALIZATION IN SOIL SCIENCE

This is a twelve-month demand-driven programme of course work plus a long essay course

Courses are selected from those listed for the M.Phil. with the approval of the student's Supervisory Committee, Head of Department and the sponsoring organisation. This programme is concluded with a short 3-month Dissertation.

COURSE DESCRIPTIONS

SOIL 601 RESEARCH METHODS

Experimental design, correlation and regression analysis, use of orthogonal polynomials in regression analysis, functional analysis of variance or method of orthogonal coefficient, mean separation, confounding, transforming, curve fitting techniques, computer use in statistical analysis. This course may also be taken from other Departments offering Research Methods or Biometry with contents similar to the above.

SOIL 602 SOIL FERTILITY AND PLANT NUTRITION

Description of soil-plant continuum. Plant system: plant root-uptake-trans-location of nutrients. Mechanism of nutrient absorption and translocation. Absorption: passive entry space into the roots-the "outer space" Donnan free-space and "apparent free space" (osmosis, diffusion, mass flow, cation exchange). The carrier hypothesis: active or metabolic entry into the roots " the inner space." Solute transport at the cellular level, energy sources for active transport, driving force, symplast and apoplast, the xylem and phloem pathways. Role of organic matter in soil-fertility. Evaluation of soil nutrient supply (laboratory, greenhouse and field methods). Radioactive tracer techniques. Fertilizers: their efficient use, environmental effect and evaluation. Interaction of plant nutrients in a high-yield agriculture. Building maximum-yield system. Cropping system, and soil management.

SOIL 603 SOIL CHEMISTRY

Characterisation and soil system: SOLID PHASE: Structure and composition of silicate minerals, layer silicate groups, amorphous silicates, oxides and hydroxides. Electrical characteristics of soil/water interface, origin and distribution of charges on soil colloid surface, double layer theory, surface activity, point zero charge, ions exchange. Liquid Phase: Composition, concentrations, activities and activity coefficients, solid phase/liquid interphase, oxidation and reduction in submerged soils, redox potentials. Principles and practice of Soil Science, nutrient supply, soil acidity: active and potential acidity, production and development of soil acidity, lime requirement, mechanism of cation an anion fixation in soils, ammonium, potassium and phosphorus sorption and desorption, solubility product principle. Nutrient potentials: lime phosphate and potassium potentials, intensity, capacity and rate factors of nutrient availability and uptake. Salinity, drought tolerance, nutrient uptake under stress conditions and genotypic differences.

SOIL 604 SOIL MINERALOGY

Review of crystal chemistry and mineral structures: Types of bonding and ionic arrangements, geometry of crystal patterns, structural classification of soil minerals; Minerals in soil environment; Clay mineralogy, phyllosilicates, allophanes-imogolites; Soil mineral separations and characterisation: fractionation techniques, x-ray diffraction, infrared spectroscopy, thermal analyses, surface area; microscopic and sub microscopic techniques, Structural formula calculations; Interactions of soil minerals with microbes and natural organics; Applications of clay minerals in agriculture, industry and environmental management.

SOIL 605 SOIL PHYSICS

Composition of soils, interaction of soil and water, soil water potentials,

potential diagrams and soil water retention; Principles of water movement in soil: Darcy's Law, distribution of water in soils, infiltration; Soil structure, physical, chemical and biological agents in soil aggregation, soil consistency and strength, effect of soil physical properties on root growth; Management of soil water: water storage in soils, soil water balance, concepts of water extraction by plant roots; Chemical transport in soils: leaching of chemicals (sorbed and non-sorbed) through the soil, mass flow and diffusion, irrigation water quality, soil salinity and its control.

SOIL 606 SOIL-PLANT-WATER RELATIONSHIPS

Systems approach to the study of soil-plant-water–atmosphere continuum (SPAC). Processes of plant growth and development; Transport laws: gas and radiation laws, fluxes of heat, gases and wind, momentum transfer; Environmental factors affecting plant growth: temperature radiation, wind and water, Significance of water for plant growth. Agro-climatology: methods of estimating evapotranspiration: empirical, micrometeorological and water balance methods; Agro-hydrology, irrigation and drainage.

SOIL 607 SOIL MICROBIOLOGY

Microbial ecology, Biotic and abiotic factors affecting soil microbial activity, major groups of micro organisms occurring in soils, The inter-relationship- symbiosis, Transformations of S, Fe and Mn in Soil, Basic principles of pesticides microbiology. Problems of environmental pollution. Rhizobiology, biology and microbiology of azolla, Mycorrhiza.

SOIL 608 SOIL AND WATER CONSERVATION

Soil structure, soil strength and aggregate stability: methods of assessment. Physics of rainfall: rainfall intensity, rainfall prediction models and rainfall erosivity. Infiltration and runoff. Soil erosion processes: soil detachment by raindrop impact, soil erodibility, sediment transport and deposition. Types of erosion and control methods. Erosion models: USLE, WEPP AND GUEST, etc. Water conservation methods: mulching, tillage, rain harvesting.

SOIL 609 SOIL BIOCHEMISTRY Source of soil organic matter, Biological mediators of soil organic matter transformation, Humification and organic matter stability, Biochemistry of Lignin decomposition, formation and decomposition of humic substances, Soil organic matter as plant nutrient reservoir, organic matter and soil physical structure, current and future concern of organic matter management. Sources of soil pollution: Agricultural Sector-pesticides and chemical fertilizers, industrial and mining operations, Heavy metal pollution in soil, Urban and domestic waste management, methodology of assessing pollution levels in soils.

SOIL 610 INDEPENDENT STUDY

Directed research on a specific area in soil science resulting in a term paper.

SOIL 611 SOIL SURVEY AND CLASSIFICATION

Principles of soil classification, soil as a population: categories and classes, single and multiple category systems, natural and technical classification, U.S.D.A. Soil Taxonomy, F.A.O legend, Charter's (Ghana) classification system, French and other classification systems. Geomorphic processes in relation to pedogenesis and soil survey, scales and the various kinds of soil map,

detailed and reconnaissance soil surveys, soil mapping units: phases of series, associations, complexes and undifferentiated groups, stages of soil survey: work plan, preliminary studies, legends, mapping, field review, correlation and publication, cartographic principles, relationship of maps and legends benchmark soils, practical exercises in soil survey: use of basic survey equipment, base maps (topographical maps, aerial photo and satellite images), site characterisation.

SOIL 612 INSTRUMENTATION AND METHODS OF SOIL PLANT ANALYSIS

Field and laboratory methods of soil/plant analysis: sampling, sample preparation and analyses, routine and special methods of soil/plant analyses, scientific data analysis and report writing; Basic understanding of principles of photometry, spectrometry, absortiometry, microscopy and defractometry, radioisotopes, stable isotope techniques and differential thermal analyses in soil and plant studies, Design and construction of simple equipment for measuring soil and plant properties.

SOIL 613 SOIL GENESIS AND MORPHOLOGY

Geology of West Africa with particular reference to Ghana, Pleistocene geology in relation to pedogenesis, Reactions and processes in progressive soil development, plinthite, petroplinthite (pans), petroferric contact, nodules, concretions, calculations in soil formation, evaluation of mineral weathering, stability of minerals, Soil structure, genesis of soil structure, Soil micro morphology: soil sampling procedures and preparation of thin sections, basic concepts of soil thin section descriptions, role of soil micro morphology in soil research.

SOIL 614 ADVANCED SOIL PHYSICS Soil water: water and soil in equilibrium, structure of water forces and energy; Movement of water in soils: saturated flow: Darcy's law and Laplace equation, fundamental concept of unsaturated flow, differential equations of unsaturated flow and their solutions, diffusivity, infiltration, Philip's solution for horizontal and vertical infiltration; Onsager's relation and coupled flow processes; Solute movement in soils; Gaseous diffusion in soils: Fick's law and the differential equation of gaseous diffusion, transient state diffusion of oxygen in soils; Soil temperature: Fourier's Heat flow law, determination of heat flux in soils, thermal conductivity in soil, simulation heat, water and solute transport in soils.

SOIL 615 SOIL POLLUTION AND REMEDIATION

Heavy metals and radio-nuclides in soils and sediments: definition of heavy metals, hazardous elements in soils and sediments, (cadmium, lead, zinc and iron): mining and smelting sites, landfill sites, sewage sludge; Accumulation of hazardous elements in plants; Treatment of contaminated land, radio-nuclides in the soil and the environment.

SOIL 616 SOILS, ATMOSPHERE AND GLOBALCLIMATE CHANGE

Physical and chemical properties of the atmosphere, radiatively active gases, carbon dioxide, carbon cycles, soil carbon and CO2 fluxes, carbon sequestration in soils, methane and methane flux from soil, nitrogen cycle, flux of nitrogen oxides from soils, other gases, eolian dust; Changes in global climate: trends in global mean land-air and sea surface temperatures.

SOIL 617 AGRICULTURAL SYSTEMS SIMULATION AND MODELLING

Introduction to agricultural systems analysis: systems and flow diagrams, components a system, stages of model building, types and properties of models, applied computing and simulation using DYNAMO; Crop growth models: modelling root growth and root water extraction, modelling the effects of water stress on plant growth; water production functions, Some simulation models of plant growth and cropping systems, e.g. QUEFTS, DSSAT, etc.; Simulation of climate variables: models of rainfall, temperature and radiation.

SOIL 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

SOIL 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

DEPARTM ENT OF AGRICULTURAL ENGINEERING

The Department offers the following programmes :

i. M.Phil
ii. M.Agric
iii. Ph.D

With specialization in Soil and Water Engineering.

M.PHIL SOIL AND WATER ENGINEERING

YEAR I

Core Courses		Credits
AGEN 601	Agrohydrology	3
AGEN 602	Soil and Water Conservation Engineering	3
AGEN 603	Field Surveying for Land and Water Management	3
AGEN 604	Field Engineering	3
AGEN 607	Farm Irrigation Systems Design	3
AGEN 608	Computer Applications	3
AGEN 611	Engineering Research Methods / Any appropriate course	3
GEOG 604	Remote Sensing and Geographical Information Systems	3

Electives

6 - 12 credits will be selected from the under listed and from other areas in consultation with the Departmental Advisory Committee and Head of Department.

AGEN 605	Agrometeorology	3
AGEN 606	Land and Water Quality	3
AGEN 609	Aquaculture	3
AGEN 610	Independent Study	3
AGEN 612	Discharge Measurement Structures	3
AGEN 613	Project Analysis	3
AGEX 611	Rural Sociology	3

YEAR II

AGEN 600	Thesis	30
AGEN 620	Seminar I	3
AGEN 630	Seminar II	3

M. AGRIC. WITH SPECIALIZATION IN AGRICULTURAL ENGINEERING

(This is a twelve month demand-driven programme of Course Work plus a long Essay)

COURSE DESCRIPTIONS

AGEN 601 AGROHYDROLOGY

Role of hydrology in Agriculture. Analysis of hydrological processes such as Evaporation, Transpiration, Infiltration etc. Rainfall and Meteorological data collection; equipment descriptions for major meteorological variables, installation and maintenance, siting and operation of rain gauge networks.

Catchment characteristics. Measurement of Run-off: Theoretical estimates, Sedimentation Data Collection. Water Harvesting and Structures, Analysis of Data: Run-off data, Non-Statistical and Statistical Analysis, Rainfall and other Meteorological data; rainfall/run-off relations etc. Water Level Recording Instruments.

AGEN 602 SOIL AND WATER CONSERVATION ENGINEERING

Conservation and the Environment; Erosion, Gully erosion, Sedimentation, and Control Practices,

Design setting out in the field, and construction of Bunds, Channels, and Vegetative ways and other Field Structures. Terracing. Flood control, Surface and sub-surface drainage. Earth Embankments and Farm Ponds. Geophysical Exploration Drilling Methods, Artificial recharge concepts for Ground Water Supply; Hydraulics of wells; Construction of wells. Pumps and pumping systems.

AGEN 603 FIELD SURVEYING FOR LAND AND WATER MANAGEMENT

Basic Surveying Techniques. Instruments for chain surveying, Errors, Obstacles, Measurement of angles, etc. Levelling: Types of Instruments, operation and adjustments. Procedure for levelling. Booking Methods. Contouring Methods characteristics, Interpolation and Extrapolation and uses of contours. Earth-works calculations including land levelling for Surface Irrigation Systems. Designing, staking out and construction of channels.

AGEN 604 FIELD ENGINEERING

Soil Survey: Codes for mapping survey from aerial photographs. Land classifications. Land development, Planning and operation of machinery. Clearing and levelling. Levelling for Irrigation. Reclamation: Water logged soils, saline soils, eroded soils. Run-off, Rational formula, Cooks Method USC Method etc. and stream flow measurements. Methods of flow measurements; velocity area, float gauging, chemical gauging. Artificial controls for flow measurements: Flumes, Parshall, Weirs, V-notch, Triangular Broad crested etc. Estimating Yield & Water Storage: Earth dams: Planning, Site location and selection etc. Estimating quantities: Storage capacity, Earth-works, Spillway/types, design of; Flood routing, Embankment or Dam Wall, Slopes, Crest, Width, protection and Construction. Small Weirs; Off Stream Storage Systems.

AGEN 605 AGROMETEOROLOGY

Introduction to Meteorological Instruments and Data Collection, Weather Forecasting and Analysis. Atmospheric dynamics, Radiation etc. Physical Climatology: Causes of Climatic Phenomena including Heat and Water Balance of the Earth's Atmospheric System and the Application of the Physical Principles involved in Agroclimatology and Hydrology.

AGEN 606 LAND AND WATER QUALITY

Water Quality Requirements for Domestic, Industrial, Agricultural, Recreational and Wild Life Water Uses. Properties of Natural Surface and Ground Waters. Field Measurement of Sediments: Equipment, Data Collection and Laboratory Analysis Chemical and Biological Constituents in Water. Salinity and Salinity control, Factors determining land and water quality for Agricultural use in general and irrigation in particular. Non point sources of water pollution: Transport of water borne pollutants and method of analysis.

AGEN 607 FARM IRRIGATION SYSTEM DESIGN

Irrigation Requirements and Scheduling Plant-Soil-Atmosphere Relations Consumptive Use and Evapotranspiration Measurement and Calculation: Water for Irrigation: Sources of Water. Water quality and quantity; Water Law, Riparian Rights. Pumps: Performance, selection etc. Surface, Irrigation System: Delivery effectiveness etc. Design of Surface Irrigation Systems, Irrigation structures. Sprinkler Irrigation System; Types, Components, Performance, Design and Operation. Trickle Irrigation; Methods, System components, control of Clogging etc. Flow measurement.

Salinity and salinity Control. Drainage systems

AGEN 608 COMPUTER APPLICATIONS

This course deals with:

i. Computer operating systems,
ii. Construction and use of flow charts and algorithms to solve problems,
iii. The nature and uses of various spread sheet, software, word processing, data management, graphics, statistical and engineering software. Hands-on assignment are emphasized. Participants in the course are expected to use the computer to prepare and present their thesis.

AGEN 609 AQUACULTURE

Site selection and Engineering studies including- Considerations in the selection of sites for aquaculture systems, Hydrological, Hydraulic, Soils, etc. Input load in design and operation. The design and construction of freshwater fish farms: Principles, Hydraulic Formulae preparation of plans, Const Estimates, Tendering etc. Problems of construction and maintenance. Design of fish Hatcheries, raceways, cages and other flow-through systems. Re-circulation systems, Mechanization of Fish Farm Operations. Economic aspects of Aquaculture. Health aspects in Aquaculture Planning.

AGEN 610 INDEPENDENT STUDY

A directed Library/Field Study/design on a specific area in Agricultural Water Management. The student should be in good standing or with the consent of the Head of Department in consultation with the Graduate Advisory Committee of the Department.

AGEN 611 ENGINEERING RESEARCH METHODS

Engineering research Process, Drafting research Proposals, Design of Questionnaire, Research Report Writing, Nature of Statistics. Time series and Cross-sectional Data. Experimental design, Correlation Regression analysis, etc. Computer Programming.

AGEN 612 DISCHARGE MEASUREMENT STRUCTURES

Basic Hydraulics; Continuity, Equation of motion, Hydrostatic pressure Distribution. Total Energy, Specific Energy. Critical flow, Flow through pipes. Open channel Flow. Broad-crested weirs. Sharp-crested weirs, Flumes, Orifice. Miscellaneous structures.

AGEN 613 PROJECT ANALYSIS

General project concept, Project cycle, Project Preparation and analysis, problems associated with agricultural projects. Identification of costs and benefits. Financial analysis, economic analysis and measures of project worth. Project implementation, control and management. Case studies and project site visits.

AGEN 620 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

AGEN 630 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

DEPARTMENT OF BIOCHEMISTRY, CELL AND MOLECULAR BIOLOGY

Programmes:
M.Phil and PhD degree programmes are available to interested candidates at the Department of Biochemistry, Cell and Molecular Biology

Departmental Requirement:
To be admitted to a graduate degree programme in Biochemistry a candidate must have obtained a good first degree in Biochemistry, Chemistry or other degree programmes with adequate biochemistry content.

YEAR 1

Core Courses

BCHM 601	Molecular Biology	3
BCHM 602	Gene Cloning and Expression	3
BCHM 610	Special Topics	2
BCHM 620	Molecular Biology Practical	2
BCHM 630	Data Analysis, Writing and Scientific Presentation I	3
FDSC 601	Experimental Design and Data Analysis	3
FDSC 630	Scientific Reporting and Presentation Techniques	3

Electives

BCHM 604	Principles and Applications of Biotechnology	3
BCHM606	Mitochondrial Biochemistry	3
BCHM 612	Neurotransmitters	3
BCHM 613	Mechanism of Action of Antimicrobial Compounds	2
BCHM 615	Signal Transduction	3
BCHM 616	Advanced Protein Biochemistry	3
BCHM 617	Advanced Enzymology	3
BCHM 618	Secondary Plant Metabolites II	3
BCHM 621	Molecular Biomarkers of pollution	3
BCHM 623	Secondary Plant Metabolites I	2

YEAR II

BCHM 600	Thesis	30
BCHM 640	Data Analysis, Writing and Scientific Presentation II	3

COURSE DESCRIPTIONS

BCHM 601 MOLECULAR BIOLOGY

General review of nucleic acids: Structure and function; DNA replication, repair and recombination, site-directed mutagenesis, transcription, including splicing, capping, polyadenylation, transcription factors, translation (regulation e.g. Operon theory). Basic concepts and techniques of DNA technology: Escherichia coli, plasmids and bacteriophages. Extraction and analysis of DNA and RNA; Enzymatic manipulation of DNA with restriction endonucleases. Southern and Northern blotting techniques; Polymerase Chain Reaction (PCR), Restriction Fragment Length Polymorphisms, DNA fingerprinting. Construction of genomic and cDNA libraries. Chemical synthesis of oligonucleotides; screening of gene libraries using radiolabeled oligonucleotides or DNA probes. Non-radioactive labeling.

BCHM 602 GENE CLONING AND EXPRESSION

Construction and Analysis of cDNA and genomic libraries. Preparation of radiolabeled DNA. Synthetic oligonucleotide probes: uses, purification, and radiolabeling, hybridization. Screening of expression libraries with Oligonucleotides or antibodies. DNA sequencing; site directed mutagenesis. Polymerase chain reaction (PCR). Expression of cloned genes in E. coli, Baccilus, yeast and mammalian cells. Transformation. Expression vectors/hosts. Detection and analysis of proteins expressed from cloned genes, Western blotting; inclusion body formation. Application of recombinant DNA technology in Agriculture, Health and Industry.

BCHM 604 PRINCIPLES AND APPLICATIONS OF BIOTECHNOLOGY

Diagnositics, Genomics and Gene therapy-Preparation and uses of molecular tools for clinical diagnostics, monoclonal antibodies, enzyme-linked immunoassays (ELISA) DNA fingerprinting and PCR vaccine development, bioassays and therapeutic products derived from genetic recombinant proteins e.g. growth factors, insulin. Secondary metabolites e.g. antibiotics and anti-parasitic drugs. Uses and applications of genetic databases for human, pathogens and vectors in genetic disease diagnosis, detection and therapy. Chemical/microbial production of organic chemicals from renewable resources, bio-oxidation of gold sulfide ores in mining, treatment of biological waste in methane production (biogas), industrial enzymes e.g. proteases such as papain and amylases (brewing), immobilized enzyme, alkaline proteases (detergents). Genetically modified foods/organisms, insect pest control, transgenic plants, nutrient enrichment strategies legal/ethical issues – biosafety, benefit sharing, intellectual property rights.

BCHM606 MITOCHONDRIAL BIOCHEMISTRY (3 Credits)

Review of mitochondrial oxidative phosphorylation: Mitochondrial ATP synthesis; the chemiosmotic theory, measurement of mitochondrial respiration, efficiency and plasticity of mitochondrial energy transduction. Defects in mitochondrial oxidative phosphorylation: Inefficiency in mitochondrial oxidative phosphoryation, proton leak (mitochondrial uncoupling) and redox slip; measurement of mitochondrial proton leak, significance of mitochondrial proton leak, mechanisms of mitochondrial proton leak, the uncoupling proteins: UCPs 1, 2, 3, 4 etc; mechanism of action, regulation and physiological importance. Functions of mitochondrial proton leak: obesity, cachexia and thermogenesis. Role of mitochondria in growth and development: Mitochondria and Ageing; theories of ageing (e. g. the rate of living theory, the free radical

theory), mitochondria and ageing, mitochondria and Apoptosis, mitochondria and eschemia reperfusion, the permeability transition pore. Mitochondria and cellular signalling: Nitric oxide and cellular regulation, superoxides and cellular regulation. Mitochondria and some common diseases: Diabetics; uncoupling proteins and diabetics, mitochondria and cancer, mitochondria involvement in parasitic diseases; HIV, Malaria, Schistosomiasis etc, Mitochondrial DNA mutations: The mitochondrial DNA, The inheritance of the mitochondrial DNA, Mitochondrial mutations and neurodegerative diseases. Mitochondria and inheritance or evolution: the African eve, mitochondria and forensic science, mitochondria and the haplogroups; the importance of the haplogroups in evolution.

BCHM 610 SPECIAL TOPICS

Long essays and seminars on current topics of interest to biochemistry.

BCHM 611 PARASITE BIOCHEMISTRY AND HOST DEFENSE MECHANISM

The life cycles and the biochemistry of causative organisms of the following tropical parasitic diseases: malaria, onchocerciasis, schistosomiasis and trypanosomiasis. Host defence mechanisms and the evasive mechanisms of parasites. Parasite antigens and antibody production.

BCHM 612 NEUROTRANSMITTERS

The structure, biosynthesis, degradation and mechanism of action of chemical messengers in the central and peripheral nervous system: e.g. acetylcholine, gamma-aminobutyrate, dopamine and the peptide transmitters. Excitatory and inhibitory neurotransmitters. Biochemical reactions and the movement of ions in the transmission of nerve impulse. Stimulus-response coupling via Ca++. Factors affecting cytosolic Ca++ concentrations; calcium ionophores; receptor- and voltage-operated calcium channels; Calcium binding proteins.

BCHM 613 MECHANISM OF ACTION OF ANTIMICROBIAL COMPOUNDS

Chemotherapy and chemoprophylaxis of parasitic diseases. Principles of selective toxicity . Chemical structure, mode of action and toxicity of chemotherapeutic agents. Mechanisms of drug resistance. Drug development.

BCHM 615 SIGNAL TRANSDUCTION

Different pathways for coupling response to stimulus, involving (i) cyclic nucleotide (ii) DAG/IP3 (III) tyrosine kinase activation (iv) phospholipase A2 activation, (v) de novo synthesis of response proteins and (vi) small inorganic molecules e.g. Nitric oxide (NO)

BCHM 616 ADVANCED PROTEIN BIOCHEMISTRY

Physical properties of protein; size, shape composition. Separation techniques: chromatography electrophoresis. Protein structure and stability; secondary, tertiary and quaternary structure; conformational dynamics, water exchange, dynamics of protein folding. Protein structure prediction: hydropathy distances, environment, interactions, fluorescence spectroscopy, Raman spectroscopy, NMR, ESR, spectroscopy.

BCHM 617 ADVANCED ENZYMOLOGY

Steady state and pre-steady state: steady state enzyme kinetics; methods for identifying kinetic mechanisms; isotope exchange rates; multiple substrate kinetics; kinetic techniques in enzymology; stop flow methods, relaxation (temperature jump) methods; intra- and

extra cellular enzymes. Fast reactions: Application and importance to biochemistry; reactions between proteins and small molecules. Protein-ligand binding measurement; analysis of binding isotherms; cooperativity; Hill and Scatchard plots; kinetics of allosteric enzymes. Industrial production uses of enzymes; enzyme stabilization and immobilization; their effects on kinetics; enzyme reactors; type of bioreactors.

BCHM 618 SECONDARY PLANT METABOLITES

Natural products derived from the acetate-malonate and acetate-mevalonate pathways: biosynthesis, degradation, importance and/or bioactivity of unusual fatty acids and lipids; polyacetylenes, thiophenes, polyketides, terpenoids and steroids. Natural products derived from the shikimic acid pathway and mixed-biogenesis and nitrogen-containing natural products: biosynthesis, degradation, importance and/or bioactivity of oxygen heterocyclics, amino acid-derived compounds; alkaloids, porphyrins, purines and pyrimidines. Techniques: for isolation of secondary plant metabolites.

BCHM 620 MOLECULAR BIOLOGY PRACTICALS

A practical laboratory session to expose students to modern techniques and methods of isolation, purification, analysis and manipulation of genetic material of different organisms.

BCHM 621 MOLECULAR BIOMARKERS OF POLLUTION

Biotransformation reactions for eliminating organic xenobiotics: details of the NADPH-dependent monooxygenase reaction; cytochrome P450 induction; conjugation reactions. Metal toxicity and induction of metallothioneins. Stress proteins. Genomic Markers. Measurement of induced proteins.

BCHM 623 SECONDARY PLANT METABOLITES I

Compartmentation and stereochemical aspects of product biosynthesis; turnover and degradation; relation to general plant development; tissue culture and the study of secondary metabolism; secondary metabolites and their role in biochemical plant pathology and ecology.

BCHM 630 DATA ANALYSIS, WRITING AND SCIENTIFIC PRESENTATION I

In year 1, each student in the Department is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

BCHM 640 DATA ANALYSIS, WRITING AND SCIENTIFIC PRESENTATION II

For year 2 each student will make a presentation after the Year I examinations on his/her thesis Research Proposal and also present a progress report midway into the second semester. In addition each student is expected to attend all Departmental seminars. These will be assessed for 3 credits.

DEPARTMENT OF BOTANY

M.PHIL PROGRAMME

The M.Phil Botany programme has 7 areas of specialization.

Plant Anatomy
Genetics
Plant Ecology and Conservation
Fungal Physiology, Soil Microbiology and Plant Pathology
Plant Physiology
Plant Taxonomy
Plant Biodiversity

For each programme, there are 2 seminars, one in Year I (BOTN 650) and a second in Year II (BOTN 660)

PLANT ANATOMY

Core Courses

BOTN 601	Vegetative Plant Anatomy	4
BOTN 602	Anatomy of the Flower, Fruit and Seed	4
BOTN 603	Applied Plant Anatomy	4
BOTN 604	Cytology	4
BOTN 605	Plant Anatomical Methods	4
BOTN 661	Biometry	2

Additional courses from Ecology and Plant Taxonomy will be selected in consultation with supervisor

ECOLOGY

Core Courses

BOTN 611	Autecology	3
BOTN 612	Environmental Studies	4
BOTN 613	Ecological Methods	4
BOTN 614	Population Ecology	4
BOTN 615	Synecology	3
BOTN 616	Conservation of Biological Resources	3
BOTN 661	Biometry	2

Additional courses from other areas will be selected in consultation with supervisor

GENETICS

Core Courses

BOTN 621	Cytogenesis	4
BOTN 622	Plant Breeding and Evolution of Crop Plants	4
BOTN 623	Plant Molecular Genetics, Genetic Engineering and Biotechnology	4
BOTN 624	Genetic Resources	4
BOTN 625	Biometry for Genetics	4
BOTN 626	Linkage and Biometrical Genetics	4
BOTN 627	Population Genetics	4
BOTN 661	Biometry	2

Additional courses from other specialization will be selected in consultation with supervisor

FUNGAL PHYSIOLOGY, SOIL MICROBIOLOGY AND PLANT PATHOLOGY

Core Courses

BOTN 631	Flowering Plant Parasites of West Africa	3

BOTN 632	Introduction to Disease Management	3
BOTN 633	Modern Trends of Fungal Plant Pathology	3
BOTN 634	Plant Virology and Nematology	4
BOTN 635	Physiology of Fungi	4
BOTN 636	Modern Trends in Fungal Biotechnology	4
BOTN 637	Microfloral Activities in Soil Ecosystem	4

Additional courses from Plant Physiology and Genetics will be Selected in consultation with supervisor

PLANT PHYSIOLOGY

Core Courses

BOTN 642	Plant Growth and Development	4
BOTN 646	Seed Physiology	4
BOTN 647	Experimental Design	3
BOTN 648	Plant Biochemistry	4

Electives

BOTN 641	Environmental Effects on Plant Growth and Developmen	3
BOTN 643	Photomorphogenesis	3
BOTN 644	Quantitative plant Physiology	3
BOTN 645	Plant Tissue Culture and Biotechnology	3
BOTN 649	Resource Restoration, Maintenance and Germplasm Conservation	3
BOTN 663	Computer Science	1

Candidates to select any 3 additional courses form 641 to 649 as well as from Plant Pathology in consultation with Supervisor.

PLANT TAXONOMY

Core Courses

BOTN 651	Principles of Taxonomy	3
BOTN 652	Approaches of Taxonomy	3
BOTN 653	Taxonomic Data	3
BOTN 654	Practical and Applied Taxonomy	3
BOTN 655	Botanical Nomenclature	2
BOTN 656	Plant Systematics II: Gymnosperms	3
BOTN 657	Botanical Nomenclature	2

Electives

BOTN 602	Anatomy of the Flower, the Fruit and the Seed	4
BOTN 616	Conservation and Biological Sciences	3
BOTN 624	Genetic Resources	4

BOTN 663	Computer Science	1

PLANT BIODIVERSITY

CREDITS

Core Courses

BOTN 614	Population Ecology	4
BOTN 654	Practical and Applied Taxonomy	3
BOTN 664	Case studies and research reports	4
BOTN 665	Diversity in terrestrial and aquatic ecosystems	4
BOTN 667	Diversity in agro-ecosystems	3
BOTN 669	Protocols and policies on plant diversity	3
BOTN 671	Conservation methods	2
BOTN 627	Sustainable management of plant genetic resources	2

Additional courses from other MPhil Botany courses could be selected in consultation with supervisor.

YEAR II

BOTN 600	Research and Thesis	30
BOTN 660	Seminar II	3

COURSE DESCRIPTIONS

A. PLANT ANATOMY

BOTN 601 VEGETATIVE PLANT ANATOMY

The protoplast. The Cell Wall. Meristems and differentiation. Apical Meristem. The Vascular Cambium. The Epidermis. Parenchyma. Collencyma. Sclerenchyma. Xylem. Phloem. Secretory structures. The Periderm. The Stem. The Leaf. Anomalous Structure.

BOTN 602 ANATOMY OF THE FLOWER, FRUIT AND SEED

The Flower, Concept; Structure; Origin and Development; Abscission. Palynology. Embryology. The Fruit: Definition and Classification; Fruit wall and Periocarp; Histology of the Fruit Wall; Abscission. The Seed: Seed in relation to Ovule; Embryo; Storage Tissue; Seed coat; Nutrition aspects in relation to seed development.

BOTN 603 APPLIED PLANT ANATOMY Anatomy of timbers. Dendrochronology. Ecological plant anatomy: adaptive features of mescophytes. Xerophytes. Hydrophytes; applications; sun and shade leaves. Palynology. Embryology. Economic aspects of applied plant anatomy (Identification and classification): Taxonomic application; Phytogenetic application; Medicinal plants - pharmacognosy; Food adulterants and contaminants; Animal feeding habits; Present day wood; wood in archaeology; Wood products; Forensic applications. Pathological plant anatomy; Anatomical changes in response to pathogens and parasites. Anatomical changes in teratology.

BOTN 604 CYTOLOGY

Cytological techniques; Pixation; Cytological methods - fluorescence microscopy, metachromasia, Histochemistry, Histoimmunulogy, Autoradiography, Tissue culture, Biological computing, Cytophotometry, Instrumentation; Optical microscopy (phase contrast, interference microscopy), electron microscopy, x-ray microscopy, x-ray diffraction. Protoplasm. Viruses and prokaryotes. Extraprotoplast material; the cell wall. Plasma membrane, phagocytosis, and pinocytosis. Endoplasmic reticulum. Golgi apparatus. Ribosomes. Hitochondria. Plastids. Lysosomes and related bodies. Cilia and flagella. Microtubules; cytoskeleton. Vacuoles. Crystals. The nucleus. Metaphase chromosomes and sets. Mitosis and related cytology. Cytogenetics and reproductive cells. Developmental and molecular cytology. Alternative interpretations of the cell; organelles as Intrinsic organelles or as symbionts.

BOTN 605 PLANT ANATOMICAL METHODS

Microscopy; Microtechnique; Photomicrography; Nomarski interference Microscopy; introduction to scanning electron Microscopy; introduction to Transmission Electron Microscopy.

B. ECOLOGY

BOTN 611 AUTECOLOGY

Plant and water (effects on plant growth and development and on distribution). Adaptations of mesophytes, xerophytes. Hydrophytes; adaptations of halophytes. Plant and light. Sun and shade leaves. Plant and temperature. Plant and fire. Raunkiaerian life forms. Ecology of flowering and pollination; plant and pollinator interactions. Phenology Adaptive strategies of witchweed (Striga hermonthica), (Eichhornia Crassiped), Tapinanthus bangwensis, Sian weed (Chromolaena Odorata).

BOTN 612 ENVIRONMENTAL STUDIES

Landmarks in the study of the Environment: Stockholm Conference; World Conservation Strategy; Our Common Future (Brundtland report); Planet Earth in Jeopardy; Caring for the Earth; Agenda 21; Ascend 21; The Biodiversity Convention; The Climate Change Convention; CITES, RAMSAR. Biodiversity theory. Other initiatives; Forest, CSD, Desertification. Ghana's Environmental Action Plan; reviews of the implementation of Ghana's Environmental Action Programme. Ghana's inventory of Biodiversity (including Genetic Resources). Greenhouse effect; Climate change. Likely impacts of climate change especially on agriculture and on health. Biogeochemical cycles Environmental (and health) Impact Assessment. Environmental management for vector control; the Volta Dam and the Weija Dam. Environmental education. Environmental law. Environmental policy Institutions in Ghana and international institutions concerned with environmental protection and conservation. Conservation; conservation of endangered species. Species survival. Genetic conservation. Global problem: Pollution and exptoxicology; Nuclear (radionuclides) pollution. Global problem: Release of genetically engineered organisms in the environment. Natural disasters; disaster preparedness. Interdisciplinary approaches to the definition and solution of environmental problems. Integrated River Basin Management; Densu Basin; Volta Basin; Senegal Basin; Zambezi Basin; Mekong Basion. Integrated Coastal Zone Management. COMA model for West Africa. Ecosystem restoration or rehabilitation. Agro-ecology. Principles of environmental economics.

BOTN 613 ECOLOGICAL METHODS

Photography; Field equipment for surveying and for measuring of meteorological factors; Field taxonomy: identification, collection for the herbarium

[An introduction to Remote Sensing Applications and GIS necessary]

BOTN 614 POPULATION ECOLOGY

Population ecology of the single species. Growth of single population. Application of Leslie Matrices to change in population composition. Tree demography; leaf demography. Interaction of two species. k- species interaction. Spatial patterns in 1-species population: aggregation. Diffusion, patterns of ecological maps. Spatial patterns of two or more species. Association between pairs of species. Segregation between 2 species; segregation among many species (n-phase mosaics); patterns in zoned communities. Many species populations: species abundance; species diversity, stability and resilience; ecological diversity; classification of communities; ordination of continuously varying communities; canonical variate analysis and multiple discriminant analysis. Population and habitat vibrant analysis (Lacy: see Species 25:1) Problems of mathematical bioeconomics: optimal management of renewable resources (Clark).

BOTN 615 SYNECOLOGY

Qualitative and quantitative description of vegetation. Life from classification of vegetation. Vegetation dynamics. Predation and herbivores. Vegetation of West Africa. History of vegetation; palaeobotany. Plant geography; plant distribution.

BOTN 616 CONSERVATION OF BIOLOGICAL RESOURCES

Biodiversity at the intraspecific (gene), species and ecosystem levels. Value of Biodiversity; problems in the economic valuation of biodiversity. Conservation of Biodiversity; conservation of endangered species. Species survival. Genetic conservation. Ecosystems restoration of rehabilitation. Agro-ecology.

C. GENETICS

BOTN 621 CYTOGENETICS

Mitosis and the karyotype; anomalies of mitosis; chromosome structure. Meiosis. Synapsis. Synaptinemal complex. Crossing-over. Chiasma formation and chromatid interference. Anomalous meiosis. Structural changes in chromosomes. Deficiencies. Duplications. Inversions. Interchanges. Oenothera cytogenetics. Changes in chromosome number. Aneuploidy. Polyploidy. Applications of polyploidy. Sex determination (chromosomal basis) Chromosome and karyotype evolution. Chromosomal polymorphisms and their role in evolution. The mucleolus.

BOTN 622 PLANT BREEDING AND EVOLUTION OF CROP PLANTS

Introduction. Implications of pollination mechanisms in plant breeding. Mode of reproduction in relation to plant breeding. Autogamy. Evolutionary aspects of autogamy. Mechanisms of autogamy. Management of pollination in autogamous crops. Controlled pollination. Allogamy. Sexual reproduction; Structures and functions. Control and modification of sex. Sex expression in some economic crops and crop improvement. Incompatibility. Male sterility. Polyploidy in plant breeding. aneuploidy in plant breeding. Mutation breeding.

BOTN 623 PLANT MOLECULAR GENETICS, GENETIC ENGINEERING AND BIOTECHNOLOGY

Molecular genetics and genetic engineering. Review of structure of DNA, RNA, Gene. Review of protein synthesis. Enzymes. Nucleases. Restriction enzymes. Enzymes used in Recombinant DNA Technology. Vectors and Hosts. Plasmids. Viruses. E. coli. Yeasts. Other hosts. Recombinant techniques. Basic concepts. Cutting and joining of DNA molecules. Cloning. Nucleotide sequencing and hybridisation. Applications: Applications in Biology and Medicine. Industrial application. Precautions and regulations. Non-recombinant genetic engineering. Techniques for plant biotechnology: Tissues culture methods; Agrobacterium-mediated transformations.

BOTN 624 GENETIC RESOURCES

The following main aspects, main levels and main stages of Genetic Resources will be treated: Levels of Action: International/regional, Subregional/National/District, Community. Group: Public sector, Private sector, NGO, Go. Aspects: Area Planning/Identification/Collecting/Conservation and Maintenance/ Evaluation/Documentation and Information/Exchange of materials/Enhance use /Financial & Economic/Monitoring/Training & Education/Legal and Legislative/Collaboration. Specific topics: Conventional and molecular approaches to breeding. Genetic resources/Genetic diversity. Varieties. Molecular and classical genetics. In Vitro culture. Cytology and ploidy. Reproductive behaviour. Evolution and taxonomy. Stress tolerance. Disease and pest resistance. Quality and yield components. Intellectual property rights. Bio-safety. Comment: Special attention will be paid to issues of particular Regions of the World: Africa, The West Africa, Ghana: Including indigenous knowledge and practices of genetic conservation.

BOTN 625 BIOMETRY FOR GENETICS

Biometry. Statistical methods: analysis of variance; factorial experimentation; multivariate analysis. Classification and ordination. Maximum likelihood method of statistical estimation. Algebra: matrix algebra; complex numbers. Calculus: maxima and minima; partial differentiation; differential equations; growth functions. Systems theory. Catastrophe theory. Chaos and fractals. Use of computers: DOS, word processing, spreadsheet, database, statistical packages, introduction to programming. Remote Sensing Applications and Geographical Information Systems (Physical basis of remote sensing; remote sensing programmes; image processing and interpretation; ground truthing; applications; nature of spatial data and their interpretation; geographical information systems; solution in spatial analysis).

BOTN 626 LINKAGE AND BIOMETRICAL GENETICS

Genetic linkage: detection and measurement of linkage; genetic mapping; interference metrics. Biometrical genetics; analysis of means, variances and covariances of parental and derived populations; estimation of number of genes controlling a metric character.

BOTN 627 POPULATION GENETICS

Population genetics: Hardy-Weinberg law and evolutionary factors; inbreeding; balanced Polymorphism: genetic distances between populations.

D. FUNGAL PHYSIOLOGY SOIL MICROBIOLOGY AND PLANT PATHOLOGY

BOTN 631 FLOWERING PLANT PARASITES OF WEST AFRICA

Occurrence, distribution and biology of mistletoes (Tapinanthus spp.) dodders (Cuscuta and Cassytha spp.) witchweed (Striga spp.) and Thonningia sanguinea in West Africa. Biological, cultural and chemical control methods and their appraisal. Pre-and post-harvest diseases of selected economic crops and their control.

BOTN 632 INTRODUCTION TO DISEASE MANAGEMENT

Systematic approach to diagnosis. Epidemiology; Dynamics of interacting pathogen and host populations; Effect of biotic and Physical factors on disease. Disease forecasting and epidemic modelling. Compound and Simple Interest Disease Practical disease Management in Ghana; Major groups of chemicals used in disease control. Biological control of plant pathogenic fungi.

BOTN 633 MODERN TRENDS IN FUNGAL PLANT PATHOLOGY

Including induction of host resistance by Elicitors, Phytoalexins, Host-selective host-specific toxins. Post infectinal structures and Plant Disease Resistance. Molecular interactions between pathogen and host plants.

BOTN 634 PLANT VIROLOGY AND NEMATOLOGY

The extraction and purification of plant viruses; Viral nomenclature; The ecology and transmission of plant viruses in Ghana; Factors influencing dispersal of viruses; History of the Cocoa Swollen Shoot virus in Ghana and the importance of the virus in the economy of Ghana; virus diseases of cassava, cowpea, maize and yam in Ghana. General structure of nematodes; The soil environment and nematode activity; Parasitism of plant nematodes; The principal genera of plant-infecting nematodes; Control measures; Importance of plant nematodes in agriculture in Ghana.

BOTN 635 PHYSIOLOGY OF FUNGI

Hormones in fungi, their role in morphogenesis and reproduction in the Myxomycetes, Zygomycetes, Ascomycetes and Basidiomycetes. Dormancy and germination of fungal spores. Effect of nutritional and environmental factors on vegetative growth and reproduction. Products of microbial metabolism including secondary metabolites, antibiotics, mycotoxins. Control of mycotoxins in foods. Advanced Topics in Food Mycology. Dispersal, arrival of fungal spores in foods and their control.

BOTN 636 MODERN TRENDS IN FUNGAL BIOTECHNOLOGY

Industrial Applications of Fungal Biotechnology.

BOTN 637 MICROFLORAL ACTIVITIES IN THE SOIL ECOSYSTEM

The soil biota; Ecology of soil bacteria, cyanobacteria, green algae and fungi; Microbial interactions and survival of the soil microflora; Microbiological processes and nutrient cycling; Root mucilages and their importance in soil; The nature and role of the rhizosphere phenomenon; Processes of nodulation and factors influencing noduldation; Bionitrogen fixation; Mycorrhizas; The importance of soil microflora in farming systems in Ghana; Techniques of soil microbiology.

E. PLANT PHYSIOLOGY

BOTN 641 ENVIRONMENTAL EFFECTS ON PLANT GROWTH AND

DEVELOPMENT

Soil as a substratum for plant growth - formation, texture, water holding capacity, incipient wilt, ion exchange, pH, permanent wilting percentage; role of water in plant growth and development - special properties of water, plant-water relations, transport of ions, water and organic materials in plants, water economy of plants, moisture stress (flooding, drought), salinity; role of light - over views of effects of quality, quantity and duration of light on plant growth and development, photo - morphogenesis); temp as a factor for plant growth and development - dormancy, germination, flowering, leaf abscission, leaf flush etc; effects of fire on soil nutrient status and plant growth, possible effects of fire on new leaf flush and stimulation of flowering; effects of pollutants on plant growth and development - 502, No (acid rain), liquid effluents HNO3, dyes, H2 50, H2 ,503 etc, heavy metals - lead (Ph), Mercury (Hg), arsenic (As) etc; effects of climate change - global warning on plant growth; dynamics of growth in single cells and whole plants.

BOTN 642 PLANT GROWTH AND DEVELOPMENT

The internal environment and plant growth and development. Methods and techniques for the extraction, separation, isolation, purification, identification and quantification of phytohormones in higher plants - auxins, gibberellins, cytokinins, ethylene and abscisic acid. Relationships between quantities of these phytohormones and physiological phenomena - eg, dormancy; leaf flush, senescence, leaf abscission etc; mechanism or mode of action of the above phytohormones.

BOTN 643 PHOTOMORPHOGENESIS

Light quality in different ecosystems - sensing of light in plants; Photorceptors - structure and physiology of action perception of light quality and quantity, directions; photoperiodism; selected responses to light - modulation of growth, phototropism, photomovement photocontrol of flavonoid biosynthesis, Photocontrol of seed germination; genetic approach to photomorphogenesis; interaction between pigment systems.

BOTN 644 QUANTITATIVE PLANT PHYSIOLOGY

A survey of the extent to which physiological processes and their interactions can be formulated in a quantitative manner and integrated to describe and model various aspects of plant behaviour including growth and yield biophysical concepts - use of thermodynamics to explain and model osmotic relations and water movements into single cells, among different cells and in whole plants, Michaelis - Menten equation for enzyme kinetics, role of diffusion, facilitated diffusion, mass flow (actuated by osmotic pressure or potential) in translocation of elaborated substances in the phloem (phloem transport) membrane transport; dynamics of growth single cells and whole plants.

BOTN 645 PLANT TISSUE CULTURE AND BIOTECHNOLOGY

History of tissue culture, concept of totipotency, the Cell Theory of Schwan, regeneration in plants: in situ and in vitro tissue culture methodology:- the tissue culture medium, shot tip and organ culture, anther culture, somatic embryogenesis, protoplast, culture, use of tissue culture in genetic conservation, rapid multiplication, somaclonal variation, mutation breeding, somatic hybridization. Gene transfer, plant transformation; tissue culture in biotechnology.

BOTN 646 SEED PHYSIOLOGY

Structure, composition of seeds; embryogenesis and storage tissue formation, regulation of seed

development; seed germination - cellular events, mobilization of storage reserves, control of mobilization; ecophysiological aspects of germination; dormancy and control of germination; agricultural and industrial uses of seeds and germination.

BOTN 647 EXPERIMENTAL DESIGN

Review of: variability and frequency distributions, measures of central tendency, estimation of variation, standard deviation; standard error; tests for significance; simple experimental design (single factor experiments) and analysis of variance, randomized design, randomized block complete block design; factorial experiments; a priori and a posteriori tests for significance - orthogonal comparisons Duncan's Multiples Range (DMR) test, SNK; Correlation and Regression.

BOTN 648 PLANT BIOCHEMISTRY

Metabolism of lipids, carbohydrates, organic acids, phenolic compound, and proteins; nitrogen and sulphur assimilatism respiration, photosynthesis, cell wall composition; biosynthesis of lignin, phytohormones etc.

BOTN 649 RESOURCE RESTORATION, MAINTENANCE AND GERMPLASM CONSERVATION

Exploration of the role of plant physiology in resource restoration, maintenance and germplasm conservation practices in Ghana, the biosphere reserve concept, use of physiological knowledge (orthodox and tissue culture) in: the collection, storage, maintenance, rapid multiplication (either by seeds or other propagules(and in buffer zone development etc.

F. TAXONOMY

BOTN 651 PRINCIPLES OF TAXONOMY

Classification, Taxonomy and Systematics. Concepts of taxa. Assessment of relationship, concept and practice: phenetic, phyletic, phytogenetic.

BOTN 652 APPROACHES TO TAXONOMY

Different classification approaches: history, thought and processes. Numerical Taxonomy. Cladistics.

BOTN 653 TAXONOMIC DATA

Types and sources of taxonomic data Relevance in classification. Data handling and presentation.

BOTN 654 PRACTICAL AND APPLIED TAXONOMY

Tools in Eiosystematics: variation and speciation plant identification. Herbarium techniques and field practice. Ethnobotany.

BOTN 655 BOTANICAL NOMENCLATURE

Sources and applications of plant names. The international code of Botanical Nomenclature: history, principles and provisions.

BOTN 661 BIOMETRY (FOR PLANT ANATOMY, ECOLOGY, GENETICS)

1. Statistical methods: analysis of variance; factorial experimentation; multivariate analysis. Classification and ordination. Algebra: matrix algebra; complex numbers.Calculus: maxima and minima; partial differentiation; differential equations; growth functions. Systems theory. Chaos and fractals.
2. For Genetics: Maximum likelihood method of statistical estimation.

BOTN 663 COMPUTER SCIENCE (FOR ECOLOGY, GENETICS AND PLANT ANATOMY)

Use of computers: DOS, word processing spreadsheet, database, statistical packages, introduction to programming. For Plant Anatomy and Ecology: Database for ecological, ethnobotanical and taxonomic information in the Ghana Herbarium.

G. PLANT BIODIVERSITY

Pre-requisite: BSc. (Botany) with electives in Taxonomy/Ecology or audit courses in BSc, Taxonomy and Ecology in MPhil 1.

BOTN 664 CASE STUDIES AND RESEARCH REPORTS

Case studies of terrestrial (forest and savanna), freshwater (natural and man-made) and marine ecosystems plus agro-ecosystems. Developing research reports using the case studies. Presentation and discussion of case studies.

BOTN 665 DIVERSITY IN TERRESTRIAL AND AQUATIC ECOSYSTEMS

Species identification (morphological and molecular), ecological survey techniques; data management and monitoring of ecosystems and plant genetic resources.

BOTN 666 SUSTAINABLE MANAGEMENT OF PLANT GENETIC RESOURCES

Sustainable utilization of biodiversity, Environmental Impact Assessment - case studies.

BOTN 667 DIVERSITY IN AGRO-ECOSYSTEMS

Species and varietal identification of agricultural species; social survey techniques; information management and monitoring of agro-ecosystems and plant biodiversity. Impacts of agro-ecosystems on nature especially plant biodiversity.

BOTN 669 PROTOCOLS AND POLICES ON PLANT BIODIVERSITY

International and National protocols an policies on plant genetic resources

BOTN 671 CONSERVATION METHODS (CREDITS)

In-situ and ex-situ conservation methods for plant genetic resources. SWOT Analysis of methods for in-situ and ex-situ conservation.

BOTN 614 POPULATION ECOLOGY (See Ecology)

BOTN 654 PRACTICAL AND APPLIED TAXONOMY (see Plant Taxonomy)

BOTN 650 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

BOTN 660 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

DEPARTMENT OF CHEMISTRY

The Department offers M.Phil programmes in the areas of Natural Products and Analytical (Environmental/Inorganic) Chemistry

CORE

CHEM 600	Thesis	30
CHEM 610	Practical/Mini Project	8 (2)
CHEM 630	Seminar 1	3
CHEM 632	Further Spectroscopy and Structure Elucidation	3
CHEM 634	Advanced Medicinal Chemistry	3
CHEM 640	Seminar 2	3
CHEM 671	Instrumental Methods of Chemical Analysis	3

PRESCRIBED ELECTIVES

CHEM 631	Either Synthetic Methodology	3
CHEM 651	Or Nuclear and Radiochemistry	3

ANALYTICAL/ENVIRONMENTAL/INORGANIC OPTION

Electives (A minimum of six (6) credits from the relevant group)

CHEM 612	Atomic Structures and Spectra	3
CHEM 614	Photochemistry	3
CHEM 653	Organometallic Chemistry	3
CHEM 601	Soil and Water Quality	3
ESCI 607	Environmental Chemistry	3
CHEM 633	Alkaloids	3
CHEM 635	Terpenes	3
CHEM 636	Steroids	3
ESCI 638	Natural Oxygen Heterocycles	3

COURSE DESCRIPTIONS

CHEM 612 ATOMIC STRUCTURE AND ATOMIC SPECTRA

Pre-requisite: Quantum Chemistry Experimental arrangement for observing atomic spectra Units in atomic spectroscopy General structures of spectrum. The hydrogen atoms. Outline of solutions of the wave equation and expressions for energies. Wave Mechanical Approach. Energy level 51 Diagram of Hydrogen and Spectrum. Relatively and fine structure of lines. Alkali spectra and more complex structure.. Elusion collision experiments; Many electron atoms. Terms symbols, Multiplicity of terms. Zeeman and Paschen-Back effects. Intensity of spectral lines. Elementary Chemical processes and excited states. Collisions of the first and second kinds.

CHEM 614 PHOTOCHEMISTRY

A study of the laws and theory of Photochemistry. Topics include: the theory of the excited state, electronic spectra of excited state, transients and their behaviour, experiments techniques, photochemical processes in the gas phase, mechanisms of organic photochemical reactions, photochromism, and industrial application. Laboratory experiments give practical experience to the theory covered in class.

CHEM 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified

and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

CHEM 631 SYNTHETIC METHODOLOGY

The objective of this course is three fold: To equip the graduate with the necessary theoretical tools to enable the student formulate reasonable synthetic schemes for complex organic molecules. To enable the student read and understand articles in journals on synthesis of organic molecules. To be able to bring all elements of Organic Chemistry (mechanisms, stereochemistry and strategy) to bear on synthesis. In the first part of the course a review of the major reactions in organic synthesis will be done. In the second part some selected organic molecules will be taken from current literature and the synthetic schemes will be discussed. The selection of the molecules to be discussed will be done in such a way that the student will be exposed to almost all the major reactions in organic synthesis. Finally the student will be given one selected synthetic organic chemistry topic to review and present as a theoretical project.

CHEM 632 FURTHER SPECTROSCOPY & STRUCTURE ELUCIDATION

Pre-requisite: CHEM 431 (2 credits) or evidence of having done an equivalent course at the undergraduate level. Electronic spin resonance spectroscopy; multi-pulse techniques in two dimensional NMR spectroscopy and their application to structure elucidation; NMR of nuclei like N-15, P-31 and F-19, biological NMR, ionisation techniques in mass spectroscopy other than electron impact

CHEM 633 ALKALOIDS

Occurrence, isolation, general survey of the classes of alkaloids, application of spectroscopic methods, degradative methods, synthetic methods and conformational analysis in structure elucidation; biosynthesis.

CHEM 634 ADVANCED MEDICINAL CHEMISTRY

Topics to be treated each year will be selected from the following: Further Pharmacokinetics. The Kinetics of drug absorption and Elimination; The Plateau Principle; first order absorption and elimination; kinetics of drugs administered by inhalation.

Chemistry and Pharmacology of Selected Drug Types: The Receptor Concept; types of receptors; definitions of agonist; partial agonist antagonist; metagonist; ED50; IC50; pD2 and pA2 Antimalarials, Anti hypertensives including b-blockers. Non-steroidal anti-inflammatory drugs (NSAID); Chemical Carcinogens and Anti-cancer drugs. Vitamins Radiopharmaceuticals – preparation and application. Selected Physiochemical Methods of Drug Analysis; Bioassay methods, Fluorimetry, HPLC, Radio-immunoassays, Thermal methods. Principles of Drugs Quality Control: Quality assurance and Good Manufacturing Practices Definition of essential terms. Philosophy and Essential Elements of Quality Management.

CHEM 635 TERPENES

Occurrence; isolation; general survey of the classes of terpenes; application of spectroscopic methods, degradative methods, synthesic methods and conformational analysis in structure elucidation; biosynthesis.

CHEM 636 STEROIDS

The structure and chemistry of sterols, bile acids, sex hormones, adrenal cortex hormones, steroidal glycoside, and alkaloids. Wherever necessary, the use of spectroscopic methods in the elucidation of structures, conformational analyses and the use of molecular rotation values, optical rotatory dispersion curve, and the octant rule to determine conformations.

CHEM 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

CHEM 651 NUCLEAR AND RADIOCHEMISTRY

Introduction to Radiochemistry; Types of Radioactive decay; Nuclear Chemistry and Mass Energy Relationships, Nuclear Reactions; Rates of nuclear decay; Interaction of Radiation with Matter, Radioisotope production and availability, Radiotracer Methods; Uses of large radiation sources; Nuclear Activation Analysis; Principles of Activation Analysis; Prompt-Gamma Neutron Activation Analysis (PONAA) and Charged Particle Activation Analysis (CPNAA); Health Physics, Radiation Chemistry.

CHEM 653 ORGANOMETALLIC CHEMISTRY

The general methods for preparing the organometallic compounds of the Main Group (Groups IA, IIA IIIA, and IVA) elements and those of the d-transition elements. The important physical the chemical properties are discussed. Application of spectroscopic methods in determining the structure, including the nature of bonding between the metal and certain Organometallic compounds as intermediates in organic synthesis.

CHEM 671 INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Measurement and instrumentation; resolution, sensitivity, selectivity, detection limit; sample pre-treatment techniques; detailed, consideration and applications of some selected methods e.g. AAS, AES, IR, UV, NMR, GC, GC-MS, HPLC, XRF, NAA etc.

ESCI 607 ENVIRONMENTAL CHEMISTRY

The course covers the chemical nature of the key pollutants of air, soils and freshwater and marine bodies, the effects of the pollutants in the environment and management of the pollutants. The chemistry of the major industries, and their problems in relation to the environment and the alternatives

DEPARTMENT OF EARTH SCIENCE

GRADUATE PROGRAMMES IN EARTH SCIENCE

SPECIFICATIONS

The Department of Earth Science offers research-based Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) degrees in Geology in the following fields: Hydrogeology, Geochemistry, Petrology, Sedimentary Geology, Structural Geology, Geophysics, Economic Geology, Petroleum Geology and Mineral Economics. In addition, the Department offers (M.Sc) programmes by coursework in Mineral Exploration, Water Resources Development, Engineering Geology and Petroleum Geosciences. These MSc courses were set up following extensive consultation with the appropriate industry and are designed for working professionals wishing to update their knowledge or acquire new skills in their field of work.

MASTER OF SCIENCE IN PETROLEUM GEOSCIENCE

INTRODUCTION

The MSc programme is a full-time 12-month taught course that includes a dissertation. The objective of the programme is to provide advanced training in the field of Petroleum Geoscience. This objective is achieved through lectures, tutorials, hands-on exercises, laboratory practicals, seminars, field exercises, excursions and the preparation of a dissertation. The course is career–oriented and is recommended to professional earth and natural scientists who wish to either establish or consolidate a career in the petroleum geosciences. The broad-based approach also allows graduates to pursue their career options, and that includes consulting, research and personal development through pursuance of higher studies. The programme assumes that the student has a good first degree in the earth sciences or related discipline.

ENTRY REQUIREMENTS

A bachelor's degree or equivalent in the earth sciences from a recognised university or equivalent academic institution. Admission will be competitive and applicants will be evaluated on the same criteria as the research-based MPhil in Geology.

DURATION OF COURSE

2 semesters (12 months)

ASSESSMENT

The courses will mainly be taught through hands-on exercises, laboratory practicals, mini-projects, and field exercises. Assessment of all courses will, therefore, be by continuous assessment (60%) and end-of-semester examination (40%).

PROGRAMME STRUCTURE

The following are the credits that a registered student is required to earn in order to graduate:

Coursework	30 – 36 Credits
Seminar	3 Credits
Dissertation	12 Credits
Total	**45 – 51 Credits**

FIRST SEMESTER

Core

Code	**Title**	**Credits**
EASC 601	Introduction to Petroleum Industry and Petroleum Business	3
EASC 603	Depositional Systems	3
EASC 605	Sequence Stratigraphy	3
EASC 607	Structural Geology and Subsurface Mapping	3
	Total	**12**

Electives	**(select a minimum of 3 credits)**	
EASC 609	Seismic Data Acquisition and Processing	2
EASC 611	Petroleum Geomechanics	2
EASC 613	Geostatistics in Petroleum Geology	2
EASC 615	Basic Petroleum Geology (for students with little or no background in Geology)	3

SECOND SEMESTER

Core Courses

Code	**Title**	**Credits**
EASC 602	Health, Safety and Environment	2
EASC 604	Formation Evaluation	3

EASC 606	Development Geology	3
EASC 608	Advanced Sedimentary Petrology	3
	Total	**11**

Electives (select a minimum of 4 credits)

EASC 612	Seismic Stratigraphy	2
EASC 614	Seismic Data Interpretation	3
EASC 616	Petroleum Geochemistry	3
EASC 618	Gravity and Magnetic Survey	2

COURSE DESCRIPTIONS

EASC 600 DISSERTATION

This is an individual study culminating in a formal dissertation. The dissertation is undertaken under the supervision of faculty. The purpose of this work is to develop and underpin a personal understanding of the fundamentals required to solve a problem. Attention will be paid to the logic and systematics needed to achieve this objective in practice. The project may commonly include a fieldwork component or may entirely consist of the analysis of raw field data from industry.

EASC 601 INTRODUCTION TO PETROLEUM INDUSTRY AND PETROLEUM BUSINESS

This course introduces students to basic economics and legal framework of the petroleum industry. It presents an overview of the petroleum industry, and covers the basic economics in the petroleum life cycle and the fundamentals of international oil and gas law. Topics to be covered include:

Overview of the Petroleum Industry

Acquisition of exploration rights; Generation of exploration prospect; Drilling and evaluation of exploration well; Establishment of commerciality; Creation of asset business plan; Initiation of facility design; Design, construction and commission of facilities; Characterization, production and exploitation of asset; Disposal or decommission of asset.

Petroleum Economics

Forecasting oil production; Cash flow techniques; Pricing; Production rate; Budgeting; Worldwide business operations; Performance appraisal; Ethics in economic analyses

Petroleum Law

Law governing international petroleum transactions; Interpretation and enforcement of treaties and private contracts; Effects of international trade (and producing country) agreements; Dispute resolution approaches; Basic legal concepts of ownership of mineral rights; Expropriation and compensation issues; Laws bearing on development rights; Environmental protection laws.

EASC 602 HEALTH SAFETY AND ENVIRONMENT

The course covers the basics of Health, Safety and Environment (HSE) and HES management related to the petroleum industry. Course content includes:

Environment: Covers air, water, waste, spills, remediation and risks, addressing the following competencies: Environmental risk management and assessment; emission limits and control;

Environmental monitoring and data management; Spill response; Site assessment, management and remediation.

Health: Health risk and impact assessment; Human factors engineering; Ergonomics; Health and medical emergency facilities; Fitness for duty; Food and water hygiene; Thermal extremes; Medical surveillance/Industrial hygiene.

Safety: Safety techniques for hazard and effect management; Process safety and hazards control; Safety culture; Chemical and biological agents; Hazard communication / product stewardship; Work environment; Fire safety; Tool safety; Machine guarding; Motor vehicle; Lifting operations and lifting equipment; Electrical safety; Noise and vibration; Radiation and radioactive sources; Construction and demolition; Excavation.

HES Management: Leadership and commitment; Policy and strategic objectives; Legislation and regulation; Organisation, Responsibilities and resources; Professional training and behaviours; Risk assessment and management; Planning and procedures; Contractor controls; Security; Emergency response; Performance management; Incident reporting & investigation; Audit; Management review..

EASC 603 DEPOSITIONAL SYSTEMS

(Siliciclastic and carbonate depositional systems form a large proportion of petroleum reservoirs and this course is designed to review the fundamentals of facies analysis needed to correctly interpret depositional processes and environments. The course will review the basic sedimentary processes and resultant structures commonly encountered in cores and outcrops. It will provide criteria for practical identification and interpretation of alluvial fan, lacustrine, fluvial, deltaic, shoreline, shelf and deep sea clastic depositional systems from outcrop, core and wireline log datasets.

EASC 604 FORMATION EVALUATION

This course covers the basics of well log analysis and core sample analysis. It begins by considering the nature of the borehole environment, and the way in which the drilling process may alter the properties of rocks and their contained fluids. It then covers mudlogging, and the basic physical principles behind, and operation of, the major wireline logging tools, i.e., self-potential, resistivity, gamma ray, sonic, density and neutron. Next it considers briefly the dipmeter log and finally presents and discusses how log data can be used in paleoenvironmental analysis. Hands-on exercises provide practice in the interpretation of various logs. Such interpretation ranges from identifying the lithologies and the presence of water and hydrocarbons to paleoenvironmental interpretations of logged rock sequences. The part that deals with core analysis will teach the invaluable skill of examining and describing drill core for sedimentology, reservoir quality, depositional environments and sequence stratigraphy. Sampling methods, types of sampling equipment and sedimentary rock analytical techniques, both available at the drilling rig-site and in the laboratory, are presented and discussed.

EASC 605 SEQUENCE STRATIGRAPHY

Sequence stratigraphy is one of the vital tools available to petroleum geologists and geophysicists as it provides a predictive framework for understanding sedimentary basin fill, and integrates seismic, wireline log, core and outcrop data. The first part of the course reviews the fundamental

principles of stratigraphy and basic processes controlling sedimentation including accommodation, sediment supply, parameters influencing changes in base level and relative sea level, and the stratigraphic patterns produced from changes in the ratio of accommodation versus sediment supply (transgressions and regressions). The second part focuses on stratigraphic patterns. The phenomenon of sedimentary cycles is investigated at various scales (cyclothems, parasequences, progradational, aggradational and retrogradational stacking patterns). The third part deals with key surfaces (unconformities, erosion surfaces, flooding surfaces, maximum flooding surfaces), depositional sequences, and depositional system tracts at various scales. The final part of the course builds a practical methodology for interpreting seismic, well log, core and biostratigraphic datasets, building the skills to prepare sequence stratigraphic frameworks that are useful for prediction of reservoir, source and seal in a petroleum system. A variety of practical exercises are used, and these form the basis of assessment.

EASC 606 DEVELOPMENT GEOLOGY

This course aims to bring together the disciplines of geology, geophysics, and reservoir engineering to provide an integrated approach to developing oil and gas fields. The primary focus of the course is on the role of the geologist in a multidisciplinary team environment. Lectures and class exercises develop a working knowledge of the concepts and tools used in field development. The various phases of a field's history are discussed and illustrated through both case histories and problems/exercises. Topics to be covered include: Exploration (fairway recognition, prospect ranking, well location selection); Discovery and initial appraisal (well results compared and calibrated to pre-drill maps and seismic data); Primary development (compartmentalisation, reservoir properties); Full appraisal (stepout locations, reserves and net pay evaluation, aquifer delineation); Development plans (recovery efficiency, relative permeabilities, water cuts); Steps in building a geologic reservoir model; Impact on barriers on field development; Secondary and tertiary field development; Rejuvenating mature and marginal fields. In the practical sessions students create and interpret models using computer softwares.

EASC 607 STRUCTURAL GEOLOGY AND SUBSURFACE MAPPING

This course will be run as a hands-on workshop introducing the basic principles of structural geology and focusing on the main structural geometries seen on seismic data and in outcrop in the oil industry. The first part of the course will introduce the structural styles associated with extension, compression, inversion, strike-slip and salt diapirism. It will concentrate on practical methods used to define the relationships between faults, folds, sedimentary packages and regional elevation and how they can be used to validate an interpretation and hence a prospect. The second part of the course deals with basin tectonics. It first examines how basins are formed and how they are linked to the Earth's thermal behaviour and plate tectonics. This leads to a closer look at the mechanisms whereby the crust and lithosphere can be thinned by stretching or extensional tectonics. Then the structures associated with the termination of basin formation and the deformation of their contents during crustal thickening or compressional tectonics are described and discussed. The final part involves Identification and correlation of markers in drilling and wireline logs, and stratum contour and isopach maps for structural and stratigraphic interpretation of reservoir units.

EASC 608 ADVANCED SEDIMENTARY PETROLOGY

This course aims to provide an understanding of the processes that affect sandstone reservoir quality. Sandstone composition, texture and classification and their correlation with petrophysical

properties are discussed. Clays (and XRD techniques) are covered and their potential effects on permeability are considered. Diagenetic changes to sandstones are described and illustrated by observing thin sections under the microscope during practical sessions. Advanced petrological techniques and their application to petroleum geology, is examined. The course will also discuss carbonate reservoirs and their diagenesis as a means of providing a basis for hydrocarbon exploration. Course components include: diagenesis, karst, dolomitisation, and carbonate reservoirs (where to look and how to find them). Sampling methods, types of sampling equipment and sedimentary rock analytical techniques, both available at the drilling rig-site and in the laboratory, are also presented and discussed. Practical session will involve using binocular microscopy to examine and describe drilling cuttings.

EASC 609 SEISMIC DATA ACQUISITION AND PROCESSING

This course is designed to give students with little or no background in these areas a basic understanding of the standard methods used in acquiring and processing seismic reflection data. The course begins with a brief review of elastic waves and phenomena such as reflection, refraction, diffraction and attenuation which occur as these waves propagate through the earth. The acquisition component outlines the equipment used (sources, detectors, recorders, etc.); survey design; typical acquisition procedures for land and marine surveys; and auxiliary information such as uphole and shallow refraction surveys. The processing component deals in a non-mathematical way with the processes used to convert field data to final section. In particular, velocity analysis, statics, CDP stack, deconvolution and migration will be discussed, as these are the basis of most conventional processing.

EASC 610 SEMINAR

The Research Seminar Course is intended to provide students planning a research career in Petroleum Geoscience with the opportunity to develop the skill of critically reading and evaluating research papers. The course is open to all students, and is a required component of the MSc in Petroleum Geoscience programme. The course will consist of a weekly timetabled session in which students will read, present and discuss influential research papers across a broad range of subject areas.

EASC 611 PETROLEUM GEOMECHANICS

This course covers basic rock and fault mechanics and the determination and application of in situ stress data in the oil patch. The section on basic rock mechanics covers forces, stress and strain and Mohr's circle of stress. The section on basic fault mechanics covers failure envelopes, fault/fracture meshes, and the Andersonian classification of faults. The significance of pore pressures and law of effective stress are presented. The origin of stresses in the crust are reviewed: specifically reference states of stress, tectonic stresses, plate tectonics, and regional and local sources of stress. The course then moves specifically to the oil patch, reviewing methods for determining the in situ stress field from standard oil exploration data, specifically: overburden stress, horizontal stress orientation, borehole breakouts, drilling-induced tensile fractures, image logs, horizontal stress magnitudes, formation integrity, leak-off and hydraulic fracture tests, fracture gradient relations, and frictional limits on stress. Finally, the applications of in situ stress data in the oil patch are discussed, specifically: interpreting recent tectonic style, structural permeability, optimum development of naturally fractured reservoirs, predicting fault reactivation/seal breach, hydraulic fracture stimulation, deviated and horizontal wellbore stability.

EASC 612 SEISMIC STRATIGRAPHY

The aim of this course is to introduce students to seismic stratigraphy, which involves identifying and interpreting unconformities and other reflector terminations such as offlaps and onlaps. Topics covered in the lectures include (i) the stratigraphic significance of seismic reflectors (ii) identification of depositional sequences (iii) age determination of depositional sequences (iv) recognition and analysis of the seismic facies present in terms of reflector geometry, continuity and amplitude and mapping their distribution, and (v) interpretations of relative changes of sea-levels. Hands-on exercises provide practice in: (i) identifying examples of reflection terminations (onlap, downlap, toplap), (ii) identifying depositional sequence boundaries on seismic sections on the basis of reflector terminations, (iii) determining the age of seismic sequences using appropriate borehole data, (iv) identifying different seismic facies on seismic sections, (v) making plots of coastal onlap and constructing chronostratigraphic summary chart from suitable seismic sections or geological cross-sections.

EASC 613 GEOSTATISTICS IN PETROLEUM GEOLOGY

This course introduces the concepts and methods of spatial statistics to geologists and engineers working with oil and gas data, and covers all of the most commonly encountered geostatistical methods for estimation and simulation. Topics include calculation and modeling of semivariograms, linear methods of kriging, cokriging, nonlinear methods such as indicator kriging and disjunctive kriging, and conditional simulation, including sequential indicator simulation, sequential Gaussian simulation, and simulated annealing. Semivariogram models range from very simple to complex. The emphasis throughout is on what the practitioner needs to know, and the results that can be expected. Hands-on exercises provide practice using real-world data such as porosity and permeability, gas production, structural elevation of a reservoir, and seismic information.

EASC 614 SEISMIC DATA INTERPRETATION

The aim of this course is to introduce students to the fundamentals of seismic interpretation. It therefore concentrates on structural interpretation, leaving stratigraphic issues to the Seismic Stratigraphy course. Topics covered in the lectures include time and depth sections, artificial structure caused by velocity variations, unconformities, folds, faults, piercement structures, bright spots, dim spots, polarity reversals and flat spots, time-structural maps, and seismic modelling. Practical work involves interpretation of 2D and 3D seismic data on paper. The practicals stress the effort and discipline involved in producing a self-consistent interpretation of horizons and faults.

EASC 615 BASIC PETROLEUM GEOLOGY

Primary objectives of this course are to broaden students geological vocabulary, explain selected geological principles and processes, and describe how certain petroleum reservoirs and source rocks are formed. It involves lecture and practical sessions and covers the following: Minerals and rocks; Plate tectonics; Geological times; Weathering and erosion; Deposition; Diagenesis; Reservoirs; Structural geology and petroleum; Origin, migration, and trapping of petroleum; Field mapping techniques. The course also includes an overview of the geological formations of Ghana, and a one-week field mapping, with supervision, in a sedimentary terrain.

EASC 616 PETROLEUM GEOCHEMISTRY

Development and concepts of petroleum geochemistry in petroleum exploration. Accumulation and sedimentation of organic matter. Introduction to palynology and application of biostratigraphy

to hydrocarbon exploration. Composition and structure of organic matter and crude oil deposits. Transformation of kerogen to petroleum. Methods of source rock analysis. Thermal maturity and organic facies evaluation. Biomarker groups and their applications. Hydrocarbon migration. Oil and gas characterisation and source correlation. Source rock depositional settings. Oil from coals. Modelling hydrocarbon generation. Contributions of geochemistry to petroleum exploration. Geochemical characterisation of reservoir fluids, sampling and analytical protocols. Applications of reservoir geochemistry to field appraisal and field development.

EASC 618 GRAVITY AND MAGNETIC SURVEY

Gravity and magnetic methods have a limited use in basin analysis but can be used to locate major sedimentary basins and to define their limits and depths. This course discusses the density and magnetism of rocks, the Earth's gravity and magnetic field, gravity anomalies and the interpretation of gravity and magnetic surveys. Hands-on exercises provide practice in the use of gravity and magnetic data to recognize the presence and estimate size of any sedimentary basins, and identify some features within them, such as salt domes.

MASTER OF SCIENCE IN ENGINEERING GEOLOGY

INTRODUCTION

The MSc programme in Engineering Geology target working professionals wishing to update their knowledge or acquire new skills in the field of engineering geology. The programme seeks to expose students to appreciate and understand interactions between civil engineering designs, and the subsurface. This MSc programme is a full-time one-year taught course that includes a dissertation. The broad-based approach also allows graduates to pursue their career options including consulting and research, as well as to prepare themselves for further studies at higher levels.

The curriculum includes lectures, tutorials, hands-on exercises, laboratory practicals, seminars, field exercises, excursions and the preparation of a dissertation. Practical training programmes have been designed to include tutorial visits to building and road construction project sites, dam construction and burrow material sites, mining construction projects, coastal engineering and wetland restoration sites and laboratories of institutions such as AESL, Highways and mines to mention a few. MSc in Engineering Geology is recommended also for civil engineers who wish to upgrade their knowledge in the application of the geological sciences to engineering practice.

ADMISSION REQUIREMENTS

i. The pre-requisite for this programme is a good first degree (at least a Second Class Lower Division) in the earth sciences, civil engineering or physics.

ii. Applicants with qualifications in appropriate areas of applied science, and those with other qualifications together with suitable industrial experience may also be considered.

MINIMUM AND MAXIMUM WORK LOAD

A student shall be required to carry a minimum work load of 16 credits and a maximum of 18 credits of coursework for Semester I and minimum of 14 credits and a maximum of 18 credits for Semester II.

REQUIREMENTS FOR GRADUATION

The following are the credits that a registered student is required to earn in order to graduate:

Coursework	30 – 36 Credits
Seminar	3 Credits
Dissertation	12 Credits
Total	**45 – 51 Credits**

FIRST SEMESTER

Core

Code	Title	Credits
EASC 621	Advanced Soil Mechanics	3
EASC 623	Advanced Rock Mechanics	3
EASC 625	Laboratory and Field Techniques	3
EASC 631	Case Histories in Engineering Geology	3
	Total	**12**

Electives (Select a minimum of 3 Credits)

EASC 615	Field Geology (for students with little or no Geology background)	3
EASC 633	Earthquake Seismology and Earthquake Hazard	3
EASC 635	Disaster Risk Management	2

SECOND SEMESTER

Core

Code	Title	Credits
EASC 622	Applied Engineering Geology Fieldwork	2
EASC 626	Principles of Hydrogeology	3
EASC 628	Engineering and Environmental Geophysics	3
EASC 632	Waste Management and Landfill Engineering	3
	Total	**11**

Electives (Select a minimum of 5 Credits)

EASC 624	Independent Study	3
EASC 636	Geotechnical Earthquake Engineering	3
EASC 638	Risk Assessment	2

COURSE DESCRIPTIONS

EASC 600 DISSERTATION

An individual study culminating in a formal dissertation. The dissertation is undertaken under the supervision of a faculty member. The purpose of this work is to develop and underpin a personal understanding of the fundamentals required to solve a problem. Attention will be paid to the logic

and systematics needed to achieve this in practice. Most problems in engineering geology arise from ground conditions encountered in the field and, therefore, fieldwork is a common component of the dissertations completed. The analysis of raw field data from industry is another common source of study.

EASC 610 SEMINAR

The Research Seminar Course is intended to provide students planning a research career in Engineering Geology with the opportunity to develop the skill of critical reading and evaluation of research papers. The course is open to all students, and is a required component of the MSc in Engineering Geology programme. The course will consist of a weekly timetabled session in which students will read, present and discuss influential research papers across a broad range of subject areas.

EASC 621 ADVANCED SOIL MECHANICS

Physical and mechanical properties of natural soils; classification tests; principle of effective stress; one-dimensional consolidation and settlement; shear strength; compaction and general requirements for geotechnical analyses. Stiffness and compressibility of soils, ideal models, behaviour of real soils, critical state framework, concept of yield, elastic-plastic concepts of yield, undrained strength of soils. Soil mechanics in construction, bearing capacity for the settlement of foundations, calculation of earth pressures for retaining structures, slope stability, instrumentation, analyses and stabilisation. Design and construction processes; case studies. Examples are soft ground tunnelling; ground improvement techniques; offshore foundations; reinforced earth and soil nailing; deep excavations. Formation, accumulation and geotechnical characteristics of soils found on land and in rivers, estuaries and lakes, in tropical, arid and glacial environments.

EASC 622 APPLIED ENGINEERING GEOLOGY FIELDWORK

A total of 18 days would be spent under supervision in the field studying engineering characteristics of soils and rocks, rock mechanics, geomorphology, site investigations, earthquake engineering, tunneling, slope failures and major infrastructure projects. Visits would be made to civil engineering constructions in progress in both surface and underground works so that the coupling between ground conditions, ground investigation, design, analyses and actual performance could be considered.

EASC 623 ADVANCED ROCK MECHANICS

In situ rock stress measurement techniques, results and their engineering ramifications. Geometrical characteristics of discontinuities: RQD, mean spacing and frequency, hemispherical projection techniques. Mechanical properties of intact rock: complete stress-strain curve, simple failure criteria. Properties of rock masses: deformability, failure criteria. Inhomogeneity, anisotropy, index tests, scale effects. Rock mass clarification schemes. The complete rock mechanics problem: interactions and coupled mechanisms, auditing rock mechanics investigations. Foundations and slopes on discontinuous rock: Groundwater flow, Underground excavations in discontinuous and stratified rock: Underground excavations in continuous rock: approximate analytical methods, rock-support interaction. Formation and geotechnical character of intrusive and extrusive igneous rocks, metamorphic and sedimentary rocks, and the problem of rock-head.

EASC 624 INDEPENDENT STUDY

Report writing using data from real sites and requiring the design of investigations, the interpretation of results, recommendations for further actions, and an assessment of contractual consequences for engineering geology in practice. Includes library searches, air photo interpretation, rock and soil core logging and sample description.

EASC 625 LABORATORY AND FIELD TECHNIQUES

The course covers the conventional tests for soils used to index and classify soils, and to measure their permeability, consolidation characters, and shear strength. Commonly used field tests for assessing the strength of rocks and their discontinuities are completed in the field and incorporated into estimations of the strength of rock masses, and the explanations of rock mass response to changing loads and environments. Basic instruction in rock core logging for geotechnical purposes. Techniques of site investigation including: sample description; soil drilling and sampling; in situ testing by cone, SPT, vane, field loading and pressuremeter testing. Interpretation of strength, permeability and stiffness from in-situ tests. Principles of the laboratory measurement of load, stress, strain and pore water pressure; measurements with electronic sensors; selection of testing procedures and testing strategies. Field measurements of full-scale behaviour including: earth pressure cells; displacement gauges and piezometers. Analysis of potential errors and approaches for their mitigation.

EASC 626 PRINCIPLES OF HYDROGEOLOGY

The definition, measurement and quantification of head, the natural parameters controlling hydraulic conductivity and the transmissivity, storage and quality of groundwater, quantification of flow in pores and fissures by various methods, the assessment of field parameters, wells and water supply, the control of groundwater in surface and underground works.

EASC 628 ENGINEERING AND ENVIRONMENTAL GEOPHYSICS

This course discusses basic principles of geophysical methods that are used in site investigation to obtain subsurface engineering information and environmental evaluation of development sites. Emphasis will be given to latest geophysical techniques (surface and subsurface) used in the industry. The relationship between geophysical parameters and engineering geological properties of rock and soil will be discussed together with some case studies. Special emphasis will be given to waste disposal and contaminated sites, and detection and mapping of sinkholes and shallow buried objects.

EASC 631 CASE HISTORIES AND PRACTICE IN ENGINEERING GEOLOGY

The course comprises directed reading and tutorials reviewing classical case histories in engineering geology, the lessons to be learnt from them and their application to present practice. The course also includes a series of master classes in the assessment and presentation of geotechnical information for contracts, and risk assessment, based on data from real cases and presented viva voce.

EASC 632 WASTE MANAGEMENT AND LANDFILL ENGINEERING

The principles of landfill design and the containment of leacheate, lining systems, character of landfill waste and waste maturation, gas emissions, their monitoring and control. The course

concludes case history evidence and interdisciplinary coursework based on a real site and using real data.

EASC 633 EARTHQUAKE SEISMOLOGY AND EARTHQUAKE HAZARD

The course aims to provide an understanding of the dynamics of the solid Earth from theoretical and observational seismology and seismotectonics in relation to earthquake hazard and mitigation. It provides an in-depth study of earthquake seismology and earthquake hazard. Topics include: Seismic waves, dispersion, attenuation, earth structure. Earthquake sources processes, focal mechanisms, seismotectonics. Earthquake precursors, earthquake prediction, earthquake hazard and mitigation. A combination of lectures (including guest speakers), tutorials, MatLab excercises, individual course work and individual/group practicals are used for the course delivery.

EASC 635 DISASTER RISK

This course is a systematic approach to identifying, assessing and reducing risks of all kinds associated with hazards and human activities. It looks at natural disasters in general but gives prominence to earthquakes. The course has 2 main components: (i) a general introduction to disasters, vulnerability and disaster management. (ii) More extensive work on specific aspects of the above, looking at discrete topics that are particularly relevant to engineers working with hazard-prone societies (e.g. impact on society, economies, infrastructure, urban development, relief, reconstruction and recovery). Course delivery involves a combination of lectures, seminars (including guest speakers), individual coursework and individual/group practicals (e.g. desk-based vulnerability analysis, emergency response and assessment scenarios). Visits to other organisations and sites may be organised where appropriate.

EASC 636 GEOTECHNICAL EARTHQUAKE ENGINEERING

This course aims to impart knowledge of the impact of seismic behaviour of soils (site response and liquefaction) on the seismic hazard at a site and provides the necessary background to the seismic design and analysis of foundations and earth structures. The course will be delivered using a combination of lectures, seminars and practical/computer-based tutorials. Real case studies will be used to illustrate the concepts taught and how seismic design and analysis are carried out in practising engineering. Topics include: Dynamic properties of soils, site response analysis, liquefaction assessment, design of shallow and deep foundations, slope stability assessment, design of embankments, earth retaining structures, dynamic soil-structure interaction and design of foundations.

EASC 638 RISK ASSESSMENT

This course gives an overview of how engineers and different agencies assess seismic risk to life, economy, buildings, special structures, geotechnical structures and infrastructure. The course will also deliver an understanding of the uncertainties involved in risk estimation. The course will be delivered via lectures (including guest lectures), seminars and case study projects. Topics covered include: Methodologies for single and multiple building damage assessments, building damage scales and intensity. Methods for the prediction of earthquake risk to buildings and geotechnical structures. The importance of inventory, earthquake and building vulnerability data and the study of uncertainty associated with the estimation of seismic risk. Seismic risk assessment for special structures (e.g. nuclear facilities). Concepts of consequence/performance based design/assessment. Methods for seismic risk estimation in terms of monetary loss used by insurers and re-insurers.

Seismic risk to human populations adopted by disaster managers, NGO's, the military, etc.

MODULAR GRADUATE PROGRAMMES IN EARTH SCIENCE

INTRODUCTION

Continuous development of skills and knowledge is a critical component of success in the field of Geosciences. However, because of the constant demands of the workplace, geoscientists can rarely afford to take significant amounts of time off to update their knowledge and skills. Recognizing this, the Department of Earth Science has designed a two-year Modular Master of Science (MSc) programmes in Earth science, with two options: Mineral Exploration and Groundwater Resources Development. In addition to the general university regulations governing the award of higher degrees, the departmental regulations that apply are provided below.

ADMISSION REQUIREMENTS

The basic requirement is a BSc degree in the Earth Sciences, with at least Second Class Lower Division, and a minimum of two years industrial or equivalent experience. Admission will be competitive and applicants will be evaluated on the same criteria as the research-based MPhil programme.

DURATION OF STUDY PROGRAMME

Programme	***Duration***
Full-Time	2 Years
Part-Time	4 Years

ACADEMIC SESSION

In order to minimize the impact on the regular academic programs, the Modular programmes are conducted outside the normal academic terms, from early-June to mid-August each year.

A Programme Year shall normally be of 8 weeks duration and shall be structured as follows:

- 6 weeks of Teaching
- 1 week of Revision
- 1 week of Examinations

PROGRAMME STRUCTURE

The programme shall consist of coursework designed in modules, a seminar, and short research project (12 credits). It is expected that the project will normally be completed within two years of commencement of the programme. Two modules (12 credits each) shall be offered in each option (i.e., Mineral Exploration and Groundwater Resources Development), in alternate years. Each module shall comprise of 4 courses and will run for about 8 weeks.

Lectures and practicals of each course shall be held between 8 a.m. and 5 p.m. from Monday to Friday, over a period of two weeks (24 hours lectures and 36 hours practical work).

REQUIREMENTS FOR GRADUATION

The following are the credits that a registered student is required to earn in order to graduate:

Coursework	24 Credits
Seminar	3 Credits
Dissertation	12 Credits
Total	**39 Credits**

M.SC. MINERAL EXPLORATION

MODULE CONTENTS

Mineral Evaluation Techniques (MEVT) 12 Credits

Lectures, practical exercises, seminars on Ore Petrology; Mine Feasibility Studies; Geostatistics and Ore Reserve Estimation; Mineral Resource Economics, Policies and Management.

Mineral Exploration Techniques (MEXT) 12 Credits

Lectures, practicals, hands-on exercises, and field exercises in Exploration Geophysics, Exploration Geochemistry, Remote Sensing and GIS, and Structural Analysis.

MINERAL EVALUATION TECHNIQUES

Code	Title	Credits
EASC 641	Ore Petrology	3
EASC 642	Mine Feasibility Studies	3
EASC 643	Geostatistics and Ore Reserve Estimation	3
EASC 644	Mineral Resource Economics, Policies and Management	3
	Total	**12**

MINERAL EXPLORATION TECHNIQUES

Code	Title	Credits
EASC 645	Mineral Exploration Geophysics	3
EASC 646	Mineral Exploration Geochemistry	3
EASC 647	Remote Sensing and GIS for Exploration Geologists	3
EASC 648	Structural Analysis	3
	Total	**12**

COURSE DESCRIPTIONS

EASC 600 APPLIED RESEARCH PROJECT

All students registered in the Mineral Exploration programme will be required to complete a project report. The project work must commence in the First Year and the report must be completed and submitted by the end of the Second Year. The scope and topic of the project will be determined by the supervisor and will focus on a problem of interest to the student's employer, typically in one of their active exploration or mining areas. The general expectations are that the project report will represent original work but limited in scope compared to a traditional MPhil thesis.

EASC 610 SEMINAR

Students give seminars on a chosen topic of interest (preferably related to their research), research proposal and research results.

EASC 642 MINE FEASIBILITY STUDIES

Topic to be treated include: the role of the feasibility study in the mine development decision process, types of mine feasibility studies, organization of the preliminary feasibility study, presentation of project material, mining methods, geological data, mineral processing, surface facilities/infrastructure/environmental requirements, capital and operating cost, revenue estimation, mineral taxation and financial evaluation, sensitivity and risk analysis. Students carry out feasibility study on a given mineral deposit. Laboratory sessions and field exercises are designed to allow a feasibility report on an actual case study to be carried out.

EASC 643 GEOSTATISTICS AND ORE RESERVE ESTIMATION

This course deals with applied statistics in mineral exploration. Essentials of sampling and drilling techniques including pitting, trenching, rotary, percussion, reverse circulation and diamond core drilling are discussed. The course also includes geostatistics and advanced methods in ore reserve estimations such as variogram and semi-variogram calculations, kriging, estimation of variance, and grade and tonnage control are presented. Quality assurance/ quality control in exploration data management will also be discussed.

EASC 644 MINERAL RESOURCE ECONOMICS, POLICIES AND MANAGEMENT

The course deals with subjects such as current mineral markets, legal and fiscal considerations, environmental regulations, problems of mining and processing, exploration design, and financial management. Aspects of mineral projects evaluation techniques covering time value of money concept, the concept of cash flow and cash flow criteria, mineral projects evaluation criteria, non-discounted and discounted cash flow methods, mining taxation considerations, inflation effects on project evaluation, and sensitivity and risk analysis techniques are also included in this course.

EASC 641 ORE PETROLOGY

The course will address the geology, mineralization, and origin of hydrothermal ore deposits. Emphasis will be placed on the processes responsible for their formation, the recognition of alteration halos, and the features pertinent to exploration. Essentials of reflected light microscopy, mineralogy, textural relationships, paragenesis, and phase chemistry of major ore minerals are also covered. The course will involve lectures, practical exercises, and laboratory exercises.

EASC 645 MINERAL EXPLORATION GEOPHYSICS

This course is devoted to modern geophysical techniques required for the detection of mineral anomalies. Geophysical techniques include resistivity, gravity, aeromagnetic, induced polarization, electromagnetic and seismic methods. In laboratory sessions, students use exploration reports and computerized data bases to train in interpretation of geophysical data.

EASC 646 MINERAL EXPLORATION GEOCHEMISTRY

This course is devoted to modern geochemical techniques required for the detection of mineral anomalies in known mining areas and in “virgin” territories. The course will cover the principles and methods of geochemical exploration, including planning, sampling, geochemical analysis, data handling, and interpretation. The course will involve lectures, practical exercises, and

laboratory exercises.

EASC 648 STRUCTURAL ANALYSIS

This course covers the mechanisms of crustal deformation applied to geological structures and mineral deposits. It will focus on terrane analysis and structural controls on the localization and genesis of mineral deposits. It will examine regional and local structural controls using the lode Au deposits of the Birimian greenstone belts as a case study. The course will involve lectures, practical exercises and field studies.

EASC 647 REMOTE SENSING AND GIS FOR EXPLORATION GEOLOGISTS

The course focuses on the application of remote sensing and Geographical Information System (GIS) to mineral resources and ore body evaluation studies. Courses in remote sensing cover aerial photography and satellite image interpretations using multi-spectral, thermal infrared, and radar images. GIS softwares such as MapInfo and ArcGIS will be taught.

M.SC. GROUNDWATER RESOURCES DEVELOPMENT

GROUNDWATER EXPLORATION (GEXP) 12 Credits

Lectures, practicals, hands-on exercises and field exercises in Exploration Geophysics, Remote Sensing and GIS, Hydrological Processes at the Earth's Surface, and Aquifer Properties and Basic Principles of Groundwater Flow

GROUNDWATER EVALUATION AND CHEMISTRY (GEVC) 12 Credits

Lectures, practicals, hands-on exercises and seminars in Geology of Groundwater Occurrence, Chemistry of Natural Groundwater and Contamination, Evaluation and Management of Groundwater Resources, and Water Resource and Rural Water Supply Studies.

GROUNDWATER EXPLORATION (GEXP)

Code	Title	Credits
EASC 651	Exploration Geophysics	3
EASC 652	Remote Sensing and GIS	3
EASC 653	Hydrological Processes	3
EASC 654	Aquifer Properties and Groundwater Flow	3
	Total	**12**

GROUNDWATER EVALUATION AND CHEMISTRY (GEVC)

Code	Title	Credits
EASC 655	Geology of Groundwater Occurrence	3
EASC 656	Chemistry of Natural Groundwater and Contamination	3
EASC 657	Evaluation and Management of Groundwater Resources	3
EASC 658	Water Resource and Rural Water Supply Studies	3
	Total	**12**

COURSE DESCRIPTIONS

EASC 600 APPLIED RESEARCH PROJECT

All students registered in the Groundwater Resources Development programme will be required to complete a project report. The project work must commence in the First Year and report must be completed and submitted by the end of the Second Year. The scope and topic of the project will be determined by the supervisor and will focus on a problem of interest to the student's employer. In general, the expectations for the project report are that it represents original work but is limited in scope compared to a traditional MPhil thesis.

EASC 610 SEMINAR

Students give seminars on a chosen topic of interest (preferably related to their research), research proposal and research results.

EASC 651 EXPLORATION GEOPHYSICS

This course is devoted to modern geophysical techniques required for groundwater exploration. Geophysical techniques include resistivity, aeromagnetic, induced polarization, electromagnetic and seismic methods. In laboratory sessions, students use exploration reports and computerized data bases to train in interpretation of geophysical data.

EASC 652 REMOTE SENSING AND GIS

The course covers the application of remote sensing and Geological Information System (GIS) to groundwater investigations. Courses in remote sensing cover aerial photography and satellite image interpretations using multispectral, thermal infrared, and radar images. GIS softwares such as MapInfo and ArcGIS will also be taught.

GEOL 654 AQUIFER PROPERTIES AND GROUNDWATER FLOW

This course provides a basic understanding of the physical characteristics of the water-bearing formations and groundwater flow. It covers the understanding of boundary and initial conditions that pertain during groundwater flow including flownet analysis. Groundwater-surface water interactions and the underlying principles for the interaction between freshwater and seawater shall be treated. This course also exposes the student to the behaviour of the various aquifer systems during groundwater flow. It presents the fundamental principles underlying the determination of the hydraulic characteristics of the various aquifer systems and the understanding of the mechanisms and equations of groundwater flow. Hand-on practical examples shall be treated.

EASC 653 HYDROLOGICAL PROCESSES

The course presents an overview of elements of the hydrological cycle and how they contribute to the earth's water balance and subsurface groundwater system. Methods of measurement and quantification of these elements will also be thought. Rainfall-runoff relationships will be elucidated.

EASC 655 GEOLOGY OF GROUNDWATER OCCURRENCE

The course elucidates the various aquifer types. Particular emphasis will be placed on the in-depth understanding of the hydraulic characteristics of these aquifers and the role of geology and structure in the transmission and storage of groundwater. The hydraulic properties of fractured aquifer systems shall be dealt with comprehensively as most aquifer systems in Ghana are

localized within these aquifer types.

EASC 656 CHEMISTRY OF NATURAL GROUNDWATER AND CONTAMINATION

The course provides basic understanding of the fundamental principles governing groundwater flow and its chemical constituents. Kinetics and key reactions influencing groundwater chemistry shall be treated. Geochemistry of natural water systems such as chemical processes and their impact on water chemistry shall be presented. Water quality standards and transport processes of constituents shall be dealt with. The course shall elucidate hydrochemical behaviour of contaminants and how parameters are measured, monitored and assessed. Groundwater vulnerability to pollution and hydrochemical modelling shall be dealt with. Sources of contaminants shall be taught. Case Studies from various hydrogeological terrains shall be presented.

EASC 657 EVALUATION AND MANAGEMENT OF GROUNDWATER RESOURCES

This aspect covers various management options and basic concepts in the evaluation and management of groundwater resources. It includes insight into the development of groundwater resources, particularly the response of ideal aquifers to pumping, measurements of parameters and prediction of aquifer yields. Attention shall be paid to the response of confined, leaky and unconfined aquifers to pumping and step drawdown tests to evaluate the productivity of the wells. Well drilling methods, drilling fluids, well screens, water well design and development of water wells shall also be taught. Groundwater evaluation and management strategies and the introduction of groundwater flow modelling and practical application of these models shall be emphasized

EASC 658 WATER RESOURCE AND RURAL WATER SUPPLY STUDIES

It covers water resources of Ghana, assessment of groundwater within integrated water resources management and Ghana's water policy and guiding principles. The course also includes the following: community water supply initiatives and management challenges, water supply options in Ghana; Optimization and maintenance protocols in rural water systems; exploration strategies in rural water supply and sustainable water supply options. The course shall also cover linkages between water and sanitation in rural communities.

DEPARTMENT OF MATHEMATICS

THE M.PHIL. PROGRAM FOR MATHEMATICS.

Entry Requirement: A good first degree in Mathematics or Physics or any other relevant subject.

Programme Requirement:

- A student should undertake a minimum of three of any of the following courses per semester in the first year of enrolment.

Each course carries **4 credits.** Courses are to be selected in consultation with the Head of Department. The courses offered will depend upon the interests of available staff.

MATH 601	Topology
MATH 602	Group Theory
MATH 603	Calculus on Manifolds
MATH 604	Lebesgue Measure Theory
MATH 605	Functional Analysis
MATH 606	Convexity
MATH 607	Differential Geometry
MATH 609	Boundary Value Problems
MATH 610	Seminar I
MATH 611	Differential and Integral Equations
MATH 612	General Relativity
MATH 613	Classical Electrodynamics
MATH 614	Many-Body Problems and the Theory of Condensed Matter
MATH 615	Group Theory in Physics I
MATH 616	Group Theory in Physics II
MATH 617	Mathematical Modelling
MATH 618	Operations Research
MATH 619	Numerical Analysis
MATH 620	Seminar II
MATH 621	Statistical Mechanics

MATH 622 Probability Theory
MATH 623 Quantum Mechanics
MATH 624 Quantum Field Theory

- A student will undertake a supervised research program.

Scheme of Examination:

- A 3-hour written paper will be taken at the completion of each course.
- A thesis of research findings will be submitted by the end of the second year of enrolment.

Qualification for the award of M.Phil.: A student will qualify for the award of M.Phil. by obtaining a minimum of 24 credits for course work. In addition, a student will successfully defend the submitted thesis and also complete two seminar presentations.

COURSE DESCRIPTION

MATH 601 TOPOLOGY

Sequential, local, countable compactness, compactification. Existence of continuous functions and fixed point properties for mappings from a compact simply-connected space to R, R2. Rotation number, homotopy. Extension of existence of continuous functions to maps with compact but not simply-connected domain. Finite products and Tynchonoff's theorem. Separation properties, normal spaces, Urysohn's lemma, Tietze extension theorem. Introductory algebraic topology, fundamental group, covering spaces, classification of connected manifolds (surfaces). An introduction to homology theory.

MATH 602 GROUP THEORY

Free groups, presentations, free products, amalgamated free products and the HNN extension. Normal form theorems. Groupoids. Fundamental group, van Kampen's theorem. Coverings of spaces and complexes. Geometric realisations.

MATH 603 CALCULUS ON MANIFOLDS

Abstract differentiable manifolds, Riemannian manifolds, vector bundles, vectorfields and differential equations, covectorfields, tensors and tensorfields, the tensor calculus. Differentiation on Riemannian manifolds, constant vectorfields and parallel displacement, the curvature tensor and the Riemannian connection, differentiation of covariant tensor fields, integration on manifolds.

MATH 604 LEBESGUE MEASURE THEORY

Abstract measure, Lebesgue measure, geometric properties of Lebesgue measure, the space of measureable functions, measure preserving transformations, structure of measures in special spaces, the Daniell integral, Haar measure. The spaces Lp, classical Fourier series, reflections on Hilbert space.

MATH 605 FUNCTIONAL ANALYSIS

Basic Properties of Topological, Locally Convex and Banach Spaces; Operators; Duality; Basic Theorems in Functional Analysis; Spectral Theory in Hilbert Spaces; Integration of Vector Valued Functions; Compact Operators; Examples and Application to Classical Analysis.

MATH 606 CONVEXITY

Convex figures in Rn, frontier, width, diameter. Helly's theorem, Jung's theorem. Radon's theorem in R2. The Pasch axiom and some corollaries. Blaschke's theorem.

MATH 607 DIFFERENTIAL GEOMETRY

Conformal, inversive, hyperbolic, spherical and Minkowski geometries. Manifolds. Topology on manifolds, Riemannian manifolds, group actions, covering spaces, the Uniformisation Theorem. Introduction to the classification of 3-manifolds by their geometries and the Geometrisation Conjecture.

MATH 609 BOUNDARY VALUE PROBLEMS

Fundamental Equations and Solutions of Partial Differential Equations; Existence and Regularity of Solutions; Boundary Value Problems and Mixed Boundary Value Problems.

MATH 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

MATH 611 DIFFERENTIAL AND INTEGRAL EQUATIONS

Differential Equations: Existence, Uniqueness, Dependence on initial values and parameters; Qualitative Behaviour of Linear and Non-Linear Equations; Regular Eigenvalue Problems.

Integral Equations: Basic Existence Theorems; Fredholm Theory; Dual Integral and Series Equations; Singular Integral Equations; Application.

MATH 612 GENERAL RELATIVITY

The principles of equivalence and general covariance. Motion of a particle in the gravitational field, geodesics; static and stationary fields. Einstein gravitational field equations. Solutions with special symmetries; Schwarzschild solution. Gravitational collapse, singularity, black holes. Gravitational waves and radiation. Cosmology, isotropic and homogeneous spaces, stability. Maxwell's equations in curved space-time.

MATH 613 CLASSICAL ELECTRODYNAMICS

Covariant Maxwell's equations. Motion of a charge in an electromagnetic field. The electromagnetic field tensor; energy-momentum tensor; Maxwell's stress tensor. Multi-pole moments; systems of charges in an external field. Spectral and Fourier resolutions of electromagnetic waves; diffraction. Retarded potential; Lienard-Wiechert potentials; radiation of electromagnetic waves. Scattering of waves by charges; effective cross-section.

MATH 614 MANY-BODY PROBLEMS AND THE THEORY OF CONDENSED MATTER

Second quantisation; Schrondinger, Heisenberg and Interaction pictures; Thermal Green's

functions; finite temperature Wick's theorem; Feymann diagrams; equations of motion; applications to solid state physics; zero-temperature formalism. Basic energy band theory of solids; the fermi surface; theory of phonons and lattice vibrations; electrons in metals; electron-phonon interaction; magnetic moments and their interactions in solids; linear response theory; linear response function; the inhomogeneous electron gas; density functional theory; spin susceptibility; theory of superconductivity and superfluidity.

MATH 615 GROUP THEORY IN PHYSICS I

Concept of a group, structure of groups, representations of groups. Theory of group representation; representation of the symmetric groups; topological groups; theory of representations of topological groups; the classical groups.

MATH 616 GROUP THEORY IN PHYSICS II

Lie Algebras and Lie Groups. Finite-dimensional irreducible representations of semi-simple Lie groups.

MATH 617 MATHEMATICAL MODELLING

Transforming real life situations into mathematical statements; Deterministic Mathematical Models; Examples from Areas of Biology, Economics, Industry, Deformable Media and Other Dynamical Systems.

MATH 618 OPERATIONS RESEARCH

Replacement Theory; Scheduling; Inventory Control; Queueing Theory; Dynamic Programming; Markov Chains and Simulation; Decision Theory; Mathematical Game Theory; Gambling.

MATH 619 NUMERICAL ANALYSIS

Numerical Differentiation and Integration; Numerical Solution of Ordinary and Partial Differential Equations; Parabolic and Elliptic Systems; Eigen Value Problems; Chebychev, Optimization and Monte-Carlo Methods.

MATH 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

MATH 621 STATISTICAL MECHANICS

A review of basic principles of statistical mechanics; applications; correlation and response functions; phase transition; liquid helium; hard-sphere Bose gas; the Ising and related models; Onsager solution of the 2-dimensional Ising model.

MATH 622 PROBABILITY THEORY

Abstract measure, probability as measure, conditional probability. Random variables as measureable functions, distribution functions, discrete random variables, continuous random variables, probability density. Binomial, Poisson distributions, Convergence. The space of distribution functions, characteristic functions, the inversion and continuity theorems, generating functions. Independence, the central limit theorem, the law of the iterated logarithm. An introduction to the general theory of stochastic processes.

MATH 623 QUANTUM MECHANICS

Ket and Bra vectors; equations of motion; perturbation theory; collision problems; theory of radiation; relativistic theory of the electron; representation theory; symmetry principles and their consequences; spin; addition of angular momentum. Path integral formulation of quantum mechanics.

MATH 624 QUANTUM FIELD THEORY

The Action functional; general properties of the action; action for scalar, spinor and vector fields. The path integral formulation. Renormalisation. Global and local gauge symmetries. The Yang-Mills theory. Gauge Theory of Gravitation.

DEPARTMENT OF NUTRITION AND FOOD SCIENCE

M. PHIL (FOOD SCIENCE)

ENTRY REQUIREMENTS

A good first degree in Food Science. A candidate with a good first degree in Nutrition, Biochemistry, Chemistry, Engineering or an equivalent qualification may also be considered.

YEAR 1

Core Courses

FDSC 601	Experimental Design and Data Analysis	3
FDSC 602	Advances in Food Microbiology	3
FDSC 603	Food Biotechnology	3
FDSC 604	Food Chemistry and Analysis	3
FDSC 618	Food Engineering and Operations	3
FDSC 607	Food Process and Product Development	2
FDSC 612	Quality control and Analysis	2
FDSC 630	Seminar I (Scientific Reporting and Presentation Techniques)	3

Electives A

FDSC 608	Post-harvest Conservation	2
FDSC 609	Food Additives and Toxicology	2
FDSC 610	Special Topics	1
FDSC 619	Food Rheology	2
NUTR 604	Advances in Macro and micro-nutrients	2
NUTR 614	Interaction of Nutrition, food and agriculture	1

Electives B

(Selection to be based on the advice of Department)

FDSC 302	Thermal processing of foods	2
FDSC 305	Physical principles in food processing	3
FDSC 309	Biometry	1
FDSC 405	Sensory Analysis of Foods	1
FDSC 407	Quality control in food processing	2
NUTR 301	Nutrients and their metabolism I	2
NUTR 302	Nutrients and their Metabolism II	

M. PHIL YEAR II / PHD

*FDSC 600	Thesis Research	30
FDSC 640	Seminar II	3

COURSE DESCRIPTIONS

FDSC 600 RESEARCH AND THESIS

Research in Food Science and Technology or in cognate areas

FDSC 601 EXPERIMENTAL DESIGN AND DATA ANALYSIS

Statistical techniques in food nutrition research, project design and evaluation. Data analysis

FDSC 602 ADVANCES IN MICROBIOLOGY

Rapid methods of identification of microorganism; microbiology of effluents from food industries; principles of waste management. Microbiology in Environment management in food

industries.

FDSC 603 FOOD BIOTECHNOLOGY

General principles in Food biotechnology. Genetic engineering and the Food industry. The role of microorganisms in biotechnology. Yeast biotechnology. Food fermentations including brewing. Enzymes in biotechnology. Application of biotechnology to improve food quality and yield. Environmental, ethical, legal and other issues in biotechnological applications.

FDSC 604 FOOD CHEMISTRY AND FOOD ANALYSIS

Selected topics on the chemistry of food proteins , lipids and carbohydrates. Analytical techniques in food research –chromatography, nuclear magnetic resonance spectroscopy, differential scanning calorimetry, light microscopy, transmission and scanning electron microscopy etc. Use of radioisotopes

FDSC 607 FOOD PROCESS AND PRODUCT DEVELOPMENT

Procedures in food product development. New product and market evaluations Process or product optimization techniques (use of design of experiments in product and process research and development). Quality control in product development.

FDSC 608 POST-HARVEST FOOD CONSERVATION

Losses in food materials during storage, reduction of post-harvest losses. Loss assessment and methodology. Management of storage structures.

FDSC 609 FOOD ADDITIVES AND TOXICOLOGY

Classes of food additives; properties and chemistry and modes of action; use and detection of additives. Essentials of toxicology; sources of toxicants, naturally occurring toxicants in foods. Antinutritional factors in foods. Alcohol in nutrition. Nutrition and metabolism of drugs; carcinogens; agricultural residues in foods.

FDSC 610 SPECIAL TOPICS

A survey of recent advances in research and in technological developments in Food Science and technological developments in Food Science and Technology. Selected readings and essays.

FDSC 612 QUALITY CONTROL AND ANALYSIS

Techniques and practices in the quality control department in industry. Principles of total quality assurance. General discussion on methodology for assessing the quality of foods – physical, chemical and organoleptic. Analyses of quality control data. Institutionalization of standards. Food standards and legislation and procedures involved in establishing standards.

FDSC 614 FOOD RHEOLOGY

Mechanical properties of foods. Instrumental measurement of food texture. Interpretation of force curves. Newtonian and non-newtonian flow. Texture of different food commodities. Sensory measurements of texture. Psychophysical relations in food texture. Texture-structure relations in food systems. Fluid dynamics in food processing engineering.

FDSC 618 FOOD ENGINEERING OPERATIONS

Engineering principles in food processing and preservation. Thermal processes for foods. Drying. Size reduction. Mixing. General unit operations in food and chemical engineering.

Contact – equilibrium processes. Food irradiation technology. Microwaves in food technology and handling. Engineering principles in traditional food processing.

FDSC 630 SCIENTIFIC REPORTING ANDPRESENTATION TECHNIQUES (SEMINAR 1)

Audio-visual techniques for scientific presentations. Critique of scientific papers. Report writing. Computer graphics and other applications. Ethical issues in research and publications. Seminar and other presentations. Students will make oral presentations each semester and present a write-up of presentation for assessment.

FDSC 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

FDSC 661 RESEARCH PROPOSAL SEMINAR

Identification of research area and topic. Statements of problem, objectives of study, Literature review and methodology.

M.PHIL NUTRITION

YEAR I

Core Courses

NUTR 601	Nutritional Surveillance & Intervention	1
NUTR 602	Maternal & Child Nutrition	2
NUTR 604	Advances in Macro & Micronutrients	2
NUTR 606	Food & Nutrition Problems in Africa	2
NUTR 610	Practicals in Food and Nutrition Research	3
FDSC 601	Experimental Design & Data Analysis	3
NUTR 619	Nutritional Epidemiology	2
NUTR 640	Seminar 1 (Scientific Reporting and Presentation Techniques)	3

Electives A

(Minimum of 6, Maximum of 12 credits per Year)

		Credits
NUTR 603	Diet, Disease & Infections	2
NUTR 607	Geriatric Nutrition	1
NUTR 608	Regulation of Food & Water Intake	1
NUTR 609	Bioenergetics and Nutrition	1
NUTR 611	Biotechnology in Nutrition	1
NUTR 612	Growth and Body Composition	1
NUTR 613	Community Nutrition	1
NUTR 614	Interaction of Nutrition, Food & Agriculture	1
NUTR 618	Practicals in Dietary Management of Disease	2

NUTR 620	Special Topics	2
NUTR 621	Nutritional Toxicology	1

ELECTIVES B
(Minimum of 4, Maximum of 8 credits per Year)
Selection to be based on the advice of the Department

		Credits
FDSC 307	Principles of Food Preservation	1
FDSC 413	Food Laws and Regulations	1
ADMN 201	Introduction to Management	3
ADMN 321	Fundamentals of Entrepreneurship	3
SOCI 204	Social Structures of Modern Ghana	2
	Sub-Total	**10**

(In consultation with the Department student without Nutrition background will be given a set of make-up courses to take)

YEAR II

		Credits
NUTR 600	Thesis Research	30
NUTR 650	Seminar II	3

COURSE DESCRIPTION

NUTR 600 RESEARCH AND THESIS
Research in Nutrition or in cognate areas.

NUTR 601 NUTRITIONAL SURVEILLANCE AND INTERVENTION
The role of Nutritional surveillance. Data needs for a nutritional surveillance system. Examples of organizational structure of surveillance systems. Early warning system. Nutrition intervention programs in the prevention and control of nutritional problems. Management in Food and Nutrition

NUTR 602 MATERNAL AND CHILD NUTRITION
Maternal nutrition and the outcome of pregnancy; Nutritional needs of the child; nutritional considerations of lactation; infant and child feeding; growth monitoring and growth reference curves.

NUTR 603 DIET, DISEASES AND INFECTIONS
The role of diet in the genesis and management of diseases. Relationship between nutrition, infections and infestations.

NUTR 604 ADVANCES IN MACRO AND MICRO-NUTRIENTS
Pre-requisite (NUTR 301, NUTR 302)
Recent concepts concerning vitamin and mineral nutrition; nutritional biochemistry of lipids;

regulation of whole body protein metabolism; nutritional role of dietary fiber; interrelationship of the nutrients. Micronutrients of public health importance.

NUTR 606 FOOD AND NUTRITION PROBLEMS IN AFRICA

Factors influencing nutritional problems in Africa. Drought, civil strife and other calamities precipitating famine. Organization of famine relief. Nutrition of refugees. Major nutritional deficiency problems; Changing pattern of nutrition related diseases.

NUTR 607 GERIATRIC NUTRITION

Effect of aging on nutritional status; nutritional requirements of the elderly; causes of undernutrition in the elderly. Meeting the nutritional needs of the elderly.

NUTR 608 REGULATION OF FOOD AND WATER INTAKE

Hunger, appetite and satiety; the role of the hypothalamus; theories of the control of food intake. Water intake, water contents and compartments of the body. Water balance and disturbances in the system.

NUTR 609 BIOENERGETICS

New research in energy requirements of the various age and physiological groups. Human working capacity; Nutrition and working efficiency and physical performance.

NUTR 610 PRACTICALS IN FOOD AND NUTRITION RESEARCH (LAB.)

Application of spectrophotometry, flame photometry, chromatography, electrophoresis, radioisotopy and animal experimentation in nutrition research.

Techniques for macronutrient and micronutrient determinations. Centrifugation and separation. Chromatography, Electrophoresis, (PAGE), Techniques in enzyme studies. Determination of various nutritional parameters in body fluids. Protein, iron, ferritin, zinc, cholesterol, retinol, iodine and thyroid stimulation hormone (TSH). Urinary iodine. Body composition measurements. Computer in food and nutrition.

NUTR 611 BIOTECHNOLOGY AND NUTRITION

The impact of biotechnology on nutrition; use of transgenic animals for specialized proteins such as milk protein production; bioactive proteins and peptides; genetic engineering and modification of food composition; moral and ethical issues relating to materials produced by biotechnology.

NUTR 612 GROWTH AND DEVELOPMENT -

Physical growth from foetal life through infancy, adolescence to adulthood. Factors influencing growth and development. Effects of early growth on physiological and biochemical events; incidence of non-communicable diseases in later life.

NUTR 613 COMMUNITY NUTRITION

Concepts of nutrition as applied in community and public health; Nutrition education; nutritional status of population groups.

NUTR 614 INTERACTION OF NUTRITION, FOOD AND AGRICULTURE

The role of agriculture in supplying food needs; effects of cash crop on food crop production; food distribution and marketing. Agricultural development, economic growth and nutrition. Plant

breeding and nutritional values of food crops.

NUTR 618 PRACTICALS IN DIETARY MANAGEMENT OF DISEASE

The practice of nutritional therapy. Hospital and Clinical internship in the use of diet in the management of metabolic disorders and diseases.

NUTR 619 NUTRITIONAL EPIDEMIOLOGY

Introduction to epidemiology: Measuring disease frequency, prevalence, incidence, proportions; Screening; Human health outbreak investigations; Questionnaire development; Exposure and outcome assessment (diet and disease) Modeling; Experimental and observational epidemiologic study designs.

NUTR 620 SPECIAL TOPICS

Review of new research findings and current topics.

NUTR 621 NUTRITIONAL TOXICOLOGY

Principle and divisions of toxicology. Toxicants in foods, agricultural residues in foods, principles and mechanisms of carcinogenesis, toxicological tests, nutrition and alcoholism, drugs, food allergy, food intolerance. Food additives and hypersensitive reactions, allowable daily intakes.

NUTR 640 SCIENTIFIC REPORTING AND PRESENTATION TECHNIQUES (SEMINAR 1)

Report writing. Computer graphics and other applications. Audio-visual techniques for scientific presentations. Critique of scientific papers. Ethical issues in research and publications. Seminar and other presentations. Student will make at least one oral presentation to be assessed each semester and present a write-up of the presentation for assessment

NUTR 650 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Pro posal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

FDSC 601 EXPERIMENTAL DESIGN AND DATA ANALYSIS

Statistical techniques in Nutrition. Experimental design and data analysis.

DEPARTMENT OF OCEANOGRAPHY AND FISHERIES

The Department offers Master of Philosophy and Doctor of Philosophy degree programmes in Oceanography and Fisheries Science. The Oceanography programme has specialization in four areas:

1. Biological Oceanography
2. Physical Oceanography
3. Chemical Oceanography
4. Marine Geoscience

EXAMINATION SCHEME

M.PHIL FISHERIES SCIENCE OR M.PHIL OCEANOGRAPHY

The M.Phil programmes consist of a first year of course work, followed by a second of year of thesis to be presented within 24 months.

PH.D OCEANOGRAPHY OR PH.D FISHERIES SCIENCE

The Ph.D programme is purely by research with a thesis to be submitted not earlier than 27 months and not later than 60 months from the date of registration. In addition, a candidate shall be examined orally on the substance of his/her thesis.

ADMISSION REQUIREMENTS

1. (a) M.PHIL OCEANOGRAPHY

A good first degree in the Physical or Biological Sciences from a recognized University

is required for admission.

(b) M.PHIL FISHERIES SCIENCE

A good first degree in the Physical or Biological Sciences from a recognized University is required for admission.

2. (a) PH.D OCEANOGRAPHY

A two-year research Master's degree in Oceanography or related discipline from a recognized University is required for admission. In some instances, a student may be required to read and pass prescribed relevant core course(s) at level 600.

(b) PH.D FISHERIES SCIENCE

A two-year research Master's degree in Fisheries Science or related discipline with adequate fisheries science content is required for admission. In some instances, student may be required to read and pass relevant core courses at level 600.

Course Codes

OCFS : Core courses for both Oceanography and Fisheries Science students.
OCNO : Oceanography courses.
FISH : Fisheries Science course.

M.PHIL OCEANOGRAPHY

YEAR 1 ***(24 credits minimum and 36 credits maximum for Year 1)***

Course Codes

OCFS 603	Coastal Zone Management	2
OCFS 610	Seminar I	3
OCNO 611	Biological Oceanography	3
OCNO 613	Chemical Oceanography	3
OCNO 615	Physical Oceanography	3
OCNO 617	Oceanographic Techniques	2
OCNO 619	Marine Geoscience	3
FISH 605	Statistics and Computing	2

Electives

(A minimum of 7 credits to be selected depending on the student's research area and in consultation with the supervising lecturer)

OCFS 601	Aquatic Environmental Studies	2

OCNO 602	Advanced Biological Oceanography	3
OCNO 604	Advanced Chemical Oceanography	3
OCNO 606	Advanced Physical Oceanography	3
OCNO 608	Advanced Marine Geoscience	3
OCNO 622	Law of the Sea	1
OCNO 624	Ecology of Estuaries	2
OCNO 626	Ecology and Conservation of Higher Marine Vertebrates	2
OCNO 628	Deep Sea Biology	2
OCNO 632	Marine Botany	2
OCNO 634	Marine Biogeochemistry	2
FISH 611	Ecology of Fishes	3
FISH 612	Aquaculture	3
FISH 613	Fisheries Resource Dynamics and Assessment	3
FISH 615	Fisheries Management and Economic Studies	3
FISH 617	Fisheries Techniques	2

YEAR II ***(Requirement of 36 credits)***

OCNO 600	Thesis Research	30
FISH 620	Seminar II	3

M.PHIL FISHERIES SCIENCE

YEAR 1 ***(24 credits minimum and 36 credits maximum for Year 1)***

Course Codes

OCFS 603	Coastal Zone Management	2
OCFS 605	Statistics and Computing	2
OCFS 610	Seminar I	3
FISH 611	Ecology of Fishes	3
FISH 612	Aquaculture	3
FISH 613	Fisheries Resource Dynamics and Assessment	3
FISH 617	Fisheries Techniques	2
FISH 618	Fish Physiology	

ELECTIVES

(A minimum of 5 credits to be selected in consultation with the supervising lecturer and may depend on the student's research area)

Course Codes

OCFS 601	Aquatic Environmental Studies	2
OCNO 611	Biological Oceanography	3
OCNO 613	Chemical Oceanography	3
OCNO 615	Physical Oceanography	3
OCNO 617	Oceanographic Techniques	2
OCNO 619	Marine Geoscience	3
OCNO 622	Law of the Sea	1

OCNO 624	Ecology of Estuaries	2
OCNO 626	Ecology and Conservation of Higher Marine Vertebrates	2
OCNO 632	Marine Botany	2
FISH 614	Conservation and Preservation of Fisheries Genetic Resources	3
FISH 615	Fisheries Management and Economic Studies	3
FISH 616	Fish Pathology	2
FISH 622	Fish Nutrition and Energetics	2
FISH 624	Fish Processing and Marketing	1
FISH 626	Ecology of Freshwater and Wetlands	2
FISH 628	Freshwater Botany	2
FISH 632	Limnology	2

YEAR II ***(Requirement of 36 credits)***

Course Code		
OCNO 600	Thesis Research	30
OCNO 620	Seminar II	3

COURSE DESCRIPTIONS

OCNO 601 AQUATIC ENVIRONMENTAL STUDIES

Environmental impacts of development projects on aquatic systems; assessment and management of pollutants in aquatic systems.

OCNO 602 ADVANCED BIOLOGICAL OCEANOGRAPHY

Microbiology and meiofaunal studies; ecology of marine invertebrates and vertebrates; physiology of marine organisms including biochemical adaptations; special habitats:- estuaries, lagoons, Intertidal zones and the deep sea environment; mariculture; special topics.

OCNO 603 COASTAL ZONE MANAGEMENT

Tropical coastal zone as an integrated system; management of coastal resources and developments, including legislation.

OCNO 604 ADVANCED CHEMICAL OCEANOGRAPHY

Speciation of elements in seawater; processes occurring at the sediment-water interface; marine biochemical cycles; marine organic chemistry; special topics

OCNO 606 ADVANCED PHYSICAL OCEANOGRAPHY

Tropical meteorology; air-sea interactions; tides and waves; sound in the oceans; special topics.

OCNO 610 SEMINAR I

Each student is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment.

OCNO 611 BIOLOGICAL OCEANOGRAPHY

Scope of biological oceanography; morphology and systematics of marine invertebrates and vertebrates; structure and function of marine ecosystems (global perspectives); tropical marine ecology including mangroves, coral reefs, lagoons; planktonology; algology.

OCNO 613 CHEMICAL OCEANOGRAPHY

Scope of physical oceanography; physical properties of seawater; major pathways of natural elements and other substances; interactions between particular and dissolved constituents of seawater; marine pollution chemistry.

OCNO 615 PHYSICAL OCEANOGRAPHY

Scope of physical oceanography; physical properties of seawater; oceanic circulation, including abyssal circulation; estuarine and coastal physical processes.

OCNO 617 OCEANOGRAPHIC TECHNIQUES

Oceanographic field and laboratory methods, including position finding at sea, water mass movements, salinity determinations, sampling methods; remote sensing.

OCNO 619 MARINE GEOSCIENCE

Scope of marine geoscience; origin of ocean basins; physical sedimentology; structural setting and topography of the continental shelf and ocean floor; coastal geological processes.

OCNO 620 SEMINAR II

Each student will make a presentation soon after Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed.

OCNO 622 LAW OF THE SEA

The Law of the Sea Convention and its relevance to management of marine resources and scientific research.

OCNO 624 ECOLOGY OF ESTUARIES

Biotic and abiotic process and their interactions in the estuarine environment; anthropogenic impacts.

OCNO 626 ECOLOGY AND CONSERVATION OF HIGHER MARINE VERTEBRATES

Ecology and conservation of marine reptiles, birds and mammals.

OCNO 628 DEEP SEA BIOLOGY

Physiology and ecology of the fauna in the deep sea, including hydrothermal vents and cold seeps.

OCNO 632 MARINE BOTANY

Taxonomy, physiology, ecology and economic importance of marine plants.

OCNO 634 MARINE BIOGEOCHEMISTRY

Redox chemistry of seawater; chemistry of marine sediments; organic biogeochemistry.

FISH 605 STATISTICS AND COMPUTING

Experimental design and data analysis: computing with special reference to oceanography and fisheries.

FISH 610 SEMINAR I

Each student is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment.

FISH 611 ECOLOGY OF FISHES

Spawning, growth, survival distribution in relation to environmental factors with emphasis of Ghanaian coastal waters, lagoons and freshwater environments.

FISH 612 AQUACULTURE

Environmental and ecological considerations; methods of production, cultural practices employed for selected species; selective breeding; feeding and feed formulation; processing and marketing.

FISH 613 FISHERIES RESOURCE DYNAMICS AND ASSESSMENT

Population dynamics of fishes-estimation of population parameters, factors involved in regulation of fish populations. General estimates of fishery potential, Production Models, Analytical Models. Data needs for fisheries assessment and monitoring. Problems in tropical fish assessment..

FISH 614 CONSERVATION AND PRESERVATION OF FISHERIES GENETIC RESOURCES

Principles of biodiversity and conservation. Strategies and techniques for monitoring, preservation and enhancement of genetic resources of fishes, significance of fish genetic diversity; special topics.

FISH 615 FISHERIES MANAGEMENT AND ECONOMIC STUDIES

Technical guidelines for strategies for fisheries management with emphasis on tropical fisheries; Economic theories applicable to fisheries management methodologies. Socio-economics of fishing communities in West Africa. The FAO Code of Conduct for Responsible fisheries. Problems for the management of tropical multispecies stocks. State of world fisheries.

FISH 616 FISH PATHOLOGY

Anatomy and histology; types of fish diseases; host-pathogen relationships; disease diagnosis, prevention and control; special topics.

FISH 617 FISHERIES TECHNIQUES

Field and laboratory methods used in fishery studies, including age determination quantitative description of diet and aquatic habitat measurements; remote sensing.

FISH 618 FISH PHYSIOLOGY

Environmental physiology of fishes; energy metabolism; fish endocrinology; special topics.

FISH 620 SEMINAR II

Each student will make a presentation soon after Year I examinations on his/her Thesis Research

Proposal and also present a progress report midway into the second semester. These will be assessed.

FISH 622 FISH NUTRITION AND ENERGETICS

Formulation of artificial and natural feed; nutritional quality and energy value of feed ingestion levels, assimilation, respiration, construction of energy budgets for different developmental stages; special topics.

FISH 624 FISH PROCESSING AND MARKETING

Patterns of fish marketing in the developed and developing economies; producer-consumer linkages; product-types and processing; trader and functions; i.e. small-scale and large-scale; equipment and installation; prices, costs and internal rate of returns; special topics.

FISH 626 ECOLOGY OF FRESHWATER AND WETLANDS

The freshwater environment; biotic and abiotic processes and interactions of freshwater environments; anthropogenic impacts; wetlands as an ecosystem; their evolution, physical and biological characteristics; anthropogenic impacts and management.

FISH 628 FRESHWATER BOTANY

Taxonomy, physiology, ecology and economic importance of freshwater plants.

FISH 632 LIMNOLOGY

Classification of freshwater bodies; physical and chemical processes; limnological techniques.

PH.D. PROGRAMMES

The Ph.D degree shall normally be of a 3-year duration. It is a research programme, the topic of which will be chosen in consultation with the candidate's supervisory committee. On completion of the programme the candidate is required to submit a thesis on his research project. Subsequently, the candidate will be examined orally on the substance of thesis presented.

DEPARTMENT OF PHYSICS

MASTER OF PHILOSOPHY

ADMISSION REQUIREMENTS
A good first degree in Physics with adequate Mathematics background

YEAR I

Course Codes

PHYS 610	Seminar I	3
PHYS 611	Classical Mechanics	4
PHYS 612	Statistical Mechanics	4
PHYS 613	Quantum Mechanics	4
PHYS 614	Electrodynamics	4
PHYS 620	Seminar II	3

Electives Group A
A minimum of eight (8) credits to be selected from this section

PHYS 621	Principles of Nuclear Physics	4
PHYS 622	Solid State Physics	4
PHYS 631	Instrumentation & Physical Measurements	4
PHYS 632	Physics of Surfaces	4
PHYS 633	Semiconductor Materials & Devices	4
PHYS 634	X-ray Fluorescence Analysis	4
PHYS 635	Meteorology	4
PHYS 636	Crystal Diffraction & Electron Microscopy	4
PHYS 638	Energy	4
PHYS 639	Defects In Crystalline Materials	4
PHYS 641	Reactor Physics	4
PHYS 642	Radiation Bio-Physics	4
PHYS 643	Isotope Geochronology	4
PHYS 644	Mass Spectrometry	4

Electives Group B
(For candidates offering the Theoretical Physics Option a minimum of eight (8) credits to be selected)

The courses will be offered in collaboration with the Department of Mathematics.

PHYS 661	Mathematical Methods I	4
PHYS 662	Mathematical Methods II	4
PHYS 663	Quantum Theory of Solids	4
PHYS 664	Fluid Dynamics	4
PHYS 665	Advanced Quantum Mechanics	4
PHYS 666	Quantum Electrodynamics	4
PHYS 667	Field Theory	4

NOTE: It may be necessary to give some courses in the semester in which specialist staff is available.

YEAR II

Seminar Presentation II	3
PHYS 600 (Thesis)	30

COURSE DESCRIPTIONS

PHYS 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

PHYS 611 CLASSICAL MECHANICS

Survey of elementary principles including principles of particle and rigid body dynamics, constraints. Lagrange's equation. Hamiltonian mechanics. Transformation theories of mechanics including Hamilton-Jacobi and Poisson bracket formulation. Lagrangian formulation of continuous media.

PHYS 612 STATISTICAL MECHANICS

The interpretation of classical equilibrium thermodynamics using statistical mechanics; Equilibrium in statistical mechanics. General formulation of statistical thermodynamics. Boltzmann distribution, the perfect classical gas. The partition function, the perfect quantal gas; negative temperatures. Heat capacity of an insulating solid, phonons. Black body radiation. The canonical distribution. Fermi-Dirac and Bose-Einstein distribution functions and their applications. The ideal Fermion gas, free electron theory of metals; white dwarf and neutron stars. The ideal boson gas, Bose-Einstein condensation

PHYS 613 QUANTUM MECHANICS

The Dirac description of quantum mechanical state. Approximation methods for stationary states Equations of motion and classical correspondence. Time-dependent perturbation theory and application to atomic radiation. Scattering theory.

PHYS 614 ELECTRODYNAMICS

Review of Basic Electromagnetism and Maxwell's equations. Plane EM waves and propagation in a medium. Dispersion relations between Absorption and Diffraction. Kramers-Kronig Relations. Radiating systems and Scattering.

Special relativity: Covariance of Maxwell's equations under the Transformations of Special Relativity, relativistic transformations of potentials, applications of the transformations, the Lienard-Wiechert potentials. Covariant (Lagrangian and Hamiltonian) description of charged particles and EM fields.

Electromagnetic Energy Radiation by accelerated charges; Cerenkov Radiation.

PHYS 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

PHYS 621 SOLID STATE PHYSICS

Periodic structures; lattice waves; electron states and energy band calculations; interatomic forces and static properties of solids; electron-electron and electron-phonon interactions; dynamics of electrons. Transport properties; optical properties; the fermi surface. Cooperative phenomena: magnetism; superconductivity.

PHYS 622 PRINCIPLES OF NUCLEAR PHYSICS

Introduction to Nuclear Physics. Static Nuclear Properties; mass, moments, charge distribution. Electron Scattering. m-Mesic x-rays. Nuclear forces, the deuteron, nucleon-nucleon scattering. Nuclear models. Nuclear reactions

PHYS 631 INSTRUMENTATION & PHYSICAL MEASUREMENTS

Analysis and design principles of electronic system for measurement.
Review of basic devices. Transducers. Laboratory techniques and instrument characteristics. Instrument resolution. Scintillators and semiconductor detectors
High speed counting and recording. Electrical measurement of non-electrical quantities.

PHYS 632 PHYSICS OF SURFACES

Surface structure and chemical composition; electronic contact potential and work function; surface states; band bending, plamons etc. Surface lattice dynamics, surface diffusion and surface melting. Adsorption of atoms and molecules; chemisorption and epitaxial processes; adhesion, friction, lubrication and wear of surfaces. Bulk methods used in studying surface properties.

PHYS 633 SEMICONDUCTOR MATERIALS & DEVICES

Characteristics of elemental and compound semiconductor materials. Amorphous and magnetic semiconductors. Fabrication of semiconductor materials and devices. p-n junction, diode. Transistor. Statistics of recombination and trapping. Applications of tunneling heterojunctions and Schottky barriers. Impurity and impurity band conduction. Hot electron effects.

Avalanche and avalanche transit time oscillators. Optical properties. Lasers and photodetection.

PHYS 634 X-RAY FLUORESCENCE ANALYSIS (XRFA)

Interaction of radiation with matter; Interaction of charged particles with matter Cross-section. Radiation and charged particle detectors, basic linear electronic systems. Quantitative XRFA. Practical analysis. Utilization of microcomputers in XRFA.

PHYS 635 METEOROLOGY

Physics of the atmosphere; Heat transfer; Condensation & precipitation. Winds; Synoptic meteorology; Boundary layer meteorology (micrometeorology. Instruments and Observation analysis; Remote sensing methods; Weather forecasting.

PHYS 638 ENERGY

Review of Energy resources – conventional and non-conventional, renewable and non-renewable. Basis for solar energy consideration. Elements of astronomy, solar spectrum. Instruments and measurements of terrestrial insolation. Thermal conversion – low, medium, and high temperatures. Photovoltaic conversion: Physics of solar cells; Photovoltaic Engineering. PV modules. Systems application. Economics of solar energy. Environmental Impact.

PHYS 639 DEFECTS IN CRYSTALLINE MATERIALS

Vacancies, interstitials, impurity atoms. Energies of formation, equilibrium concentrations. Interactions between point defects, energies of migration, theory of diffusion. Quenching, irradiation damage, cold work, non stochiometry.
Shear processes; slip in crystals, Burger's vector, screw and edge dislocations.
Simple theory of dislocations; grain boundaries; plastic deformation.

PHYS 641 REACTOR PHYSICS

Basic principles of the reactor. Diffusion and slowing-down theory. Excitation cross-section. Diffusion equation for thermal neutrons. Slowing-down of neutron as a single process, slowing-down of fission neutrons, diffusion of neutrons in the slowing-down region. Transport mean free path; the four factor formula for homogeneous reactor. Diffusion equation; critical size of homogeneous reactor. Inhomogeneity of reactor core. Heterogeneous reactor.
Two-group reactor theory; Types of reactors.

PHYS 642 RADIATION BIO-PHYSICS

The Biophysicist's view of the cell: energetics and statistical relationships in the cell, intra and inter-molecular forces, physics of cellular processes. Absorption spectroscopy and molecular structure, action spectra and quantum yields. Interaction of electromagnetic and particulate radiation with biological systems: radiation counting and dosimetry, radiation damage and repair, survival curves and models, effect of radiation on cells, molecules, tissues and organs.

PHYS 643 ISOTOPE GEOCHRONOLOGY

Radioactive decay; types of radioactive clocks. Fundamental requirements of radioactive dating. Useful radioactive schemes. Analytical techniques and errors. Typical isotope dating methods. Interpretation of radiometric dates.

PHYS 644 MASS SPECTROMETRY

Development and general theory. Types of mass spectrometers; Applications of mass spectrometers. Advances in mass spectrometry.

Ph.D. PROGRAMMES

The Ph.D degree shall normally be a 3-year programme. It is a research programme, the topic of which shall be chosen in consultation with the candidate's supervisory committee. On completion of the programme the candidate is required to submit a thesis on his research project.

DEPARTMENT OF STATISTICS

The Department of Statistics runs an M.Phil Programme. It involves one year of course work followed by a year of supervised research, with a thesis to be submitted at the end of the second year.

ADMISSION REQUIREMENTS

A good first degree including at least two years of University Mathematics

PROGRAMME OUTLINE

Core Courses		**Credits**
STAT 601	Estimation and Decision Theory	4
STAT 602	Tests of Hypotheses	4
STAT 603	Probability Theory	4
STAT 604	Distribution Theory	4
STAT 610	Seminar I	3
STAT 620	Seminar II	3

Electives (Minimum 8 Credits, Maximum 16 Credits)

To be selected on the advice of the Department

		Credits
STAT 605	Linear Statistical Models	4
STAT 606	Non-Parametric Inference	4
STAT 607	Analysis of Discrete Data	4
STAT 608	Biostatistical Processes	4
STAT 609	Advanced Sampling Theory	3
STAT 611	Stochastic Processes	4
STAT 612	Actuarial Statistics	4
STAT 613	Demographic Statistics	4
STAT 614	Multivariate Analysis	3
STAT 616	Analysis of Experimental Design	3
STAT 630	Advanced Data Analysis	2

COURSE DESCRIPTIONS

STAT 601 ESTIMATION AND DECISION THEORY

Specification of a Decision Problem. Optimal procedures. Invariance and Unbiasedness. Admissibility. Uniformly Minimum Variance Unbiased (UMVU) Estimation. Minimax and Bayesian Estimation.

Large Sample properties of estimators. Comparison of UMVU, Bayes and Minimax procedures.

STAT 602 TESTS OF HYPOTHESES

The Neyman-Pearson Theory. Most Power and Uniformly Most Powerful Tests. One sided and two-sided hypotheses. Unbiased Tests. Likelihood Ratio Tests and applications. Bayesian Tests and Confidence Intervals.

STAT 603 PROBABILITY THEORY

Probability measure and Probability space. Axioms and basic properties of a probability measure. The Probability Calculus. Random Variable and Distribution Function. Expectation and Conditional Expectation. Characteristic Functions. Convergence concepts. Limit Theorems.

STAT 604 DISTRIBUTION THEORY

Univariate distribution families. Binomial and Poisson processes and related distributions. Generating Functions and their applications. Vector Random Variables. Transformations of random vectors. The Gamma and Beta distributions and related families. Order Statistics. Multivariate Normal distribution theory.

STAT 605 LINEAR STATISTICAL MODELS

Theory of Least Squares Estimation. Optimality property and distribution theory. Interval estimation and tests under the General Linear Model. Polynomial and multiple linear regression. Analysis of variance and covariance.

STAT 606 NON-PARAMETRIC STATISTICS

Application and interpretation of non-parametric tests including weighted rank tests, normal score tests and permutation tests. Comparison of tests. Non-parametric estimation.

STAT 607 ANALYSIS OF DISCRETE DATA

Analysis of contingency tables. Linear, log-linear and logit models for two-way tables. Methods of estimation and testing. Analysis of quantal responses. Regression and analysis of variance with discrete data.

STAT 608 BIOSTATISTICAL PROCESSES

Deterministic and stochastic models of population change. The Life Table, its concepts and structure. Competing risks of illness and death. Survival and life expectancy of populations at risk.

Stochastic illness-death models : Epidemic processes. Chain-binomial models, Clustering theory. Effects of immunization. Illness-death processes; Application to studies of chronic diseases.

STAT 609 ADVANCED SAMPLING THEORY

Analysis and comparison of various sampling schemes. Optimal designs.

STAT 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

STAT 611 STOCHASTICS PROCESSES

Basic Concepts. Theory and application of selected discrete and continuous parameter processes.

STAT 612 ACTUARIAL STATISTICS

Principles of General Insurance. Theory of Interest and Decremental Rates. Life Contingencies, Social Security and Pension Schemes. Risk Analysis and associated statistical problems.

STAT 613 DEMOGRAPHIC STATISTICS

Demographic Concepts and measures. Collection and evaluation of demographic data.
Analysis of demographic data. Population Dynamics. Stable Population Theory. Population Projection.

STAT 614 MULTIVARIATE ANALYSIS

The multivariate normal distribution. Sampling theory, estimation and tests for multivariate normal populations. Multivariate analysis of variance and covariance. Classification and discriminant analysis. Component and factor analysis, Canonical correlations.

STAT 616 ANALYSIS OF EXPERIMENTAL DESIGN

Model specialications for single-factor and multi-factor designs. Main effects, specific effects and interactions. Estimation. Multiple Comparisons. Analysis of covariance.

STAT 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year 1 examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

STAT 630 ADVANCED DATA ANALYSIS
Descriptive and Exploratory studies of Large Data Sets ; Model Fitting and Testing.

DEPARTMENT OF ANIMAL BIOLOGY AND CONSERVATION SCIENCE

REQUIREMENTS
A good first degree with adequate Biology or Zoology content.

COURSES

Courses are to be taken by all students in the first year of the MPhil degree programme, to be followed in the second year by research and thesis writing. A minimum of 24 credits to a maximum of 36 credits is required for the first year. For the second year, the requirement is 36 credits.

One course credit is equivalent to one hour of lectures or three hours of practical per week per semester, or a combination of lectures and practicals based on this weighting

AREAS OF SPECIALIZATION

The following four areas of specialization are available:

Entomology (see Insect Science Programme (ARPPIS) for details)
Parasitology
Freshwater Biology
Biodiversity Studies

PARASITOLOGY

YEAR I

Core Courses

PARA 601	Biology of Parasites	4
PARA 602	Epidemiology of Tropical Diseases	3
PARA 603	Techniques & Preparations	3
PARA 604	Mini-Projects	3
PARA 605	Immunology of Parasites	3
PARA 606	Histopathology of Parasites	3
PARA 620	Seminar I	3
CROP 692	Biometry	3
BCHM 611	Parasite Biochemistry and Host Defence Mechanisms	2

Elective Courses

PARA 607	Physiology of Parasites	3
PARA 608	Zoonotic Diseases	2
PARA 609	Plant Parasitic Nematodes	2
PARA 610	Special Topics in Immunology	2
BCHM 400	Molecular Biology	2
BCHM 613	Mechanisms of Action of Microbial Compounds	2

YEAR II

PARA 600	Thesis Research	30
PARA 630	Seminar II	3

COURSE DESCRIPTIONS

PARA 601 BIOLOGY OF PARASITES

Animal associations: phoresis, commensalisms, symbiosis (mutualism), and parasitism as

examples. Origins and evolution of parasitism.
Principles of classification: Parasites: their world and ours. Biology of parasites and vectors of medical, veterinary and agricultural importance. Anatomy, development, life cycle and the pathogenicity of parasites of socio-economic importance.

PARA 602 EPIDEMIOLOGY OF TROPICAL DISEASES

History and methods of epidemiology. An epidemiological treatment of the major parasitic diseases of the tropics (i.e., malaria, the leishmaniasis, trypanosomiasis, schistosomiasis, onchocerciasis, the filariases, including guinea worm). AIDS. Central role of human behaviour in the epidemiology of tropical diseases and its implications for control.

PARA 603 TECHNIQUES AND PREPARATIONS

Basic techniques involved in preparing parasitological material for studies and for preservation. Microtone work; slide preparations; fixation techniques.

PARA 604 MINI-PROJECTS

Practical supplement of the epidemiology course in which students work as a team on three disease systems, for each of which a study is devised and conducted in an area where the diseases are endemic. Individual reports of the studies are written up and submitted for assessment.

PARA 605 IMMUNOLOGY OF PARASITES

Overview of innate and acquired immunity, premunition, age and non-specific resistance. Cellular co-operation in the immune response and complement. Parasites in immunized hosts. Immunity to helminths and parasitic protozoa. Hypersensitivity and allergic reactions in parasitic infections; tissue damage by immunological mechanisms; utoimmunity. Antibody-antigen interactions. Immunological applications in parasitology; classification and characterization of parasites, localization of parasites in hosts, immunohistopathology and immunodiagnosis in immunoprophylaxis. Immuno-therapy and immuno-control in parasitic infections.

PARA 606 HISTOPATHOLOGY OF PARASITES

Gross and histopathology; humoral, chemical and toxic responses of organs and tissues to parasitic infections. Reaction of the skin and alimentary tract to bites and infestations of arthropods (e.g. biting flies, lice, mites, ticks), helminths, protozoa and their larvae. Reaction of the heart and lungs to helminths and their larvae. Tissue damage of the genitourinary system to parasitic infestation by protozoa and helminthes. Effect of protozoa and helminths in the vascular and lymphatic systems

PARA 607 PHYSIOLOGY OF PARASITES

Physico-chemical considerations and general metabolism. In vitro cultivation of parasites; media, temperature, biological oxygen, osmotic pressure, and other conditions required for culturing. General metabolism: carbohydrate, protein, lipid and nucleic acid metabolism. Electron transport and intermediate products as target sites for drug action.

PARA 608 ZOONOTIC DISEASES

Diseases of other animals transmitted to man; animals considered as possible sources of infection: dogs rodents, cats. Epidemiology of some zoonotic diseases: rabies, brucelliosis, tapeworm (Echinococcus spp.). Potential and real health risk factors due to animals and their

products. The role of international agencies in the management of these diseases. Cases of zoonotic disease epidemics and their management.

PARA 609 PLANT PARASITIC NEMATODES

Parasitism of plant nematodes; general and principal features of plant-infecting nematodes; control measures; examples of plant nematodes in Ghana.

PARA 610 SPECIAL TOPICS IN IMMUNOLOGY

Extraction of parasite antigens and immunizations. Tissue culture; monoclonal antibody production and characterization. Microplate-based enzyme linked immunoasorbent assay; dot immunobinding assay; immunofluorescence; western blotting. Serology and sero-diagnostic methods in immunoprophylaxis.

PARA 620 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

PARA 630 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

BCHM 611 PARASITE BIOCHEMISTRY AND HOST DEFENCE MECHANISMS

Respiration of parasites; nutrition and metabolism; biochemistry of parasites with special emphasis on DNA analysis; recombinant DNA technology; monoclonal antibody preparation and uses.

BCHM 613 MECHANISMS OF ACTION OF ANTI-MICROBIAL COMPOUNDS

Chemotherapy and chemoprophylaxis of parasitic diseases; principles of selective toxicity. Chemical structure, mode of action and toxicity of chemotherapeutic agents. Mechanisms of drug resistance. Drug development

CROP 692 BIOMETRY

Brief review of the meaning, scope, and function of statistics in biological study. Brief survey of descriptive statistics and presentation of statistical data. Probability and sampling distributions. Estimation and hypothesis test. Frequency data, contingency tables. Correlation analysis: simple and multiple regression analyses. Principles of experimental design; analysis of variance and covariance. Review of various experimental designs and analyses relevant to insect study. Non-parametric statistical techniques. Use of computers in data processing and analysis.

BCHM 400 MOLECULAR BIOLOGY

2. BIODIVERSITY STUDIES

YEAR I

Core Courses

BIOS 601	Environmental Studies	3
BIOS 602	Population Ecology	3
BIOS 603	Advanced Animal Ecology	3
BIOS 604	Mini-Projects	3
BIOS 605	Biology and Ecology of Tetrapods	4
BIOS 606	Tetrapod Conservation Biology	3
BIOS 607	Field Techniques	4
BIOS 620	Seminar I	3
CROP 692	Biometry	3

Elective Courses

*ESCI 605	Remote Sensing	4
*ESCI 606	Environmental Impact Assessment	3
*ESCI 612	Forest Resource Management	3
**BOTN 613	Ecological Methods	4
**BOTN 616	Conservation of Biological Resources	4

***Offered by Environmental Science Programme**
****** Offered by Botany Department**

YEAR II

BIOS 600: Research and Thesis	30
BIOS 630: Seminar II	3

COURSE DESCRIPTIONS

BIOS 601 ENVIRONMENTAL STUDIES

West African climate, vegetation, soils, and water regime. Surveying and mapping techniques. Flora of Ghana. Use of botanical keys. Biogeography. Ghana's Environmental Policy, laws and institutions

BIOS 602 POPULATION ECOLOGY

Population dynamics - growth models, density-dependent and density-independent processes. Life tables and survivorship curves. Key-factor analysis. Methods of estimating population density and size.

BIOS 603 ADVANCED ANIMAL ECOLOGY

Concepts of niche overlap and competition. Species diversity and its measurement. Ecological energetics; methods of estimating production. Construction of energy budgets. Predator-prey relationships. Species interactions

BIOS 604 MINI-PROJECTS

Practical supplement to the various core courses in which students select topics of interest, devise and undertake field studies either individually or in groups, with written individual reports

for assessment.

BIOS 605 BIOLOGY AND ECOLOGY OF TETRAPODS

Evolution, systematics, distribution and general biology of tetrapods. Tetrapod fauna of Ghana. Growth and growth processes in vertebrates. Environmental physiology in relation to the ecology and behaviour of tetrapods. Social behaviour of tetrapods. Tetrapods as pests.

BIOS 606 TETRAPOD CONSERVATION BIOLOGY

Use of wildlife in Ghana. Conservation of the Ghanaian fauna and their habitats. Wildlife laws/regulations and their implementation. In situ and ex situ biodiversity conservation. Protected areas in Ghana. Extinction and speciation. Endangered species. International conventions.

BIOS 607 FIELD TECHNIQUES

Ageing methods. Assessment of feeding habits from gut content analysis, faecal analysis and slides of plant cuticle. Field studies of herpetofaunal, bird and mammal ecology and behaviour. Demography of bird and mammal populations. Baseline surveys and environmental monitoring. Construction and use of keys in field identification of terrestrial vertebrates.

BIOS 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

BIOS 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

ESCI 605 REMOTE SENSING

The principles and application of remote sensing for use in geographic, geological, hydrological, environmental studies, and meteorological monitoring.

ESCI 606 ENVIRONMENTAL IMPACT ASSESSMENT

The identification and assessment of environmental impacts of development and their implication in the overall decision-making process. Mitigation of impacts on physical, social and biological systems. Environmental Impact Assessment as a tool for achieving sustainable development.

ESCI 612 FOREST RESOURCES MANAGEMENT

Climate, soil and plant-growth interrelationships on the structure, composition and functioning of plant communities of the different vegetation types of in West Africa. Forest dynamics and study of both temporal and spatial changes. Animal-plant interactions. Forest and wildlife management.

BOTN 613 ECOLOGICAL METHODS

Biometry. Statistical methods: analysis of variance; experimentation; multivariate analysis. Classification and ordination. Algebra: matrix algebra; complex numbers. Calculus: maxima and minima; partial differentiation; differential equations; growth functions. Systems theory.

Catastrophic theory. Chaos and fractals. Use of computers. DOS, Word Processing, spreadsheet, database, statistical package, introduction to programming. Geographical Information Systems (GIS), Remote Sensing Applications: physical basis of remote sensing; remote sensing programmes; image processing interpretation; ground truthing; applications; nature spatial data and their interpretation; GIS solutions in spatial analysis. Database for ecological, ethnobotanical, and taxonomic information in the Ghana Herbarium. Photography. Field equipment for surveying and for measurement of meteorological factors. Translation from the French. Field Taxonomy; identification, collection for the herbarium.

BOTN 616 CONSERVATION OF BIOLOGICAL RESOURCES

Biodiversity at the intraspecific (gene), species and ecosystem level. Value of biodiversity; problems in the economic valuation of biodiversity; conservation of endangered species. Species survival. Genetic conservation. Ecosystems restoration or rehabilitation. Agro-ecology.

3. FRESHWATER BIOLOGY

YEAR I

CORE COURSES

FWBI 601	Physical Limnology	3
FWBI 602	Typology of Freshwaters	2
FWBI 603	Chemical Limnology	3
FWBI 604	Mini-Projects	3
FWBI 605	Integrated Water Resource Management	3
FWBI 606	Freshwater Flora and Fauna	3
FWBI 620	Seminar	3
FWBI 607	Field Techniques	4

ELECTIVE COURSES:

(A minimum of 3 credits to a maximum of 9 credits are to be selected per semester, depending on availability of courses and the advice of Departmental Graduate Studies Board. Courses may also be selected from other graduate programmes)

FWBI 608	Advanced Physical Limnology	3
FWBI 609	Ecotoxicology and Freshwaters	2
FWBI 610	Advanced Chemical Limnology	3
FWBI 611	Hydro-development and Freshwaters	2
FWBI 612	Freshwater Pollution	3
FWBI 613	Freshwater Ecology	4
FWBI 614	Wetlands	3

YEAR II

FWBI 600	Thesis Research	30
FWBI 630	Seminar II	3

COURSE DESCRIPTIONS:

FWBI 601 PHYSICAL LIMNOLOGY

Physical properties of freshwater. Density, viscosity, solar radiation, and the fate of light in freshwaters. Water movements; current systems; circulation patterns; thermal properties.

FWBI 602 TYPOLOGY OF FRESHWATERS Origin of lake basins. Classification of lakes, streams and groundwater. Analysis of floodplain environments.

FWBI 603 CHEMICAL LIMNOLOGY Sources of salinity; pathways of natural elements, major ions, conservative and non-conservative ions; interactions between particular and dissolved constituents of freshwaters. Chemistry of saline lakes; nutrients and micronutrients. Chemical cycles in nature.

FWBI 604 MINI-PROJECTS

Practical supplement to Physical and Chemical Limnology courses. Students work using the team approach on a lotic or lentic system to present individual reports on the ecological character of the systems.

FWBI 605 INTEGRATED WATER RESOURCE MANAGEMENT

Basins as integrated systems; management of aquatic resources; influence of land-based activities on freshwaters. Trans-boundary approaches for management of shared river basins. Stakeholder analysis and preparation of management plans; role of the Environmental Impact Assessment process.

FWBI 606 FRESHWATER FLORA AND FAUNA

Microbiology and meio-faunal studies of freshwater organisms; ecology of freshwater plants, invertebrates, and vertebrates; systematics of freshwater invertebrates and vertebrates; physiology of freshwater organisms, including biochemical adaptations to special conditions such as thermal, hyper-saline, and anoxic environments.

FWBI 607 FIELD TECHNIQUES

Experimental design and data analysis; statistical computing with special reference to Ecology. Aquatic field and laboratory methods, including use of GPS and GIS techniques. Rapid Aquatic Appraisal methods; field taxonomy. Care and maintenance of field equipment.

FWBI 608 ADVANCED PHYSICAL LIMNOLOGY

Use of radiation in freshwater characterization. Reynolds number. Light attenuation in freshwaters. Heat budgets and energy transfer. Morphology of stream channels.

FWBI 609 ECOTOXICOLOGY AND FRESHWATERS

Principles of ecotoxicology. Eco-toxicological tests and water quality; LD50 and LC50 biochemical markers.

FWBI 610 ADVANCED CHEMICAL LIMNOLOGY

Speciation of elements in freshwater; processes occurring at the sediment-water interface; biochemical cycles and spirals; redox chemistry of freshwaters; chemistry of freshwater sediments and inundated soils.

FWBI 620 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

FWBI 630 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

FWBI 611 HYDRO-DEVELOPMENT AND FRESHWATERS

Environmental impacts of development projects on aquatic systems. Irrigation and water abstraction. Global water demand. Dams and development.

FWBI 612 FRESHWATER POLLUTION Chemical nature of key pollutants of water; pollution pathways and fate of pollutants. Eutrophication, bio-magnification, POPs, PAHCs. Assessment and management of pollutants in aquatic systems. Rehabilitation of polluted habitats.

FWBI 613 FRESHWATER ECOLOGY

Structure and ecological function of freshwater ecosystems. Major communities- plankton, neuston, benthos. Ecology and conservation of freshwater flora and fauna. Invasive Alien Species. Taxonomy, physiology, ecology, and economic importance of freshwater plants.

FWBI 614 WETLANDS

Wetland classification, environment evolution, physical and biological characteristics, functions, values, attributes. Biotic and abiotic processes and interactions in wetland environments; wetlands as threatened ecosystems; management of wetlands; Ramsar Convention.

M. PHIL ENTOMOLOGY
(INSECT SCIENCE PROGRAMME)

INTRODUCTION

The Insect Science Programme at the University of Ghana provides an international course for the training of entomologists at the Masters' degree level for the West Africa Sub-region. This programme was initiated on the recommendation of the Academic Board of the African Regional Postgraduate Programme in Insect Science (ARPPIS) based at the International Centre for Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya. There are currently three sub-regional Centres of this programme operating in Africa. One for Southern Africa at the University of Zimbabwe at Harare, a second one for North and Eastern Africa at the Addis Ababa University in Ethiopia and the third one for West Africa at the University of Ghana, Legon.

At this University, the programme is administered as an inter-faculty course between the School of Agriculture and the Faculty of Science, with the Departments of Crop Science and Zoology as the collaborating Departments.

ENTRY REQUIREMENT

A good first degree in Agriculture, Zoology, Biology or related field and must have taken a basic course in Entomology in their undergraduate programme.

Course Unit Requirements

The M.Phil Entomology is a four-semester programme embodying course work in the first year plus another year of research relating to thesis on an approved topic.

In the first year, a number of Core courses (23 credits) plus Seminar and Elective courses (up to 10 credits) are to be taken by students.

- During the Inter semester break of the first year, students visit various research establishments in the country for fieldwork.
- The second year is devoted to research, thesis writing and submission (30credits).
- Total credit hours required for completing the MPhil Entomology is 69.

YEAR ONE

Core Courses		**Credits**
ENTO 601	Systematics	3
ENTO 603	Functional Morphology of Insects	3
ENTO 604	Insecticide Science	3
ENTO 605	Insect Physiology and Biochemistry	3
ENTO 607	Insect Ecology	3
ENTO 609	Research Methods and Project Management	3
ENTO 610	Seminar I	3
ENTO 612	Integrated Pest and Vector Management	3
CROP 629	Biometry/ Statistics for biologists	3

Core Courses		**Credits**
BIOT 601	Biotechnology Concepts	3
BIOT 602	Bioinformatics	3
ENTO 602	Agricultural Pests	3
ENTO 606*	Disease Vectors of Medical and Veterinary Importance	3
ENTO 608*	Stored Products Entomology	3
ENTO 616	Forest Entomology	3
ENTO 618	Urban Entomology	3
ENTO 622	Applied Insect Taxonomy	3

ENTO 624	Pesticide Application Technology	3
CROP 693	Agricultural Production. Syst. & Sustainable Rural Livelihoods	3
ENTO 620	Seminar II	3

*** ENTO 606 cannot be combined with ENTO 608**

YEAR TWO

		Credits
ENTO 600	Thesis	30

BIOT 601 BIOTECHNOLOGY CONCEPTS

This course provides a comprehensive overview of the key concepts in molecular biology, Prokaryotic and Eukaryotic cell. Nucleic acid structure and function, DNA replication, transcription, translation, chromosome structure, and regulation of gene expression in prokaryotes and eukaryotes. Principles of energy metabolism, protein structure, enzyme mechanisms and regulation. Methods in recombinant DNA technology, Microarrays. Historical Development of Biotechnology, and Applications.

BIOT 602 BIOINFORMATICS

This course explores the theory and practices of computer-based analysis of biological sequence information. Molecular database searching, sequence alignment, phylogenetics, oligonucleotides design, secondary structure analysis, functional motif searches. Integrated information retrieval and analysis. Analysis of software set up and usage, sequence analysis over the internet and interpretation of results. Basic computer concepts of UNIX operating system, relational databases, structured programming and object-oriented programming.

ENTO 601 SYSTEMATICS

Taxonomy, Classification, International Code of Zoological Nomenclature, Concept of Species and their application, Speciation, Taxonomic Hierarchy and Higher Systematics. Identification of major insect orders, Phylogenetics, sources of published taxonomic data. Taxonomic characters and techniques: Cytogenetics, Morphometrics, use of Identification keys, Collection and Curation of insects.

ENTO 602 AGRICULTURAL PESTS

The concept of pest, development of pest situations and when to control pests; survey of pests of crops, including important non-insect pests such as mite, nematodes, birds and rodents; Critical review of the biology, ecology, damage and management of major pests of selected important crops emphasizing on the use of the Integrated Production and Pest Management approach from the following: Vegetables and spices, cereals, legumes, plantains, root & tuber crops, fruit and plantation/industrial crops, beverage crops, ratoon crops; Study of pests of major economic importance in Africa: migrant pests (e.g. locusts, grasshoppers armyworms, quelea birds etc.) The course links up for inputs from scientists and Visiting lecturers from International and National Research Institutions.

ENTO 603 FUNCTIONAL MORPHOLOGY OF INSECTS

Basic organization and evolution of the insect head and mouthparts; functioning of mouthparts of

selected insects. Modifications of the insect neck and thorax including adaptations of legs. The insect wing; Major modifications of spiracles and tracheae; Appendages and processes of the abdomen, including full treatment of genitalia. Stridulation, Morphological modification of alimentary, respiratory, reproductive and nervous systems in insects, Embryonic and post-embryonic development.

ENTO 604 INSECTICIDE SCIENCE

a. Insecticide application

Introduction to pesticide application – ground application, types of sprayers and nozzles, calibration and use of spray equipment in pesticide application, safety aspects of application, maintenance of equipment.

b. Toxicology

Pesticides and pest control, General principles of toxicology and aspects of insect physiology related to toxicology. Development evaluation and consumption of insecticides. Types of Insecticides formulation and modes of action. Effects of insecticides on non-target organisms. Insecticide resistance and its management.

Biochemical modes of action of insecticides and insect growth regulators;

Toxicodynamics and selective toxicities of insecticides; metabolism of insecticides and its relation to resistance; environmental problems of insecticide use; insecticide residue determination and analysis- basic knowledge of residue isolation and analytical procedures.

ENTO 605 INSECT PHYSIOLOGY & BIOCHEMISTRY

A system approach to the major functional categories of insect life: feeding, gas exchange, homeostasis, locomotion, reproduction, development, communication and their interrelations. The alimentary and circulatory systems; integument, respiratory and excretory systems; the sensory, nervous, muscular, endocrine and exocrine systems. The reproductive system and development; unusual modes of reproduction and other adaptive processes that enhance the success of insects.

Introduction to structure and function of biomolecules: peptides and proteins, carbohydrates, lipids, nucleotides; enzymes – properties and classification. General introduction to metabolism: production of energy from carbohydrates, lipids and amino acids; Coenzymes and cofactors. Energy utilization for biosynthesis, light generation and flight: insect flight – flight muscle ultra-structure, mobilization and transport of fuels to flight muscle. Insect hormones and regulation: structure, modes of action and biochemical activities – adipokinetic and hypertrehalosemic hormones in energy metabolism; ecdysone, ecdysiotropic hormone, bursicon and juvenile hormones in moulting process and sclerotization; pheromones.

ENTO 606 DISEASE VECTORS OF MEDICAL AND VETERINARY IMPORTANCE

Arthropod vectors of diseases; taxonomy, biology, and incrimination of vector capacity, ecology of vectors, Epidemiology of vector-borne diseases, Parasites transmitted by insect vectors, life cycle and symptomatology of diseases; animal reservoirs, Vector control methods as applied to blackfly, tsetsefly, mosquitoes, ticks and mites. Emerging disease vectors of medical and veterinary importance

ENTO 607 INSECT ECOLOGY

a. Terrestrial

Practical and theoretical aspects of ecology, Properties of populations; methods of estimating population size and population dispersion, Sampling techniques, Measurement and description of factors regulating populations, Construction and analysis of life tables and their application, Biotic associations and community structure, Intra-and interspecific competition, prey-predator, and host-parasite relationships as applied to pest management. Social systems and behaviour in insects, Forests and savannah insects; seasonal phenomena in tropical insects; pest migrations, Impact of pesticides on the environment and community, Ecological foundations of the analysis of biological control, Population modeling and systems analysis.

b. Aquatic

Insects in lotic, lentic and astatic systems: their identification, classification and biology, Insect activity patterns, Role of insects in aquatic ecosystems.

ENTO 608 STORED PRODUCTS ENTOMOLOGY

Human population growth and the global food problem, the post-harvest system: nature and components. The concept of stored products; the stored products environment; factors that affect the stored products environment and their role, Damage and food loss in the post-harvest systems; types and causes of loss; the role of causal agents, Loss assessment methods, Origin of stored products pests, Survey of stored –product pests, Biology of major stored product insect pests, Review of storage systems of the tropics, Control of stored product insect pests, Modern trends in pest control in the post-harvest system.

ENTO 609 RESEARCH METHODS AND PROJECT MANAGEMENT

Modern scientific techniques in research initiation; conduction, analysis and write-up. The use of computers in Literature searches, data collection and analysis, and write-up. Rapid methods of reviewing the literature and scientific writing. Other techniques such as insect rearing, photography slide preparation and other forms of presentation. Introduction to general Management Aspects of organizational behaviour (Interpersonal skills, work motivation, team work), leadership skills, ethics and social responsibilities. Proposal writing and fund management; Project information management, Project evaluation and impact assessment; Strategic project management.

ENTO 612 INTEGRATED PEST AND VECTOR MANAGEMENT

Formulation of pest problems, economic assessment of losses due to pests and vectors, Decision making to control pests. Evolution and development of IPM. Ecological basis of pest and vector management. Pest forecasting, transgenic plants (GMOs) and Quarantine regulations.

Multidisciplinary approach, integration of multiple strategies, knowledge and intensive information, systems approach, risk minimization (safety, profitability and durability), linking agriculture with environment, biodiversity, human health and sustainability, sophisticated higher technologies and low conventional technologies, useful environment as education tool for

extension workers, farmers and general public.

Policy framework; pest diagnostic and monitoring tools/techniques and services; Biotechnology and biopesticides; Precision agriculture technology and GIS; biological pest management; Information, communication and education; farmer empowerment through IPPM, International initiatives in IPM.

Economic significance of agricultural production systems, Environmental and human health impact of production systems, environmental management.

CROP 629 BIOMETRY

Topics include probability theory and distributions; Population parameters and their sample estimates; descriptive statistics for central tendency and dispersion; hypothesis testing and confidence intervals for means, variances, and proportion; and the chi-square statistic; and nonparametric methods. The course will provide students a foundation to evaluate information critically to support research objectives and product claims and a better understanding of statistical design of experimental trials for biological products/devices.

ENTO 616 FOREST ENTOMOLOGY

An introduction to forest types in Ghana, General description of the major groups of forest insect pests: Defoliators/leaf feeders and woodborers of living plants, Life history, damage and management of serious forest insect pests of living plants, Special reference topests of commercial and economic plants, Pests of flowers, fruits and seeds of high value tree species and exotic plants, Biology and management of pests of logs, lumber and other forest products; ambrosia beetles, powder post beetles, wood borers, Detailed treatment of the biology and management of termites in forest ecosystems: nutrient cycling, water penetration, soil aeration, soil formation and profile movement.

ENTO 618 URBAN ENTOMOLOGY

An introduction to insect pests of humans in and around buildings, insect pest problems associated with urbanization and in recreational areas. Identification and description of the major groups of urban insect pests: wood destroying insects, pests on or near food, pests of stored food products, pests of fabrics and paper, pests attacking humans and pets, pests of house plants and miscellaneous pests associated with the urban environment. Damage symptoms, biology and management of urban insect pests. The role of the pest control operator in the community. Nuisance pests on ornamentals, pests of urban agricultural systems.

ENTO 622 APPLIED INSECT TAXONOMY

Biological Species concept and its application, International code of Zoological Nomenclature, Taxonomic characters and techniques: Cytotaxonomy, Bioacoustics, Morphometrics, Chemotaxonomy and Molecular Taxonomy, Computer aided Taxonomy, construction and use of Taxonomic Keys. Identification and Diagnosis of insects of Agricultural, Environmental, Veterinary and Medical Importance with special reference to pests, Natural enemies, vectors and Bioindicators; use of indicators in habitat and ecosystem analysis, international Conventions on insect conservation, collection and curatorial techniques, Value and Management of Entomological collections.

ENTO 624 PESTICIDE APPLICATION TECHNOLOGY

Pesticide Application for Insect pest / Vector / Disease and Weed control strategies; Methods of application, including availability of appropriate application and safety equipment; Mode of action of pesticides and choice of equipment; main types of spray application; The biological target (volume of spray: spray distribution and coverage); Current advances in pesticide application; Spray droplet production, sampling and measurement; Calibration of spray equipment; Integration of pesticide application in pest/vector management; Management of agricultural equipment and chemicals at Research centres and at farm level; (storage, transportation and safety aspects of pesticide application).

CROP 693 AGRICULTURAL PRODUCTION SYSTEMS AND SUSTAINABLE RURAL LIVELIHOODS

Diversity of Africa agricultural production systems; the agricultural production chain-production, storage, transportation and marketing, processing, utilization and value addition; stakeholders in agricultural production systems; urban agricultural production systems; crop production; livestock production/livestock integration production systems, Economic significance of agricultural production systems; environmental and human health impact of production systems, Promoting sustainable production; environmental management, farmer empowerment, farmer learning groups and field schools, concepts of Integrated production and pest/vector management, participatory technology development, PTD; concepts of participatory Development communication.

ENTO 610 SEMINAR I

In the first semester of year 1, students are expected to attend all seminars specified and are to make their own presentations on selected topics to an audience to earn credits. Each student is expected to make at least one oral presentation to be assessed each semester and then present a full write-up of the presentation for another assessment.

ENTO 620 SEMINAR II

In the second semester of the first year, each student will be required to make a Thesis Research Proposal presentation and write-up for assessment.

ORAL EXAMINATION

There will be an Oral examination based on the thesis submitted for the award of the MPhil Entomology degree.

M.PHIL ENVIRONMENTAL SCIENCE

The aim of the M.Phil Programme in Environmental Science is to provide graduate education in the causes, effects and control of environmental problems, particularly in Ghana, for graduates in the basic sciences and closely related disciplines. The role of the environmental scientist is seen as of responsibility for monitorial, investigational and advisory functions in the management of the environment. The programme comprises of two semesters of taught courses followed by one year's research from the area of specialization. The syllabus is divided into two sections. Candidates are required to choose a minimum of two out of the courses in Section B, which are electives.

ADMISSION REQUIREMENTS

A degree in science or its equivalent acceptable to the Graduate Board. An appropriate professional qualification accepted as equivalent to a Degree.

M.PHIL ENVIRONMENTAL SCIENCE COURSES

SECTION A
Human Population and Urbanization
Environmental Economics
Environmental Impact Assessment
Remote Sensing
Soil, Water and Air Quality
Environmental Law

SECTION B
Water Resource Management
Forest Resource Management
Environmental Chemistry
Atmospheric and Environmental Physics
Environmental Geology

NB. Subject to the availability of staff, other options will be added.
YEAR 1

Courses

ESCI 601	Soil Water and Air Quality	4
ESCI 602	Environmental Economics	3
ESCI 603	Human Population and Urbanization	3
ESCI 604	Environmental Law	3
ESCI 605	Remote Sensing	4
ESCI 606	Environmental Impact Assessment	3
ESCI 607*	Environmental Chemistry	3
ESCI 608*	Atmospheric and Environmental Physics	3
ESCI 609*	Water Resource Management	3
ESCI 610*	Environmental Geology	3
ESCI 612*	Forest Resource Management	3

ESCI 601-606 are Core Courses to be taken by all candidates.

*Elective (Candidates to select at least, one Elective Course each semester)

YEAR II
(Requirements of 36 credits)

ESCI 600	Research Thesis	30
ESCI 620	Seminar I	3
ESCI 630	Seminar II	3

COURSE DESCRIPTIONS

ESCI 601 SOIL, WATER AND AIR QUALITY

Properties of various classes of pollutants and processes determining the fate of pollutants. Treatment of industrial waste and sewerage. Hydrological concepts and their impact on water quality. Soil characteristics and biological activities in soil and chemical degradation in soil, including monitoring the rehabilitation of chemically and physically degraded sites.

ESCI 602 ENVIRONMENTAL ECONOMICS

A study of the application of economic theory to the problems of ecology. Topics include the interplay of supply and demand and the notion of the market, benefit-cost analysis and social decision making, and sustainable development.

ESCI 603 HUMAN POPULATION AND URBANIZATION

A study of the structure of human population, population regulation factors and the relationship between human population growth, resource use, technology and the ecosystem. Urbanization with special reference to land-use, slum and squatter settlements.

ESCI 604 ENVIRONMENTAL LAW

Regulatory mechanisms that address environmental problems related to development including constitutional responsibilities and powers with respect to environmental planning and management.

ESCI 606 ENVIRONMENTAL IMPACT ASSESSMENT

The identification and assessment of environmental impacts of development and their implication in overall decision-making process. The mitigation of the impacts on physical, social and biological systems. Environmental Impact Assessment as a tool for achieving sustainable development.

ESCI 607 REMOTE SENSING

The Principles and application of remote sensing for use in geographic, geological, hydrological and environmental studies, and in meteorlogical monitoring.

ESCI 607 ENVIRONMENTAL CHEMISTRY

The course covers the chemical nature of the key pollutants of air, soils and freshwater and marine bodies, the effects of the pollutants in the environment and management of the pollutants. The chemistry of the major industries, and their problems in relation to the environment and their alternatives

ESCI 608 ATMOSPHERIC AND ENVIRONMENTAL PHYSICS

The course deals with the important aspects of meteorology and characteristics of the earth systems – the atmosphere, oceans and solid earth and the effect of landforms on climate and environment. The role of ozone, carbon dioxide, minor constituents and aerosols.

ESCI 609 WATER RESOURCE MANAGEMENT

Determinants of the biological status and quality of river systems coastal waters, and studies on the effects of pollutants on aquatic ecosystems. Monitoring strategies and standards for pollution

control. Integrated coastal Management. Fisheries exploitation and management.

ESCI 610 ENVIRONMENTAL GEOLOGY

The course covers aspects of geochemistry related to the environment, and the supply, conservation and quality of groundwater and surface water. Other major areas of the course include the nature and effects of geologic hazards, and technologies for minimizing the hazards.

ESCI 612 FOREST RESOURCE MANAGEMENT

Climate, soil and plant growth interrelationships on the structure, composition and functioning of plant communities of the different vegetation types in West Africa. Forest dynamics and study of both temporal and spatial changes. Animal-plant interactions. Forest and wildlife management. Agricultural system and soil conservation.

ESCI 620 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

ESCI 630 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

SCHOOL OF NUCLEAR AND ALLIED SCIENCES (SNAS)

INTRODUCTION

The School of Nuclear And Allied Sciences (SNAS) jointly established by the University of Ghana (UG) through the agency of the Faculty of Science and the Ghana Atomic Energy Commission (GAEC) and in co-operation with the International Atomic Energy Agency (IAEA), Vienna, offers accredited Master of Philosophy (M.Phil) and Doctor of Philosophy (PhD) programmes in the following areas of specialization:

1. Applied Nuclear Physics
2. Medical Physics (In collaboration with the School of Allied Health Sciences)
3. Radiation Protection
4. Nuclear and Environmental Protection

5. Nuclear and Radiochemistry
6. Nuclear Engineering
7. Nuclear Agriculture
8. Radiation Processing
9. Computational Nuclear Sciences and Engineering
10. Nuclear Earth Sciences

MPHIL IN APPLIED NUCLEAR PHYSICS

YEAR 1

Core Courses

Course Code	Course Title	Credits
NSAP 601	Principles of Nuclear Physics	3
NENG 601	Basic Reactor Physics	3
NENG 603	Types of Reactors	2
NENG 607	Health Physics and Radiation Protection	3
NENG 611	Computational Methods in Nuclear Engineering	3
NSAP 613	Research Methods and Scientific Communication	2
NSAP 602	Nuclear Instrumentation and Electronics	4
NSAP 604	Radiation Dosimetry	4
NSAP 612	Practical Exercises	3
SNAS 602	Nuclear Law and Legislation	2

Elective Courses

NSAP 603	X-ray Fluorescence Spectroscopy (XRF)	3
NSAP 605	Accelerator Physics	3
NSAP 610	Seminar 1	3
NSAP 606	Neutron Activation Analysis (NAA)	3
NSAP 608	Solid State Nuclear Track Detection (SSNTD)	3
NSAP 610	Seminar 1	3

MPHIL IN NUCLEAR AND RADIOCHEMISTRY

YEAR 1

Course Code	Course Title	Credits
NSAP 627	Introduction to Nuclear and Radiochemistry	3
NSAP 629	Types and Chemistry of Radioactive decay	3

NSAP 631	Interaction of Radiation with Matter	3
NSAP 633	Radioisotope Production Techniques	2
NSAP 635	Chemistry and Analysis of Radionuclides	2
NSAP 637	Radiological Protection and Nuclear Safety	2
NSAP 613	Research Methods and Scientific Communication	2
NSAP 610	Seminar 1	3
NSAP 626	Detection and Measurement of Radiation and Radioisotope Metrology	2
NSAP 628	Nuclear Activation Analysis and Allied Analytical Techniques	2
NSAP 632	Radiation Chemistry and Dosimetry	2
NSAP 634	Nuclear Dating Methods	2
NSAP 636	Isotope Geochemistry and Isotope Geology	2
NSAP 638	Management of Radioactive Waste	2
NSAP 642	Practicals on Radionuclide Analysis	3
NSAP 644	Radiotracer Methods	2
SNAS 602	Nuclear Law and Legislation	2
NSAP 610	Seminar 1	3

MPHIL IN NUCLEAR AND ENVIRONMENTAL PROTECTION

YEAR 1

Course Code	**Course Title**	**Credits**
NSAP 627	Introduction to Nuclear and Radiochemistry	3
NSAP 637	Radiological Protection and Nuclear Safety	2
NSAP 653	Hazardous Chemicals	3
NSAP 655	Human Toxicology	3
NSAP 657	Environmental Toxicology	2
NSAP 659	Environmentally Sound Management of Toxic Chemicals	3
NSAP 661	Occupational Health and Safety	2
NSAP 610	Seminar 1	3
NSAP 652	Radioactive and Urban Waste Management.	3
NSAP 654	Environmental Impact Assessment	3
NSAP 656	Measurement of Organic Chemical Residues in the Environment	3
NSAP 658	Multi Elemental Analysis	3
NSAP 662	Radionuclide Measurements	2
NSAP 664	Environmental Hydrogeology	2
NSAP 610	Seminar 1	3
SNAS 602	Nuclear Law and Legislation	2

MPHIL IN NUCLEAR EARTH SCIENCES

Year 1

Core Courses

Course Code	Course Title	Credits
NSAP 613	Research Methods and Scientific Communication	2
NSAP 631	Interaction of Radiation with Matter	3
NSAP 633	Radioisotope Production Techniques	2
NSAP 637	Radiological Protection and Nuclear Safety	2
NSAP 677	Nuclear Geochemistry	2
NSAP 679	Nuclear Geophysics	2
NSAP 681	Current Topics in Nuclear Earth Science	2
NSAP 683	Stable Isotope Geochemistry	2
NSAP 685	Research and Field Methods in Nuclear Earth Science	2
NSAP 610	Seminar 1	3
NSAP 628	Nuclear Activation Analysis and Allied Analytical Techniques	3
NSAP 676	Nuclear Applications in Hydrology and Hydrogeology	3
NSAP 678	Geology of High-level Nuclear Waste Disposal	3
NSAP 602	Nuclear Instrumentation and Electronics	4
NSAP 610	Seminar 1	3
SNAS 602	Nuclear Law and Legislation	2

Elective Courses

GEOL 607	Trace Element Geochemistry	2
GEOL 615	Aqueous Geochemistry	2
NENG 653	Computational Mathematics	2
GEOL 678	Environmental Geophysics	2
NSAP 634	Nuclear Dating Methods	2

MPHIL IN NUCLEAR AGRICULTURE

There are two areas of specialization. Choose one option.

1. Mutation Breeding And Plant Biotechnology

YEAR 1

Core Courses

Course Code	Course Title	Credits
NARP 601	Radioisotopes, Radiations and Dosimetry	3
NARP 605	Principles of Genetics	2

NARP 607	Plant Genomics and Diversity	3
NARP 609	Plant Physiology and Morphogenesis	3
NARP 631	Soil Fertility and Management	2
NSAP 613	Research Methods and Scientific Communications	2
NARP 610	Seminar 1	3
NARP 602	Radiobiology and Radiation Protection	3
NARP 604	Mutagenesis and Mutation Breeding	3
NARP 616	Plant Breeding	3
NARP 622	Design and Analysis of Experiments	3
SNAS 602	Nuclear Law and Legislation	2

Electives

NARP 633	Sustainable Agricultural Production	3
CROP 641	Plant Virology and Viral Diseases	3
NARP 606	Crop Pests and Vector Management	3
NARP 608	Molecular Genetics and Genetic Engineering	3
NARP 612	Plant Tissue Culture	3
NARP 614	Post-Harvest Physiology	3
NARP 632	Nuclear Techniques in Crop Nutrition Studies	3

2. Soil Water And Crop Nutrition

YEAR 1

Core Courses

Course Code	**Course Title**	**Credits**
NARP 601	Radioisotopes, Radiations and Dosimetry	3
NSAP 613	Research Methods and Scientific Communications	2
NARP 609	Plant Physiology and Morphogenesis	3
NARP 631	Soil Fertility and Management	2
SOIL 603	Soil Chemistry	3
SOIL 605	Soil Physics	3
NARP 602	Radiobiology and Radiation Protection	3
NARP 622	Design and Analysis of Experiments	3
NARP 632	Nuclear Techniques in Crop Nutrition Studies	3
NARP 610	Seminar 1	3
SNAS 602	Nuclear Law and legislation	2

Electives

SOIL 614	Advanced Soil Physics	3
NARP 607	Plant Genomics and Diversity	3
NARP 633	Sustainable Agricultural Production	3
NSAP 676	Nuclear Applications in Hydrology and Hydrogeology	3
NARP 636	Water Management	3

MPHIL IN RADIATION PROCESSING

There are three areas of specialization. Choose one option.

1. Radiation Processing (Food, Medical Supplies And Polymers)

YEAR I

Core Courses

Course Code	Course Title	Credits
NARP 601	Radioisotopes, Radiations and Dosimetry	3
NSAP 613	Research Methods and Scientific Communications	2
NARP 663	Stored Products Entomology	3
NARP 651	Radiation Applications in Post-Harvest systems	3
NARP 653	Food Microbiology	3
NARP 655	Radiation Processing of Food and Medical Products	3
NARP 657	Food and Industrial Biotechnology	3
MPHY 607	Radiobiology and Radiation Protection	3
NARP 610	Seminar 1	3
NARP 622	Design and Analysis of Experiments	3
NARP 652	Radiation Processing of Industrial Products/Polymers and Environmental Waste	3
SNAS 602	Nuclear Law and Legislation	2

Electives

Course Code	Course Title	Credits
NARP 665	Agricultural Finance	3
NARP 659	Marketing of Agricultural Produce and Trade Regulations	3
NARP 671	Seed Preservation and Management	3
NARP 656	Micro-enterprise Development and Management	3
NARP 658	Packaging of Irradiated Products and Environmental Issues	3
NARP 662	Applied Entomology	3

2. Radiation Entomology

YEAR 1

Core Courses

Course Code	Course Title	Credits
NARP 601	Radioisotopes, Radiation and Dosimetry	3
NSAP 613	Research Methods and Scientific Communications	2
NARP 651	Radiation Applications in Post-Harvest Systems	3
NARP 661	General Entomology	2
NARP 663	Stored Products Entomology	3

NARP 673	Radioisotope and Radiation Techniques in Entomology	3
MPHY 607	Radiobiology and Radiation Protection	3
NARP 610	Seminar 1	3
NARP 622	Design and Analysis of Experiments	2
NARP 664	Integrated Insect Pest and Vector Management	3
NARP 668	Genetic Control of Insect Pests Using Sterile Insect Techniques (SIT)	3
SNAS 602	Nuclear Law and Legislation	2

Electives

Core Courses

Course Code	Course Title	Credits
GEOL 649	Remote Sensing and Geographic Information System	3
NARP 665	Medical and Veterinary Entomology	3
NARP 655	Radiation Processing of Food and Medical Products	3
ENTO 604	Insecticide Science	3
NARP 608	Molecular Genetics and Genetic Engineering	3
NARP 656	Micro-enterprise Development and Management	3
NARP 662	Applied Entomology	3
NARP 666	Medical and Veterinary Entomology	3

3. Food Science And Post-Harvest Technology

YEAR I

Core Courses

Course Code	Course Title	Credits
NARP 601	Radioisotopes, Radiations and Dosimetry	3
NSAP 613	Research Methods and Scientific Communications	2
NARP 651	Radiation Applications in Post-Harvest Systems	3
NARP 653	Food Microbiology	3
NARP 667	Chemistry of Irradiated Foods	3
NARP 669	Food Safety and Quality Assurance	2
NARP 657	Food and Industrial Biotechnology	3
MPHY 607	Radiobiology and Radiation Protection	3
NARP 610	Seminar 1	3
NARP 622	Design and Analysis of Experiments	2
NARP 672	Food Analysis and Sensory Evaluation	3
SNAS 602	Nuclear Law and Legislation	2

Electives

NARP 659	Marketing of Agricultural Produce and trade regulations	3
NARP 661	General Entomology	3
NARP 665	Agricultural Finance	3
NARP 608	Molecular Genetics and Genetic Engineering	3

NARP 656	Micro-enterprise Development and Management	3
NARP 658	Packaging of irradiated products and Environmental Issues	3

MPHIL IN MEDICAL PHYSICS

YEAR 1

Core Courses

Course Code	Course Title	Credits
MPHY 601	Selected topics in Anatomy, Physiology and Chemistry	4
MPHY 605	Radiation Physics	2
MPHY 607	Radiobiology and Radiation Protection	3
MPHY 609	Electronics, Instrumentation, Signal Analysis, Imaging and Display	3
MPHY 611	Dosimetry for Photon and Electron Beams	4
MPHY 613	Practicals in Radiation Dosimetry	3
MPHY 615	Practicals in Radiotherapy	3
NSAP 613	Research Methods and Scientific Communications	2
MPHY610	Seminar 1	3
MPHY 617	Clinical Practice in Radiotherapy, Diagnostic Radiology and Nuclear Medicine at the Hospital I	2
MPHY 602	Ultrasonics, Theory, Instrumentation and Practice	2
MPHY 604	NMR Spectroscopy and Imaging	3
MPHY 606	X-Rays and Diagnostic Radiology	3
MPHY 608	Nuclear Medicine	3
MPHY 612	Radiotherapy	4
MPHY 614	Applications of Digital Computers, Lasers and Ultraviolet Radiation in Medicine	2
SNAS 602	Nuclear Law and Legislation	2
MPHY 610	Seminar 1	3
MPHY 616	Clinical Practice in Radiotherapy, Diagnostic Radiology and Nuclear Medicine at the Hospital II	2

MPHIL IN NUCLEAR ENGINEERING

There are two areas of specialization. Choose one option.

1. Reactor Physics

YEAR 1

Core Courses

Course Code	Course Title	Credits

NENG 601	Basic Reactor Physics	3
NENG 603	Types of Reactors	2
NENG 605	Nuclear Heat Transfer and Fluid Flow	3
NENG 607	Health Physics and Radiation Protection	3
NENG 609	Radiation Detection	2
NENG 611	Computational Methods in Engineering	2
NSAP 613	Research Methods and Scientific Communications	2
NENG 610	Seminar 1	3
SNAS 602	Nuclear Law and Legislation	2
NENG 602	Reactor Statics	3
NENG 604	Reactor Dynamics	3
NENG 606	Nucleonics	3
NENG 608	Fuel Management	3
NENG 610	Seminar 1	3
NENG 620	Seminar 2	3

Inter-Semester Practicals on Radiation and Health Physics Measurements.

NENG 624 Experiments on radiation measurement: 2

i. Gamma-Ray spectroscopy using NaI(TI).

ii. Study of hydrogenous materials for neutron shielding.

NENG 626: Experiments on Activation Analysis: 2

i. Measurement of average neutron flux using HPGe detector.

ii. Determination of manganese in steel using NAA

2. Reactor Engineering

YEAR 1

Core Courses

Course Code	**Course Title**	**Credits**
NENG 601	Basic Reactor Physics	3
NENG 603	Types of Reactors	2
NENG 605	Nuclear Heat Transfer & Fluid Flow	3
NENG 607	Health Physics and Radiation Protection	3
NENG 609	Radiation Detection	2
NENG 611	Computational Methods in Engineering	2
NSAP 613	Research Methods and Scientific Communications	2
NENG 610	Seminar 1	3
NENG 620	Seminar 2	3
SNAS 602	Nuclear Law and Legislation	2
NENG 628	Two-Phase Flows and Heat Transfer in Nuclear Systems	3
NENG 612	Radiation Shielding	3
NENG 614	Reactor Materials and Radiation Damage	3
NENG 616	Analysis of Cycles of Nuclear Power Plants	3

Inter-Semester Practicals on Reactor Experiments and Computer Exercises

NENG 618 **Reactor Experiments.** 2

i. Control Rod Calibration

ii. Measurement of neutron temperatures in the inner and outer irradiation sites

NENG 622: **Computer Exercises** 2

i. Computer exercises for calculation of reactor parameters

ii. Computer simulation of reactivity transients

MPHIL IN COMPUTATIONAL NUCLEAR SCIENCE AND ENGINEERING

YEAR 1

Core Courses

Course Code	Course Title	Credits
NSAP 613	Research Methods and Scientific Communications	2
NENG 601	Basic Reactor Physics	3
NENG 605	Nuclear Heat Transfer & Fluid Flow	3
NENG 651	Mathematical Modeling and Simulations in Nuclear Sciences	3
NENG 655	Practicals (Scientific Computing Skills)	3
NENG 653	Nuclear Sciences and Applications	2
NENG 611	Computational Methods in Engineering	2
NENG 610	Seminar 1 (Programming Techniques for Artificial Intelligence Computer Graphics Simulation and Visualization)	3
NENG 652	Monte Carlo Simulations and Applications	3
NENG 654	Computational Methods in Power Systems (Analysis & Controls)	2
NENG 656	Computational Optimization (Optimization Methods for System and Control)	2
NENG 658	Practicals (Programming Skills)	2
NENG 662	Computational Fluid Dynamics	3
SNAS 602	Nuclear law and Legislation	2
NENG 620	Seminar 2	3

Electives

Course Code	Course Title	Credits
NENG 661	Parallel Computing, Numerical Algorithms and	

	Programming	3
NENG 663	Heuristic Problem Solving	3
NENG 664	Computational Nuclear and Reactor Physics	2
NENG 666	Computational Hydrology	2
NENG 668	Parallel Computing, Numerical Algorithm & Programming	3
NENG 672	Radiation Damage and Corrosion Models in Nuclear Reactors	3
NENG 674	Heuristic Problem Solving	3

MPHIL IN RADIATION PROTECTION

YEAR 1

Course Code	Course Title	Credits
NSAS 601	Review of Fundamentals of Radiation Physics	3
NSAS 603	Radiation Quantities and Measurements	2
NSAS 605	Biological Effects of Ionizing Radiations	2
NSAS 607	Principles of Radiation Protection, International Framework and Nuclear Safety	2
NSAS 609	External and Internal Exposure and dose Assessment	3
NSAS 611	Sources and Protection Against Non-Ionizing Radiation.	2
NSAS 619	Intervention for the Protection of the Public in Situations of Chronic and Acute Emergency Exposure	2
NSAS 617	Demonstrations (During Inter-semester break)	3
NSAP 613	Research Methods and Scientific Communications	2
NSAS 610	Seminar 1	3
NSAS 602	Occupational Radiation Protection	3
NSAS 604	Medical Exposure in Diagnostic Radiology Radiotherapy and Nuclear Medicine	3
NSAS 606	Exposure of the Public due to Practices and Environmental Protection	3
NSAS 608	Practical Exercises	3
NSAS 614	Technical Visits and Case Studies	3
NSAS 616	Regulatory Framework For control of Radiation Sources	2
SNAS 602	Nuclear Law and Legislation	2

UNIVERSITY OF GHANA MEDICAL SCHOOL

These degrees are offered in the Departments of Anatomy, Chemical Pathology, Haematology, Medical Biochemistry, Microbiology, Pathology, Pharmacology and Physiology.

DEPARTMENT OF ANATOMY

M.PHIL PROGRAMME

DURATION
4 Semesters (24 months)

ENTRY REQUIREMENTS
A good first degree in Biology or Medical Science with FGPA of at least 3.5 or a basic registrable medical degree (MB.Ch.B or its equivalent).

COURSE STRUCTURE
A candidate is required to take a minimum of 60 credits in 4 semesters. The course credit requirements are as follows:

	Credits
• Course work	24 – 36
• Seminar Presentation I	3
• Seminar Presentation II	3
• Thesis	30

YEAR 1

Core Courses		**Credits**
ANAT 601	Gross Anatomy I	3
ANAT 602	Neuroanatomy	3
ANAT 603	Gross Anatomy II	4
ANAT 605	Gross Anatomy III	2
ANAT 607	Histology	4
ANAT 604	Anatomical Techniques I	3
ANAT 609	Embryology	2
ANAT 606	Genetics and Cytogenetics	2
ANAT 608	Stereology	1
ANAT 610	Seminar I	3
GSPH 601	Biostatistics and Research Methods	2

	(Offered in the School of Public Health)	
BIOC 601	Molecular Aspects of Cell Biology (Offered in the Dept. of Medical Biochemistry, UGMS)	3
BIOC 603	Genetic Information Storage, Transmission and Expression (Offered in the Dept. of Medical Biochemistry, UGMS)	3 credits

ELECTIVE COURSES

ANAT 612	Anatomical Techniques II	2 credits
ANAT 614	Anatomical Techniques III	2 credits

ANAT 601, 602, 603, 605, 607 and 609 are based on the approved Level 300 courses and are to be taken on the advice of the Head of Department, supervisor or statutory body established in the Medical School. These courses are intended to lay the foundation for teaching Anatomy.

YEAR II

ANAT 600	Thesis	30 credits
ANAT 620	Seminar II	3 credits

FIELDS OF SPECIALIZATION

1. Neural tube development
2. Cardiac muscle development and ultrastructure
3. Development/Structure of foetal membranes in health and disease
4. Experimental Embryology
5. Cytogenetics

COURSE DESCRIPTIONS

ANAT 601 GROSS ANATOMY I

Introductory Lectures: History of anatomy, introduction to anatomy, anatomical nomenclature, skeletal system, joints, muscular system, circulatory system, nervous system.

Upper limbs, Pectoral region/breast, axilla, brachia, plexus, the hand, joints of the upper limbs.

Thorax: Thoracic cage, lungs and pleurae, mediastinum, the heart.

ANAT 602 NEUROANATOMY

The spinal cord, brainstem (medulla oblongata, pons midbrain), cerebellum, thalamus, basal ganglia and internal capsule, hypothalamus, cerebral cortes, pathways – sensory, motor, visual auditory vestibular and olfactory.

ANAT 603 GROSS ANATOMY II

Head and Neck: Triangles of the neck, cranial nerves, temporal and infratemporal regions, intracranial venous sinuses, the orbit, the ear, larynx, lymphatic drainage of the head and neck.

Abdomen, Pelvis and Perineum: Anterior abdominal wall, inguino-scrotal region, abdonimal cavity, kidneys and ureters, pelvic viscera I and II, perineum I and II.

ANAT 605 GROSS ANATOMY III

Lower Limbs: Overview of the lower limb, the gluteal region, venous and lymphatic drainage of lower limb, the foot.

ANAT 604 ANATOMICAL TECHNIQUES I

Histological techniques - fixation, embedding, microtomy, staining. Microscopy - light, fluorescent, phase-contrast microscopy. Electron microscopy: principles of electron microscopy, fixatives, stains, resins, ultramicrotomy.

ANAT 606 HUMAN CYTOGENETICS General principles of cytogenetics. Sex chromosomes: Buccal smear, Hair root sheath, Blood smears, Y chromosome fluorescence. Chromosome analysis: Chromosome preparation; Chromosome banding: Q-banding, G-banding, 5-bromodeoxyuracil (BrdU). Karyotyping. Chromosomal abnormalities: classification, diagnosis.

ANAT 607 HISTOLOGY

Introduction to histology, histological methods, covering epithelia, glandular epithelium, connective tissue, cartilage and bone, muscle tissue, nervous tissue, nerve and central nervous system, heart, blood, blood formation, blood and lymph vessels, respiratory system I, respiratory system II, alimentary system I, alimentary system II, alimentary system III, liver, gall bladder, pancreas, endocrine glands I endocrine glands II, lymphoid tissues I, lymphoid tissues II, integument I, integument II, eye, ear, female genital I, female genital II, female genital III, male genital I, male genital II.

ANAT 608 BIOLOGICAL MORPHOMETRY (STEREOLOGY)

Stereological principles. Sampling of tissue. Point counting methods: basic principles, coherent test systems.

Estimating quantities in 3-D space: volume, membrane thickness. Performing a stereological study: strategy, organ size and body weight, specimen preparation, instrumentation.

ANAT 609 EMBRYOLOGY

Introduction to embryology, fertilization, implantation, gastrulation, neurulation and organogenesis, body cavities and membranes, establishment of the heart, development of the heart, septation of the heart, development of arterial system, development anomalies of the cvs, development of nervous system, development of respiratory system, development of buccal cavity, pharyngeal apparatus I, pharyngeal apparatus II, post-pharyngeal guti, post-pharyngeal gut II and III development of urinary system, development of male genital system, development of female genital system, development of the eye and ear I, development of the eye and ear II.

ANAT 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be

expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

ANAT 612 ANATOMICAL TECHNIQUES II

Labelling tracer techniques - Histochemistry, cytochemistry, vital staining.

ANAT 614 ANATOMICAL TECHNIQUES III Culture techniques - Cell and tissue culture, whole embryo culture, morphological assessment, protein content determination. Chick embryo culture (New culture technique).

ANAT 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

BIOC 601 MOLECULAR ASPECTS OF CELL BIOLOGY

Self-assembling macromolecular assembly of large complexes. Biomolecular aggregates: microtubules, ribosomes, viruses. Details of the structure and assembly of HIV, the AIDS virus. Biological membrane transport system: novel transport systems, multidrug transporter, osteoclast protein pumps of bone, amphipathic ion translocating peptides. Cellular signalling and signal transduction: super-families of membrane receptors, oncogenes, tumour suppressor genes, sensory transduction, neurotransmission, neurological disorders. Transmission of nerve impulses and signal transduction in sensory systems.

BIOC 603 GENETIC INFORMATION: STORAGE, TRANSMISSION AND EXPRESSION

DNA structure, replication and repair. Gene rearrangements, recombination and transposition. RNA: translation and targeting. Control of gene expression in prokaryotes. Eucaryotic chromosomes and gene expression. Viruses and oncogenes. Gene cloning and recombinant DNA methodology.

GSPH 601 BIOSTATISTICS AND RESEARCH METHODS

Introduction - concept of universe. Descriptive statistics. Data processing. Measurements of central tendency, Measures of dispersion, Normal distribution. Probability concepts; Tests of significance; Levels of confidence. Sampling and estimation of sample size. Multivariate analysis. Computer data processing. Use of statistical programme packages.

DEPARTMENT OF HAEMATOLOGY

M.PHIL PROGRAMME

DURATION
4 Semesters (24 months)

ENTRY REQUIREMENTS
Post BSc: A candidate who already has an MSc in a subject in Laboratory Medicine.

Post MBChB: A candidate who possesses MBChB of the University of Ghana Medical School or other medical degree from a recognized university.

All candidates may be required to satisfy other courses in the Biomedical Science programme in the selection process.

COURSE STRUCTURE

- Course work 32-36 credits
- Two advanced research seminars on appropriate topics 6 credits
- Research/Thesis 30 credits

Written and oral examination at end of programme.

YEAR ONE

Core Courses		**Credits**
HAEM 601	Cellular Haemopathology	1
HAEM 602	Blood Transfusion and Coagulation	1
HAEM 603	Practicals on Basic haematological Investigations	2
HAEM 604	Practicals on Basic Coagulation and blood Transfusion Methods	3
HAEM 606	Advanced Blood Transfusion	1
HAEM 608	Advanced Haemostasis	1
HAEM 630	Seminar I	3
CPAT 601	Instrumentation; Water & Electrolytes; Acid/Base; Renal Function	1
CPAT 603	Practicals related to CPAT 601	3
CPAT 606	Endocrinology; Carbohydrate; Calcium and Phosphate Metabolism	
CPAT 608	Practicals related to CPAT 606	2
CPAT 609	Protein; Enzymology; Liver Function	1
CPAT 611	Practicals related to CPAT 609	2
MICB 601	Introduction to Microbiology and General microbiology	1
PATH 601	Characteristics and cellular basis of disease. Inflammation, Healing & Repair	1
PATH 607	Immunology and Immunopathology	1
PATH 610	Pathology of the Lymphoreticular system	1
GSPH 601	Biostatistics and Research Methods	2
BIOC 602	Molecular Aspects of cell Biology	3
BIOC 604	Genetic Information, storage, transmission and expression	3

Prescribed Electives

CPAT 605	CSF; Inborn Errors of Metabolism; Nutritional deficiency	1
CPAT 607	Practicals related to CPAT 605	2
PATH 609	Disorders of growth and neoplasia	1
PATH 613	General Pathology practicals	2
PHAM 601	Pharmacokinetics	2
PHAM 603	Immunopharmacology and drug allergy	1
PHAM 605	Pharmacogenetics	1
PHAM 607	Pharmacoepidemiology	1
PHAM 609	Drug development and evaluation	1
PHAM 611	Practical 1	2

YEAR II

HAEM 60	Thesis	30
HAEM 640	Seminar II	3

COURSE DESCRIPTIONS

HAEM 601 CELLULAR HAEMOPATHOLOGY

Normal haemopoiesis and functions of the cellular components of the blood and blood forming organs. Iron metabolism and hypochromic anaemias. Metabolism of Vitamin B12 and folic acid and megaloblastic anaemia. Haemoglobin structure, catabolism and function. Congenital and acquired haemolytic anaemias. Benign and malignant disorders of the white cells. Physiology and factors affecting normal haemostasis. Presentation, pathogenesis, management and prognosis of the various anaemias and Haematological malignancies.

HAEM 602 BLOOD TRANSFUSION AND COAGULATION

The diagnosis and treatment of inherited and acquired bleeding disorders and hypercoagulable states. The genetics, biochemistry and application of the blood groups and the HLA system. Antigen-antibody reactions and factors controlling the reactions. Clinical blood transfusion and immune haemolytic anaemias.

HAEM 603 BASIC HAEMATOLOGICAL INVESTIGATIONS (PRACTICALS)

Haematological stains and staining techniques including supravital staining and cytochemical staining. Cell counting, manual and automated. Examination of thin and thick blood films and bone marrow films. Methods used in investigating haemolytic anaemias including sickling and solubility tests, Hb electrophoresis HbF and A2 estimation, G6PD screen and electrophoresis, osmotic fragility tests, autohaemolysis tests, spectroscopy, Platelet function test.

HAEM 604 BASIC COAGULATION AND BLOOD TRANSFUSION METHODS (PRACTICALS)

Screening tests for bleeding disorders, correction studies and factor assay. Test for fibrinolysis. Transfusion medicine. Blood donor screening. Microbiological screening techniques including particle agglutination, ELISA and R.I.A. Various methods of red cell grouping using both liquid and solid phase methods. Compatibility testing. Antibody screening and identification using various methods. Application on forensic medicine. Product preparation including FFP, platelet concentrate, cryoprecipitate. Investigation of transfusion reaction and haemolytic disease of the new-born. HLA typing.

HAEM 606 ADVANCED BLOOD TRANSFUSION

The chemistry and genetics of blood groups. The complexity of the A & B sub groups and the rhesus system. Lectins, polyagglutination and use of enhancers in antibody antigen reactions. Modern principles of blood banking. Adverse effects of blood transfusion. Paternity test. Technological advances and the future trends in blood banking.

HAEM 608 ADVANCED HAEMOSTASIS

Arachidonate metabolism in blood cells and vessel walls. The vessel wall and its interactions with platelets, coagulation factors and the fibrinolytic system. Disorders of platelets, coagulation factors and fibrinolysis. Laboratory support in diagnosis of coagulation disorders. Genetic

engineering and coagulation factors.

HAEM 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

HAEM 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

BIOC 602 MOLECULAR ASPECTS OF CELL BIOLOGY

Self-assembling macromolecular assembly of large complexes. Bimolecular aggregates; microtubules, ribosomes, virus. Details of the structure and assembly of HIV, The AIDS virus. Biological membrane transport systems; novel transport systems, multidrug transporter, osteoclast protein pumps of bone, amphipathic ion translocating peptides. Cellular signalling and signal transduction; super-families of membrane receptors, oncogenes, tumour suppressor genes, sensory transduction, neurotransmission, neurological disorders. Transmission of nerve impulses and signal transduction in sensory systems.

BIOC 604 GENETIC INFORMATION: STORAGE, TRANSMISSION AND EXPRESSION DNA structure, replication and repair. Gene rearrangements, recombination and transposition RNA; translation and targeting. Control of gene expression in prokaryotes. Eucaryotic chromosomes and gene expression. Viruses and ocogenes. Gene cloning and recombinant DNA methodology.

SPECIFIC OBJECTIVES

At the end of the course, the graduate should be able to

i. Perform haematological tests, identify and correct errors in these tests
ii. Prepare and standardise blood products
iii. Prepare and store quality control samples
iv. Initiate research in at least two of the following areas; coagulopathy, haemoglobinopathy and other haemolytic anaemias, haematological malignancies, blood groups and tissue typing.

DEPARTMENT OF MEDICAL BIOCHEMISTRY

M.PHIL. PROGRAMME

DURATION
4 Semesters (24 months)

ENTRY REQUIREMENTS
A good first degree in Biochemistry, Biological Sciences or Medical Sciences or a basic registrable medical degree (MB Ch.B or equivalent) with at least a credit in Medical Biochemistry.

COURSE STRUCTURE
A candidate is required to take a minimum of 60 credits. The requirements are as follows:

• Course Work	24-36 credits
• Seminars (2)	6 credits
• Research/ Thesis	30 credits
	60-72 credits

YEAR I

Core Courses		**Credits**
BIOC 601	Molecular Aspects of Cell Biology	3
BIOC 603	Genetic Information: Storage, Transmission and Expression	3
BIOC 604	Biochemical Techniques	3
BIOC 608	Molecular Biology Practicals	2
BIOC 610	Seminar 1	3
BCHM 602	Molecular Cloning and Expression (Offered in the Department of Biochemistry, Legon)	3
BCHM 617	Recent Advances in Enzymology (Offered in the Department of Biochemistry, Legon)	3
GSPH 601	Biostatistics and Research Methods (offered in the School of Public Health)	2

YEAR II

BIOC 600	Thesis	30
BIOC 620	Seminar II	3

Electives
A minimum of seven (7) credits to be selected from the underlisted list and from other areas in consultation with the Advisory Committee and Head of Department:

MICB 601	Introduction to Microbiology and General Microbiology (Offered in the Department of Microbiology)	1
MICB 604	Virology (offered in the Dept. of Microbiology)	2
PHAM 605	Pharmacogenetics (Offered in the Dept. of Phamacology)	1
PHAM 607	Pharmacoepidemiology (Offered in the Dept. of Pharmacology)	1
PHAM 609	Drug Development and Evaluation (offered in the Dept of Pharmacology)	1

BCHM 621	Molecular Biomarkers and Evaluation (offered in the Dept. of Biochemistry, Legon)	3
PHYG 601	General, Cellular Gastrointestinal Physiology (offered in the Dept. of Physiology)	5
PATH 601	Characteristics And Cellular Basis of Disease. Inflammation, Healing and Repair. (Offered In The Dept. of Pathology)	1

COURSE DESCRIPTIONS

BIOC 601 MOLECULAR ASPECTS OF CELL BIOLOGY

Self-assembling macromolecular assembly of large complexes. Bimolecular aggregates; mocritubules, ribosomes, viruses. Details of the structure and assembly of HIV, the AIDS virus. Biological membrane transport systems: novel transport systems, multidrug transporter, osteoclast protein pumps of bone, amphipathic ion translocating peptides. Cellular signalling and signal transduction; super-families of membrane receptors, oncogenes, tumour suppressor genes, sensory transduction, neurotransmission, neurologoical disorders. Transmission of nerve impuleses and signal transduction in sensory systems.

BIOC 603 GENETIC INFORMATION: STORAGE, TRANSMISSION

AND EXPRESSION

DNA structure, replication and rapair, Gene rearrangements, recombination and transposition. RNA: translation and targetting. Control of gene expression in prokaryotes. Eucaryotic chromosomes and gene expression. Viruses and oncogenes. Gene cloning and recombinant DNA methodology.

BIOC 604 BIOCHEMICAL TECHNIQUES

Qualitative and quantitative measurements and instrumentation, sample pre-treatment techniques, and instrumentation: resolution, sensitivity, detection limit. Detailed consideration and application of some selected methods e.g. chromotagraphy, electrophoresis, redioimmuno-assay, spectrophotometry etc.

BIOC 608 MOLECULAR BIOLOGY PRACTICALS

A practical laboratory session to expose the students to modern techniques and methods of isolation, purification, analysis and manipulation of genetic materials of different organisms.

BCHM 602 GENE CLONING AND EXPRESSION

Construction and Analysis of cDNA libraries. Genomic libraries. Preparation of radiolabelled DNA: Synthetic oligonucleotide Probes:- uses, purification and radiolabeling, hybridization. Screening of expression libraries with oligonucleotides or antibodies. DNA sequencing; Site-Polymerase Chain Reaction (PCR) for DNA amplification. Site-directed mutagenesis. Expression of cloned genes in E. coli Bacillus, yeast and mammalian cells. Transformation. Expression vectors/hosts. Detection and analysis of proteins expressed from cloned gene; Inclusion body formation. Application of recombitant DNA technology in agriculture, health and industry.

BIOC 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

BIOC 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

BCHM 617 ADVANCED ENZYMOLOGY

Steady state and pre-study state: steady state enzyme kinetics; methods for identifying kinetic mechanisms; isotope exchange rates; multiple substrate kinetics; kinetic techniques in enzymology; stop flow methods, relaxation (temprerature jump) methods; intre – and extra cellular enzymes. Fast reactions: Application and importance to biochemistry; reactions between proteins and small molecules. Protein – ligand binding measurement; analysis of binding isotherms; cooperativity; Hill and Scatchard plots; kinetics of allostetic enzymes. Industrial use of enzymes: practical and economic advanges; enzyme stabilization and immunobilization; their effects on kinetics; enzyme ractions; type of bioreactiors.

BCHM 621 MOLECULAR BIOMARKERS OF POLLUTION

Biotransformation reactions for eliminating organic xenobiotics: details of the NADPH-dependent monooxygenase reaction; cytochrome P450 induction; conjugation reactions. Metal toxicity and induction of metallothioneins. Stress proteins. Genotoxic markers. Measurement of induced proteins.

GSPH 601 BIOSTATISTICS AND RESEARCH METHODS

Biostatistics

Introduction: Descriptive Statistics; Data Presentation, Measures of Central Tendency, Measures of Dispersion, Normal Distribution. Probability Concepts; Tests of Significance; Levels of Confidence. Sampling and Estimation of sample Sizes. Multivariate Analysis. Computer Data Processing. Use of statistical programme packages. Concept of enquiry in public health. Research tools in public health; Descriptive, Cross sectional, longitudinal, Operational, Analytical, Case control (retrospective), cohort (prospective); Experimental studies.

Research Methods: Research design; problem-formulation, selection of methodology, Quantitative studies, Survey instruments; Qualitative Studies, focus group discussion, Participant observation, Exit interviews. Sampling techniques. Data collection: tools and sources, censuses, special surveys, focus group discussion, literature study, special registers study, vital statistics, Coroner's registers study, Opinion poll, Health institutional data study. Data reporting and presentation. Team work e.g. Consultation with statisticians. Proposal writing.

MICB 601 INTRODUCTION TO AND GENERAL MICROBIOLOGY

Classification schemes as applied to microorganisms phytogenetic and numerical, structural and biochemical characteristics for the purpose of identifying microorganisms - Bacteria, Parasites, Viruses. Structure and ultrastructure of micro-organisms, nutrition and growth kinetics. Basic

physiology. Sterilisation and Disinfection.

MICB 604 VIROLOGY

Nature of viruses, methods of classification, multiplication and pathogenesis of viral infections. Modes of spread, prophylaxis. Isolation and identification of unknown agents presumed to be viruses. Properties of major groups known to affect man and of bacterial and plant viruses. Animal techniques. Collection, transportation and storage of specimens. Electron microscopy.

PATH 601 CHARACTERISTICS AND CELLULAR BASIS OF DISEASE. INFLAMMATION, HEALING AND REPAIR

History of pathology; Techniques available in pathology. Aetiology; Pathogenesis; Manifestation and Presentation; Complications and Sequelae; Prognosis. Causes of disease - Genetics; Infective (Bacteria Viruses, Yeasts and Fungi; Parasites); Chemical Agents; Physical Agents. Nomenclature- Primary and Secondary; Acute and Chronic; Benign and Malignant; Prefixes and Suffixes; Syndromes. Classification - Congenital (Inherited and not Inherited); Acquired; Iatrogenic

Cellular Basis of Disease

Cell Proliferation ; Homeostasis. Cellular injury - Mechanisms of cellular injury; Cell Injury (Sublethal and lethal); Effects of Physical, Chemical and Biological agents.- Cellular response to injury - Hydropic change, Fatty change; Necrosis , Coagulative, Colliquative/Liquefactive; Caseous; Gangrene; Light and Electron microscopic changes in Apoptosis.

Inflammation, Healing and Repair

The Acute Inflammatory Process - Mechanism, Humoral Mediators. Histamine and serotonin, Platelet Activating Factor, Arachidonic Acid Derivatives, Coagulation and Fibrinolytic systems, Kinin System, Complement, Cytokines, Neutrophil- derived lysosomal compounds (proteases, cationic proteins, free radicals); Morphological Features including abscess, types of exudate, pseudomembranous inflammation; Effects-beneficial and Harmful, Local and Systemic- Local Sequelae - Suppuration; Resolution, Regeneration, Organisation and Repair (Healing by Fibrosis); Progression to Chronic Inflammation- Chronic inflammation - Progression from acute, Recurrent acute and Primary chronic inflammation; Cells involved in chronic inflammation (including specialised forms of macrophages); Granulomatous inflammations; -

Healing - Wound Healing - First Intention/Primary Union, Second Intention/Secondary Union; Fracture Healing; Healing of mucosae; granulation Tissue; Molecular control of healing - Growth Factors and their interaction; Factors affecting Healing)

PHAM 605 PHARMACOGENETICS

Drug toxicity due to impaired drug metabolism, increased sensitivity to drug, novel drug effect, decreased responsiveness to drug, abnormal distribution of drug.

PHAM 607 PHARMACOEPIDEMIOLOGY

Drug legislation, national drug policy and regulation; pharmaceutical policy, legislation and regulation; drug information; drug procurement and distribution; economic policies and incentives on drug use; rational drug use: social and cultural attitudes, beliefs, surroundings, information,

promoting generic drug use, personal characteristics, primary care providers, prescribing monitoring, essential drugs programme, and pharmacosurveillance.

PHAM 609 DRUG DEVELOPMENT AND EVALUATION

Qualitative and quantitative estimation of drug action, methods of developing new drugs, clinical trial, use and misuse of drugs, monitoring of drug use, drug interaction.

PHYG 601 GENERAL CELLULAR AND GASTRO INTESTINAL PHYSIOLOGY

In-depth study of general and gastro-intestinal physiology. Application of the laws of thermodynamics to the cell; to mass and energy transport mechanisms in physiological homeostasis and regulation. The cell and its membranes, cellular transduction processes, intercellular communication, membrane transport mechanisms, excitation and nerve conduction and innervation of muscle and neuromuscular transmission.

Application of the fundamental principles to the whole organism's acquisition of nutrients and micronutrients, the role of enzymes and hormones and their environment in gastrointestinal physiology.

DEPARTMENT OF MICROBIOLOGY

M.PHIL PROGRAMME

DURATION

4 Semesters (24 months)

ENTRY REQUIREMENTS

Post B.Sc

The programme shall be open to candidates who possess a good first degree (at least a second class lower division) in any Biological Science or Microbiology.

Post MBChB/BSc Medical Science

Candidates who possess MBChB/BSc Medical Science of the University of Ghana Medical School or other Medical Degree from a recognized university.

Post MSc

A candidate who already has an MSc in a subject in Laboratory Medicine

COURSE STRUCTURE

- Course work 24-36 Credits
- Seminar presentation I 3 Credits
- Seminar presentation II 3 Credits
- Research/Dissertation or Thesis 30 Credits

YEAR I

Core Courses

MICB 601	Introduction to General Microbiology	1
MICB 602	Chlamydia	1
MICB 603	Practicals(for MICB 601) Basic Microbiology	1
MICB 604	Virology	2
MICB 605	Mycology	1
MICB 606	Electron microscopy and tissue culture	1
MICB 607	Mycology Practicals	1
MICB 608	Inoculation of clinical material	1
MICB 609	Bacteriology	4
MICB 610	Parasitology and Entomology	3
MICB 611	Investigation of diseases; special Techniques	1
MICB 612	Investigation of Parasitic Disease	1
MICB 613	Antimicrobials - Practicals	1
MICB 614	Cultural Techniques in Parasitology	1
MICB 616	Practicals on General Parasitology	1
MICB 618	Tutorials in special topics in Parasitology	2
MICB 630	Seminar I	3
GSPH 601	Biostatistics and Research Methods	2
BIOC 602	Molecular Aspects of cell Biology	3
BIOC 604	Genetic Information, storage, transmission and expression	3
PHAM 606	Drug resistance	1

Prescribed Electives

Students are to take a minimum of 4 credits from these electives

PATH 601	Characteristics and cellular basis of disease. Inflammation, healing and repair	1
PATH 607	Immunology and Immunopathology	1
PATH 613	General Pathology practicals	2
CPAT 601	Instrumentation; Water & Electrolytes; Acid/Base; Renal Function	1
CPAT 603	Practicals related to CPAT 601	3
HAEM 601	Cellular Haemopathotology	1
HAEM 603	Practicals on Basic haematological Investigations	2

Prescribed Electives

Prescribed elective courses may be selected from 2nd semester courses of other departments as may be directed by the Biomedical Science Committee.

YEAR TWO

MICB 640	Seminars II	3
MICB 600	Thesis	30

COURSE DESCRIPTIONS

Specific Objectives

At the end of the course, the student should:

i. Have a sound theoretical knowledge of the structure of microorganisms.
ii. Know how to collect specimens for the diagnosis of infectious diseases
iii. Be able to set up tests for investigation of infection and interpret the results.
iv. Be equipped to initiate research in at least one major area in Microbiology, e.g., Virology, Bacteriology or Parasitology

MICB 601 INTRODUCTION TO GENERAL MICROBIOLOGY

Classification schemes as applied to microorganisms, phytogenetic and numerical, structural and biochemical characteristics for the purpose of identifying microorganisms - Bacteria, Parasites, Viruses. Structure and ultrastructure of micro-organisms, nutrition and growth kinetics. Basic physiology. Sterilisation and Disinfection.

MICB 602 CHLAMYDIA

Classification and identification of Chlamydia, Rickettsia and related bacteria. Collection and storage of specimens. Direct detection techniques. Investigation of diseases. Serological tests. Evaluation and interpretation of results.

MICB 603 PRACTICAL IN BASIC MICROBIOLOGY

Microscopy. Principles of staining and staining techniques-Gram stain, ZN, spore staining, Nigrosin. Culture methods in bacteriology, virology and Parasitology. Collection and preparation of material for diagnosis of infectious disease. Direct detection of microorganisms in specimens. Preparation of media.

MICB 604 VIROLOGY Nature of viruses, methods of classification, multiplication and pathogenesis of viral infections. Modes of spread, prophylaxis. Isolation and identification of unknown agents presumed to be viruses. Properties of major groups known to affect man and of bacterial and plant viruses. Animal techniques. Collection, transportation and storage of specimens. Electron microscopy.

MICB 605 MYCOLOGY

Structure and classification of fungi of medical importance, Environmental fungi, Dermatophytes, Opportunistic fungi, Dimorphic molds. Antifungal agents, Investigation of fungal infections.

MICB 606 PRACTICAL – VIROLOGY ELECTRON MICROSCOPY

Principles of purification and concentration of viruses, cataloguingand indexing, electron microscopy, Negative staining, ultra-thin section techniques. Important disease causing viruses, public health aspects of virology. Persistence of viruses in milk water air and sewage. Use of disinfectants in virology. Care of apparatus and equipment.

MICB 607 PRACTICAL IN MYCOLOGY

Staining of fungi, investigation of fungal infections-superficial, subcutaneous, systemic and opportunistic. Identification of yeast, dermatophytes, environmental fungi.

MICB 608 PRACTICAL IN ANIMAL TECHNIQUES AND

INNOCULATION OF CLINICAL MATERIAL

Animal housing ,feeding and management of healthy and infected animals and birds. Post-mortem examination. Cruelty to Animals Act. Egg techniques-care and handling of fertile eggs. Candling for embryo viability. Assessment of developing embryo . Harvesting and detection of viruses from infected eggs. Inoculation of clinical material. Tissue culture- Cell and organ culture, different tissues for primary cell culture Cytopathic effect. Storage and preservation of cells. Contamination of cell culture.

MICB 609 BACTERIOLOGY

Major groups of bacteria and fungi associated with disease Aetiology and investigation of disease. Antibiotics and chemotherapy. Application of bacteriology to the industrial production of substances of medical interest.

MICB 610 PARASITOLOGY AND ENTOMOLOGY

Morphology, life cycles and classification of human parasites Parasites of animals. Arthropods associated with human disease Epidemiology and geographical distribution of human parasitic diseases.

MICB 611 PRACTICALS IN INVESTIGATION OF BACTERIOLOGICAL DISEASE

Investigation of acute and chronic bacterial, infections-endocarditis, sexually transmitted diseases, meningitis septicaemia, pneumonia, UTI, diarrhoea, osteomylitis, tuberculosis. Serological tests including agglutination, CIE and ELISA.

MICB 612 INVESTIGATION OF PARASITIC DISEASES

Methods of examination of tissues, body fluids and faeces for parasites. Serology. Collection and preparation of material for parasitological examination. Fixation, staining, clearing and mounting methods. Concentration methods for parasites in biological specimens - faeces and body fluids.

MICB 613 PRACTICALS IN ANTIMICROBIALS

Sensitivity tests, Stokes method, Kirby Bauer. Antagonistic and synergistic tests. MIC, MBC, Antibiotic assays. Betalactamase tests. Assays for activity of biologic fluids.

MICB 614 CULTURAL TECHNIQUES IN PARASITOLOGY

Cultural techniques in parasitology including biological cultivation of parasites (animal inoculation). Maintenance of blood protozoa and helminths for research. Hatching test for viability of ova. Parasites of domestic animals. Arthropods associated with human disease. Using a key for identification of arthropods. Permanent preparation and mounting of arthropods.

MICB 616 PRACTICALS ON GENERAL PARASITOLOGY

Morphology, life cycle and classification of human parasites. Diagnosis of parasitic infections of humans; e.g. nematodes, trematodes, cestodes and protozoa.

MICB 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

MICB 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits

BIOC 602 MOLECULAR ASPECTS OF CELL BIOLOGY

Approved course in the Department of Medical Biochemistry UGMS.

BIOC 604 GENETIC INFORMATION: STORAGE, TRANSMISSION AND EXPRESSION

Approved course in the Department of Biochemistry UGMS.

GSPH 601 BIOSTATISTICS AND RESEARCH METHODS

Approved course in the School Public Health.

For the following **elective** courses refer to the and department for a detailed syllabus:

		Credits
PATH 601	Characteristics and cellular basis of disease. Inflammation, healing and repair	1
PATH 607	Immunology and Immunopathology	1
PATH 613	General Pathology practicals	2
CPAT 601	Instrumentation; Water & Electrolytes; Acid/Base; Renal Function	1
CPAT 603	Practicals related to CPAT 601	3
HAEM 601	Cellular Haemopathotology	1
HAEM 603	Practicals on Basic haematological Investigations	2

DEPARTMENT OF PHARMACOLOGY

M.PHIL PROGRAMME

DURATION
4 Semesters (24 months)

ENTRY REQUIREMENTS

i. The programme shall be open to candidates who possess Bachelor of Science degree with a minimum of 2nd Class degree in any science subject (Biomedical, Biological, Physics with biology) from a recognized university.

ii. All candidates shall be required to satisfy departmental requirements in a selection process.

To obtain M.Phil degree in Pharmacology:

A. A candidate shall be required to undertake
   i. Two-semester taught courses in Level 600 Pharmacology and other Biomedical Science courses
   ii. Research project of a minimum of nine calendar months and satisfy a minimum of two research seminars.

B. A candidate without Pharmacology background shall, in addition to the above, be required to undertake remedial Level 300 courses in Anatomy, Biochemistry and Physiology, and Level 400 courses in Pharmacology.

   Where appropriate, a candidate may be granted exemption in the subject in which the first degree was obtained.

C. All candidates shall satisfy all other existing requirements as stipulated in the University Graduate Regulations.

COURSE STRUCTURE
24 credits minimum and 36 credits maximum for year 1 (12 credits minimum/semester and 18 credits maximum /semester).

- Course work: 24 – 36 credits
  All required Level 600 courses in Pharmacology for two semesters in addition to other core subjects prescribed by the Department.
  Free electives
  Prescribed electives
- Two research seminars 6 credits
  Research/Thesis 30 credits

YEAR I

Core Courses

PHAM 601	Pharmacokinetics	3
PHAM 602	Drug Tolerance and Dependance	1
PHAM 603	Immunopharmacology and drug allergy	1
PHAM 604	Chemical carcinogenesis and Teratogenesis	2
PHAM 605	Pharmacogenetics	1
PHAM 606	Drug resistance	1
PHAM 608	Practical I	2
PHAM 609	Drug development and Evaluation	1
PHAM 610/626	Courses for specialization	4
PHAM 630	Seminar I	3
PHAM 611	Practical II	2
GSPH 601	Biostatistics and Research Methods	2

YEAR II

PHAM 600	Research Project/Thesis	30
PHAM 640	Seminar II	3

Prescribed Electives

PHAM 607	Pharmacoepidemiology	1
BIOC 601	Molecular aspects of cell biology	3
BIOC 603	Genetic information, storage, transmission and expression	3
PATH 601	Characteristics and cellular basis of disease. Inflammation, Healing and repair	1
PATH 605	Genetic and Metabolic disorders	1
PATH 607	Immunology and Immunopathology	1
PATH 609	Disorders of growth and neoplasia	1
MICB 613	Antimicrobials - Practicals	1
MICB 606	Electron microscopy and Tissue Culture	1
MICB 614	Culture techniques in Parasitology	1

Free Electives

CPAT 601	Instrumentation; water and electrolytes; Acid/Base; Renal Function	1
CPAT 605	CSF; Inborn Errors of Metabolism; nutritional deficiencies	1
CPAT 609	Protein; Enzymology, Liver function	1
HAEM 601	Cellular Haemopathology	1
HAEM 608	Advanced haemostasis	1
PATH 602	Pathology of the cardiovascular system	1
PATH 604	Pathology of the respiratory system	1
PATH 606	Pathology of the GIT system; Liver, Biliary Tract, and Pancreas	1
MICB 604	Virology	2

COURSE DESCRIPTIONS

PHAM 601 PHARMACOKINETICS

Time course of drug action: rate of absorption, rate of elimination, plateau principle; dosage regimens, drug accumulation and toxicity, kinetics of changes in enzyme levels, therapeutic drug monitoring, interpretation of drug concentration measurements. Drug metabolism: methods of study, chemical pathways, stimulation and inhibition, genetic variation, effects of age.

PHAM 602 DRUG TOLERANCE AND DEPENDENCE

Metabolic tolerance, homeostatic adjustment antagonising drug action, tachyphylaxis, tolerance and physical dependence in the central nervous system.

PHAM 603 IMMUNOPHARMACOLOGY AND DRUG ALLERGY

Immune mechanism, test of immunocompetence, relationship between immunosuppressive therapy and cancer chemotherapy, immunosuppressive agents, immunomodulating agents, immunological basis of drug allergy, immediate drug allergy autoimmune reactions to drugs, serum sickness and vasculitic reactions, clinical identification of immunologic reactions to drugs.

PHAM 604 CHEMICAL CARCINOGENESIS, TERATOGENESIS

Mechanism of action of chemical carcinogens, principal groups of chemical carcinogens modifying factors, biotransformation, carcinogenic hazards in the human environment; experimental teratogenesis, teratogenesis in man.

PHAM 605 PHARMACOGENETICS

Drug toxicity due to impaired drug metabolism, increased sensitivity to drug, novel drug effect, decreased responsiveness to drug, abnormal distribution of drug.

PHAM 606 DRUG RESISTANCE

Origin of acquired resistance: mutation - selection mechanism, patterns of emergence and spread of drug resistance; biochemical mechanisms; antibacterial agents that inhibit protein synthesis; selection of drug-resistance cells.

PHAM 607 PHARMACOEPIDEMIOLOGY

Drug legislation, national drug policy and regulation; pharmaceutical policy, legislation and regulation; drug information; drug procurement and distribution; economic policies and incentives on drug use; rational drug use: social and cultural attitudes, beliefs, surroundings, information, promoting generic drug use, personal characteristics, primary care providers, prescribing monitoring, essential drugs program, and pharmacosurveillance.

PHAM 608 PRACTICAL I

Animal and human experiments, fluorescence polarisation immunoassay; radioimmunoassay; functioning of a pharmacology analytical laboratory; ELISA. A double blind control study with statistical analysis.

PHAM 609 DRUG DEVELOPMENT AND EVALUATION

Qualitative and quantitative estimation for drug action, methods of developing new drugs, clinical

trial, use and misuse of drugs, monitoring of the drug use, drug - drug interaction.

PHAM 611 PRACTICAL II

Isolated tissues and organs experiments, gel electrophorsis and Western Blotting Receptor, isolation, subcellular fractionation, tissue culture and sterile techniques, use of flourescence and light microscopes.

PHAM 610-626 COURSES FOR SPECIALIZATION

Student-led seminars on current topics in specialised areas. The courses are intended to hone students' communication skills, ability to seek information and do literature search; and also form the basis of specialisation in a chosen field. Students shall, in consultation with the supervisor, select only one of the following courses:

PHAM 610	Advances in Respiratory Pharmacology and Physiology	4
PHAM 612	Advances in Cardiovasculo-Renal Pharmacology and Physiology	4
PHAM 614	Advances in Gastrointestinal Pharmacology and Physiology	4
PHAM 616	Advances in Neuropharmacology and Neurophysiology	4
PHAM 618	Advances in drug modification of inflammatory process	4
PHAM 620	Advances in Immunopharmacology and Drug Allergy	4
PHAM 622	Advances in Molecular Pharmacology	4
PHAM 624	Advances in Toxicology	4
PHAM 626	Ethnopharmacology	4
	Phytochemistry, extraction and purification, galenicals, computer data-base, isolation of active principle; pharmacokinetic, pharmacodynamic and toxicologic study; clinical trial.	

PHAM 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

PHAM 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

BIOC 601 MOLECULAR ASPECTS OF CELL BIOLOGY

Self-assembling macromolecular assembly of large complexes. Biomolecular aggregates; microtubules, ribosomes, virus. Details of the structure and assembly of HIV. The AIDS virus. Biological membrane transport systems; novel transport systems, multidrug transporter, osteoclast protein pumps of bone, amphipathic ion translocation peptides. Cellular signalling and signal transduction; super-families of membrane receptors, oncogenes, tumour Suppressor genes sensory transduction, neurotransmission, neurological disorders. Transmission of nerve impulses and

signal, transduction in sensory systems.

BIOC 603 GENETIC INFORMATION: STORAGE, TRANSMISSION AND EXPRESSION

DNA structure, replication and repair. Gene rearrangments, recombination and transposition RNA: translation and targeting. Control of gene expression in prokaryotes. Eucaryotic Chromosomes and gene expression. Viruses and oncogenes. Genes cloning and recombinant DNA methodology.

DEPARTMENT OF PHYSIOLOGY

M.PHIL PROGRAMME

DURATION OF STUDY

4 Semesters (24 months)

ENTRY REQUIREMENTS

Candidates may be required to take specific remedial courses in the B.Sc. (Med. Sc.) programme if they have not done human physiology and biochemistry equivalent to level 300 of the B.Sc. (Med. Sc.) degree programme. Such courses will be taken as part of the first year core courses spread over the first and second semesters. A CGPA of 3.5 or above in these core courses is required before progression to the 2nd year of the M.Phil programme, where credits for an elective course, 2 seminars and a thesis are offered.

COURSE STRUCTURE

A candidate is required to take a minimum of 62 and maximum of 72 credits in four (4) semesters as follows:

- Course work 26 - 36 credits
- Seminar I 3 credits
- Seminar II 3 credits
- Thesis 30 credits

Total **62 - 72 credits**

PROGRAMME

Core Courses

PHYG 601	General, Cellular, Gastrointestinal	4
PHYG 602	Cardiovascular, Renal and Respiratory Physiology	4
PHYG 604	Endocrinology, Metabolism and Reproduction	4
PHYG 606	Neurophysiology	4
PHYG 610	Seminar I	3
GSPH 601	Biostatistics and Research Methods (Offered in the School of Public Health)	2
BIOC 601	Molecular Aspects of Cell Biology (Offered in the Department of Med. Biochemistry, UGMS)	3
BIOC 603	Genetic Information Storage, Transmission and Expression (Offered in the Department of Med. Biochemistry, UGMS)	3

YEAR II

PHYG 620	Seminar II	3
PHYG 600	Thesis/Research	30

AREAS FOR SPECIALIZATION (One to be offered by candidates)

A. Renal Physiology
B. Cardiovascular Physiology
C. Respiratory Physiology
D. Endocrine Physiology
E. Cellular & Molecular Physiology

Seminars will be based on current advances in these areas.

COURSE DESCRIPTIONS

PHYG 601 GENERAL CELLULAR AND GASTROINTESTINAL PHYSIOLOGY

In-depth study of general and gastro-intestinal physiology. Application of the laws of thermodynamics to the cell; to mass and energy transport mechanisms in physiological homeostasis and regulation. The cell and its membranes, cellular transduction processes, intercellular communications, membrane transport mechanisms, excitation and nerve conduction and innervation of muscle and neuromuscular transmission. Application of the fundamental principles to the whole organism's acquisition of nutrients and micronutrients, the role of enzymes and hormones and their environment in gastrointestinal physiology.

PHYG 602 CARDIOVASCULAR, RENAL AND RESPIRATORY PHYSIOLOGY

The function of the cardiovascular, renal and respiratory systems as an integrative and interrelated multi-system unit is emphasized. Candidates will be well versed in haemorheology, cardiac

function and control, fundamental concepts in peripheral circulation and its regulation, haemodynamics in regional circulatory beds and an integration of the control of the circulation. Renal function and formation of urine, principles of renal transport, and action of hormones on the kidneys. Pulmonary ventilation, gas exchange and gas transport.

PHYG 604 ENDOCRINOLOGY, METABOLISM AND REPRODUCTION

The endocrine system as a communication system, characteristics of hormones and the mechanisms of action. Feedback control mechanisms. The role of the endocrine system in the homeostatic control of body fluid volume and composition, metabolism and energy balance, reproduction, stress adaptation and growth. An integrated view is stressed.

PHYG 606 NEUROPHYSIOLOGY

Neural systems for homeostatic control. Synaptic circuits and physiological operations in the central nervous system. Special Networks of the cerebral cortex. Functional organisation and plasticity. Motor functions and their control. Parallel circuits. Behavioral and higher functions of the brain.

PHYG 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

PHYG 613 ADVANCES IN RENAL PHYSIOLOGY In-depth studies of selected topics in current advances in renal physiology.

PHYG 615 ADVANCES IN CARDIOVASCULAR PHYSIOLOGY

In-depth studies of selected topics in current advances in CV physiology.

PHYG 617 ADVANCES IN RESPIRATORY PHYSIOLOGY

In-depth studies of selected topics in current advances in respiratory physiology.

PHYG 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

PHYG 619 ADVANCES IN ENDOCRINE PHYSIOLOGY

In-depth studies of selected topics in current advances in endocrine physiology.

PHYG 621 ADVANCES IN CELLULAR & MOLECULAR PHYSIOLOGY

In-depth studies of selected topics in current advances in cellular and molecular physiology.

BIOC 601 MOLECULAR ASPECTS OF CELL BIOLOGY

Self-assembling macromolecular assembly of large complexes. Bimolecular aggregates: microtubles, ribosomes, viruses. Details of the structure and assembly of HIV, the AID virus. Biological membrane transport systems: novel transport systems, multi-drug transporter, osteoclast protein pumps of bone, amphipathic ion translocating peptides. Cellular signaling and

signal transduction: super-families of membrane receptors, oncogenes, tumour suppressor genes, sensory transduction, neurological disorders. Transmission of nerve impulse and signal transduction in sensory systems.

BIOC 604 GENETIC INFORMATION: STORAGE, TRANSMISSION AND EXPRESSION

DNA Structure, replication and repair. Gene rearrangements, recombination and transposition. RNA: translation and targeting. Control of gene expression in prokaryotes. Eucaryotic chromosomes and gene expression. Viruses and oncogenes. Gene cloning and recombinant. DNA methodology.

GSPH 601 BIOSTATISTICS AND RESEARCH METHODS

Introduction – concept of universe. Descriptive statistics. Data processing. Measurements of central tendency, Measures of dispersion, Normal distribution. Probability concepts; Tests of significance; Levels of confidence. Sampling and estimating of sample size. Multivariate analysis. Computer data processing. Use of statistical programme packages.

DEPARTMENT OF CHEMICAL PATHOLOGY

M.PHILCHEMICAL PATHOLOGY

DURATION
4 Semesters (24 months)

ENTRY REQUIREMENTS

Post BSc
The programme shall be open to candidates who possess a good first degree (at least a second class lower division) in any Biological Science, Chemical Pathology, Biochemistry, Physiology, Pharmacology, Toxicology, Chemistry or Microbiology.

POST MBCHB/BSC MEDICAL SCIENCE
Candidates who possess MB.ChB/BSc (Medical Science) of the University of Ghana Medical School or other Medical Degree from a recognized university.

Post MSc
A candidate who already has an MSc in a subject in Laboratory Medicine – namely, Pathology, Chemical Pathology, Haematology and Microbiology.

All Candidates may be required to satisfy the Biomedical Science departments in a selection process.

DEGREE REQUIREMENTS FOR MPHIL
To obtain an MPhil degree in Chemical Pathology, a candidate is required to possess any of the following:

POST BSc

a. Attend two semesters of some Level 600 Chemical Pathology Courses. In addition they will be required to undertake a research project for at least 2 semesters and satisfy a minimum of 2 research seminars.

b. There will be a written examination at the end of the first year for post BSc and an oral examination on completion of the project at the end of the 2nd year.

POST MBCHB/BSC MEDICAL SCIENCE
A candidate who possesses MBChB/BSc Medical Science of the University of Ghana Medical School or other Medical Degree recognized by the University of Ghana is required to satisfy a minimum of 4 semesters extended programme, an approved research, project (including extra practical exercises) and a minimum of 2 research seminars. In addition, the candidate shall be expected to sit in some level 400 lectures

Post MSc
A candidate who already has an MSc in a subject in Laboratory Medicine may be required to satisfy a minimum of at least 2 semesters on an approved research project and a minimum of 2 research seminars.

There will be an oral examination at the end of the programme.

There will be a written examination at the end of the first year of the programme. All candidates will have to satisfy all other existing requirements as stipulated in the University-Postgraduate regulations.

COURSE STRUCTURE

- Course work 24 – 36 credits
- Two advanced research seminars on appropriate topics 6 credits
- Research/Thesis. 30 credits

YEAR I

Core Courses		**Credits**
CPAT 601	Instrumentation; Water & Electrolytes; Acid/Base; Renal Function	1
CPAT 602	Intoxication; Trace Metals; Therapeutic Drug Monitoring	1
CPAT 603	Practicals related to CPAT 601	3
CPAT 604	Practicals related to CPAT 602	2
CPAT 605	CSF; Inborn Errors of Metabolism; Nutritional deficiency	1
CPAT 606	Endocrinology; Carbohydrate; Calcium and Phosphate Metabolism	1
CPAT 607	Practicals related to CPAT 605	2
CPAT 608	Practicals related to CPAT 606	2
CPAT 609	Protein; Enzymology; Liver Function	1
CPAT 610	Gastroenterology; Lipid Metabolism	1
CPAT 611	Practicals related to CPAT 609	2
CPAT 612	Practicals related to CPAT 610	2
CPAT 630	Seminar I	3
GSPH 601	Biostatistics and Research Methods	2
BIOC 602	Molecular Aspects of cell Biology	3
BIOC 604	Genetic Information, storage, transmission and expression	3
	Tutorials	2

Prescribed Electives

Students are to take a minimum of 4 credits from these electives

HAEM 601	Cellular Haemopathotology	1
HAEM 603	Practicals on Basic haematological Investigations	2
PATH 601	Characteristics and cellular basis of disease. Inflammation, healing and repair	1
PATH 607	Immunology and Immunopathology	1
PATH 613	General Pathology practicals	2
MICB 601	Introduction to Microbiology and General microbiology	1
MICB 603	Practicals for MICB 601	1
PHAM 601	Pharmacokinetics	2

Electives

Prescribed elective courses may be selected from 2nd semester courses of other departments as may be directed by the Biomedical Science Committee. Students are to take a minimum of 3 credits from these electives.

HAEM 602	Blood Transfusion and Coagulation	1
HAEM 604	Practicals on Basic Coagulation and blood Transfusion Methods	3
HAEM 606	Advanced Blood Transfusion	1
HAEM 608	Advanced Haemostasis	1
MICB 602	Chlamydia	1
MICB 604	Virology	2
MICB 606	Electron microscopy and tissue culture	1
MICB 608	Inoculation of clinical material	1
MICB 610	Parasitology and Entomology	3
MICB 612	Investigation of Parasitic Disease	1
MICB 614	Cultural Techniques in Parasitology	1
MICB 616	Practicals on General Parasitology	1
MICB 618	Tutorials	2
PATH 602	Pathology of the Cardiovascular System	1
PATH 604	Pathology of the Respiratory System	1
PATH 606	Pathology of the GIT System; Liver, Biliary Tract, and Pancreas	1
PATH 608	Pathology of the Genitourinary System	1
PATH 610	Pathology of the Lymphoreticular system	1
PATH 612	Pathology of the Nervous, Musculoskeletal and Endocrine Systems	3
PATH 614	Systemic Pathology Practicals	2
PHAM 602	Drug Tolerance and Dependence	1
PHAM 604	Chemical Carcinogenesis and Teratogenesis	2
PHAM 606	Drug resistance	1
PHAM 608	Practical II	2

YEAR II

CPAT 640	Seminar II	3
CPAT 600	Research/Thesis	30

DEPARTMENT OF PATHOLOGY

M.PHIL PROGRAMME

1. DURATION

Two Academic Sessions - (4 semesters).

2. ENTRY REQUIREMENTS

i. Post B.Sc

The programme shall be open to candidates who possess a Bachelor of Science degree with a minimum of a 2nd Class Upper in any Biological Science, Chemical Pathology, Biochemistry, Physiology, Pharmacology, Toxicology, Chemistry or Microbiology; all described under the heading Biomedical Science.

ii. Post MBChB

A candidates who possess MB,ChB of the University of Ghana Medical School or other Medical degree recognised by the Council of the University Ghana.

iii. Post Msc

A candidate who already has an MSc in a subject in Laboratory Medicine.

All Candidates may be required to satisfy the Biomedical Science departments in a selection process.

3. DEGREE REQUIREMENTS FOR M.PHIL

To obtain an M.Phil degree in Pathology a candidate is required to satisfy the following:

1. Post BSc

a. Attend two semesters of Level 600 Medical Science Courses. In addition they will be required to undertake a research project for at least 2 semesters and satisfy a minimum of 2 research seminars.

b. There will be a written examination at the end of the first year. There may also be an oral examination on completion of the research project.

2. Post MB ChB

A candidate who possess MB ChB of the University of Ghana Medical School or other Medical degree recognised by the Council of the University of Ghana requires to satisfy a minimum of 4 semesters of 68 weeks extended programme on an approved research project (including extra practical exercises and a minimum of 2 research seminars. In addition, the candidate shall be expected to sit in all level 600 lectures.

There will be a written examination at the end of the first year. There may also be an oral examination on completion of the research project.

3. Post Msc

A candidate who already has an MSc. In a subject in Laboratory Science may be required to satisfy a minimum of at least 2 semesters on an approved research project and a minimum of 2 research seminars.

All candidates will have to satisfy all other existing requirements as stipulated in the University Graduate regulations.

4. Admission Requirements for Ph.D

The programme shall be open to candidates who possess

1) An M.Phil degree, good MSc degree in Biomedical Science or its equivalent in a subject in laboratory Medicine (Biomedical Science)
2) All candidates may be required to satisfy departments of Laboratory Medicine in the selection process.

5. Degree Requirement for PhD

To obtain a Ph.D degree in Pathology, a candidate must have undertaken an approved research project for a minimum period of 6 semesters. In addition candidates must satisfy a minimum of 6 research seminars. There will be an oral examination at the end of the programme.

6. Programme Structure

M.Phil Courses

1. Course work and written examination at the end of year 1.
2. Two advanced research seminars on appropriate topics (6 credits)
3. Research work for 2 semesters on approved topic (30 credits)
4. Oral examination at the end of the programme.

Ph.D Courses

1. Research work for 6 semesters on approved topic
2. Six advanced research seminars
3. Oral examination at the end of the programme.

Course Structure – M.Phil

A candidate is required to take a minimum to 60 credits. The course credit requirements are as follows:

Course work	24 – 36 credits
Seminar Presentation I	3 credits
Seminar Presentation II	3 credits
Research/Dissertation or Thesis	12/30 credits

PROGRAMME

YEAR ONE

Core Courses

PATH 601	Pathology 1	4
PATH 602	Pathology II	4
PATH 604	Histological Techniques	3
PATH 606	Histological Techniques Practical	2
PATH 630	Seminar I	3
GSPH 601	Biostatistics and Research Methods	2
BIOL 601	Molecular Aspects of Cell Biology	3
BIOL 603	Genetic Information; Storage and Transmission	3
MICB 601	Introduction to Bacteriology/Mycology/ Parasitology	4
ANAT 610	Genetics and Cytogenetics	2
ANAT 612	Biological Morphometry	2

ELECTIVES **Max 4 credits**

As part of their general education, candidates will be required to take electives from other cognate Departments to support their chosen fields.

YEAR TWO

PATH 640	Seminar 2	3
PATH 600	Research/Thesis	30

OBJECTIVES

The candidate should at the end of the course have a sound theoretical knowledge of the Scientific

principles and mechanisms of disease causation. The candidate should be able to embed, cut and stain sections ready for examination and also have basic practical knowledge in histochemistry, immunocytochemistry and electron microscopy. In addition, candidates should be able to conceive and follow through research.

OUTLINE OF COURSES

PATH 601	Pathology I (5 credits) -Cellular Response to Injury, Cell Injury, Cell Adaptation, Inflammation Healing and Repair.
PATH 602	Pathology II (5 credits): Genetic diseases and metabolic disorders, Immunology and immunopathology, circulatory disorders, disorders of growth and Neoplasia
PATH 604	Histological techniques (3 credits): Fixation of Tissue, Processing, embedding,, microtomy, staining, histochemistry, cytochemistry, immunostaining, microscopy: light, fluorescent and electron microscopy.
PATH 606	Practical aspects of histological techniques (2 credits).
PATH 610	Thesis (30 credits) A supervised and independent study and research involving the use of Library, Scientific Literature and a Project. The work must contribute to the advancement of scientific knowledge. The submission of a thesis on this project is a requirement for graduation.
PATH 630	Research Seminar In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.
PATH 640	Research Seminar 2 For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.
GSPH 601	Introduction to Biostatistics and Research methods (2 credits)
ANAT 610	Human cytogenetics (2 credits) - general principles of cytogenetics.
ANAT 612	Biological morphometry (2 credits)
BIOC 601	Molecular aspects of cell biology (3 credits)
BIOC 603	Genetic information; storage and transmission (3 credits)
MICB 601	Introduction to bacteriology/parasitology/mycology (4 credits)

SCHOOL OF NURSING

M.Sc NURSING

ENTRY REQUIREMENTS

The candidates for admission should have:

- B.A./B.Sc. Nursing with a minimum of second class lower division and
- Practised Nursing for not less than 3 years.

DURATION

The programme will last a period of two semesters. (12 months)

COURSE STRUCTURE

First Semester

Core Courses		**Credits**
NURS 601	Management Theories and Health Policies	3
PSYC 603	Research Methods	3
NURS 609	Independent Study 1: Clinical Theory	4
Electives (Students are to select one)		
NURS 605	Foundations of Advanced Nursing Practice	4
NURS 607	Programme Planning and Evaluation	4

Second Semester

Core Courses		**Credits**
NURS 602	Issues in Nursing and Health Care Delivery	3
NURS 626	Independent study 2: Clinical Practice	4
NURS 630	Seminar presentation	3

Functional Electives: (Students are to select either Option A or B)

Option A		
NURS 604	Curriculum Development in Nursing	2
NURS 606	Instructional Methodologies and Evaluation	2
Option B		
NURS 608	Human Resource Management in Health Care	2
NURS 612	Administration of Health Care Institutions	2
NURS 640	Dissertation	2
	Total Credits	**40**

COURSE DESCRIPTIONS

NURS 601 MANAGEMENT THEORIES AND HEALTH POLICIES

This course provides an introduction to various organizational theories underlying major management functions. Management principles are examined and applied to the health care system. Issues and factors that lead to formulation, development and implementation of health policies are discussed and the nurses' influence in this process identified.

Graduates from this programme will be expected to provide nursing leadership in senior positions in Ghana's health care and educational systems as well as in government, non-governmental and community organizations. Classroom discussions will include: theoretical concepts relevant to structure, process, and design of organizations, leadership behaviour, the legal framework for health care, the development of health care and educational policy, innovation and change, inter-organizational politics, interdisciplinary relations, fiscal accountability, health system integration, research and evaluation. Central to the course are the implications of organization and management theory, leadership behaviour, and research activities to the education of nurses and the provision of nursing services.

NURS 602 ISSUES IN NURSING AND HEALTH CARE DELIVERY

The course examines the place of nursing in the health care delivery system: social economic, political and historical factors are examined in the context of their influence on the health of society and the delivery of health services; issues affecting the roles of nursing and inter-sectoral cooperation with other health care providers in the delivery of health services are studied within local, national and international organizations. Leadership in nursing, nursing professionalism and values, and strategies for instituting change will also be covered.

NURS 604 CURRICULUM DEVELOPMENT IN NURSING

In this course, factors that underpin and influence curriculum development are analyzed; principles, concepts and learning theories from educational psychology and nursing are applied to the process of curriculum throughout the stages of development, in relation to new programmes and curriculum change. Opportunity is provided for developing a curriculum and for examining different types of curricula for the purpose of curriculum evaluation.

NURS 605 FOUNDATIONS OF ADVANCED NURSING PRACTICE

Tools and procedures employed by nurse/midwives to develop and implement scientific- based nursing/midwifery care and practice are examined theoretically. Communication skills, complete physical assessment skills, interpersonal relationships, problem-solving approaches and values are stressed.

NURS 606 INSTRUCTIONAL METHODOLOGIES AND EVALUATION

The focus of this course is on the processes and methods of instruction of nursing students in various settings. Opportunity is provided for students to practice instructional processes of identifying learning needs and preparing and implementing teaching strategies as well as developing evaluation procedures. Emphasis will be placed on adult learning techniques.

NURS 607 PROGRAMME PLANNING AND EVALUATION

This course provides insight into programme planning and evaluation with an emphasis on health-related projects. There is a consensus within the health sector that programme planning and

evaluation represent a major constraint in both domestic and international programmes. Many project planners and administrators may not have the necessary skills or understanding to develop and manage such projects. The course will focus on theory and the application of theory related to the program planning and evaluation process.

NURS 608 HUMAN RESOURCE MANAGEMENT IN HEALTH CARE

This course examines leadership in instituting change, effective use of communication skills and the acquisition and maintenance of human resources in nursing service administration. Strategies for in-service education and the development of human resources are examined.

NURS 609 INDEPENDENT STUDY 1: CLINICAL THEORY

This innovative course affords students the opportunity for self-directed study. The course is designed to meet the needs of a wide variety of practitioners. Students will be expected to apply the theoretical knowledge and skills acquired in their various specialities to real life situations in the field. Students will be allowed to outline their own objectives and determine learning experiences that will maximize critical and/or analytical thinking. Students are encouraged to explore avenues that will enable them to gain much insight into their specialities, improve their understanding of current issues in their areas of interest, and formulate a knowledge base that will serve as a basis for a planned change in existing health services. Students will be assigned academic supervisors for on-going consultation and will be offered opportunities to share and debate their experiences with a panel of experts for constructive criticism.

NURS 612 ADMINISTRATION OF HEALTH CARE INSTITUTIONS

This course examines the leadership and managerial role of the nurse manager, and applies management principles and processes to nursing service. Special attention is paid to resources management including finances. Practical experience is provided by placement of students in health care institutions for observation and participation in administrative activities.

NURS 626 INDEPENDENT STUDY 2: CLINICAL PRACTICE

This course is designed to allow students to explore in depth, clinical areas of interest. Students will choose a specialty area of nursing, formulate objectives, learning strategies, and evaluate the outcomes. Six hours of clinical practice per week will be required. It is expected that students will use this opportunity to build on previous areas of nursing expertise or interest in order to develop advanced expertise in the area of focus. There will be regular meetings with faculty and supervisors. Papers from individual projects will be presented in an open lecture to which students, faculty, and the wider nursing community will critique.

NURS 630 SEMINAR PRESENTATION

The purpose of this course is to create opportunity for students to present and critique papers. Students will also be required to do a presentation on their dissertation (NURS 640) and lead a discussion about the implications of their work. Students are expected to attend and participate in all presentations.

ASSESSMENT

Assessment of students will be made up of continuous and terminal assessment. Continuous assessment will account for 30 per cent whilst end of semester assessment will make up 70 per cent of the course grade.

The overall assessment of courses will consist of:

1. Continuous assessment:- seminars, individual and group assignments
2. Terminal assessment:- end of semester examination, project work
3. Dissertation assessed by both internal and external examiners
4. Assessment of reports on field practice

M.PHIL PROGRAMME

DURATION OF PROGRAMME

4 Semester (24 months) comprising of course work and a research thesis in the second year.

ENTRY REQUIREMENTS

In addition to the general entry requirements to graduate programmes, the candidate must have been a practicing nurse for not less than 3 years.

FIRST YEAR

Core Courses		**Credits**
NURS 601	Management Theories and Health Policies	3
NURS 602	Issues in Nursing and Health Care Delivery	3
NURS 603	Theoretical Foundations for Advanced Nursing	3
NURS 605	Foundations of Advanced Nursing Practice	4
PSYC 602	Advanced Statistics	3
PSYC 603	Research Methods	3
PSYC 303	Statistics for Psychologists (Pre-requisite for PSYC 602)	3
NURS 610	Seminar Presentation I	3

Functional Electives

(Candidates are to select either option A or B)

OPTION A

NURS 604	Curriculum Development in Nursing	2

NURS 606	Instructional Methodologies and Evaluation	2

OPTION B

NURS 608	Human Resource Management in Health Care	2
NURS 612	Administration of Health Care Institutions	2

Clinical Electives

(Candidates are to select only one of the following courses)

NURS 614	Adult Health Nursing	4
NURS 616	Family Health Nursing/Midwifery	4
NURS 618	Child Health Nursing	4
NURS 622	Community Health Nursing	4
NURS 624	Mental Health Nursing	4

SECOND YEAR

Core Courses		**Credits**
NURS 620	Seminar Presentation II	3
NURS 600	Thesis	30

Presented at the end of the 2nd year based on Research of an approved topic related to Nursing and the clinical specialty area of the Student's choice.

SUMMARY FOR M.PHIL

A.	Course Work	27
B.	Seminar Presentation I	3
C.	Seminar Presentation II	3
D.	Thesis	30
		63

COURSE DESCRIPTIONS

NURS 601 MANAGEMENT THEORIES AND HEALTH POLICIES

This course introduces the student to various organizational theories that underlie the major management functions. Management principles are examined and applied to the health care industry. Issues and factors that lead to formulation, development and implementation of health policies are discussed and the nurses` influence in this process identified.

NURS 602 ISSUES IN NURSING AND HEALTH CARE DELIVERY

The course examines the place of nursing in the health care delivery system; social, economic, political and historical factors are examined in the context of their influence on the health of society and the delivery of health services; issues affecting the roles of nursing and inter-sectoral cooperation with other health care providers in the delivery of health services are studied within local, national and international organizations. Leadership in Nursing, nursing professionalism and values, and strategies for instituting change are also covered.

NURS 603 THEORETICAL FOUNDATIONS FOR ADVANCED NURSING

This course explores current nursing concepts, theories and philosophies that provide the framework for nursing practice both in hospitals and within the community. The interrelationships among theory, practice and research are emphasized.

NURS 604 CURRICULUM DEVELOPMENT IN NURSING

Factors that underlie and influence curriculum development are analysed; principles concepts and learning theories from educational psychology and nursing theories are applied to the process of curriculum building, throughout the stages of development, in relation to new programmes and curriculum change. Opportunity is provided for developing a curriculum and for examining different types of curriculum for the purpose of curriculum evaluation.

NURS 605 FOUNDATIONS OF ADVANCED NURSING PRACTICE

Tools and procedures employed by nurses/midwives to develop and implement scientifically based nursing/midwifery care and practice are examined theoretically. Communication skills, physical assessment skills, interpersonal relationships, problem solving approaches and values are stressed.

NURS 606 INSTRUCTIONAL METHODOLOGIES AND EVALUATION

The focus of this course is on the processes and methodologies of instruction of nursing students in various settings. Opportunity is provided for students to practice instructional processes of identifying learning needs and preparing and implementing teaching strategies as well as developing evaluation procedures. Emphasis will be placed on the adult learning techniques

NURS 608 HUMAN RESOURCE MANAGEMENT IN HEALTH CARE

This course examines leadership in instituting change, effective use of communication skills and the acquisition and maintenance of human resources in nursing service administration. Strategies for in-service education towards development and improvement of education of human resources are examined.

NURS 610 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

NURS 612 ADMINISTRATION OF HEALTH CARE INSTITUTIONS

This course examines the leadership and management role of the nurse manager, and attempts to apply management principles and processes to nursing service. The course will examine the concept, scope and importance of financial management. Practical experience is provided by placement of students in health care institutions for observation and participation in administrative activities.

NURS 614 ADULT HEALTH NURSING

This course provides the opportunity for in-depth study of the concepts, principles and theories basic to decision making in the provision of care to the sick adult, male and female, and explores interrelationships between the health of the individual and that of his family in health and during

illness. Opportunity is provided for the student to focus on the study of tools and procedures in the care and management of patients with acute medical/surgical conditions; with chronic medical/surgical conditions; and also on the teaching and supervision of others giving care. Students will be required to select an area of specialty.

NURS 616 FAMILY HEALTH NURSING/MIDWIFERY

This course is a second level course of the study of the woman throughout her childbearing years. Opportunity is provided for exposure to contemporary issues in the study of the three trimesters of pregnancy, labour and peurperium, including nutritional requirements and high risk situations for the mother and child during the various stages as well as life saving skills during labour. The roles of other members of the family such as husbands and children are studied in relation to their influence on mother and child health. Opportunity is provided for the management of at least 5 families. Population issues are discussed, and skills in delivering family planning services provided. The role of the nurse midwife as a family primary provider is also expected.

NURS 618 CHILD HEALTH NURSING

The course provides opportunity for in-depth study of the developmental and health problems of infants and children through adolescence. Emphasis is placed on promotion and maintenance of health, development and prevention of health problem in this age group, in homes, institutions and community using the multi-disciplinary approach. The nursing process is employed as the basis of management of the more common diseases and conditions peculiar to the age group. Opportunity is provided for the care and management of both healthy and sick children, in acute and chronic health care facilities as well as in the community using the team approach.

NURS 620 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

NURS 622 COMMUNITY HEALTH NURSING

This course is based on the nurses` previous knowledge of resources for community services and various roles nurses play within this service. Socio-economic and political forces that shape health policies will be explored. Interpretation of health policies and their implementation at the national, regional and district levels are examined, and nursing policies derived and developed from role expectations for community health. Emphasis will be placed on development and analysis of community based programmes designed for health maintenance and promotion, disease prevention and identification and utilization of resources for community health. Opportunity is provided for special focus on services for specified population groups with extensive practical training.

NURS 624 MENTAL HEALTH NURSING

The principles and practice of mental health promotion and maintenance and prevention of mental illness are discussed as bases for study of psychopathology and therapeutics. The major psychiatric diagnoses and interventions are reviewed with emphasis on nursing interventions. Nursing process as a choice of nursing tool for care management is practiced both in institutional and community management of psychiatric patients with acute and chronic conditions.

SCHOOL OF PUBLIC HEALTH

MASTER OF PUBLIC HEALTH (MPH) PROGRAMME

DURATION

The programme will be full time for a period of 12 months comprising 2 semesters of 16 weeks

each and the last quarter of the period will be devoted to Public Health Practice and the writing of a Dissertation.

ENTRY REQUIREMENT

A good first degree in a relevant discipline from a recognized university. Three years relevant working experience would be an advantage.

FIELD PRACTICE:

Students will spend up to two (2) months in the field working as public health residents under the supervision of District and Regional Directors of Health Services or other professionals in related fields who are eligible as part-time lecturers of the school. The Field Programme offers them an opportunity to apply the knowledge learned in the classroom and to acquire a critical set of competencies needed for effective public health practice. They also undertake research into health and managerial problems of relevance to the district, laboratory, sector or industry where they are posted.

ASSESSMENT

Continuous assessment during each semester will take the form of students' reports, written assignments, assessments of field work through supervisors' evaluation and log book. Each course will be examined in at the end of the semester in which it is taken, graded and credits awarded. The final examination consists of an assessment of the dissertation and other output during the programme.

COURSES:

A candidate is expected to obtain a minimum of 39 credits and a maximum of 48 credits of studies.

These will consist of:

1.	Core Courses	16
2.	Departmental Required Courses	6
3.	Elective Courses	4 - 7
4.	Seminars	3
5.	Public Health Practice	4
6.	Dissertation (including oral exams)	12

COURSE CONTENT FOR MPH PROGRAMME

Semester I

Core Courses		**Credits**
BSTT 601	Methods in Biostatistics I	3
BSTT 603	Research Methods in Public Health	2
EPDC 607	Principles of Epidemiology	3
HPPM 609	Introduction to Management of Health Services	2
SOBS 611	Behavioural Science	2
PFRH 613	Introduction to Population Studies	2
EPDC 615	Foundations of Public Health	2
Semester II	**Departmental Required and Elective Courses**	

All departmental required courses in the School are available as elective courses for students in other departments of the School.

BIOLOGICAL, ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES

BEOH 602	Environmental Health	2
BEOH 622	Occupational Health	2
BEOH 624	Human Health and Environmental Impact	2
BEOH 626	Global Health Issues	2
BEOH 628	Infection And Immunity	2

BIOSTATISTICS

BSTT 602	Methods in Biostatistics II	2

EPIDEMIOLOGY AND DISEASE CONTROL

EPDC 602	Advanced Epidemiology	2
EPDC 604	Disease Control	2
EPDC 606	Disease Outbreak Investigation and Response	2
EPDC 618	Injury Epidemiology	2
EPDC 622	Scientific Communication	2
EPDC 626	Introduction to Non-Communicable Disease Epidemiology	2
EPDC 628	Economic Analysis & Evaluation	2
EPDC 632	Epidemiology of Malaria and Planning its Control	2
EPDC 634	Epidemiological Methods for Evaluating Health Programmes and Services	2
EPDC 636	Selected topics in Epidemiology	3
EPDC 638	Cardiovascular Disease Epidemiology	2
EPDC 642	Pharmaco-epidemiology and Pharmaco-vigilance	2
EPDC 644	Veterinary Public Health	3

HEALTH POLICY, PLANNING AND MANAGEMENT

HPPM 642	Advanced Health System Development and Management	2
HPPM 644	Health Policy Development, Research And Analysis	2
HPPM 646	Advanced Health Policy	2
HPPM 648	Advanced Health Planning	2
HPPM 652	Health Legislation	2
HPPM 654	Health Systems Research Methods	2
HPPM 656	Applied Economics for Health Policy	2

POPULATION, FAMILY AND REPRODUCTIVE HEALTH

PFRH 606	The Family in Health and Ill-health	2
PFRH 608	Child Health in Public Health	2
PFRH 612	Child Growth Development And Health Maintenance	2
PFRH 614	Public Health Nutrition	2
PFRH 616	Motherhood Issues and Maternal Morbidity & Mortality	2
PFRH 624	The Adolescent in Health and Illness	2
PFRH 628	Theory and Research Techniques in Adolescent Health	2

PFRH 632	Fertility and Family Planning	2
PFRH 634	Populations, Health and Survival	2
PFRH 636	Clinical and Organizational Practices of Reproductive Health Services	2

SOCIAL AND BEHAVIOURAL SCIENCES

SOBS 602	Implementation Research	2
SOBS 604	Social Science Data Management and Report Writing	2
SOBS 608	Gender and Health	3
SOBS 670	Fundamentals of Implementation Research	2
SOBS 618	Health Research Policy Development and Implementation	2
SOBS 614	Evidence-Based Approach to Health Communication	2
SOBS 616	Global Perspectives in Health Promotion	2
SOBS 612	Theories and Models of Health Promotion	2
SOBS 620	Applied Social Science for Public Health	2
SOBS 650	Health Promotion and Practice	2
SOBS 622	Community Mobilisation in Health and Development	2
SOBS 624	Ageing and Health	2
SOBS 626	Women's Health in Sub-Saharan Africa	2
SOBS 628	Gender and Violence	2
SOBS 632	Behaviour Change Theories in Public Health Practice and Research	2
SOBS 634	Health and Development in the Third World	2
SOBS 636	Plural Medical Systems in the Developing World	2

Semesters I & II

BEOH 610	Seminars in BEOH	3
EPDC 610	Seminars in EPDC	3
HPPM 610	Seminars in HPPM	3
PFRH 610	Seminars in PFRH	3
SOBS 610	Seminars in SOBS	3

Electives

EPDC 620	Computers in Public Health Research	2
BEOH 630	Public Health Practice in BEOH	2
EPDC 630	Public Health Practice in EPDC	2
HPPM 630	Public Health Practice in HPPM	2
PFRH 630	Public Health Practice in PFRH	2
SOBS 630	Public Health Practice in SOBS	2

BEOH 640	Dissertation in BEOH	12
EPDC 640	Dissertation in EPDC	12
HPPM 640	Dissertation in HPPM	12
PFRH 640	Dissertation in PFRH	12
SOBS 640	Dissertation in SOBS	12

BEOH 660	Special Electives in BEOH	2

EPDC 660	Special Electives in EPDC	2
HPPM 660	Special Electives in HPPM	2
PFRH 660	Special Electives in PFRH	2
SOBS 660	Special Electives in SOBS	2

Semester II Departmental Required And Elective Courses

All departmental required courses in the School are available as elective courses for students in other departments of the School.

The special electives (BEOH 660, EPDC 660, HPPM 660, PFRH 660, SOBS 660) will consist of special tutorial courses which will allow one or two students to attach themselves to a senior member in a specific department whose area of specialisation is of particular interest to them. A programme of work comprising a comprehensive reading list in the subject and work such as assisting in the analysis of research or other technical activity will be drawn for students taking special electives.

SCHEME OF EXAMINATION

Students will be assessed continuously during and at the end of each course. The examination components will be:

1 to 3 hours written papers at the end of the first and second semesters.

The examination of the dissertation will be by assessment of each student by internal and external examiners, who will also examine the candidate orally.

COURSE DESCRIPTIONS

BSTT 601 METHODS IN BIOSTATISTICS I

This course introduces the basic statistical concepts and methods as applied to diverse problems in public health, medicine and clinical trials. It demonstrates methods of exploring, organizing, and presenting data, and introduces fundamentals of probability, including probability distributions and conditional probability with applications to case-control studies and diagnostic testing. It presents the foundations of statistical inference, including concepts of population parameter, sampling and sampling distribution of estimates, and approaches to inferences using confidence intervals and hypothesis tests for normal and non-normal data, sample size estimation, contingency tables and chi-square tests, 1-way analysis of variance, simple linear regression and correlation. Statistical software packages, STATA and SPSS are employed to manipulate data and for data analysis.

BSTT 603 RESEARCH METHODS IN PUBLIC HEALTH

The course focuses on the steps involved in planning and implementing a piece of research. It includes an exposition of the theoretical approaches to and practical applications of research. An introduction to empirical methods, including qualitative and quantitative methods, the design of surveys and experiments (including Clinical Trials) and analysis of the resulting data, sampling, questionnaire design, data collection and data processing. The course also discusses ethical issues involved in medical research, such as patient consent and confidentiality.

EPDC 607 PRINCIPLES OF EPIDEMIOLOGY

Definitions: uses of epidemiology. Disease and health. Disease measurement and

significance of indices used. Mortality measurement and significance of indices used. Standardization of rates. Epidemiological methods; descriptive, analytic, experimental. Application of epidemiology to investigation of epidemics and for community diagnosis. Epidemiology of Diseases; Communicable diseases, Non-communicable Diseases. Screening. New Epidemiological Concepts, for example, Burden of disease, DALYs, special groups at risk.

HPPM 609 HEALTH SYSTEMS MANAGEMENT

GSPH 609 is a three credit course comprising 18 sessions of 2 hours each to make a total of 36 hours of teaching material. Each of the 6 modules in this course covers 3 sessions of teaching (6 hours). Thus each unit covers one hour of teaching material. Students are expected to read the materials that go with each session before the class to facilitate teaching and learning as well as constructive discussion.

EPDC 615 FOUNDATIONS OF PUBLIC HEALTH

History of Public Health, Threats to Public Health, Guiding Public Health Principles, International Influences on Public Health, Role of Doctors in Public Health, Role of Primary Care, Housing and Health, Environmental Health, Occupational Health, Health Promotion, Immunity and its relation to the Theory of Immunisation; Parasitic, Viral and other Microbial life of Public Health significance. Diagnostic Methods in Public Health. Role of Nutrients and Micronutrients as well as of Drugs of public health importance ; Introduction to Basic Cell Physiology and Biochemistry, Molecular Biology, Genetics and its applications to Health of Populations; Introduction to Public Health Ethics.

SOBS 611 BEHAVIOURAL SCIENCE

This course is in two (2) parts. Health and Development work requires that professionals with different training backgrounds work together to address problems in the field. The first part of the course, therefore, addresses the Principles and Methods of Group Dynamics, Team Building and Teamwork.

The second part of the course is based on the premise that most of society's health and disease problems are behaviour/lifestyle induced. The students are exposed to the social, economic, political and cultural contexts within which health and illness occur. Opportunities are given which enable students to appreciate public health and related problems more holistically and to assess critically the impact of socio-cultural dynamics on the health seeking behaviour of individuals and groups in society.

PFRH 613 INTRODUCTION TO POPULATION STUDIES

The course is designed to furnish the student an overview of demographic perspectives and tools in the investigation of Public Health issues. The course is designed to cover major concepts and theories, major problems societies face in the field of population and health and their responses (policies, strategies, programmes, etc.). In this respect, topics to be covered include: basic concepts:population growth and socio-economic development, rates and ratios, sources of demographic data, data evaluation, age-sex composition, estimates and projections, ideal family size, fertility preference, value of children, measures of infant, foetal and perinatal mortality, construction of crude and adjusted mortality rates, contraceptive technology and reproductive health risks, the role of women,observed gender variations in demographic, economic and social characteristics, dependency model, demographic transition, epidemiologic transition, and Coale and Hoover theory.

EPDC 620 COMPUTERS IN PUBLIC HEALTH RESEARCH

Basic concepts of Web structure and its application in science, Internet/Email and applications, finding and using online literature, search for information on the internet.

Use a computer to manage data in field investigation, introduction to data processing and analysis, designing questionnaires, data entry, cleaning and validation in Epi Info, basic data management in Stata (labeling, recoding, writing do – and log – files).

Students will be introduced to the advanced principles of STATA, including data management, manipulation and analysis. Students will be taught how to create new datasets, specifying subsets of data, generating and replacing variables, importing data from other programs, combining two or more datasets, etc. in addition they will be taught how to generate summary statistics, including generation of two-way and multiple-way cross tabulations. They will be introduced to how to generate tests statistics and hypothesis. It is also expected that by the time students would have gone through the course, they would have been introduced to how to run regression analysis as well as doing diagnostic test. Finally, students will be taught how to generate graphs from their data.

BIOLOGICAL, ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES

BEOH 602 ENVIRONMENTAL HEALTH

The Environmental Health course is designed to give students a wide range of knowledge on the basic principles of Environmental Health. The course prepares the student to participate in the planning and administration of environmental health programmes and to develop policies and regulations relevant to the protection and improvement of the physical environment. The course includes topics on basic principles of Environmental Health, identifying the environmental hazards to which men are exposed, modes of transmission of the hazards to men and the corresponding measures for protection against or prevention of transmission. It also touches on the basic principles in designing of Environmental Health programmes.

BEOH 622 OCCUPATIONAL HEALTH Students will undertake advanced courses in Occupational Medicine and Hygiene in relation to agriculture, industrialisation and topics relating to the national and international economic activities and social issues. Discussions will focus on research in any aspect of hazards and patho-physiology

encountered in the working environment, particularly in the area of respiratory physiology and related population predicted values. Advanced studies in Occupational Epidemiology, Ergonomics, Occupational Toxicology and Psychology will be emphasized. Legal and administrative aspects of occupational safety and health and compensation issues will be explored.

BEOH 624 HUMAN HEALTH AND ENVIRONMENTAL IMPACT

The impact of pathogens on our health and wellbeing can be understood as an interaction between the physical environment and the complex "environment" of the human body. In addition to these, the challenges of our working environment with its associated hazards need to be highlighted in our various occupations. The course is fundamental in nature and is organized under four subheadings as indicated below.

Ecology and Health
Microbes and Parasites
Environmental Health
Occupational Health

BEOH 626 GLOBAL HEALTH ISSUES

The goals of the programme in Global Public Health Issues focus on International Public Health Programmes for Prevention and Control of Diseases and Disabilities and in Advancing the Health of Populations worldwide. The course includes presentations on topics such as Global Overview of, Challenges faced in the areas of Global Health including Medical, Cultural, Historical, Economic, and Political Influences. The course will also address the adequacy of the scientific base to support improvements in Health and Health Care, Tropical Medicine Issues (including diseases that `impact on Global Health and Health Care Systems in Transition. It will Include Assessment of Biomedical Knowledge and Research for the reduction of Behavioural, Socio-economic and Environmental Risks to Public Health, Ethical Issues on Public Health, Availability of Trained Health Personnel, Institutional Capacity Building for Health Research and Establishment of Supportive Partnership and Collaboration.

BEOH 628 INFECTION AND IMMUNITY

The programme focuses on Health Challenges of Infections and Parasitic Diseases, Concepts and Reality. The programme emphasises on Training for Public Health Practitioners who will use their training in Immunology, Epidemiology, Laboratory and Statistics to improve the protection of Populations from vaccine-preventable diseases. Courses will include Epidemiology, Pathogenesis and Immunity of Infectious Diseases, Principles of Immunisation, Vaccinology and will establish a forum on microbial threats. The diverse faculty of physicians, epidemiologists, vaccinologists and biostaticians will bring to this course their expertise and research related to prevention and control of diseases including community-based prevention trials, laboratory studies in vaccine development and testing; phase I, II, and III clinical trials and developing new approaches to the detection and control of morbidity and mortality.

BIOSTATISTICS

BSTT 602 METHODS IN BIOSTATISTICS II

Pre-requisite: BSTT 601 Methods in Biostatistics I

This course expands on the student's abilities to conduct and report the results of valid statistical analysis of quantitative public health information by focusing on multiple linear regression, two-way analysis of variance models, covariance analysis with single covariate, nonparametric methods, logistic regression with dichotomous and continuous independent variable, introductory survival analysis, and sample size determination controlling for both type I and type II errors.

EPIDEMIOLOGY AND DISEASE CONTROL

EPDC 602 ADVANCED EPIDEMIOLOGY

Data interpretation and hypothesis generation, Causation – Koch's postulate and modern causality structure, Study design specifics – Case-Control studies, case and control selection, Cohort studies – prospective, retrospective Analytical Cross-sectional studies, Experimental studies – randomized trial, Measures of association and impact - 2 by 2 tables absolute risk, relative risks and odds ratios, attributable risk, Rate standardization – direct and indirect adjustment, Confounding and effect modification – random error and systematic error, types of bias, control of confounding, Analyzing complex surveys and the use of matching, Sampling – methods, cluster, estimation, Qualitative methods – focus groups, key informants, Exploratory data analysis, Regression – linear and logistic regression.

EPDC 604 DISEASE CONTROL

General concepts of communicable and non-communicable diseases. Definitions. Reportable diseases. Quarantinable disease. Factors influencing communicable diseases transmission process. Control of Oral-faecal transmitted diseases; Vector-borne diseases, Sexually transmitted diseases; Water related diseases; Contact diseases; Zoologic diseases and Air borne diseases.

EPDC 606 DISEASE OUTBREAK INVESTIGATION AND RESPONSE

Introduction to Integrated Disease Surveillance and Response; The Role of the Laboratory in Integrated Disease Surveillance and Response; Investigate and Respond to Suspected Outbreaks/ Epidemics (Introduction, Case Control Studies, Report Writing); Public Health Disease Surveillance; Introduction to Scientific Writing.

EPDC 618 INJURY EPIDEMIOLOGY

Introduction to injury as a public health problem. Research methods, study designs, risk factors, and prevention strategies applied to the problem of injuries. General framework for students to apply to the study of specific injury mechanisms.

EPDC 622 SCIENTIFIC COMMUNICATION

Identification of target audience. Scientific writing: articles, perspectives, review articles, editorials, executive summaries, books. Review and creation of abstracts. Responsibilities of authorship and co-authorship and intellectual property rights, including patent. Dissemination of research findings: oral scientific presentations, lectures, posters, bulletin articles, scientific articles for peer-reviewed journals, internal office correspondence; Media relations. Public Health Advocacy. (Workshop)

EPDC 626 INTRODUCTION TO NON COMMUNICABLE DISEASE

EPIDEMIOLOGY

An overview of non-communicable diseases in both developed and developing country settings, the global burden of such diseases, temporal trends in mortality from cardiovascular diseases and cancer, diet and cancer and the epidemiology and prevention of mental disorders. Developing and criticising strategies for preventing cardiovascular disease at the community and individual level.

EPDC 628 ECONOMIC ANALYSIS & EVALUATION

General principles of economic analysis: purpose of cost analysis, components of cost analysis: direct, indirect tangible costs, outcome components: health related, non health related, Define prevention effectiveness, Frame a prevention effectiveness study.

Decision analysis: components of decision analysis, decision trees, utility analysis
Burden of disease measures: QALY, DALY, YPLL, Interpret results to determine burden of disease

Choose appropriate analysis: Cost analysis, cost-effective analysis, cost-utility analysis, cost-benefit analysis, sensitivity, specificity, predictive values, evaluation methods, quality indicators, Monitoring and Evaluation (M and E): Tools development for M and E, Procedures and processes of M and E. Assessing the efficacy therapeutic and preventive measures

EPDC 632 EPIDEMIOLOGY OF MALARIA AND PLANNING ITS CONTROL

Epidemiology of malaria, Surveillance, Planning for malaria control, communication: community mobilization and advocacy, Strategic management functions and practices, Health economics and social aspects of malaria, Malaria research agenda and process, Strategic orientation of prevention and control of malaria.

EPDC 634 EPIDEMIOLOGICAL METHODS FOR EVALUATING HEALTH PROGRAMS AND SERVICES

Definition of health evaluation, Methodological frameworks for evaluating health programs, Health evaluation categories & indicators, Typologies of indicators for evaluation of public health services, Research designs for evaluative studies, How to quantify effects of health programmes, Reporting health evaluation.

EPDC 636 SELECTED TOPICS IN EPIDEMIOLOGY

Readings in the philosophy and technique of epidemiologic modelling. Peer review process including validity and reliability of the peer review system. Common mistakes in reporting results from epidemiologic research.

EPDC 638 CARDIOVASCULAR DISEASE EPIDEMIOLOGY

History of cardiovascular disease (CVD) epidemiology, Classification of CVDs, Epidemiology of CVDs in rich economies, Epidemiology of CVDs in LMICs, Genetic basis of CVDs, Paediatric causes of CVDs, Tobacco control, Obesity, Stroke, Coronary artery disease, Rheumatic heart disease, Diabetes and cardiovascular diseases, Conducting field trials in CVDs, Approaches to control of CVDs – dietary approaches.

EPDC 642 PHARMACOEPIDEMIOLOGY AND PHARMACOVIGILANCE

Principles of Pharmacovigilance, Pharmacovigilance Reporting Systems,

Pharmacoepidemiological Methods, Tools for Management of Reports, Global Initiatives in Pharmacovigilance, Regulatory Pharmacovigilance, Causality Assessment Principles and Analysis, Signal Detection in Pharmacovigilance, ADRs and Public Health, Communication in Pharmacovigilance.

EPDC 644 VETERINARY PUBLIC HEALTH

The Veterinary Public Health includes Advanced Meat and Milk Hygiene, Meat Quality, Fish and Shellfish Hygiene, Introduction and Review of Fish Hygiene in Ghana, Fish-borne Diseases, Microbial Safety of Fishery Products; Zoonotic and other Communicable Diseases, a Review of Zoonotic Diseases and their Classification, Bacterial, Viral, Parasitic and Zoonoses Prevention, Detection, Prevalence and Control of Zoonoses in Ghana, Veterinary Jurisprudence, A Review of Acts, Regulations, Rules and Orders relating to animal movements, importation and trade cattle routes, Legislation regulating the importation, marketing and uses of veterinary drugs and other biologicals, international aspects and responsibilities in Veterinary Jurisprudence; Applied Veterinary Immunology; Biological Basis of Health and Disease, Infection, Diseases and Immunity, Serological Epidemiology; Diseases Monitoring, Surveillance and Reporting; Animal By-Products and Quality Control Measures Advances in Veterinary Extension, Promotion and Delivery

HEALTH POLICY, PLANNING AND MANAGEMENT

HPPM 642 ADVANCED HEALTH SYSTEMS DEVELOPMENT AND MANAGEMENT

The objective of this course is to improve health care delivery through better understanding and management of resources (human, financial, raw materials, technological and information) health care services and stewardship.

HPPM 644 HEALTH POLICY RESEARCH AND ANALYSIS

This two-credit course focuses on the identification and generation of empirical evidence to inform the content of health policy and health systems reform. It provides a practical guide to the identification of health policy and systems development and reform issues that need research to generate empirical data to support decision-making. It also provides skills in identifying and reviewing existing information related to the problem or issues on how to conduct multi-disciplinary health policy and systems research to generate new information, analyze the findings and provide recommendations in clear succinct reports. It also provides an introduction to the concepts and methods of public analysis. The emphasis is on providing students with analytical skills that can be applied.

HPPM 646 ADVANCED HEALTH POLICY

This two-credit course (24 hours of teaching material) critically examines factors that influence the development and implementation of health related public social policies and their accompanying programs in developing countries. It also emphasizes how to use this understanding to improve the process of public policy and program development and implementation for health. Methods and sills in influencing and advocating for public policy design and implementation are introduced.

The course is intended for MPH, MPhil and PhD residents who are interested in understanding the factors that influence health-promoting policies nationally and in developing skills in health policy advocacy. The course will be useful to those with interest in health development, responding to priority public health problems, developing strategic policies based on health criteria and using research evidence in enhancing the policy process. This course will be valuable for residents with careers or planning to enter careers in public service. It will also be useful to residents who work with NGOs or other organizations but whose works involve aspects of public policy advocacy, design and implementation at all levels.

As a prerequisite, registrants for this course should have taken introductory courses HPPM 609 and 608 in which the definition, concepts and evolution of health systems and the process of policy formulation are covered.

HPPM 648 ADVANCED HEALTH PLANNING

Introduction to planning; Elements of Planning; Types of Planning Activities; Planning, Policy – making and Implementation; The Political Context of Planning; Planning for Health; Development of Government Policies and Plans; Role of non-State Sector; Non – Government Organizations; Planning for multi-sectoralism; Techniques for planning; planning process; Data Collection; Analysis and Presentation; Modeling and Forecasting; Implementation, Monitoring and Evaluation; Organization and Planning; Operational and Spatial levels of planning activity; Health Information Systems; Information and Planning; Identifying information needs and indicators, routing and non- data collection methods; Information technology and Health Information System Management of Health Information Systems. Using Computers in Health Information Systems; Basics of Geographical Information Systems; Influences on Health Information System design; Approaches to Strengthening Health Information Systems; Health Information System Reform.

HPPM 652 HEALTH LEGISLATION

This is a two credit hour course which will cover basic introduction to legislation and health as well as principles behind the existing health legislation. It is a field that health workers tend to neglect.

Governments of nation states are run on clearly stated policies. For these policies to be implemented effectively, it is necessary that they are backed by legislation. Thus Parliament passes the laws from these policies. These then become binding to the people of the country.

Legislation pertaining to health is known as Health Legislation. It is a set of rules or norms of conduct relating to health which forbid, permit or mandate specified actions and relationships among people and organization. They are needed to ensure that quality health services are provided to the members of the community. Health Legislation protects the public from (substandard) health services.Health Legislation is to guide health service delivery for quality and efficiency.

Health practitioners are guided by set of codes derived from Legislation. Invariably some of them come to realize there is legislation only when they have had altercations with the law.

HPPM 654 HEALTH SYSTEMS RESEARCH METHODS

Health systems research (HSR) is a challenging and creative professional activity that develops knowledge to inform decision in health care delivery. This course provides students with the opportunity to become familiar with the elements of a research proposal and to develop their own. Ideally, each student will select a topic they plan to pursue for their dissertation research and develop the research proposal during the 12 week programme.

HPPM 656 APPLIED ECONOMICS FOR HEALTH POLICY

HPPM 656 is an advanced economics course that builds on the introductory course in Economics of Health Care (HPPM 609). Requirement for the course is the introductory course in Economics of Health Care of 609 (Module 6). Candidates with a diploma/degree in Economics may be exempted from this requirement after demonstrating adequate understanding of economics of health care.

DEPARTMENT OF POPULATION, FAMILY AND REPRODUCTIVE HEALTH

PFRH 606 THE FAMILY IN HEALTH AND ILL-HEALTH

The course is an introduction to today's family types, roles and functioning and the challenges they present to public health workers, which need to be fully understood in order to equip them for effective dealings with families.

PFRH 608 CHILD HEALTH IN PUBLIC HEALTH

The health problems of children as an identifiable vulnerable group take a large proportion of public health workers' professional time. This course acquaints students with the determinants, scope and levels of child health care in Public Health. It will also provide students with insights into embryonic development and factors that affect it; infancy and early childhood – healthy and deviations; dimensions of Child-Personhood: biophysical, psychosocial and cultural; child-environment interactions – parent-child, familial, community and wider macro-environment as stimuli; psychological and intellectual development of the child; child vulnerabilities and resiliencies; preventive health care from birth to adolescence; socio-medical and chronic childhood problems; major threats to child survival – contribution of IMCI, neonatal emergencies, congenital abnormalities, failure to thrive,

PFRH 612 CHILD GROWTH DEVELOPMENT AND HEALTH MAINTENANCE

This is a course designed to develop and refine advanced clinical and programme organising skills of child health care professionals. Problems of children as an identifiable vulnerable group are addressed in the course by drawing upon the experiences of incumbent program managers.

PFRH 614 PUBLIC HEALTH NUTRITION

This course provides basic nutritional information and is designed to enable students develop the insight in Nutrition Issues, on the acquisition and efficient utilisation of food resources that ensure optimal growth, development and health.

PFRH 616 MOTHERHOOD ISSUES AND MATERNAL MORBIDITY & MORTALITY

This course is designed to enable students to develop insight into the issues, concerns and

considerations that affect pregnancy and childbearing and underpin policy-making and programme development in safe motherhood programmes.

PFRH 624 THE ADOLESCENT IN HEALTH AND ILLNESS

This course is designed to give students an understanding of the biological and psychosocial development that occurs during the transitional period between childhood and adulthood. It also looks at some of the health problems and the social challenges that affect adolescents.

PFRH 628 THEORY AND RESEARCH TECHNIQUES IN ADOLESCENT HEALTH

This course is designed to give students an understanding of research into adolescent health and development, particularly reproductive health issues affecting adolescent males and females.

PFRH 632 FERTILITY AND FAMILY PLANNING

This course summarizes evidence concerning the relationship between reproductive patterns and women's reproductive health. It discusses the effectiveness and health consequences of specific contraceptive methods and women's reproductive health. It also discusses issues and programmatic strategies related to the development, organization and management of family planning programmes in developing countries with emphasis on social, cultural, political and ethical barriers to family planning programmes.

PFRH 634 POPULATION, HEALTH AND SURVIVAL

This course summarizes the make up of existing and emerging disease patterns as they affect various population subgroups, with focus on disease patterns when society undergoes modernization.

PFRH 646 CLINICAL AND ORGANIZATIONAL PRACTICES OF REPRODUCTIVE HEALTH SERVICE

A course for mid career reproductive health practitioners that addresses the clinical and organizational requirement for effective reproductive health service delivery.

SOCIAL AND BEHAVIOURAL SCIENCES

SOBS 602 IMPLEMENTATION RESEARCH

The course will introduce students to the three cycles if Implementation research: Pre-intervention, intervention and post intervention cycles. Students will also be introduced to the community entry techniques, situational techniques, stakeholders' analysis, stakeholder consultations, cultural and social relations in the community.

SOBS 604 SOCIAL SCIENCE DATA MANAGEMENT AND REPORT WRITING

The course will seek to introduce students to theories that underlie the processes on interpreting and analyzing data. Qualitatively, the course will stress on how to transcribe (verbatim) all interviews and discussions; incorporate all notes and observations for an interview into the transcript; includes background information on respondents or people observed; how to use and apply all Participatory Rural Appraisal (PRA) tools; code the main segments of their text using interview guide; produce a research/problem solving matrix; check for consistency and

inconsistencies in the responses and interpret the information using all sources of information; put the information into various topics/themes based on objectives of study and add quotes, proverbs, local sayings etc that help explain information collected. Quantitatively, the course will emphasize on data sorting and quality control checks; data entry and processing; verification and analysis of data and triangulate the qualitative and quantitative data.

SOBS 608 GENDER AND HEALTH

The main aim of this course is to provide Public Health and Development Workers with the relevant understanding of the role of gender in health and welfare of the populace. The course examines the interrelationship of gender and health. It examines the socio-cultural, socio-political and socio-economic constructs of gender and how these constructs impact on women and men's health in the developing world. The central idea of the course, however, is to move beyond a description of specific health problems to critically analyze how women and men's health problems develop, are perceived, and are responded to both medically and socially in contemporary society. In this context, an important theoretical aspect of the course is the development of a socio-medical perspective on health and, specifically, the analysis of women and men's health in relation to their lives and how these experiences are shaped by culture, social institutions and social policies. Some topics under this course are gender concepts; patriarchy; gender, experience, culture, power, and health; poverty, health and health care, gender and men's health.

Additionally, it explores the various ways in which the study of gender and health helps Public Health and Development workers to understand women and men's health in a changing world.

SOBS 612 THEORIES AND MODELS OF HEALTH PROMOTION

This course is designed to help students understand why theories, models, and constructs are considered the backbone of the processes used to plan, implement, and evaluate Health Promotion interventions. During the course, students are provided with opportunities to review some social science and/or behavioural theories and models and explore how these can be used to guide programme planners in selecting the type of interventions that are needed to accomplish specified goals and objectives. The appropriate use of learning and behavioural theories can help to ensure congruence between the planned interventions and expected outcomes.

SOBS 614 EVIDENCE- BASED APPROACH TO HEALTH COMMUNICATION

The course is designed to walk the students through the steps of a communication plan which has to be based on good research. Students need to understand the importance of having a plan in place before developing communication activities. The planning steps begin with the identification of the problem to be addressed and the target population as well as behaviours that need to change. Then a formative assessment is conducted to help identify the communication objective. Community design and strategy development workshops are held to facilitate the process of selecting communication approaches. Messages are developed and channels selected before materials are developed and produced.

SOBS 616 GLOBAL PERSPECTIVES IN HEALTH PROMOTION The course is designed to help the student examine the challenges associated with the implementation of Health Promotion activities around the globe with special reference to developing country

contexts. It also provides insights into how to design effective strategies within severe resource constraints. Health Promotion interventions have contributed to substantial improvements in the health status of many nations. Systematic motivations of families clearly helped bring about the reductions in mortality rates recorded in many countries. In recent years, these impressive gains in maternal and child survival have leveled off in some countries; while in others, the positive trends have even reversed. Important lessons learned will be discussed.

SOBS 618 HEALTH RESEARCH POLICY DEVELOPMENT AND IMPLEMENTATION

This course aims at providing a general understanding of how public policies and programmes are developed in the sub-Saharan Africa context at all levels. It also aims at providing some understanding of the factors that affect the success or failure of control policy and programmes development and the basic principles of advocacy for better policy and programmes development and implementation at all levels of the health system.

SOBS 620 APPLIED SOCIAL SCIENCE FOR PUBLIC HEALTH

The aim of this course is to introduce students to the theoretical underpinnings of the range of social sciences that are applied in public health research and practice. These include anthropology, demography, economics, geography, law, political science, psychology, and sociology. Students will explore the challenges of multidisciplinary, interdisciplinary, and cross-disciplinary research and practice. These applied social science disciplines were developed in response to increasing specialties that employed and adapted the principles of the disciplines in the study of contemporary societies. Applied Social Science for Public Health is an interdisciplinary and dynamic field, which integrates the knowledge and tools for research and analysis from a range of these disciplines for the purposes of understanding the various determinants of health and developing solutions to public health problems.

SOBS 622 COMMUNITY MOBILISATION IN HEALTH AND DEVELOPMENT

This course is designed to introduce students to commonly used communication approaches at the periphery and help them develop community mobilisation plans. In order for community mobilisation to be successful, it is essential that all people and organisations involved feel ownership of the plan, support the plan, and are engaged in implementing the plan. Community mobilisation uses a variety of communication channels and usually relies heavily on face-to-face communication. Practical examples will be discussed and the group process outlined.

SOBS 624 AGEING AND HEALTH

The course introduces students to the issues of global ageing in general and with reference to Africa in particular. The impact of ageing on the structure and composition of society and its implications for the economy, health, and development will be discussed. The course also explains the magnitude of health and development issues as they relate to ageing and enables students to do a gender analysis of these issues. Students will be given the opportunity to review existing policies and programmes and identify gaps and issues for research, advocacy, and planning.

SOBS 626 WOMEN'S HEALTH IN SUB-SAHARAN AFRICA

The main goal of the course is to explain a variety of health problems faced by sub-Saharan African women, often compounded by cultural values, and religious principles that influence decision-making processes on reproductive and other health issues. The course will also review various factors that impinge on women's health and emphasize some of the emerging changes brought about by gender mainstreaming of health issues in sub-Saharan Africa. Students will have the opportunity to compare the situation of sub-Saharan African women with those from other parts of the world including the United States.

SOBS 628 GENDER AND VIOLENCE

This course introduces students to the demographic, socio-cultural, and economic factors that impact on gender and violence. Students will be exposed to a wide range of issues that include physical, emotional, and sexual abuse. They will also look at the impact of violence on mental health and the various coping strategies and responses to physical violence.

SOBS 632 BEHAVIOUR CHANGE THEORIES IN PUBLIC HEALTH PRACTICE AND RESEARCH

Public health is about the prevention of diseases, injuries and disability as well as the promotion of good health all of which require change in human behaviour. This course examines, in detail, theoretical frameworks in the social sciences such as the health belief model, social cognitive theory, stage theory, theory of reasoned action and others. Emphasis will be given to the application of these theories in public health practice, design of evaluation of public health interventions and in research.

SOBS 634 HEALTH AND DEVELOPMENT IN THE THIRD WORLD

For the past decade or so, the relationship between health and development has been discussed at both the national and international level. This course will allow students to examine the various social, economic and political changes that have taken place in the developing world and analyze the impact such changes have had on the health status of populations. The course will define development and explain the link between health and development. It will then review some social and economic development theories as well as the demographic and health transition theories in relation to the developing world. This will lead to an examination of the demographic/health profile of developing nations (e.g. Ghana) and the historical perspective of development policies and their impact on health delivery. This course will also examine critical health issues and their impact on the development and health delivery efforts of developing countries (e.g. HIV/AIDS, Malaria etc). The role of international agencies in health delivery and the impact of urban growth on health delivery will also be discussed by the class.

SOBS 636 PLURAL MEDICAL SYSTEMS IN THE DEVELOPING WORLD

Indigenous people have developed regimes for addressing health needs. With the introduction of biomedicine, the pattern of health seeking behaviour has changed to accommodate the diverse health resources. The course will examine the rationale for several medical systems in the developing world and how these health resources are utilised at the individual and national level.

SOBS 650 HEALTH PROMOTION AND PRACTICE

The course is designed to enhance the student's knowledge of the basic concepts and strategies of Health Promotion. It will provide opportunities for appropriate application of Health Promotion

interventions in changing and uncertain environments with special focus on key players charged with preventing diseases and promoting Public Health. Emphasis will be placed on behaviour change theories, strategies and methods for responding to emerging and pertinent Public Health issues. Students will be exposed to the importance of research in Health Promotion and Practice and also encouraged to appreciate the role of Health Promotion in Public Health Practice.

SOBS 670 FUNDAMENTALS OF IMPLEMENTATION RESEARCH

This course seeks to provide an overview of the principles underlying implementation research. Implementation research for disease control is applied social science related research that aims to develop the critical evidence base for the effective and sustained adoption of interventions. It deals with the knowledge gap between efficacy, effectiveness, and current practice to produce the greatest gains in disease control. Implementation research involves the systematic and critical investigation and analysis of the dynamic processes that influence how individuals, populations and health systems adapt in order to adopt new technologies and interventions. Additionally the course will provide active and experiential learning involving fieldwork and research, introduce students to population profiles, community entry techniques, community involvement in research and collaborative research.

BEOH 610, EPDC 610, HPPM 610, PFRH 610, SOBS 610 SEMINARS

All students in a Department or Programme at this level are expected to attend all seminars specified and be made to give at least one seminar on a review article which, may or may not be in their area of intended research. A student should make a presentation on his/her dissertation proposal and also attend all seminars at the Department. Both presentations should be graded using a common format designed and should earn each student a total of 3 credits.

BEOH 630, EPDC 630, HPPM 630,
PFRH 630, SOBS 630 PUBLIC HEALTH PRACTICE

Public Health Practice comprises field visits during the first and second semesters and a 3-month field residency during the second semester. During Public Health Practice, students work as part of the health team to acquire competencies needed for managing systems and programmes. The competencies include Community Assessment and Design of Health Survey; Investigation and Control of Disease Outbreaks; Community Mobilisation for Health Action Education, and Effective Communication.

BEOH 640, EPDC 640, HPPM 640,
PFRH 640, SOBS 640 DISSERTATION

The objective of the dissertation is to test the students' skills in defining a problem and designing appropriate research into the problem. It will also test skills in writing literature search and analytical thinking. The dissertation should not be more than 80 pages.

BEOH 660, EPDC 660, HPPM 660,
PFRH 660, SOBS 660 SPECIAL ELECTIVES

A special elective may consist of special tutorial courses, which will allow one or two students to attach themselves to a senior member whose area of specialisation is of particular interest to them. A programme of work drawn up by the student and the senior member including a comprehensive reading list must have prior approval by the Director of the School. A special elective may also consist of a structured course on any emerging subject of Public Health importance, which may be offered on an ad hoc basis if and when the need arises.

MASTER OF HEALTH INFORMATICS

Entry Requirement

A good first degree in a relevant discipline (science, technology or a medical/health specialty, social science, law) is required. Undergraduate coursework in elementary statistics and basic mathematics are desirable. Computer literacy in basic computer applications e.g., word processing, e-mail and use of the Internet would be an advantage.

PROGRAM STRUCTURE AND DURATION

The program will cover a full time period of 12 months, made up of 2 semesters and a 12-week practical period with a host institution, and the writing of a field practicum report.

HEALTH INFORMATICS PRACTICUM

Students will spend a 12—week practical period on the field acquiring compe-tencies in health informatics with institutions whose functions are identified to be relevant to the objectives of the program, and that are also capable of providing the training grounds for the students. The field practicum also provides an opportunity for the student to apply classroom knowledge to practical problems in the field. Field Supervisors are appointed by the host institution, with the approval of the School of Public Health (SPH), to provide the guidance and supervision of the student.

ASSESSMENT

Continuous assessment will be based on quizzes, written assignments, and scheduled mid-term examinations. Assessment of field work will be through supervisor's evaluation and log book, student's presentations and reports. End-of-Semester examinations will be conducted for each course taken. Final grade for the program will be based on the totality of all these assessments.

COURSE CONTENT

Students pursuing the Masters degree are required to take a total of 26 credits of core courses, 8 credits of elective courses, 6 credits of practical attachment, and 3 credits of seminars **(total of 43 credits)**. The breakdown of the load for the two semesters is as follows:

Core Courses	26 credits
Elective Courses	8 credits
Health Informatics Practicum	6 credits
Seminars	3 credits

For the second semester, students may select courses offered from other SPH departments to meet the minimum required credit hours for the program and also to meet their own professional needs.

Course Code	**Course Title**	
Semester I		
BSTT 601	Methods in Biostatistics I	3
BSTT 613	Research Methods in Health Informatics	2

BSTT 615	Fundamentals of Health Informatics	2
BSTT 617	Database Management & Administration	2
BSTT 619	Information Systems Analysis & Design	2
BSTT 621	Data Analysis & Software Applications I	2
EPDC 615	Foundations of Public Health	2
EPDC 607	Principles of Epidemiology	3
	Total Core	**18**

Semester II

BSTT 612	Ethical & Legal Concerns in Health Informatics	2
BSTT 616	Geographic Information System Applications	2
BSTT 618	Health Information Security	2
BSTT 632	Health Data & Electronic Health Care Records	2
	Total Core	**8**

Electives

BSTT 602	Methods in Biostatistics II	2
BSTT 614	Health Surveillance Informatics	2
BSTT 622	Data Analysis & Software Applications II	2
BSTT 634	Web Technology	2
BSTT 636	Data Mining & Knowledge Discovery	2
BSTT 638	Software Engineering	2
BSTT 658	Health Informatics Practicum	6
BSTT 610	Special Seminars in Health Informatics	3

COURSE DESCRIPTIONS

Semester I

BSTT 601 METHODS IN BIOSTATISTICS I

Course introduces the basic statistical concepts and methods as applied to diverse problems in public health, medicine and clinical trials. It demonstrates methods of exploring, organizing, and presenting data, and introduces fundamentals of probability, including probability distributions and conditional probability with applications to case-control studies and diagnostic testing. It presents the foundations of statistical inference, including concepts of population parameter, sampling and sampling distribution of estimates, and approaches to inferences using confidence intervals and hypothesis tests for normal and non-normal data, sample size estimation, contingency tables and chi-square tests, 1-way analysis of variance, simple linear regression and correlation. Statistical software packages, STATA and SPSS are employed to manipulate data and for data analysis.

BSTT 613 RESEARCH METHODS IN HEALTH INFORMATICS

This course provides the student the opportunity to develop competencies in the design, analysis, interpretation and evaluation of health informatics research studies. It exposes the student to theoretical approaches to and practical applications of research. An introduction to empirical methods, including qualitative and quantitative methods, the design of surveys and experiments and analysis of the resulting data, sampling, questionnaire design, data collection and data

processing. The course also discusses ethical issues involved in medical research, such as patient consent and confidentiality.

BSTT 615 FUNDAMENTALS OF HEALTH INFORMATICS

The purpose of this course is to provide students with a basic understanding of Health Informatics and its application in a public health setting. It introduces the definition of data, information and knowledge as well as what defines a system and a model. A central focus will be issues relating to privacy, confidentiality, security and the ethical use of health information. This will include discussions of relevant legislation.

BSTT 617 DATABASE MANAGEMENT & ADMINISTRATION

This course covers the study of relational database design, using SQL and MS Access. This includes data structures, logic database design, the relational model, and the process of normalization and the functions of a database management system. Object-oriented database design is introduced, and query languages, their implementation and comparisons with relational design are covered.

BSTT 619 INFORMATION SYSTEMS ANALYSIS AND DESIGN

This course will focus on the design, implementation and components of Information Systems. The course will include a history of health and healthcare information systems. It will examine the changing uses and expectations of such systems and their expected usage at each level of development. The course will explore new options in technology and design, which will allow for the clinically driven Information Systems of the future. The needs of multiple disciplines will be explored to understand how they can share and communicate patient information using Information Systems.

BSTT 621 DATA ANALYSIS & SOFTWARE APPLICATIONS I

This course familiarizes students with the use of the statistical software packages and skills needed for effective data management, data manipulation, and data analysis. Students learn how to document and replicate their work. Graphical techniques for displaying data and the interpretation of statistical results are discussed. The software introduced may vary from semester to semester although exclusive to STATA, SPSS and SAS, with STATA as the common choice. However, most technical knowledge and computing techniques covered in the course are applicable to any statistical package. Students must have a laptop computer with the appropriate software installed.

EPDC 615 FOUNDATIONS OF PUBLIC HEALTH

History of Public Health, Threats to public health, guiding public health principles, International influences on public health, Role of doctors in public health, role of primary care, Housing and health, Environmental health, occupational health, Health promotion, Immunity and its relation to the Theory of Immunisation; Parasitic, Viral and other Microbial life of Public Health significance. Diagnostic Methods in Public Health. Role of Nutrients and Micronutrients as well as of Drugs of public health importance Introduction to Basic Cell Physiology and Biochemistry, Molecular Biology, Genetics and its applications to Health of Populations. Introduction to Public Health Ethics.

EPDC 607 PRINCIPLES OF EPIDEMIOLOGY

Definitions: uses of epidemiology. Disease and health. Disease measurement and significance of indices used. Mortality measurement and significance of indices used. Standardization of rates.

Epidemiological methods; descriptive, analytic, experimental. Application of epidemiology to investigation of epidemics and for community diagnosis. Epidemiology of Diseases; Communicable diseases, Non-communicable Diseases. Screening. New Epidemiological Concepts, for example, Burden of disease, DALYs, special groups at risk.

Semester II

BSTT 612 ETHICAL & LEGAL CONCERNS IN HEALTH INFORMATICS

Health Informatics involves rapidly changing technology, which impacts the way in which legal and ethical considerations are understood in our culture. This course will examine the relationships between technology of collection, processing, transmission and dissemination of information, and law & ethics. Particular considerations will be given to the concepts of privacy, autonomy, responsibility and decision-making. These concepts will be discussed from both legal and ethical perspectives. The impact of current and future technology will be discussed as it relates to these concepts and the impact on Health Informatics.

BSTT 614 HEALTH SURVEILLANCE INFORMATICS

The course will introduce students to the principles of a good surveillance system, different types of surveillance and the different applications of surveillance in public health. The practical challenges that confront surveillance systems in resource-poor settings and how they could be remedied will be discussed.

BSTT 616 GEOGRAPHIC INFORMATION SYSTEM APPLICATIONS

The course introduces the use of geographic information systems (GIS's) in the analysis of public health data. GIS skills are developed through homework and case studies, and in particular, basic GIS operations such as buffering, layering, and spatial queries are addressed. In addition to GIS issues the course addresses introductory cartography, and basic statistical aspects of spatial analysis.

BSTT 618 HEALTH INFORMATION SECURITY

This course will address security issues as they impact health information systems. It will focus on strategies for designing, implementing, auditing and evaluating the technical, physical and human components of an information security system that adheres to a healthcare organization's legal, ethical and organizational requirements. Physical security of the hardware and software including redundancy, back up and restricted access will be discussed. Security and appropriateness of access will be addressed in terms of both hardware and software solutions. Data integrity, audit ability and system integrity will be considered along with the unique problems, which result from network access.

BSTT 632 HEALTH DATA AND ELECTRONIC HEALTH CARE RECORDS

This course covers approaches to the management of clinical information, focusing on the role and purpose of healthcare records and the development of electronic healthcare record architectures. It deals with practical issues such as standardization, security and evaluation as well as disease classifications and more theoretical questions of medical knowledge representation and the comparison of methodologies. The course will review the impact of electronic records on health

and healthcare including legal, financial and clinical design issues.

Electives

BSTT 602 METHODS IN BIOSTATISTICS II
(Pre-requisite: Semester I

BSTT 601) Methods in Biostatistics I
This course expands on the student's abilities to conduct and report the results of valid statistical analysis of quantitative medical/health information by focusing on multiple linear regression, two-way analysis of variance models, covariance analysis with single covariate, nonparametric methods, logistic regression with dichotomous and continuous independent variable, introductory survival analysis, and sample size determination controlling for both type I and type II errors.

BSTT 622 DATA ANALYSIS & SOFTWARE APPLICATIONS II

(Pre-requisite: BSTT 621) Data Analysis & Software Applications I
This course expands on the student's skills in STATA, SPSS or SAS to know when and how to use the relevant software in performing each of a comprehensive set of the most important and frequently used data analysis techniques for research and evaluation in medical/health research. The student will choose the most appropriate data analysis tools, to perform qualitative, descriptive, inferential, parametric, non-parametric, multifactor and multivariate techniques as well as graphical data modelling analytic techniques using the computer. Qualitative data analysis and related software will demonstrate alternate methods for data collection and reduction. Students must have a laptop computer with the appropriate software installed.

BSTT 634 WEB TECHNOLOGY
The subject of this course is the delivery of dynamic information via the internet. Most internet applications follow a client/server model, and as a result, dynamic data generation can be found at two places: creation of data from dynamic sources in the server, and dynamic presentation of this data to the user. A recent development, which enhances the usability and portability of dynamic data presentation, is the emergence of international standards for representation of data between the client and the server. The course will focus especially on these areas.

BSTT 636 DATA MINING & KNOWLEDGE DISCOVERY
Database mining and knowledge discovery from large databases is one of the most active topics in database research, at the intersection of database systems, statistics, information retrieval, pattern recognition, AI/machine learning, and data visualization. The course will introduce data mining methods and study their principles, algorithms, implementations, and applications.

BSTT 638 SOFTWARE ENGINEERING
This course aims at presenting the fundamental principles of software engineering and illustrates the application of those principles in the different phases of the software development, namely, software design, process, quality, and requirements. Students will be exposed to current technology used to develop software. Both the theoretical and practical aspects of software engineering will be presented in the course.
Students will apply software engineering techniques to homework assignments and mini-projects throughout the course.

BSTT 658 HEALTH INFORMATICS PRACTICUM

Students spend an initial familiarization and problem identification field visit of 1 week and a 12 – week practical period on the field acquiring compe-tencies in health informatics with institutions whose functions have been identified to be relevant to the objectives of the program, and who are also capable of providing the training grounds for the students. It is a period of planned and supervised learning experience in a functionally relevant institution, where the student will, among others, gain experiences which are not usually available in a classroom, apply classroom learning to practice, enhance public health and health information management skills, and provide limited services to the institution.

Field supervisors are appointed by the institution, with the approval of SPH, to provide the guidance and supervision of the student.

Practicum Evaluations:

The assessment of the student's practicum experience will be based on the following:

1. Assessment determined by the field supervisor and based on the level of progress made by the student towards the acquisition of the competencies in health informatics.
2. Review and marking of the student's log book that captures his/her daily activities. The logbook must be read and signed by the field supervisor
3. Assessment of presentation by student on field experiences and products developed.
4. Marking of the final project report (with electronic copies on a CD) submitted by the student within 3 weeks of completion of practicum experience.

The final grade for the practicum will be based on the totality of all the above.

BSTT 610 SPECIAL SEMINARS IN HEALTH INFORMATICS

For both semesters, students in the Health Informatics program are expected to attend all depart-mental student seminars, where students are made to give at least one presentation on a review article which, may or may not be in their area of intended research.

In addition, students are to attend and provide critic of series of seminars given by visiting speakers including health informatics experts, clinicians, managers and consultants involved in some of the leading health informatics projects in Ghana. Examples of any new clinical and health informatics services are explored.

MASTER OF SCIENCE (MSc.) IN CLINICAL TRIALS

DURATION

The programme will be full time for a period of two semesters (12 months)

ENTRY REQUIREMENTS

A good first degree in a relevant discipline from a recognised university, preferably with three years relevant working experience. Candidates should have a background or interest in public health.

COURSE STRUCTURE

There will be 2 semesters and a field attachment for 10 weeks. The programme will consist of a

combination of didactic lectures and field placement activities. Candidates will be expected to pass all the core courses.

EVALUATION STRATEGY

Students will be expected to participate fully in the programme. Attendance will be required at all formal instruction at the University of Ghana Legon campus, and in the field. Assignments will be expected to be completed in a timely manner.

CONTINUOUS ASSESSMENT

Eight evaluation methods will be used throughout the programme. These methods can be characterised in three major categories

Core Courses

Semester I

EPDC 607	Principles of Epidemiology	3
EPDC 651	Fundamentals of clinical trials	3
EPDC 653	Basic statistics for clinical trials	2
EPDC 655	Clinical trials in practice	2
EPDC 657	Reporting and reviewing clinical trials	2
EPDC 659	Protocol development	2
EPDC 661	Ethics of Clinical Research in developing countries	2

Additional Elective (Optional) Courses

EPDC 613	Introduction to Non-Communicable Disease Epidemiology	2
EPDC 620	Computers in Public Health Research	2

Semester II

Programme Electives

EPDC 652	Trial Designs	2
EPDC 654	Project management and research co-ordination	2
EPDC 656	Regulatory Issues, and good clinical and laboratory practice	2
EPDC 658	Data Management	2
EPDC 662	Design and analysis of epidemiological studies	2
EPDC 664	Advanced statistical methods in clinical trials	2
EPDC 666	Cluster randomized trials	2
EPDC 668	Data Monitoring and interim analyses	2

Additional Elective (Optional) Courses

EPDC 606	Disease Outbreak Investigation and Response	2
EPDC 618	Injury Epidemiology	2
EPDC 620	Computers in Public Health Research	2
EPDC 622	Scientific Communications	2

EPDC 632	Epidemiology of Malaria and Planning its Control	2
EPDC 634	Epidemiological Methods for Evaluating Health Programmes and Services	2
EPDC 636	Selected topics in Epidemiology	3
EPDC 638	Cardiovascular Disease Epidemiology	2
EPDC 670	Dissertation	12

Field Work & Practicum

Practical attachment to sites in Ghana to give hands-on experience in trial procedures

COURSE DESCRIPTIONS

EPDC 607 PRINCIPLES OF EPIDEMIOLOGY

Definitions: uses of epidemiology. Disease and Health. Disease measurement and significance of indices used. Mortality measurement and significance of indices used. Standardization of rates. Epidemiological methods; descriptive, analytic, experimental. Application of epidemiology to investigation of epidemics and for community diagnosis. Epidemiology of Diseases; Communicable diseases, Non-communicable Diseases. Screening. New Epidemiological Concepts, for example, Burden of disease, DALYs, special groups at risk.

EPDC 651 FUNDAMENTALS OF CLINICAL TRIALS

The aim of this course is to introduce students to the key features in the design, conduct and reporting of clinical trials. The course will cover; Principles of Clinical Trials, The Role of Observational Studies, Randomisation, The Use of Blinding and Placebos, Size of Trials, Monitoring Trial Results, Reporting Trial Results, Multiplicity of Data: Subgroup Analysis, Multiplicity of Data: Multiple Outcomes/Treatments and Repeated Measures, Alternative Designs,

- Explore key decisions surrounding the design and analysis of clinical trials
- Explain th principles of trial conduct and reporting

EPDC 653 BASIC STATISTICS FOR CLINICAL TRIALS

The aim of this course is to introduce students to basic statistical methods relevant to use in clinical trials. The course will cover; Introduction to Basic Statistics for Clinical Trials, Types of Data Summary and Data Presentation, Probability: Evaluating the Role of Chance, The Normal or Gaussian Distribution, The Binomial Distribution, Principles of Statistical Inference. Point and Interval Estimation, Inference from a Sample Mean, Comparison of Two Means, Comparison of Two Proportions, Association Between Two Categorical Variables, Measures of Effect in 2 x 2 Tables, Correlation and Linear Regression, Introduction to Survival Analysis, Allowance for Baseline Values.

EPDC 655 CLINICAL TRIALS IN PRACTICE

The aim of the course is to explore practical aspects of the conduct of clinical trials. The course will cover; Before the Trial Starts, Responsibilities, Roles, and Governance, Essential Documents, Project Management, Methods of Data Collection, Data Processing and Management, Recruitment and Randomization, GCP in Relation to Quality Assurance and Quality Control, Follow-up, Analysis, Reporting and Dissemination of Results.

EPDC 657 REPORTING AND REVIEWING CLINICAL TRIALS

This course is to enable the students to describe how trials are reported using best practice and to carry out and report a systematic review of the literature on a topic. The course will cover; Introduction to Reporting and Reviewing Clinical Trials, Critical Appraisal of a Clinical Trial Report, Title, Abstract and Background for a Clinical Trial Report, Methods for a Clinical Trial Report, Results for a Clinical Trial Report, Discussion and Abstract Sections for a Clinical Trial Report, Submitting a Paper to and Dealing with a Journal, Including Peer Review, Introduction to Systematic Reviews. Why Do We Need Them and What Do They Do? Critical Appraisal of Systematic Reviews, Systematic Reviews and Selection Bias, Synthesis in systematic reviews,

EPDC 659 PROTOCOL DEVELOPMENT

The course material will build on the work of the core units, and will go further into the steps to be taken for preparing the protocol for a trial: including data collection forms, logistical and budgetary issues, and procedures of different funding bodies.

EPDC 661 ETHICS OF CLINICAL RESEARCH IN DEVELOPING COUNTRIES

The course aims to discuss the critical ethical issues related to conducting clinical trials in the developing world. The course will cover a historical overview of research ethics in the developing world, risk-benefit assessments, vulnerable populations as research subjects, informed consent: process and documentation, privacy and confidentiality of research subjects and data, responsible conduct of scientific research, the role and functions of Institutional Review Boards, Data and Safety Monitoring Boards, international research; the Declaration of Helsinki

EPDC 652 TRIAL DESIGNS

Use of different trial designs: non-inferiority and equivalence, cross-over, factorial, multi-armed and cluster randomized trials in assessing interventions and therapies, including complex interventions. Strengths and weaknesses of each design: discussed together with implications for sample size requirements, analytic methods, interpretation and reporting.

EPDC 654 PROJECT MANAGEMENT AND RESEARCH CO-ORDINATION

Project and Business Management Theory: within the context of a clinical trial, this course will teach students to develop a project management plan; identify key milestones and develop delivery plans; implement and co-ordinate the project plan with an emphasis on communication and project promotion and monitoring. Consider the major challenge of identifying barriers to implementation and creating deliverable solutions.

EPDC 656 REGULATORY ISSUES, GOOD CLINICAL & LABORATORY

PRACTICE Regulatory legislation and associated approvals and permissions required to conduct high-quality single-centre, national and international clinical trials. Integral to the legislation is Good Clinical Practice (GCP): understand GCP explore ways of implementing GCP, including risk assessment and trial monitoring. Explore Good Laboratory Practice (GLP) in trial settings, Quality control and assurance systems.

EPDC 658 DATA MANAGEMENT

Issues in the collection of data and their subsequent management prior to analysis will be addressed in this course. Students will be taught how to define and write a management plan and

use different computer packages to implement the plan in practice.

EPDC 662 DESIGN AND ANALYSIS OF EPIDEMIOLOGICAL STUDIES

Epidemiological studies: important background information prior to initiating a trial. Trial datasets may prove to be the basis for further epidemiological research. Introduction to key considerations in planning and designing epidemiological studies: includes descriptions and interpretations of epidemiological measures, including disease frequency, effect, and public health impact, and the relative merits of different study designs. Strategies for addressing sampling error, bias and confounding in epidemiological studies Analytic methods including stratified and multivariable approaches; critical appraisal of design, analysis and interpretation of published epidemiological studies.

EPDC 664 ADVANCED STATISTICAL METHODS IN CLINICAL TRIALS

This course will build on Basic Statistics for Clinical Trials and cover more advanced statistical methods in clinical trials. Methods of analysis include graphical data analysis, analysis of variance, linear regression, logistic regression and survival analysis.

Discussion of other topics include, adjustment for covariates, repeated measures and other correlated data, missing data, sub-group analyses and sensitivity analyses. Data analyses will be carried out using Stata/SPSS/EPI

EPDC 666 CLUSTER RANDOMIZED TRIALS

Trials in which individuals are randomized in groups (clusters): These are being increasingly utilized, especially in the fields of infectious diseases, implementation research, and public health and complex interventions.

Advantages and disadvantages of the use of cluster trials: particular emphasis on statistical considerations for their design and analysis, as well as the implications for informed consent and reporting.

EPDC 668 DATA MONITORING AND INTERIM ANALYSES

The course covers issues relating to on-going monitoring of data in a study so that sufficient data are available to answer the trial's question reliably without recruiting more patients than necessary, or exposing them to unacceptable risks. Focus is on the ethical context of decisions: whether or not to continue entering patients into trials. A number of different statistical approaches will be explored, and the role and conduct of data monitoring committees in this process will be examined.

EPDC 606 DISEASE OUTBREAK INVESTIGATIONS AND RESPONSE

Factors that suggest infectious cause of disease, those that determine the spatial, temporal and social distributions of communicable diseases, and the measurement of the transmissibility of infections. Design, implementation, analysis, interpretation and report of an outbreak investigation. Principles underlying mathematical models of communicable diseases. Methods for evaluating vaccine efficacy, and practical applications of epidemiological methods through the study of specific diseases

EPDC 613 INTRODUCTION TO NON COMMUNICABLE DISEASE EPIDEMIOLOGY

An overview of non-communicable diseases in both developed and developing country settings, the global burden of such diseases, temporal trends in mortality from cardiovascular diseases and

cancer, diet and cancer and the epidemiology and prevention of mental disorders. Developing and criticizing strategies for preventing cardiovascular disease at the community and individual level.

EPDC 618 INJURY EPIDEMIOLOGY

Introduction to injury as a public health problem. Research methods, study designs, risk factors, and prevention strategies applied to the problem of injuries. General framework for students to apply to the study of specific injury mechanisms.

EPDC 620 COMPUTERS IN PUBLIC HEALTH RESEARCH

Computer hardware and operating systems: Personal computer components, modern operating system designs, basic concepts of computer networks, Windows ® Operating system: navigation, file management, Spreadsheet software and its application in science: Navigate a worksheet, Create a new worksheet, Create and correct simple formulas, Create graphs.

Word Processing software and its application in science: Navigate a document, Modify text by changing the font, size and adding special effects, Manipulate text using copy, cut and paste, Format paragraphs with bullets, numbering and alignment, Modify page layout.

Graphics software and its applications in science: creating and modifying presentations, designing effective presentations, using graphs, charts and images.

Internet: Basic concepts of Web structure and its application in science, Internet/Email and applications, finding and using online literature, search for information on the internet.

Use a computer to manage data in field investigation, introduction to data processing and analysis, designing questionnaires, data entry, cleaning and validation in Epi Info, basic data management in Stata (labeling, recoding, writing do – and log – files).

EPDC 622 SCIENTIFIC COMMUNICATION

Identification of target audience. Scientific writing: articles, perspectives, review articles, editorials, executive summaries, books. Review and creation of abstracts. Responsibilities of authorship and co-authorship and intellectual property rights, including patent. Dissemination of research findings: oral scientific presentations, lectures, posters, bulletin articles, scientific articles for peer-reviewed journals, internal office correspondence; Media relations. Public Health Advocacy. (Workshop)

EPDC 632 EPIDEMIOLOGY OF MALARIA AND PLANNING ITS CONTROL

Epidemiology of malaria, Surveillance, Planning for malaria control, communication: community mobilization and advocacy, Strategic management functions and practices, Health economics and social aspects of malaria, Malaria research agenda and process, Strategic orientation of prevention and control of malaria.

EPDC 634 EPIDEMIOLOGICAL METHODS FOR EVALUATING HEALTH PROGRAMS AND SERVICES

Definition of health evaluation, Methodological frameworks for evaluating health programs, Health evaluation categories & indicators, Typologies of indicators for evaluation of public health

services, Research designs for evaluative studies, How to quantify effects of health programmes, Reporting health evaluation.

EPDC 636 SELECTED TOPICS IN EPIDEMIOLOGY

Readings in the philosophy and technique of epidemiologic modeling. Peer review process including validity and reliability of the peer review system. Common mistakes in reporting results from epidemiologic research.

EPDC 638 CARDIOVASCULAR DISEASE EPIDEMIOLOGY

History of cardiovascular disease (CVD) epidemiology, Classification of CVDs, Epidemiology of CVDs in rich economies, Epidemiology of CVDs in LMICs, Genetic basis of CVDs, Paediatric causes of CVDs, Tobacco control, Obesity, Stroke, Coronary artery disease, Rheumatic heart disease, Diabetes and cardiovascular diseases, Conducting field trials in CVDs, Approaches to control of CVDs – dietary approaches.

EPDC 670 DISSERTATION

The objective of the dissertation is to test the student's skill in defining problem and designing appropriate research study to evaluate the problem. The essay should not be more than 80 pages or 28,840 words.

M.SC/ M.PHIL IN APPLIED HEALTH SOCIAL SCIENCE (MSc./ MPHIL AHSS)

INTRODUCTION

Applied Health Social Sciences is an interdisciplinary field which emphasizes the application of the entire range of Health Social Science disciplines such as Sociology, Psychology, Economics, Anthropology to Public Health and the application of Social Science research methodologies and Implementation Research to promote health and well-being. The course is therefore, designed to provide a structured but flexible exposure to topics in the areas of Public Health, Biostatistics, Social Science methods in Health Systems/ Implementation Research, Health Policy and Ethics. The main thrust of the programme is to expose health and development workers to Social Science techniques, tools, approaches, methodologies and best practices needed for effective programme design, implementation, monitoring, evaluation, and management. Students will be exposed to various field experiences and practices and would be required to master Social Science approaches to health research. Some of the main areas of application include health promotion, gender advocacy in health, gender in development, implementation research, health research, health programme design, implementation, and management, the application of Social Science to health programme and service delivery, management and sustainability, and health promotion activities.

ENTRY REQUIREMENTS

A good first degree in Social Science or Health, with preferably three (3) years working experience. Candidates should have a background or interest in Public Health.

STRUCTURE OF THE PROGRAMME

The Applied Health Social Science Programme is one of a series of programmes planned by the department in pursuance of its goals and objectives. The programme has two (2) versions – an MSc and an MPhil respectively.

MSc (AHSS)

The MSc. Applied Health Social Science (AHSS) programme has been organised as a 12-month full-time residential course of two semesters and 12-week of field practice. The first semester will be devoted to core course work and the second to both core and elective course work. After the second semester examinations, students will devote a maximum of twelve (12) weeks to field practice and/or field attachment where they will have hands-on experience of Implementation Research and the Research Cycle, Community Mobilisation, Health Promotion and Practice etc.

MPhil (AHSS)

Students who perform creditably in the first semester of the first year and wish to pursue the MPhil programme will be advised to apply for an upgrade in programme. In addition to the two (2) semesters described above, the MPhil students will spend two additional semesters in the field collecting and analysing data and writing up their thesis. Additionally, during the two semesters, MPhil students will be expected to participate in two Research Seminars where they will present various aspects of their Thesis Research, from the proposal development to the stage of completion, to students and faculty of SPH. This exercise is to help students sharpen their information dissemination skills based on their thesis research as well as to help them produce good theses.

COURSE DELIVERY

Course delivery will include lectures, seminars, workshops, group work, student presentations, and assignments. Tutorials may be given on individual or group basis. Teaching staff for the courses will be drawn from the SPH, the University faculty at large and senior specialists from the Ghana Health Service. Academic Supervisors will guide student research and production of theses from the Department, other departments in SPH as well as collaborating institutions in the University of Ghana. District Directors of Health Service specially appointed in collaboration with SPH and Directors of Research or designated staff will serve as Field Supervisors. Students will use existing University facilities such as lecture theatres, library, laboratories, and designated District Health service set-ups and field stations etc.

PROGRAMME REQUIREMENTS

Students enrolled in the MSc. AHSS option will be expected to complete a total between 39 – 45 credit hours of course work. This is made up of 25 credit hours of core course work offered in the first and second semesters, and 8 credit hours of elective course work offered during the same period: four credit hours in each semester. In the 12 weeks following the second semester, MSc. students will complete 3 credit hours of field practicals and attachment and 12 credit hours of dissertation production.

For the MPhil programme option, students will be expected to complete a total of 60 - 72 credit hours. The course structure for the first year of the MPhil option of the programme follows the same structure as the first year of the MSc. programme option. During the second year however, MPhil students will undertake 3 credit hours of field practicals and attachment, 30 credit hours of Thesis Research and write up and 3 credit hours of two (2) Thesis Research seminars.

MSC. PROGRAMME

FIRST SEMESTER

Core	Title	Credits
BSTT 601	Methods in Biostatistics I	3
BSTT 603	Research Methods in Public Health	3
EPDC 607	Principles of Epidemiology	2
EPDC 615	Foundations of Public Health	2
SOBS 611	Behavioural Science	2
SOBS 620	Applied Social Science for Public Health	2
SOBS 650	Health Promotion and Practice	2
SOBS 670	Fundamentals of Implementation Research (IR)	2

Second Semester

Core	Title	Credits
SOBS 602	Implementation Research	2
SOBS 604	Social Science Data Management and Report Writing	2
SOBS 608	Gender and Health	3
SOBS 622	Community Mobilisation in Health and Development	2
Electives		
SOBS 612	Theories and Models of Health Promotion	2
SOBS 614	Evidence-based Approach to Health Communication	2
SOBS 616	Global Perspectives in Health Promotion	2
SOBS 618	Health Research Policy Development and Implementation	2
SOBS 624	Ageing and Health	2
SOBS 626	Women's Health in sub-Saharan Africa	2
SOBS 628	Gender and Violence	2
SOBS 634	Health and Development in the Third World	3
SOBS 636	Plural Medical Systems in the Third World	2
SOBS 664	Social Science Theories in Public Health Practice & Research	2
HPPM 642	Advanced Health Systems Development and Management	2

Field Practice Period

Core	Title	Credits
SOBS 666	Field Practicals and Attachment	3
SOBS 680	Dissertation in AHSS	12

MPHIL PROGRAMME

Year I

First Semester

Core	Title	Credits
BSTT 601	Methods in Biostatistics I	3
BSTT 603	Research Methods in Public Health	2
EPDC 607	Principles of Epidemiology	3
EPDC 615	Foundations of Public Health	2
SOBS 611	Behavioural Science	2
SOBS 620	Applied Social Science for Public Health	2
SOBS 650	Health Promotion and Practice	2
SOBS 670	Fundamentals of Implementation Research (IR)	2

Second Semester

Core	Title	Credits
SOBS 602	Implementation Research	2
SOBS 604	Social Science Data Management and Report Writing	2
SOBS 608	Gender and Health	3
SOBS 622	Community Mobilisation in Health and Development	2

Electives

SOBS 612	Theories and Models of Health Promotion	2
SOBS 614	Evidence-based Approach to Health Communication	2
SOBS 616	Global Perspectives in Health Promotion	2
SOBS 618	Health Research Policy Development and Implementation	2
SOBS 624	Ageing and Health	2
SOBS 626	Women's Health in sub-Saharan Africa	2
SOBS 628	Gender and Violence	2
SOBS 634	Health and Development in the Third World	3
SOBS 636	Plural Medical Systems in the Third World	2
SOBS 664	Social Science Theories in Public Health Practice & Research	2
HPPM 642	Advanced Health Systems Development and Management	2

* All MPhil Students are advised to take SOBS 664 - Social Science Theories in Public Health Practice & Research.

Year II

Core	Title	Credits
SOBS 610	Seminars - Research Proposal and Research Results	3
SOBS 690	Thesis - Write Up and Submission	30

DESCRIPTION OF COURSES

SOBS 666 FIELD PRACTICALS AND ATTACHMENT

For field practicals and attachment, students will be attached to various District and Regional Health and Research Institutions. The main import of this exercise is for students to bring all the skills acquired in the classroom as regards Implementation Research and Social Science research methodologies to bear on the identification and solving of health problem at the field site.

SOBS 602 IMPLEMENTATION RESEARCH

The course will introduce students to the three cycles of Implementation Research: Pre-intervention, Intervention, and Post-intervention Cycles. Students will also be introduced to the community entry techniques, situational analysis, stakeholders' analysis, stakeholder consultations, cultural and social relations in the community.

SOBS 604 SOCIAL SCIENCE DATA MANAGEMENT AND REPORT WRITING

Social Science data is made up of both qualitative and quantitative data. Every set of qualitative data collected is distinct because it captures the thoughts and experiences of individuals and people. It is a challenge to analyse the data and therefore there is the need to look at the data systematically and comparatively i.e. manually and, with the assistance of qualitative data analysis software.

SOBS 608 GENDER AND HEALTH

The main aim of this course is to provide Public Health and Development Workers with the relevant understanding of the role of gender in the health and welfare of the populace. The course examines the interrelationship between gender and health. It examines the socio-cultural, socio-political, and socio-economic constructs of gender and how these constructs affect women and men's health in the developing world. This course moves beyond a description of specific health problems to critically analyze how women and men's health problems develop, are perceived, and responded to both medically and socially in the contemporary society. In this context, an important theoretical aspect of the course is the development of a socio-medical perspective on health and, specifically, the analysis of women and men's health in relation to their lives and how culture, social institutions, and social policies shape these experiences. Course topics include gender concepts, patriarchy, gender, experience, culture, power, health; poverty, health and health care, gender, and men's health. Additionally, it explores the various ways in which the study of gender and health helps Public Health and Development workers to understand women and men's health in a changing world.

SOBS 610 SEMINARS

All students in the Department or Programme at this level are expected to attend all seminars specified and be made to give at least one seminar on a review article which, may or may not be in their area of intended research. This should be in both the first and second semester.

SOBS 611 BEHAVIOURAL SCIENCE

The course is in two (2) parts. Health and development work requires that professionals with different backgrounds work together to address problems in the field. The first part of the course addresses the principles and methods of group dynamics, team building, and teamwork. The second part of the course is based on the premise that most of society's health and disease problems are behaviour/lifestyle induced. The students are exposed to the social, economic, political, and cultural contexts within which illness occurs. Opportunities are given which enable

students to appreciate public health and related problems more holistically and to assess critically the impact of socio-cultural dynamics on the health seeking behaviours of individuals and groups in society.

SOBS 612 THEORIES AND MODELS OF HEALTH PROMOTION

This course is designed to help students understand why theories, models, and constructs are considered the backbone of the processes used to plan, implement, and evaluate Health Promotion interventions. During the course, students are provided with opportunities to review some social science and/or behavioural theories and models and explore how these can be used to guide programme planners in selecting the type of interventions that are needed to accomplish specified goals and objectives. The appropriate use of learning and behavioural theories can help to ensure congruence between the planned interventions and expected outcomes.

SOBS 614 EVIDENCE-BASED APPROACH TO HEALTH COMMUNICATION

The course is designed to walk the students through the steps of a communication plan, which has to be based on good research. Students need to understand the importance of having a plan in place before developing communication activities. The planning steps begin with the identification of the problem to be addressed and the target population as well as behaviours that need to change. Then a formative assessment is conducted to help identify the communication objective. Community design and strategy development workshops are held to facilitate the process of selecting communication approaches. Messages are developed and channels selected before materials are developed and produced.

SOBS 616 GLOBAL PERSPECTIVES IN HEALTH PROMOTION The course is designed to help the student examine the challenges associated with the implementation of Health Promotion activities around the globe with special reference to the context of the developing world. It also provides insights into how to design effective strategies within severe resource constraints. Health Promotion interventions have contributed to substantial improvements in the health status of many nations. Systematic motivations of families clearly helped bring about the reductions in mortality rates recorded in many countries. In recent years, these impressive gains in maternal and child survival have levelled off in some countries while in others the positive trends have even reversed. Important lessons learned will be discussed.

SOBS 618 HEALTH RESEARCH POLICY DEVELOPMENT AND IMPLEMENTATION

This course aims at providing a general understanding of how public policies and programmes are developed in the sub-Saharan Africa context at all levels. It also aims at providing some understanding of the factors that affect the success or failure of control policy and programmes development and the basic principles of advocacy for better policy and programmes development and implementation at all levels of the health system.

SOBS 620 APPLIED SOCIAL SCIENCE FOR PUBLIC HEALTH

The aim of this course is to introduce students to the theoretical underpinnings of the range of social sciences that are applied in Public Health research and practice. These include Anthropology, Demography, Economics, Geography, Law, Political Science, Psychology, and Sociology. Students will explore the challenges of multidisciplinary, interdisciplinary, and cross-

disciplinary research and practice. These applied social science disciplines were developed in response to increasing specialities that employed and adapted the principles of the disciplines in the study of contemporary societies. Applied Social Science for Public Health is an interdisciplinary and dynamic field, which integrates the knowledge and tools for research and analysis from a range of these disciplines for the purposes of understanding the various determinants of health and developing solutions to public health problems.

SOBS 622 COMMUNITY MOBILISATION IN HEALTH AND DEVELOPMENT

This course is designed to introduce students to commonly used communication approaches at the periphery and help them develop community mobilisation plans. In order for community mobilisation to be successful, it is essential that all people and organisations involved feel ownership of the plan, support the plan, and be engaged in implementing the plan. Community mobilisation uses a variety of communication channels and usually relies heavily on face-to-face communication. Practical examples will be discussed and the group process outlined.

SOBS 624 AGEING AND HEALTH

The course introduces students to the issues of global ageing in general and with reference to Africa in particular. The impact of ageing on the structure and composition of society and its implications for the economy, health, and development will be discussed. The course also explains the magnitude of health and development issues as they relate to ageing and enables students to do a gender analysis of these issues. Students will be given the opportunity to review existing policies and programmes and identify gaps and issues for research, advocacy, and planning.

SOBS 626 WOMEN'S HEALTH IN SUB-SAHARAN AFRICA

The main goal of the course is to explain a variety of health problems faced by sub-Saharan African women, often compounded by cultural values, and religious principles that influence decision-making processes on reproductive and other health issues. The course will also review various factors that impinge on women's health and emphasise some of the emerging changes brought about by gender mainstreaming of health issues in sub-Saharan Africa. Students will have the opportunity to compare the situation of sub-Saharan African women with those from other parts of the world including the United States.

SOBS 628 GENDER AND VIOLENCE This course introduces students to the demographic, socio-cultural, and economic factors that impact on gender and violence. Students will be exposed to a wide range of issues that include physical, emotional, and sexual abuse. They will also look at the impact of violence on mental health and the various coping strategies and responses to physical violence.

SOBS 634 HEALTH AND DEVELOPMENT IN THE THIRD WORLD

For the past decade or so, the relationship between health and development has been discussed at both the national and international level. This course will allow students to examine the various social, economic, and political changes that have taken place in the developing world and analyze the impact such changes have had on the health status of populations. The course will define development and explain the link between health and development. It will then review some social and economic development theories as well as the demographic and health transition theories in relation to the developing world. This will lead to an examination of the demographic/health profile of developing nations (e.g. Ghana) and the historical perspective of development policies

and their impact on health delivery. This course will also examine critical health issues and their impact on the development and health delivery efforts of developing countries (e.g. HIV/AIDS, Malaria etc.). The role of international agencies in health delivery and the impact of urban growth on health delivery will also be discussed by the class.

SOBS 636 PLURAL MEDICAL SYSTEMS IN THE THIRD WORLD I

ndigenous people have developed regimes for addressing health needs. With the introduction of biomedicine, the pattern of health seeking behaviour has changed to accommodate the diverse health resources. The course will examine the rationale for several medical systems in the developing world and how these health resources are utilised at the individual and national level.

SOBS 650 HEALTH PROMOTION AND PRACTICE

The course is designed to enhance the student's knowledge of the basic concepts and strategies of Health Promotion. It will provide opportunities for appropriate application of Health Promotion interventions in changing and uncertain environments with special focus on key players charged with preventing diseases and promoting Public Health. Emphasis will be placed on behaviour change theories, strategies and methods for responding to emerging and pertinent Public Health issues. Students will be exposed to the importance of research in Health Promotion and Practice and also encouraged to appreciate the role of Health Promotion in Public Health Practice.

SOBS 664 SOCIAL SCIENCE THEORIES IN PUBLIC HEALTH PRACTICE AND RESEARCH

Public Health is about the prevention of diseases, injuries, and disability as well as the promotion of good health all of which require a change in human behaviour. This course examines, in detail, theoretical frameworks in the social sciences such as the Health Belief Model, Social Cognitive Theory, Stage Theory, Theory of Reasoned Action, and others. Emphasis will be given to the application of these theories in public health practice, the design, and evaluation of public health interventions and in research.

SOBS 670 FUNDAMENTALS OF IMPLEMENTATION RESEARCH

This course seeks to provide an overview of the principles underlying implementation research. Implementation research for disease control is applied social science related research that aims to develop the critical evidence base for the effective and sustained adoption of interventions. It deals with the knowledge gap between efficacy, effectiveness, and current practice to produce the greatest gains in disease control. Implementation research involves the systematic and critical investigation and analysis of the dynamic processes that influence how individuals, populations and health systems adapt in order to adopt new technologies and interventions. Additionally the course will provide active and experiential learning involving fieldwork and research, introduce students to population profiles, community entry techniques, community involvement in research and collaborative research.

SOBS 680 DISSERTATION

All students in the Department or Programme at this level are expected to write a dissertation based on a chosen and approved topic. This involves a research proposal that is approved in the first semester after which data is collected, analysed and written up in the second semester.

MASTER OF PHILOSOPHY IN APPLIED EPIDEMIOLOGY AND DISEASE CONTROL (M.PHIL AEPDC)

PROGRAMME DURATION

The programme will be full time for a period of 2 semester (24 months)

ENTRY REQUIREMENTS

A good first degree in a relevant discipline preferably with three (3) years relevant working experience. Candidates should have a background or interest in public health.

COURSES

The course requirement is as follows:

Course work	24-36 credits
Seminar presentation I	3 credits
Seminar presentation II	3 credits
Research/Thesis	30 credits
Total	**62-72 credits**

YEAR 1

Core Courses

Semester I

EPDC 603	Principles of Field Epidemiology	3
EPDC 605	Public Health Surveillance I	3
EPDC 601	Epidemiological Research Methods	2
EPDC 609	Laboratory Methods in the field	2
EPDC 613	Introduction to Non Communicable Disease Epidemiology	2
PFRH 613	Introduction to Population Studies	2
EPDC 610	Data Management Information Systems	2

Semester II

Laboratory Public Health Core

EPDC 608	Public Health Surveillance II	2
EPDC 610	Data Management Information Systems	2
EPDC 614	Management & Leadership	2
EPDC 616	Laboratory Management, Policy & System Design	3
BSTT 632	Advanced Biostatistics	3

Epidemiology Core

EPDC 608	Public Health Surveillance II	3
EPDC 602	Advanced Epidemiology	2
EPDC 610	Data Management Information Systems	2
EPDC 614	Management & Leadership	2

EPDC 624	Fundamental Laboratory Methods	2
BSTT 632	Advanced Biostatistics	3

Electives (Maximum of 6 credits)

EPDC 636	Selected topics in Epidemiology	3
EPDC 628	Economic Analysis and Evaluation	2
*EPDC 606	Disease Outbreak Investigation and Response	2
EPDC 634	Epidemiological Methods for Evaluating Health Programs and Services	2
EPDC 632	Epidemiology of Malaria and Planning its Control	2
EPDC 638	Cardiovascular Disease Epidemiology	2
BEOH 602	Environmental Health	2
PFRH 606	Introduction to Family Health	2
BEOH 612	Occupational Health	1
PFRH 614	Public Health Nutrition	1
*EPDC 618	Computers in Public Health Research	2
*EPDC 622	Scientific Communications	2
EPDC 617	Injury Epidemiology	2

Year II

Semester I

Seminar I

Each student will make a presentation on his/her thesis research proposal

EPDC 660	Seminar I	3
EPDC 680	Research Work	30

Semester II

Seminar II

Each student will make a presentation on his preliminary work and present a progress report midway into the second semester.

EPDC 660	Seminar II	3
EPDC 680	Research Work	30

A candidate is required to take a minimum of 62 and a maximum of 72 credits in four semesters.

COURSE DESCRIPTIONS

EPDC 601 EPIDEMIOLOGICAL RESEARCH METHODS

Research: definition, use, and application. Types of research: participatory, qualitative, operational, and evaluative. Study Designs; Research Methods: qualitative and quantitative. Proposal and protocol development and implementation. Funding: management of resources, technical and financial analysis of research projects; Collaboration and partnership in research;

Questionnaire design. Ethics and regulation of research: Fundamental ethical principles – respect of persons and justice, Risks of research: physical, psychological, social and economic and minimization of risk; Benefits of research: physical, psychological, social and economic and maximization of benefits. The Declaration of Helsinki – guidelines in health and biomedical research involving human subjects (a portion of this course will be a workshop)

BSTT 602 METHODS IN BIOSTATISTICS II

Pre-requisite: BSTT 601 Methods in Biostatistics I

This course expands on the student's abilities to conduct and report the results of valid statistical analysis of quantitative public health information by focusing on multiple linear regression, two-way analysis of variance models, covariance analysis with single covariate, nonparametric methods, logistic regression with dichotomous and continuous independent variable, introductory survival analysis, and sample size determination controlling for both type I and type II errors.

EPDC 603 PRINCIPLES OF FIELD EPIDEMIOLOGY

Introduction to Field Investigations: Steps of an epidemiological field investigation, Laboratory methods for epidemiologists, Biosafety Field Investigation Reports, Principles of screening, measures of test performance and predictive value theory, Evaluate investigation from 4 viewpoints: scientific, community, media, political

Outbreak Investigations: Describe essential roles in the logistics of outbreak organization and response, hypothesis generation, Design a useful prevention and control recommendation for outbreak investigation, Develop a risk communication strategy for a field investigation.

Data management: Identify the data investigators and decision makers' needs during an investigation, describe how data needs change throughout the course of an investigation, data cleaning and editing.

EPDC 605 PUBLIC HEALTH SURVEILLANCE I

Basic principles of public health surveillance: Define public health surveillance systems and their value in public health, national & regional surveillance systems, List sources of data used for surveillance, Identify needs when establishing a surveillance system, International Health Regulations and their impact on public health

Evaluate public health surveillance systems: Steps to evaluate a surveillance system, Detect aberrations in surveillance, Conduct an evaluation, Provide constructive feedback

EPDC 608 PUBLIC HEALTH SURVEILLANCE II

Analyze and interpret surveillance data using Epi Info, SPSS, DataManager and HealthMapper software: Evaluate the reliability and validity of surveillance data, Analyze and interpret time series data, Describe Epidemiology and surveillance of injuries and non communicable diseases: Unique data sources of data for injury and non-communicable disease, global & national trends in chronic disease, Estimate burden of chronic disease (mortality, hospital discharge, BRF) at national & regional levels. Establish a surveillance system

EPDC 609 LABORATORY METHODS IN THE FIELD

Describe the function and structure of laboratory as it interacts with clinical medicine and public health

Coordinate laboratory and epidemiology activities including test selection, communication, and reporting results in the field.

Analyze and interpret laboratory data accounting for factors that influence the results of diagnostic tests
Identify and implement appropriate specimen collection, storage, and transportation measures

Laboratory's role in surveillance for communicable diseases: The impact of laboratory results on disease and diagnosis, Reporting mechanisms within a laboratory based surveillance system

EPDC 613 INTRODUCTION TO NON COMMUNICABLE DISEASE EPIDEMIOLOGY

An overview of the importance in non-communicable diseases in the developing world. Describe the burden and trend of non-communicable diseases in the developing world. Identify methodological issues in identifying causes in non-communicable diseases. Identify evaluation processes in preventive strategies of non-communicable diseases. Historical overview of the emergence of non-communicable disease epidemiology. Surveillance for non-communicable diseases in the developing world. Application of different types of study designs (e.g., ecological, cohort studies, case-control studies, etc) of major non-communicable diseases (e.g., circulatory diseases, cancers, diabetes mellitus, lung diseases, tobacco and substance abuse related disorders, mental disorders).

EPDC 680 RESEARCH/FIELD PLACEMENT

Design, implement or evaluate a public health surveillance or health information system
Conduct or participate substantively in a field investigation of a potentially serious public health problem that requires a rapid public health response.
Use surveillance or other health information system to identify public health problems requiring investigation
Develop, conduct and interpret an epidemiological analysis of a new or existing data set
Develop and carry out an epidemiological study or survey to assess a health problem of public health importance.
Respond appropriately to written or oral public health inquiries from the public, the media, government officials, or other health professionals
Manage a public health project.

EPDC 610 DATA MANAGEMENT INFORMATION SYSTEMS

Databases and database systems: Use appropriate software such as Epi-Info, SPSS, STATA or SAS to manage public health data; develop and modify questionnaires; Enter and store data; Conduct basic analysis; prepare frequencies, tables, and graphs; Import files from other applications; Interface with Microsoft applications. Use the SAS statistical package to document work and make work replicable. Graphical techniques for displaying data in SAS. Epidemiologic uses of GIS.

EPDC 614 MANAGEMENT & LEADERSHIP

Team building, Managing field operations, Time management, Training techniques and mentoring skills Project management, Planning a public health intervention – analyze health problems using determinants, risk factors, and contributing factors.
Supervisory skills, Negotiation and Conflict management, Interview skills, basic budgeting and finance tasks, Manage meetings, Organize field resources, supervisory skills development goals
Personal information management, Leadership models and Introduction to total quality

management

EPDC 616 LABORATORY MANAGEMENT, POLICY AND SYSTEM DESIGN

Laboratory documentation and records management, Organization management: Personnel Management, Equipment management,: Procurement: purchasing of laboratory equipment i.e. acceptance procedure;

and inventory management, Process control management, Information management, Internal and external assessment, Process Improvement, Facilities and safety, Specimen storage systems, Planning field laboratory investigations for surveillance-sentinel or routine, for disease outbreaks and research. Essential Laboratory needs at different levels: Local, District, Provincial, and National. Public Health versus hospital diagnostic laboratory services. Laboratory building design (laboratory safety) and laboratory system design, Laboratory Legal issues, Ethical issues, Laboratory personnel training and competency, quality monitoring, proficiency testing. Laboratory standards and accreditation. (Workshop)

EPDC 604 ADVANCED EPIDEMIOLOGY

Data interpretation and hypothesis generation, Causation – Koch's postulate and modern causality structure, Study design specifics – Case-Control studies, case and control selection, Cohort studies – prospective, retrospective Analytical Cross-sectional studies, Experimental studies – randomized trial, Measures of association and impact - 2 by 2 tables absolute risk, relative risks and odds ratios, attributable risk, Rate standardization – direct and indirect adjustment, Confounding and effect modification – random error and systematic error, types of bias, control of confounding, Analyzing complex surveys and the use of matching, Sampling – methods, cluster, estimation, Qualitative methods – focus groups, key informants, Exploratory data analysis, Regression – linear and logistic
regression.

EPDC 624 FUNDAMENTAL LABORATORY METHODS

Principles of Good Laboratory Practices – standard operating procedures, Principles of Biosafety – universal precautions and personal protective equipment, dangerous goods regulations, infectious substance regulations and radioactive material regulations, bio-containment issues, Techniques for recovering and identifying bacterial, parasitic, fungal and viral pathogens – microscopy, colony morphology, media , grams and other stains, Molecular technologies including PCR, CD4/CD8 testing, Viral load testing – impact of viral load on patient and disease status, Drug Resistance Testing in Bacteria, Mycobacteria and HIV – techniques of drug resistance testing and value of knowledge, Global Disease Eradication Initiatives, Rapid tests evaluation

PFRH 613 INTRODUCTION TO POPULATION STUDIES

General overview, basic concepts: Population Growth and Socio-economic Development, Rates and Ratios, Sources of Demographic Data, Data Evaluation, Age-Sex Composition, Estimates and Projections, Ideal Family Size, Fertility Preference, Value Of Children, Measures Of Infant, Foetal And Perinatal Mortality, Construction Of Crude And Adjusted Mortality Rates, Contraceptive Technology And Reproductive Health Risks, The Role Of Women, Observed Gender Variations In Demographic, Economic And Social Characteristics, Dependency Model,

Demographic Transition, Epidemiologic Transition, And Coale And Hoover Theory.

BEOH 602 ENVIRONMENTAL HEALTH

Introduction: Environmental Health Policy and Administration; Hygiene education, Waste Management, Food Hygiene. Water Supply; quality standards; Vector and Pest control. Human settlements. Environmental pollution. General environment, education and community management; Environmental protection; structures, legislation and enforcement, education and community mobilization, treaty obligations and transnational considerations.

EPDC 606 DISEASE OUTBREAK INVESTIGATION AND RESPONSE

Introduction to Integrated Disease Surveillance and Response; The Role of the Laboratory in Integrated Disease Surveillance and Response; Investigate and Respond to Suspected Outbreaks/ Epidemics (Introduction, Case Control Studies, Report Writing); Public Health Disease Surveillance; Introduction to Scientific Writing.

PFRH 606 INTRODUCTION TO FAMILY HEALTH

The family, its structure and function. The rationale for family health, MCH and family planning. Historical developments; global movements in population policy and family planning. Child survival and Development. Maternal, infant and child morbidity and mortality, growth and development. Low birth weight. School age and adolescent health issues; Maternal morbidity and mortality. Safe motherhood. Gender issues and health. Family Planning, Reproductive and Sexual Health. Disability. Services for the family, including home visiting. Programme planning, implementation and evaluation.

BEOH 622 OCCUPATIONAL HEALTH

Students will undertake advanced courses in Occupational Medicine and Hygiene in relation to agriculture, industrialisation and topics relating to the national and international economic activities and social issues. Discussions will focus on research in any aspect of hazards and patho-physiology encountered in the working environment, particularly in the area of respiratory physiology and related population predicted values. Advanced studies in Occupational Epidemiology, Ergonomics, Occupational Toxicology and Psychology will be emphasized. Legal and administrative aspects of occupational safety and health and compensation issues will be explored.

PFRH 614 PUBLIC HEALTH NUTRITION

This course provides basic nutritional information and is designed to enable students develop the insight in Nutrition Issues, on the acquisition and efficient utilisation of food resources that ensure optimal growth, development and health.

EPDC 619 COMPUTERS IN PUBLIC HEALTH RESEARCH

1. Basic concepts of Web structure and its application in science, Internet/Email and applications,
   finding and using online literature, search for information on the internet.
2. Use a computer to manage data in field investigation, introduction to data processing and analysis, designing questionnaires, data entry, cleaning and validation in Epi Info, basic data management in Stata (labeling, recoding, writing do – and log – files)
3. Students will be introduced to the advanced principles of STATA, including data management, manipulation and analysis. Students will be taught how to create new datasets,

specifying subsets of data, generating and replacing variables, importing data from other programs, combining two or more datasets, etc. in addition they will be taught how to generate summary statistics, including generation of two-way and multiple-way cross tabulations. They will be introduced to how to generate tests statistics and hypothesis. It is also expected that by the time students would have gone through the course, they would have been introduced to how to run regression analysis as well as doing diagnostic test. Finally, students will be taught how to generate graphs from their data.

EPDC 620 INJURY EPIDEMIOLOGY

Introduction to injury as a public health problem. Research methods, study designs, risk factors, and prevention strategies applied to the problem of injuries. General framework for students to apply to the study of specific injury mechanisms.

EPDC 622 SCIENTIFIC COMMUNICATIONS

Identification of target audience. Scientific writing: articles, perspectives, review articles, editorials, executive summaries, books. Review and creation of abstracts. Responsibilities of authorship and co-authorship and intellectual property rights, including patent. Dissemination of research findings: oral scientific presentations, lectures, posters, bulletin articles, scientific articles for peer-reviewed journals, internal office correspondence; Media relations. Public Health Advocacy. (Workshop)

EPDC 628 ECONOMIC ANALYSIS & EVALUATION

General principles of economic analysis: purpose of cost analysis, components of cost analysis: direct, indirect tangible costs, outcome components: health related, non health related, Define prevention effectiveness, Frame a prevention effectiveness study.

Decision analysis: components of decision analysis, decision trees, utility analysis. Burden of disease measures: QALY, DALY, YPLL, Interpret results to determine the burden of disease.

Choose appropriate analysis: Cost analysis, cost-effective analysis, cost-utility analysis, cost-benefit analysis, sensitivity, specificity, predictive values, evaluation methods, quality indicators, Monitoring and Evaluation (M and E): Tools development for M and E, Procedures and processes of M and E. Assessing the efficacy therapeutic and preventive measures

EPDC 632 EPIDEMIOLOGY OF MALARIA AND PLANNING ITS CONTROL

Epidemiology of malaria, Surveillance, Planning for malaria control, communication: community mobilization and advocacy, Strategic management functions and practices, Health economics and social aspects of malaria, Malaria research agenda and process, Strategic orientation of prevention and control of malaria.

EPDC 634 EPIDEMIOLOGICAL METHODS FOR EVALUATING HEALTH PROGRAMS AND SERVICES

Definition of health evaluation, Methodological frameworks for evaluating health programs, Health evaluation categories & indicators, Typologies of indicators for evaluation of public health services, Research designs for evaluative studies, How to quantify effects of health programmes, Reporting health evaluation.

EPDC 636 SELECTED TOPICS IN EPIDEMIOLOGY

Readings in the philosophy and technique of epidemiologic modelling. Peer review process including validity and reliability of the peer review system. Common mistakes in reporting results from epidemiologic research.

EPDC 638 CARDIOVASCULAR DISEASE EPIDEMIOLOGY

History of cardiovascular disease (CVD) epidemiology, Classification of CVDs, Epidemiology of CVDs in rich economies, Epidemiology of CVDs in LMICs, Genetic basis of CVDs, Paediatric causes of CVDs, Tobacco control, Obesity, Stroke, Coronary artery disease, Rheumatic heart disease, Diabetes and cardiovascular diseases, Conducting field trials in CVDs, Approaches to control of CVDs – dietary approaches.

EPDC 665 SEMINAR I

Each student will make a presentation on his/ her thesis research proposal

EPDC 660 SEMINAR II

Each student will make a presentation on his/ her preliminary work and present a progress report midway into the second semester.

DOCTOR OF PHILOSOPHY (PH.D) IN PUBLIC HEALTH is a 3-5 year post-M. Phil programme. This programme may include 24 credit hours of taught course for students who may be adjudged to have a deficiency in Public Health.

SCHOOL OF ALLIED HEALTH SCIENCES

DEPARTMENT OF DIETETICS

M. Sc. AND M.PHIL DIETETICS PROGRAMME

ENTRY REQUIREMENT

A good first degree (at least a second class lower division) in Dietetics, Nutrition, Food Science, Biochemistry, Home Science (Food and Nutrition Option) or Nursing. A candidate without any background in Biochemistry will be required to take recommended courses in Biochemistry.

COURSES

The following graduate programmes are proposed:

Master of Science (M.Sc): This is a one-year programme of course work in addition to a dissertation.

Master of Philosophy (M.Phil): This is a two-yearprogramme of course work with a thesis.

Regulations governing graduate programmes in the University of Ghana as stated in the Handbook for Graduate Studies shall apply to these programmes.

A semester shall be of 16 weeks duration and shall be structured as:

13 weeks of Teaching
1 week of Revision
2 weeks of Examinations

MASTER OF SCIENCE (M.Sc.) PROGRAMME

FIRST SEMESTER

Core Courses		**Credits**
DIET 601	Review of Basic Nutrition	2
DIET 603	Advances in Nutrition in Life Cycle	2
DIET 605	Clinical Nutrition I (Diet Therapy)	3
DIET 607	Food Resources in Ghana and Ethical Issues in Dietetics Practice	2
DIET 609	Food Analysis and Diet Laboratory	2
GSPH 601	Biostatics and Research Methods	4

INTER-SEMESTER COURSE

DIET 611	Clinical Attachment I	2

SECOND SEMESTER

Core Courses		**Credits**
DIET 602	Advances in Nutrition in Stress and Sports	2
DIET 604	Clinical Attachment II	2
DIET 608	Clinical Nutrition II	3
DIET 612	Food Safety and Toxicology	2
DIET 614	Advances in Food Preservation	2
DIET 616	Social Psychology	2
DIET 630	Seminar Presentation	3
DIET 606	Dissertation	12

PRESCRIBED ELECTIVES

The following are the prescribed electives.

DIET 622	Communication Skills	2
MLAB 401	Principles and Practice of Management	3

M.PHIL DIETETICS

YEAR ONE

Core Courses	**Credits**

DIET 601	Review of Basic Nutrition	2
DIET 602	Advances in Nutrition in Stress and Sports	2
DIET 603	Advances in Nutrition in Life Cycle	2
DIET 604	Clinical Attachment II	2
DIET 605	Clinical Nutrition I (Diet Therapy)	3
DIET 607	Food Resources in Ghana and Ethical Issues in Dietetics practice	2
DIET 608	Clinical Nutrition II	3
DIET 609	Food Analysis and Diet Laboratory	2
DIET 612	Food Safety and Toxicology	2
DIET 614	Advances in Food Preservation	2
DIET 616	Social Psychology	2
DIET 630	Seminar I	3
GSPH 601	Biostatics and Research Methods	4

INTER-SEMESTER COURSE (FIRST SEMESTER)

DIET 611	Clinical Attachment I	2

INTER-SEMESTER COURSE (SECOND SEMESTER)

DIET 618	Clinical Attachment II	3

PRESCRIBED ELECTIVES

The following are the prescribed electives.

		Credits
DIET 622	Communication Skills	2
MLAB 401	Principles and Practice of Management	3

SECOND YEAR

DIET 600	Research Project	30
DIET 640	Seminar II	3

COURSE DESCRIPTION

DIET 600 RESEARCH PROJECT

The Research Project involves a supervised individual project in dietetics. It involves the identification of a specific problem in dietetics and formulating a research hypothesis. The student designs and plans a project to test the hypothesis, undertakes the project, analyzes and interprets the information obtained and writes a thesis in an acceptable scientific format. The thesis shall comply with all the requirements set out in the University of Ghana Handbook for Graduate Studies.

DIET 601 REVIEW OF BASIC NUTRITION An overview of nutrition to include brief history and definitions of nutrients and their metabolism, energy balance; functions and food sources of nutrients; food composition data; recommended nutrient intake data; nutritional deficiency disorders; and the link between diet and disease.

DIET 602 ADVANCES IN NUTRITION IN STRESS AND SPORTS

The course covers nutrition and physical fitness, nutrition and stress management, and nutrition and sports. Nature of stress; Physiologic metabolic response to stress; Life cycles stress period; Stress related to work; High risk stress management; Nutrition and sports.

DIET 603 ADVANCES IN NUTRITION IN LIFE CYCLE

Nutritional consideration of pregnancy and lactation; and nutrition related to human growth and maintenance requirements from infancy through adolescence to the ageing years.

The course covers nutritional considerations of pregnancy and lactation; nutrition related to human growth; maintenance requirements from infancy through adolescence to the ageing years. Nutrition and pregnancy outcome; Maternal nutrient needs; Normal life cycle growth pattern; Nutritional requirements; Nutrition for adults - early, middle and later years; Individuality in nutritional needs of elderly persons.

DIET 605 CLINICAL NUTRITION I

Nutritional assessment and diet therapy in patient care, drug-nutrient interactions, enteral and parenteral nutrition, aetiology, pathogenesis and management of diseases including:

- diseases of infancy and childhood,
- gastrointestinal diseases,
- diseases of the liver,
- diseases of the gallbladder,
- pancreatic diseases.

DIET 606 DISSERTATION

The Dissertation is to assess the student's ability to define aspecific problem in dietetics, critically analyze the problem, research on and discuss available literature on the problem, and suggest appropriate solutions based on sound scientific principles and evidence-based practices.

DIET 607 FOOD RESOURCES IN GHANA AND ETHICAL ISSUES IN DIETETICS PRACTICE

A review of the food balance sheet of Ghana with respect to the availability of food in the market-place in relation to meeting dietary needs of individuals in health and disease.

Consideration of ethical and professional issues – Code of Ethics; relationship with other health professionals. Ethics of health promotion. Politics of health – the effects of socio-economic and political influences on health choices, analysis of local national and international influences and conflicts. Ethical issues arising from dietary treatment of patients (Ethical decision-making process) and research underlying the principles of dietary treatment. Influence of advertisements on the choice of diet. Client/practitioner confidentiality. Patient's rights – the patient charter. Food and Drugs Board – regulations and role in control of food products.

DIET 608 CLINICAL NUTRITION II

The course consolidates the practical experience obtained in the clinical training and further develops the students' understanding of causes and development of disease and the role of dietary management of disease. It is to prepare students for further clinical practice.

Etiology and management of: cardio-vascular diseases – hypertension; atherosclerosis and ischaemic heart disease; stroke; diabetes mellitus and other endocrine disorders;

renal disease – nephritic syndrome; chronic renal failure; obesity; AIDS; Cancer; disabling diseases – (e.g. multiples sclerosis); surgical patients.

DIET 609 FOOD ANALYSIS AND DIET LABORATORY

The course develops the students' knowledge of the principles ofthe nature of food components and their application in formulatingand evaluating diets. This is a practical hands-on course and the students' ability to handle and interpret information will be enhanced. Proximate food analysis - moisture, crude protein, fat, crude fibre, ash, carbohydrate, and total energy, formulation and evaluation of diets. Practical report writing.

DIET 611 CLINICAL ATTACHMENT I

This is a four-week practical vocational training period for students with no dietetics background to study DepartmentalAdministration. Students will be introduced to the functions of the Department and will be required to spend one week in administrative offices (reception and record-keeping) and three weeks in the Clinics with the Dietician in order to become familiar with Departmental routine and to experience patient care in the clinical situation. The students will learn about appointment system, initial referral clinic/appointment, reviewclinic/ appointment, and follow-up clinic/appointment and the organization of dietetic services in the country.

DIET 612 FOOD SAFETY AND TOXICOLOGY

The course emphasizes direct, indirect and incidental food additives and the hazards they pose in clinical situations.

Food additives and toxicology; Risk – benefit analysis of direct food additives; Toxicological evaluation of substances; Natural toxicants in foods; Agro-chemical residues in foods.

DIET 618 CLINICAL ATTACHMENT II

The student will be required to work under the supervision of a practicing dietician in the hospital Function of the dietician within and outside the Ghana Health Service.

Anthropometric measurements; Preparing out-patient cards; Taking dietary history;
Underlying physiological and biochemical abnormalities, clinical signs and symptoms and diagnosis of a range of disorders requiring treatment by therapeutic diet;

Design, preparation and evaluation of therapeutic diets for various disorders seen at the clinic; Nutritional and organoleptic effects of dietary manipulation; counselling patients and caregivers; giving out dietary information sheets; follow-up and record keeping.

DIET 622 COMMUNICATION SKILLS

The course covers communication processes and interpersonal relations.

Dynamics of communication, Verbal communication – Active/effective listening;
Empathic responding; interview skills, Non-verbal communication, Medical record information, communication process, channels of communication, factors promoting good communication, barriers in communication, interpersonal communication skills – professional communication.

DIET 614 ADVANCES IN FOOD PRESERVATION

The course covers problems of food spoilage and its effect on foodbalance sheet and food security. It covers the principles of food preservation and the effect of food processing on nutrients.

DIET 616 SOCIAL PSYCHOLOGY

Theories and principles of social psychology in social work application in dietetic practice.

Objectives: At the end of the course, the student should be able to apply knowledge in social studies in dietetic practice.

DIET 630 SEMINAR I

In year 1, each student in a Department or Programme is expected to attend all seminars specified and make his/her own presentation on selected topics to an audience. Each student will be expected to make at least one oral presentation to be assessed each semester and also present a full write-up of the presentation for another assessment. These will earn a total of 3 credits.

DIET 640 SEMINAR II

For year 2, each student will make a presentation soon after the Year I examinations on his/her Thesis Research Proposal and also present a progress report midway into the second semester. These will be assessed for 3 credits.

MLAB 401 PRINCIPLES AND PRACTICE OF MANAGEMENT

Approved Course in School of Allied Health Sciences.
The course introduces the student to the principles and practice of management and imparts to the student the basic managerial and administrative skills required to run an organization and to formulate and implement strategies for growth and development. A wide range of topics is covered and will be tailored to the hospital environment with particular reference to management of a dietetics department/unit.

GSPH 601 BIOSTATICS AND RESEARCH METHODS

(Approved course in School of Public Health)