

UNIVERSITY OF MINES AND TECHNOLOGY (UMaT), TARKWA

SCHOOL OF POSTGRADUATE STUDIES

GENERAL REGULATIONS FOR POSTGRADUATE PROGRAMMES
2011/12 ACADEMIC YEAR

INTRODUCTION

This brochure is specially prepared to afford those who are interested in pursuing postgraduate studies at this University the opportunity of having a first hand knowledge of programmes available and the regulations thereof.

ENQUIRIES

All enquiries and/or applications for admission, etc, must be addressed to:

The Secretary

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Ghana.*

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BOARD OF SCHOOL OF POSTGRADUATE STUDIES

Dean, School of Postgraduate Studies - Chairman
Head, Geomatic Engineering Department - Member
Head, Geological Engineering Department - Member
Head, Mining Engineering Department - Member
Head, Mineral Engineering Department - Member
Head, Mechanical Engineering Department - Member
Head, Electrical and Electronics Engineering Dep't - Member
Head, Mathematics Department - Member
Departmental representatives - Members
Assistant Registrar, School of Postgraduate Studies - Secretary

FUNCTIONS OF BOARD OF POSTGRADUATE STUDIES

1. To give approval of candidatures, Supervisors, coursework, theses topics, titles and synopsis for higher qualifications based upon the recommendations from the Departmental and Faculty Boards.
2. To recommend the appointment of Internal and External Examiners in respect of written papers, dissertations or thesis to the Academic Board based upon recommendations from the Departmental and Faculty Boards.
3. To keep records of all Postgraduate students.
4. To give provisional approval to postgraduate examination results upon recommendations from the Departmental and Faculty Boards.
5. To liaise with the Deans on postgraduate matters in their various Faculties.
6. To establish and maintain links with Postgraduate Schools in other universities or institutions and promote exchange of Postgraduate students and staff engaged in postgraduate work between this University and other institutions.

**PROGRAMMES
&
GUIDELINES**

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1 DEGREES AND DIPLOMAS

All postgraduate programmes of study in the University may require course work together with research work, leading to the award of the following:

- Postgraduate Diploma (PgD)
- Master of Science (MSc)
- Master of Philosophy (MPhil)
- Doctor of Philosophy (PhD)

Postgraduate Diploma programmes are offered by some Departments.

2 GENERAL REGULATIONS

2.1 Applications and Procedure for Admission

Applications for admission shall be made on a prescribed form obtainable from the School of Postgraduate Studies, to which the completed form shall be returned not later than the 30th of April preceding the academic year in which a candidate wishes to start the programme.

All candidates applying for admission to research programmes *shall* be required to submit (in about 500 to 700 words) an outline of proposed research.

Applications shall then be considered, in the first instance, by the appropriate Departmental Board. The Departmental Board shall satisfy itself of the suitability or otherwise of the candidate and the availability of resources for the successful completion of the candidate's work. Where an *interview or a qualifying examination* is required for determining the suitability or otherwise of an applicant, the Departmental Board shall decide the form of interview or qualifying examination and appoint a panel from its members to administer the interview or examination. *The School of Postgraduate Studies shall be represented at such interview or examination.*

The Head of Department shall submit to the School of Postgraduate Studies for its approval, a list of candidates recommended for admission together with:

- (a) The pertinent extracts from the minutes of the Departmental Board meeting
- (b) Statement on the nature of the programme
- (c) Dissertation/thesis topic(s) and an outline of the proposed research (where applicable)
- (d) Name(s) of proposed Supervisor(s)

2.2 Description of Postgraduate Studies

Postgraduate studies shall be categorised under two main headings: namely, full-time and part-time.

- (a) A full-time study shall be completed within a maximum duration of *twenty-four months* from the date of registration for a master's programme and *thirty-six months* for a doctorate programme. A full time student is one who is fully engaged in a programme of study and research throughout the entire duration of his/her programme.
- (b) A part-time study shall be completed within a maximum duration of *thirty-six months* from the date of registration for a master's programme and *forty-eight months* for a doctorate programme.

These maximum durations may be extended by the Board, on the recommendation of the Supervisor through the Departmental and Faculty Boards, by periods not more than six months to a maximum of one year.

2.3 Registration

Candidates admitted to the Postgraduate programmes of this University shall register at their respective Departments and at the office of the School of Postgraduate Studies at the beginning of each semester by filling in the appropriate forms prescribed for that purpose.

2.4 Academic Calendar

The semester periods shall be:

First Semester August to December

Second Semester January to May

3 REGULATIONS FOR HIGHER DEGREES

3.1 Aims and Objectives

- To train high level manpower and improve students academic competence.
- To solve national/international problems. Greater attention is to be paid to solving national problems.
- To contribute to knowledge.

3.2 Administration of Postgraduate Programmes

Postgraduate programmes are administered by a network of persons, panels and committees/boards at various levels.

The following structure outlines the Boards responsible for the administration of Postgraduate Studies at UMaT:

- Academic Board.
- Board of Postgraduate Studies (hereinafter referred to as the Board).
- Faculty Postgraduate Committee.
- Departmental Board.

(b) The composition and duties of the various Boards are as follows:

(i) ***Departmental Board Composition***

The composition is as specified in the Statutes.

Duties

- Admission of suitable candidates into Postgraduate programmes in the Department.
- Dealing with matters relating to deferment of admission, registration of students, extension of studies, nomination of Supervisors and examinations.
- Nomination of panel of Examiners (Internal and External).
- Final assessment of students for graduation.
- Review of Postgraduate academic curriculum of the Department within approved regulations.

(ii) ***Faculty Board Composition***

The composition is as specified in the Statutes.

Duties

- To consider Faculty Postgraduate matters and make recommendations to the Board
- To deal with matters initiated by it or referred to it by the Board or the Departmental Board
- To recommend to the Academic Board, through the Board, Internal and External Examiners for appointment
- To advise on regulations and syllabuses dealing with courses of study for Postgraduate degrees and other awards of the Faculty.
- To make recommendations to the Academic Board, through the Board, for the award of Postgraduate degrees (other than honorary degrees), diplomas, certificates, University fellowships, studentships, scholarships and prizes within the Faculty.

(iii) ***Board of Postgraduate Studies***

The composition and duties are as specified in the Statutes.

(iv) ***Academic Board***

The composition and duties are as specified in the Statutes.

4 PhD PROGRAMMES

The degree of Doctor of Philosophy (PhD) is awarded upon completion of an [approved programme of study](#) in which a candidate has made an original and significant contribution to knowledge.

4.1 Entry Requirements

- (a) A candidate shall hold a Master's degree or its equivalent from a recognised institution and shall submit evidence of adequate training and ability to undertake the proposed programme.
- (b) A candidate who does not hold a Master's degree shall first register for a Master's degree. If he/she proves himself/herself to be of sufficient calibre by the end of the first year of the programme, he/she may be permitted by the Board on the recommendation of the [Departmental and Faculty Boards](#) to register for the PhD degree. This registration shall be deemed retrospective from the date of the original registration of the Master's degree.
- (c) A candidate who does not satisfy the requirements stated above but is otherwise adjudged suitable may be admitted. For the purpose of assessing his/her suitability, such a candidate may either be interviewed or be required to take an entrance examination, or both, as directed by the Board on the recommendation of the appropriate [Faculty and Departmental Boards](#).
- (d) A candidate may be required, on the recommendation of the Supervisor concerned, subject to the approval of the Departmental and Faculty Boards, [to take](#) appropriate number of courses. [However, a candidate may elect to audit any number of courses.](#)
- (e) In all cases an interview may be required at the discretion of the Department.

4.2 Duration of Programme

Subsequent to registration, the candidate shall pursue a full-time programme of study and research for at least two academic years, except that:

- (a) A candidate fully engaged in advanced study and research for his/her degree, who before registration, was engaged in research to the satisfaction of the Department concerned, may be exempted from not more than one academic year.
- (b) In special circumstances, the Department may recommend, that a candidate be allowed to spend not more than one academic year of his/her programme in advanced study and research at another institution, provided that this work can be supervised in a manner satisfactory to the

Department and the Board.

- (c) A member of the full-time academic staff of the University may be accepted as a part-time candidate. Where the Board is satisfied that a Senior Member has been engaged in research evidenced by publications, he/she may submit a thesis at any time without previous registration.
- (d) In special circumstances, the Board on the recommendation of the Departmental and Faculty Boards concerned may accept as a part-time candidate a person who is not a member of the full-time staff of the University but is engaged in an occupation which, in its opinion, affords the candidate the opportunity to pursue his/her programme. In such a case the Board, on the recommendation of the Departmental and Faculty Boards, shall prescribe a minimum period for his/her programme, which in its opinion, having regard to the time he/she is able to devote to the programme prescribed by the appropriate Department, is equivalent to two academic years of full-time study.
- (e) A full-time candidate shall complete his/her programme not later than *thirty-six months* from the date of registration. A part-time candidate shall complete his/her programme not later than *forty-eight months* from the date of registration.

4.3 Course Work

- (a) Course work may be required at the PhD level. A PhD student is required to make a minimum of 36 credits (30 credits for Thesis and six credits for two Seminars). Where a candidate is required to take courses, the credits earned shall be added. A minimum of 24 months shall be spent on the research project.
- (b) All examination results for the course work shall be considered by the Departmental and Faculty Boards, which in turn, shall make their recommendations to the Board not later than three months after the examination.
- (c) The Dean of Postgraduate Studies shall call a meeting of the Board, at least once a semester, for the exclusive purpose of approving examination results of coursework, subject to the approval of the Academic Board.

4.4 Thesis

The thesis shall comply with the following conditions:

- (a) The greater portion of the work submitted must have been done subsequent to the registration of the student as a candidate for the degree.
- (b) The thesis shall be written in English.
- (c) The thesis shall consist of the candidate's own account of his/her research, and be certified. It may describe work done in conjunction with the candidate's Supervisor, provided the candidate states clearly his/her share in the investigation, and that the Supervisor certifies this statement. Under no

circumstances shall a paper written or published in the joint names of two or more persons be accepted as a thesis. Work done conjointly with persons other than the candidate's Supervisor shall be accepted as a thesis in special cases only. In such cases the approval of the Departmental, Faculty and Postgraduate Boards shall be given.

- (c) Where a thesis is submitted without previous registration by a full-time academic staff of the University, the Head of Department in consultation with the Deans of the Faculty and the School of Postgraduate Studies, shall appoint a three-member Committee to certify the thesis prior to oral examination.
- (d) A candidate shall not be permitted to submit a thesis which has been submitted elsewhere. Nonetheless, a candidate shall not be precluded, at the discretion of his/her Supervisor, from incorporating work which he/she has already submitted for a degree in this University or elsewhere, provided that he/she indicates in his/her thesis any work which has been so incorporated.
- (e) Not later than *six months* before the date when he/she proposes to enter for the examination a candidate shall submit the title of his/her thesis to the appropriate Departmental and Faculty Boards for approval and submission to the Board. After the final title of the thesis has been approved it may not be changed except with the express permission of the Board on the recommendation of the Departmental and Faculty Boards.
- (f) The thesis shall be submitted, accompanied by the prescribed form (obtainable from the School of Postgraduate Studies), not later than thirty-six months after the beginning of the programme. In the case of part-time students, this period shall be *forty-eight months*. These maximum times may be extended by the Board, on the recommendation of the Supervisor through the Departmental and Faculty Boards, by periods of not more than *six months*, to a maximum of *forty-eight months* for full-time students and *sixty-months* for part-time students.
- (g) At least FIVE typed or printed comb-bound copies of the thesis shall be submitted to the Board through the Head of Department. The paper size shall be A4 except for drawings and maps, on which no restriction shall be placed. *Only one side of the paper shall be used with a margin of 3.05 cm on the left-hand side of the page. Top/Bottom/Right margins shall be 2.54 cm.* The thesis shall be typed in either one and half or double line spacing with a maximum of 200 pages excluding appendices.
After the thesis has been approved it must be bound in a standard form as follows:
art vellum or cloth; overcast; edges uncut; lettered boldly up spine in gold (0.625 cm - 1.255 cm) degree, date, name. Black cover.
- (i) One copy each of the thesis that has been accepted for the award of a PhD degree shall be deposited at the University Library, the Department and the School of Postgraduate Studies.

4.5 Seminar

All PhD candidates are required to present at least two seminars having direct relationship to their thesis.

4.6 Publications

All PhD candidates are encouraged to publish at least a technical paper arising out of their work before graduation.

4.7 Progress Report

- (a) Students' progress on thesis should be monitored through the use of progress report forms every year (see Appendix 2). The forms shall be completed by each Supervisor and each Supervisor shall submit a copy to the Dean of Postgraduate Studies through the Head of Department and the Dean of his/her Faculty.
- (b) A student who fails to make progress for one year will be put on probation.
- (c) A student who fails to make progress on his/her programme for two academic years will be withdrawn from the programme.
- (d) Under no circumstances should a full-time and part-time PhD programme extend beyond four and five years respectively.

4.8 Supervision Committee

- (a) For the supervision of a PhD thesis, a team of a minimum of two (2) Supervisors is recommended to serve as Supervision Committee. The principal Supervisor should be a Senior Lecturer (with a PhD) or above. A Lecturer with a PhD may serve on the committee.
- (b) Supervisors shall submit reports on the work of each student at the end of each year on prescribed forms to the Deans of the Faculty and Postgraduate Studies through the Head of the Department.
- (c) On the basis of work done in the course of the year, the Departmental and Faculty Boards may recommend for approval by the Board that a candidate continue or terminate his/her studies.

4.9 Assessment

The examination for the award of a PhD degree shall comprise:

- Written examination (where appropriate) and Seminars.
 - Assessment of thesis, and
 - Oral examination.
- (a) Two External Examiners and at least three Internal Examiners shall be appointed to examine the thesis. A panel of not less than five Examiners including the two External Examiners shall conduct the oral examination. Only Senior Lecturers (with PhD) and above may be appointed as

Internal Examiners except where a Lecturer with PhD is a member of the Supervision Committee. The oral examination shall be public but only the Examiners shall examine the candidate.

- (b) The panel for the oral examination shall be made up of the following:
- Dean of Postgraduate Studies or a representative - Chairman
 - The Head of Department or a representative - Member
 - Two External Examiners and at least three Internal Examiners - Members
- (c) In recommending the appointment of an External Examiner for the purpose stated above, the Head of Department, in consultation with the Dean of the Faculty, shall submit to the Board an outline curriculum vitae of the proposed examiner based on a format obtainable from the School of Postgraduate Studies. The External Examiner should show significant contribution in the area concerned.
- (d) (i) The Examiners may recommend to the School of Postgraduate Studies that the candidate whose thesis is not up to the required standard be permitted to re-submit his/her thesis in a revised form within a specified period up to a maximum of twelve (12) months for oral examination;
- (ii) Subject to the provisions of Clause d(i), if a candidate's thesis is still not up to the required standard, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for an oral examination towards the award of either a MPhil degree or Postgraduate Diploma if the candidate so wishes.
- (iii) Where a candidate fails to pass the oral examination for the first time, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for an oral examination towards the award of a PhD degree.
- (iv) Where a candidate fails to pass the oral examination for the second time, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for the award of either a MPhil degree or Postgraduate Diploma if the candidate so wishes.
- (e) The panel shall submit its recommendations to the Dean of Postgraduate Studies in the form of a joint report signed by both Internal and External Examiners with respect to the oral examination, and separate reports with regard to the thesis on the basis of prescribed criteria. The appropriate copies of the approved thesis (with the necessary corrections) shall be submitted to the School of Postgraduate Studies through the Head of Department.
- (f) A maximum period of 90 days shall be allowed for final corrections to the thesis.

- (g) The fee for any oral examination shall be the normal fee.

4.10 Procedure for Award of a Degree

- (a) After an oral examination, extracts from the Examiners' report shall be submitted to the Department concerned to enable the student make the necessary corrections in the thesis.
- (b) The results of the written and oral examinations shall be submitted to the Board through the Departmental and Faculty Boards.
- (c) The recommendations of the Board shall be submitted to the Academic Board for approval.
- (d) Each successful candidate shall thereafter be awarded a certificate under the seal of the University at a congregation of the University for that purpose, or failing that, the certificate shall be sent to him/her by **registered post.**

5 MASTER'S PROGRAMMES

There are two levels of Masters programmes in the University: MSc and MPhil.

5.1 Designation

- (a) Master of Philosophy (MPhil) based on research with limited taught courses.
- (b) Master of Science (MSc) based on a combination of taught courses and research.

5.2 Entry Requirements

- (a) A candidate shall hold a First Class or Second Class (Upper Division) honours degree, or its equivalent, in an appropriate field of study, from a recognized University.
- (b) A candidate who does not satisfy the requirement stated in (a) but is otherwise adjudged suitable by the Departmental Board, shall, where practicable, be interviewed and in addition may be required to take an entrance examination as determined by the Departmental Board concerned. A candidate who has satisfactorily completed a Postgraduate Diploma course may be considered for admission on the recommendation of the Departmental Board concerned.
- (c) A candidate registered for the MPhil degree shall be required to pass all Faculty core courses and may be required to audit appropriate courses on the recommendation of the Supervisor and the Departmental Board concerned.

5.3 Duration of Programme

A full-time programme leading to a Master's degree shall be not less than one academic year except that:

- (a) In special circumstances, the Department may recommend that a

candidate be allowed to spend not more than *six months* of his programme in advanced study and research at another institution provided that his work can be supervised in a manner satisfactory to the Departmental, Faculty and Postgraduate Boards.

- (b) In special circumstances, the Board, on the recommendation of the Departmental and Faculty Boards concerned, may accept as a part-time candidate for the degree, any person who is engaged in an occupation, which in their opinion, affords the candidate the opportunity to pursue his/her programme. In such a case the Board on the recommendation of the Departmental and Faculty Boards shall prescribe a minimum period for the duration of his/her programme which in their opinion, having regard to the proportion of his/her time which he/she is able to devote to the programme prescribed by the appropriate Department, is equivalent to *twelve months* full-time study.
- (c) A full time candidate shall complete his/her programme not later than *twenty-four months* from the date of registration. A part-time candidate shall complete his/her programme not later than *thirty-six months* from the date of his/her registration.

5.4 Course Work

- (a) Course work is required of all Postgraduate programmes at the Master's level. A Master's student in the Faculty of Mineral Resources Technology is required to make a minimum of 42 credits and in the Faculty of Engineering, a minimum of 45 credits.
- (b) The minimum credits in the Faculty of Mineral Resources Technology shall comprise: Thesis (15 credits), Seminar (3 credits), Field Trip and Report (3 credits) and four core courses (12 credits) and three optional courses (9 credits) for MSc students; and Thesis (24 credits), Seminar (3 credits), Field Trip and Report (3 credits) and four core courses (12 credits) for MPhil students. The minimum credits in the Faculty of Engineering shall comprise: Thesis (15 credits), Seminar (3 credits), Field Trip and Report (3 credits) and five core courses (15 credits) and three optional courses (9 credits) for MSc students; and Thesis (24 credits), Seminar (3 credits), Field Trip and Report (3 credits) and five core courses (15 credits) for MPhil students.
- (c) All examination results for the coursework shall be considered by the Departmental and Faculty Boards, which in turn, shall make recommendations to the Board not later than three months after the examination.
- (d) The Dean of Postgraduate Studies shall call a meeting of the Board, at least once a semester, for the exclusive purpose of approving examination

results of coursework, subject to the approval of the Academic Board.

5.5 Thesis

- (a) The thesis shall normally be written in English.
- (b) The thesis shall consist of the candidate's own account of his/her research and be so certified. It may describe work done in conjunction with the candidate's Supervisor, provided the candidate states clearly his/her share in the investigation, and that his/her statement is certified by the Supervisor. Under no circumstances shall a paper written or published in the joint names of two or more persons be accepted as a thesis. Work done conjointly with persons other than the candidate's Supervisor may be accepted as a thesis provided his/her contribution is at least 60%. In such cases the approval of the Departmental, Faculty and Postgraduate Boards shall be given.
- (c) A candidate shall not be permitted to submit a thesis, which has been submitted elsewhere, but a candidate shall not be precluded, at the discretion of his Supervisor, from incorporating work, which he/she has already submitted for a degree in this university or elsewhere, provided that he/she indicates in his/her thesis any work which has been so incorporated.
- (d) The candidate may submit subsidiary matter in support of his/her candidature any printed contributions to the advancement of his/her subject which he/she may have published independently or conjointly or any other supporting material. In the event of a candidate submitting subsidiary matter of a conjoint nature, he/she shall be required to state fully his/her share of such conjoint work.
- (e) A provisional thesis topic shall be submitted through the Departmental and Faculty Boards within the first six months and the final topic before the last six months of the course. Within the last six months of the course any significant change in the thesis topic shall be submitted to the Board for approval.
- (f) The thesis shall be submitted, accompanied by the prescribed form obtainable from the School of Postgraduate Studies, not later than the maximum duration for the programme. These maximum times may be extended by the Board, on recommendation of the Supervisor through the Departmental and Faculty Boards, by periods of not more than *six months* to a maximum of *twelve months*.
- (g) At least Three typed or printed comb-bound copies of the thesis shall be submitted through the Head of Department to the Board. The paper size shall be A4 except for drawings and maps on which no restrictions are placed. *Only one side of the paper shall be used with a margin of 3.05 cm on the left-hand side of the page. Top/Bottom and Right margins shall be 2.54 cm.* The thesis shall be typed in either double or one and half line spacing and a maximum of 100 pages excluding appendices.

A thesis, which consists of a collection of excerpts or pamphlets, shall be bound in a similar cover. After the thesis has been approved, it must be bound in a standard form as follows:

*art vellum or cloth; overcast; edges uncut;
lettered boldly up spine in gold (0.625 cm - 1.255 cm)
degree, date, name. Dark blue cover.*

- (h) One copy each of the thesis that has been accepted for the award of a Master's degree shall be deposited at the University Library, the Department and the School of Postgraduate Studies.

5.6 Seminar

Every MSc/MPhil student is required to present at least one seminar having direct relationship to his/her thesis. This must be done before submission of the final thesis.

5.7 Publications

All MSc/MPhil students are encouraged to publish at least one paper having relationship to their theses.

5.8 Progress Report

- (a) Students' progress on thesis should be monitored through the use of progress report forms every year ([see Appendix 2](#)). The forms shall be completed by each Supervisor and each Supervisor shall submit a copy to the Dean of Postgraduate Studies [through](#) the Head of Department [and the Dean of his/her Faculty](#).
- (b) A student who fails to make progress [in his/her thesis or fails to achieve a CWA of at least 55% after one year](#) will be put on probation.
- (c) A student who fails to make progress on his/her programme for [two academic years](#) will be withdrawn from the programme.
- (d) Under no circumstances should a [full-time and part-time MSc/MPhil programme extend beyond three and four years respectively](#).

5.9 Supervision

- (a) A Senior Member of the rank of Senior Lecturer and above is eligible to supervise an MSc/MPhil candidate, though more than one person is preferred.
- (b) Supervisors shall submit reports on the work of each student at the end of each [year](#) on prescribed forms to the Dean of Postgraduate Studies through the Head of the Department concerned.
- (c) On the basis of work done in the course of the year, the Departmental [and Faculty Boards](#) may recommend for approval by the Board that a candidate continue or terminate his/her studies.

5.10 Assessment

The examination for the award of MSc and MPhil shall include:

- Written examination (where appropriate)
 - Assessment of thesis
 - Oral examination
- (a) Not less than *three Examiners*, of whom at least, *one* shall be an *External Examiner* appointed by the Board, on the recommendation of the Departmental Board, shall examine the thesis. A panel of not less than *three Examiners*, including at least one External Examiner, shall conduct the oral examination.
- (b) The panel for the oral examination shall be made up of the following:
- Dean of Postgraduate Studies or a representative - Chairman
 - The Head of Department or a representative - Member
 - One External Examiner and at least two Internal Examiners - Members
- (c) The Examiners may recommend to the Board that the candidate whose thesis is not up to the required standard be permitted to re-submit his/her thesis in a revised form within a specified period of up to *six months* and the fee shall be the normal fee.
- (d) When recommending the appointment of an External Examiner, the Departmental Board shall submit an outline curriculum vitae of the proposed examiner based on a format obtainable from the Board.
- (e) The panel shall submit its recommendations to the Departmental Board in the form of a joint report signed by both Internal and External Examiners with respect to the oral examination and separate reports with respect to the thesis, on the basis of prescribed criteria approved by the Board. These reports together with appropriate copies of approved thesis with the necessary corrections shall be submitted to the School of Postgraduate Studies through the Departmental Board.
- (f) In the case of the MSc degree, the components of the examination shall be coursework, thesis and oral examination. Candidates shall be required to pass in each component and the candidate's performance shall determine his/her success or failure. Fifty percent shall be pass for all courses, with fifty-five percent being the CWA for success or failure. A candidate who does not satisfy the Examiners at the oral examination shall not be recommended for the award of a degree, the standard of the thesis notwithstanding.
- (g) In the case of MPhil degree a candidate who does not pass the oral examination shall not be recommended for the award of a degree irrespective of the standard of his/her thesis. A candidate may re-submit himself for oral examination only once more within a period of *twelve months*. The candidate shall pass the Departmental core courses.
- (h) (i) The Examiners may recommend to the School of Postgraduate Studies

that the candidate whose thesis is not up to the required standard be permitted to re-submit his/her thesis in a revised form within a specified period up to a maximum of twelve (12) months for oral examination;

- (ii) Subject to the provisions of Clause (i), if a candidate's thesis is still not up to the required standard, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for the award of Postgraduate Diploma if the candidate so wishes.
- iii) Where a candidate fails to pass the oral examination for the first time, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for the award of a MSc/MPhil degree.
- iv) Where a candidate fails to pass the oral examination for the second time, the Examiners may advise that the candidate re-submits his/her thesis in a revised form within a specified period up to a maximum of 90 days for the award of a Postgraduate Diploma if the candidate so wishes.

5.11 Procedure for the Award of a Degree

- (a) All examination results for the coursework shall be considered by the Departmental Board, which in turn, shall make their recommendations to the Board through the Faculty Board.
- (b) After the oral examinations, extracts from the Examiners reports, shall be submitted to the Department concerned to enable the students make the necessary corrections in the thesis.
- (c) The Departmental Board would, in turn, submit its recommendations together with three certified copies of the corrected thesis to the School of Postgraduate Studies for consideration through the Faculty Board. *The submission to the Board shall include the pertinent extract from the Board's minutes.*
- (d) The recommendations of the Board shall be submitted to the Academic Board for approval.
- (e) Each successful candidate shall thereafter be presented with a certificate, under the seal of the University at a congregation of the University assembled for that purpose, or failing that, the certificate shall be sent to him/her by **registered post**.

6 POSTGRADUATE DIPLOMA PROGRAMMES

A Postgraduate Diploma is awarded on the basis of a programme of taught courses and a project work.

6.1. Qualification for Admission

The entry requirement shall be a Bachelor's degree or its recognised equivalent. In addition, candidates must satisfy the appropriate Departmental requirements.

6.2 Duration of Programme

A programme leading to a Postgraduate Diploma shall be for a period of one academic year.

6.3 Examinations

There shall be written and oral examinations. Practical examinations may also be given where appropriate.

6.4. Registration

Candidates *shall register* in their Department and at the School of Postgraduate Studies *at the beginning of each semester* for courses in which they are to be examined.

6.5 Examiners

- (a) A panel comprising not less than three Examiners, of whom at least one shall be an External Examiner, shall be appointed by the Board of Postgraduate Studies on the recommendation of the Departmental Board to assess the project work. When recommending the appointment of an External Examiner, the Departmental Board shall submit an outline curriculum vitae of the proposed examiner based on a format obtainable from the School of Postgraduate Studies.
- (b) A panel comprising not less than *three members* of whom at least *one* shall be an External Examiner shall be appointed by the Board on the recommendation of the Departmental Board to conduct the oral examination.

6.6 Assessment

Candidates shall be assessed in accordance with current university regulations. Results of the examinations shall be submitted by the Departmental Board to the School of Postgraduate Studies through the Faculty Board for approval, in the first instance, before being forwarded to the Academic Board for final approval.

6.7 Procedure for the Award of a Postgraduate Diploma

Each successful candidate shall be awarded the appropriate Postgraduate Diploma of the University, at a congregation of the University assembled for that purpose or failing that, the certificate shall be sent to him/her by **registered post**.

7 GENERAL INFORMATION

7.1 Social and Sporting Facilities

The following facilities exist for the convenience of students:

- Community Service (Halls of Residence)
- Sports and Recreation
- Chaplaincies
- Health and Counseling Services
- Students' Union

*i) Account Name — University of Mines and Technology, Tarkwa
Bank (Ghana Cedis) — Ghana Commercial Bank
Account Number — 4051130000531*

*ii) Account Name — University of Mines and Technology, Tarkwa
Bank (US\$) — Ecobank Ghana Limited
Account Number — 1901254490211
Swift Code — ECOCGHAC*

Payment of fees by cash is not acceptable by the University.

All information pertaining to fees and other expenses may be obtained from:

The Registrar
University of Mines and Technology
P. O. Box 237
Tarkwa, Ghana

Further information on all the above must be addressed to the Registrar.

7.2 The Association of Graduate Students (GRASAG)

(a) The Association, which embraces all Postgraduate students of the University, provides both social and academic facilities for its members. Membership is open to Postgraduate students pursuing approved courses of study and registered with the School of Postgraduate Studies.

(b) Further enquiries should be addressed to

The President, GRASAG,
c/o School of Postgraduate Studies,
University of Mines and Technology (UMaT),
Tarkwa, Ghana.

7.3 Cost/Fees

- (a) Academic Facility User Fee as determined by Government.
- (b) Module Fees shall be GH¢500.00 (or its dollar equivalent) per module for Ghanaian students and \$500 for foreign students (module fees are subject to changes without notice).
- (c) Internet Connectivity Fee shall be GH¢75.00 (or its dollar equivalent) per student per year. This fee is subject to change without notice.
- (d) The examination fees shall be as determined from time to time by the University. Fees shall not be refunded, but in the case of justifiable unforeseen circumstances acceptable to the Board, fees may be transferred from one examination to the next.
- (e) All fees must be paid into any of the following Account:

DEPARTMENT OF GEOMATIC ENGINEERING
8 MASTER'S (MODULAR) PROGRAMME IN GEOMATIC ENGINEERING

8.1 Title of Programme

The title of the programme is MSc/MPhil Programme (Modular) in Geomatic Engineering

8.2 Programme Objectives

Geomatics is the science and technology of the acquisition, processing and visualization of geo-information. This field of rapidly growing importance is an indispensable tool for industries, governments and businesses, from local authorities to construction and engineering.

The Geomatics profession has been without a postgraduate centre since its inception at UMaT and for the country to develop, it is imperative to train Geomaticians up to the postgraduate level.

The main objectives of the programme are:

- To provide an avenue for practising surveyors in the mining and other establishments to continue their education.
- To turn out competent postgraduates to meet the current demands of the surveying industry.
- To produce competent postgraduates capable of advanced careers in the minerals and allied industries, universities and research institutions.

8.3 Entry Requirements

- a) The entry requirements for the Master's degree in Geomatic Engineering are:
- i) Applicants must have BSc First Class or Second Class (Upper Division) in Geomatic or Geodetic Engineering or its equivalent in Earth Sciences and related Engineering programmes from a recognized university.
 - ii. Holders of UMaT Diploma in the Earth Sciences who hold senior positions in an appropriate industry and have at least 5 years professional experience and proven ability in his/her discipline are eligible for admission.
 - iii Foreign applicants with proficiency in English language who satisfy the requirements of (i) or (ii) above are eligible for admission after careful consideration of transcripts and relevant references.
- b) A student may be admitted to participate in any module on non-scoring basis. In this case, he/she may participate in class discussions, do practical work, take examinations and generally enjoy the privileges of a class member. No credit is given either on completion of a module or at a later time. Such a student shall be given the award of either a Certificate of Proficiency if he/she passes the

examination or Certificate of Participation if he/she does not take the examination or fails the examination.

8.4 Programme Requirements

The Department offers two Master's Degree Programmes. These are:

- i. MSc Geomatic Engineering Degree Programme
- ii. MPhil Geomatic Engineering Degree Programme

a) Graduation Requirements

i. MSc Geomatic Engineering Degree

- A minimum of 45 credit hours is required for the award of MSc degree. This is made up of a minimum of nine (9) modules (at least 27 credit hours). A Graduate Seminar (3 credit hours) and Field trip & Report (3 credit hours) and a Thesis (12 credit hours)
- Each module runs for a maximum of two weeks (10 working days) duration; examinations in any module shall be taken within a week after completion of the module.
- There shall be a minimum of forty (40) contact hours in each module (4 hr/day).
- A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.

ii. MPhil Geomatic Engineering Degree

- A student is required to do six (6) core modules outlined in Section 8.5a. In addition, he/she may audit modules recommended by the Supervisor to facilitate the student's research work. The candidate is also required to present at least one seminar.
- The successful defence of a thesis is required for the award of the award of the MPhil Degree in Geomatic Engineering. The thesis should be an embodiment of independent research conducted by a student under the guidance of a Supervisor on a significant problem in a chosen area of Geomatic Engineering.

b) Programme Duration

- Full Time: A maximum of 4 semesters for course work and Thesis/Project work.
- Part Time: A maximum of 6 semesters.

c) Registration

- Full time students will be required to register a minimum of three (3) modules per semester. Students should register modules they intend to participate in by the third week of every semester. Students may however pay module participation fee at the time the module is being

offered.

- To be of good standing, a part-time student must do, at least, three modules per annum.

8.5 Programme Structure

a) Core and Compulsory Modules

The MSc coursework comprises 6 core/compulsory modules namely:

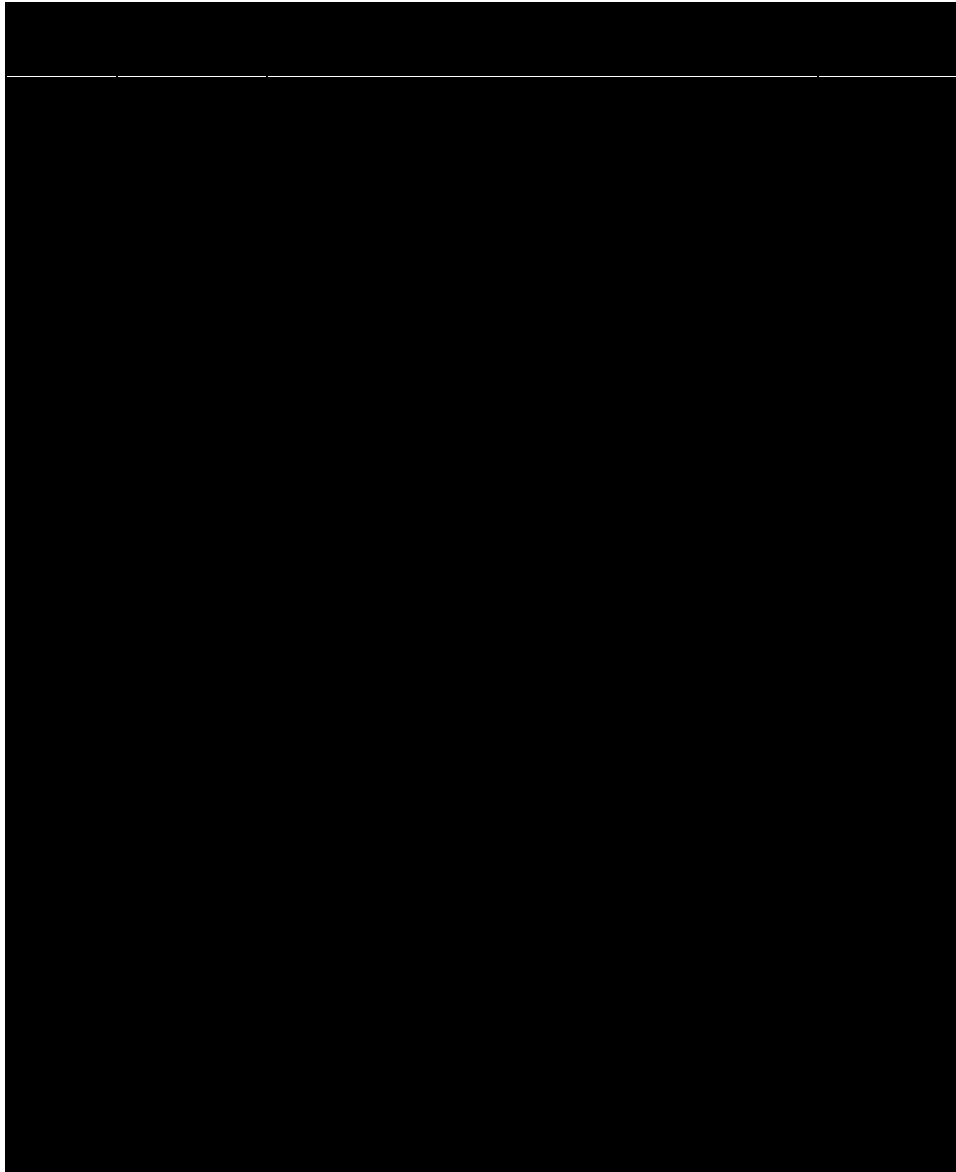
- Operations Research (GM 503)
- Statistical Models (GM 509)
- Mine Economic & Financial Evaluation (GM 506)
- Environmental Management (GM 513)
- Geographic Information Systems (GM 503)
- Global Positioning Systems (GM 508)

In addition, a minimum of three (3) other modules must be selected by the candidate in consultation with his/her Supervisor. Introduction to Computer Applications is compulsory but a candidate may apply for exemption. Applicants without adequate Geomatics background will be required to register for the module in “*Introduction to Geomatic Engineering*”.

Field trips will be organised and all students will be required to participate in at least one of them. An essential requirement of the modules is that students devote the afternoons to tutorials, practicals or field trips.

b) Content of Modules

The modules to be run, credit hours and module numbers are as follows:



Preparatory Module ** Pre-requisite Module for non-Geomaticians

GM 000 Introduction to Geomatic Engineering

Credits: 0

Digital levels, Digital Theodolite, Modern Surveying Techniques, Classical Positioning Systems- Triangulation and Trilateration, Engineering Surveying, Modern Positioning System-GPS, IPS, DPS.

GM 000 Introduction to Computer Applications

Credits: 0

Introduction to PC, Basic hardware components of the PC, Operating systems software DOS, Operating systems hardware (Dosshell, Windows, File Managers and Utilities) Word Processing, Data processing, Database, Graphics, Software installation and interfacing and summary.

GM 500 Thesis

Credits: 12

An independent research work under the guidance of a Supervisor(s) on a topic in the student's area of specialisation. A thesis embodying the results of the research will be presented to the Department and defended orally. A panel will assess the thesis.

GM 501 Map Projections

Credits: 3

Definitions of terrestrial coordinate systems and reference frames. Coordinate transformations between geodetic datum- Molodensky, Bursa-Wolf. Multiple regression equations. Map projection theory-conformity, differential geometry. Map projection types-conical, cylindrical, azimuthal. Choosing optimal projections. Case studies of projections used in Ghana, UK, Australia and overseas.

GM 502 Digital Photogrammetry

Credits: 3

Fundamentals of digital image acquisition: sampling, quantization, resampling and error sources. Charge-coupled device (CCD) architecture, operation and error sources. Automated interior, relative and absolute orientation. Image matching techniques: signal-based, feature-based and relational, with emphasis on cross-correlation and least squares matching. Use of epipolar constraints in image matching. Multiresolution analysis and image pyramids. Digital image rectification. Feature extraction.

GM 503 Operations Research

Credits: 3

Nature of Operations research in mining, Linear, the simplex algorithm for

integer & Goal programming, transportation and assignment problems, decision analyses, Markov analysis, simulation, queuing models, inventory control models, production scheduling methods-CPM, dynamic programming.

GM 504 Geodesy

Credits: 3

Physical geodesy-potential theory, earth, reference and anomalous gravity field, measurement of gravity. Figure of the earth, boundary value problems, geometrical and gravimetric geoid determination. Dynamic satellite geodesy, satellite altimetry. Reference frames and coordinate transformations, height systems. Earth rotation, solid earth tides. Geodynamics- geodetic and geophysical setting, terrestrial reference frames.

GM 505 Satellite Geodesy

Credits: 3

History of positioning and navigation using satellites, Fundamentals of satellite orbits, signals and messages, Fundamentals of coordinates reference systems, quality measures and integrity, Satellite Based Augmentation Systems (SBAS) and Ground Based Augmentation Systems (GBAS), Stand alone and differential positioning, Static and kinematics positioning, Communication protocol (NMEA, RTCM, RTCA), Observables and observation equations used in positioning, other geodetic positioning technologies; SLR, VLBI, and IMO, Detail applications and case studies, Current development (pre-requisite to Satellite Geodesy)

GM 506 Financial and Economic Evaluation

Credits: 3

Nature of and requirements for mining projects, course objectives and expected outcomes. Time value of money and economic equivalence, estimation of revenue and cost. Investment allowance, Mine Taxation and royalties. Financial alternatives. Cash flow models and analysis, investment decision methods and criteria, sensitivity and risk analysis, mine feasibility study. Case studies.

GM 507 Geographic Information Systems (GIS)

Credits: 3

Special topics in advanced technology relevant to geographic information science. The role of spatial information systems as a decision supporting tool. Management requirements for decision making. User and data needs analysis. System analysis and design. Quality assurance. Temporal databases. Use of Modelling and simulation. Reporting requirements. Selected case studies.

GM 508 Application of GIS and Remote Sensing

Credits: 3

Image enhancement and visualization, image classification and Interpretation, spatial data visualization, RS data interpretation for land resource inventory, RS and GIS for land resource change analysis, GIS tools for landscape analysis, GIS and RS for E.I.A

GM 509 Statistical Modeling

Credits: 3

Mathematical and statistical techniques for spatial data. Various interpolation techniques. Spatial statistics, Kriging. Time series analysis. Simulation techniques for spatiotemporal data. Fractal Surfaces. Remote sensing data in simulation and modelling studies

GM 510 Global Positioning Systems (GPS)

Credits: 3

GPS mathematical models, mechanics of GPS data processing. Differential positioning systems. Carrier phase modeling. Atmospheric modeling. Ambiguity resolution. Real time kinematics (RTK) and On-The-Fly positioning. GPS quality assurance. Multipath modelling and other error sources. Case studies.

GM 511 Remote Sensing

Credits: 3

Concepts of digital remote sensing and energy interaction. Remote Sensing Platforms, Image statistics, display, preprocessing. Rectification of digital imagery. Digital image processing – Image processing, Image enhancement, and classification. Spectral and Spatial filtering. Thematic information extraction, change detection and accuracy assessment. Special sensors- thermal, hyperspectral and microwave.

GM 512 Geographic Information Management

Credits: 3

Concept of geo-information technology and management, Motivation for acquiring basic knowledge in technology, Presentation of basic terminology in management, Discussion of the challenges for land administration and national surveys in a changing technological and institutional environment, Presentation of examples of innovative approaches to Geospatial Data Infrastructures, Emerging concepts in linking objectives of Geo-spatial data policy, land policy and policy instruments (World Bank, UN and FAO policies), Data sources, data acquisition, data conversion and processing, Data models, process models and databases (central/local), Electronic exchange and distribution of geo-information, Quality parameters and review procedures.

GM 513 Environmental Management

Credits: 3

Environmental Impacts of Mining (an overview). Air quality/pollution. Air quality modeling; water quality/ pollution; water quality modeling. Noise. Environmental aspects of ground vibrations and air blasts. Environmental impact assessment methodologies and practices. Ghana's Environmental Policy.

GM 514 Advanced Cartography

Credits: 3

GIS and cartographic visualization: data sources. Development and management of a cartographic database. Cartographic modeling and data analysis: spatial, temporal and thematic comparisons. Terrain visualization. Scientific Visualization. The use of colour in non-temporal animations. Dynamic variables. Visualization in GIS. Hypermaps. Rendering systems for interactive scientific visualization.

GM 515 Postgraduate Seminar

Credits: 3

Students will be required to make a minimum of one presentation on the progress and research underway in their areas of specialization. The seminar will be assessed by a Departmental Panel. Postgraduate students are required to attend.

GM 516 Engineering Surveying

Credits: 3

Analysis, design and execution of surveying and mapping projects, mine surveys, underground surveys. Highway surveys and Setting out methodologies of engineering design projects.

GM 517 Geographic Data for Resource Management

Credits: 3

Geographic data to information for resource management extract and integrate spatial and non-spatial data from various sources and formats, explore, analyze and interpret information contained in geographical data, data obtained through sampling, statistic and cartographic visualization, descriptive and inferential statistics, validity and reliability of final results.

GM 518 Field Trip & Report

Credits: 3

Field trips will be organised and students are required to participate in, at least, one of them. They are required to submit a written report and make oral presentation on it/them.

GM 519 Land Information Systems (LIS)

Credits: 3

Land as the basis of all societies. Operational aspects of creating a land information system and the scientific concepts, models and methods of land information will be the core course content. The course will provide theoretical and practical knowledge and expertise in building a viable land information system. Boundary concepts.

8.6 Areas of Research

A candidate may be required to audit appropriate course/modules and also submit a thesis under the supervision of an academic staff in any of the following areas of research:

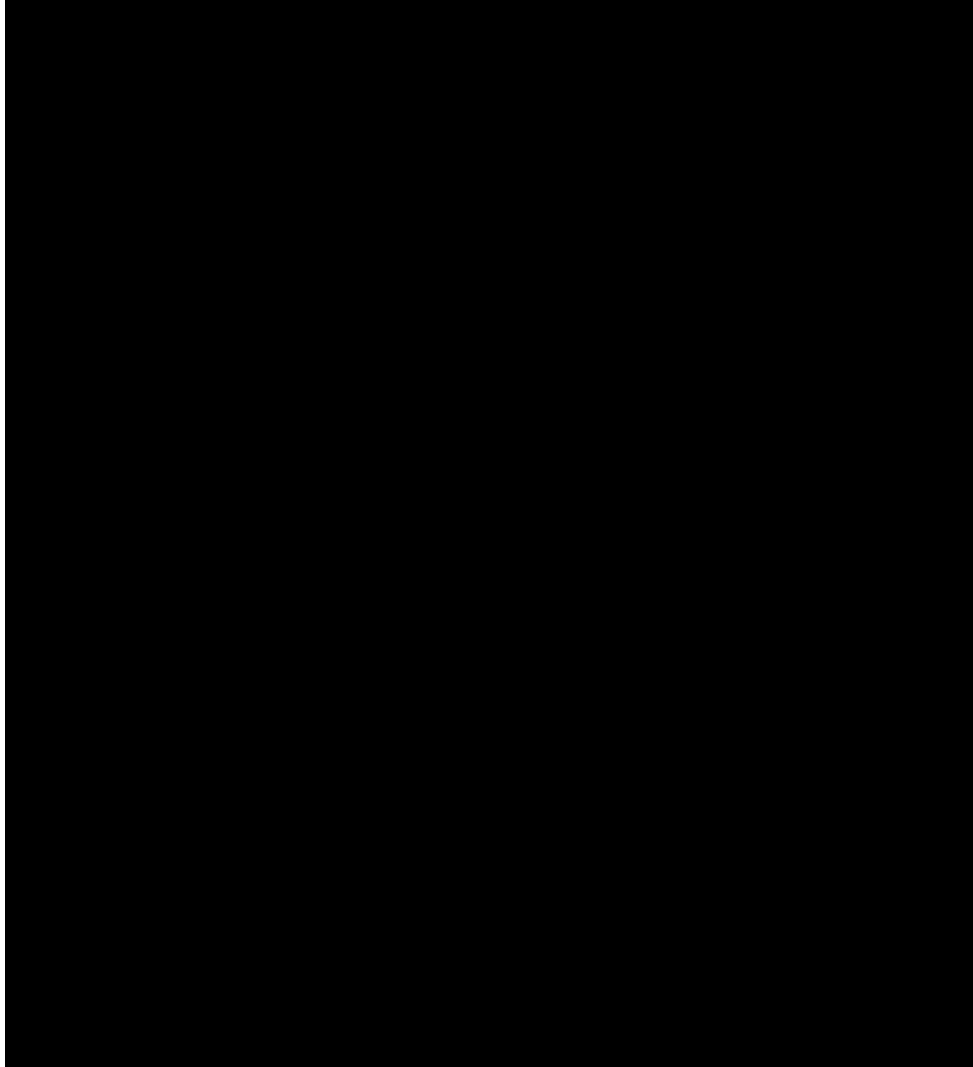
- Geographical Information System
- Global Positioning System
- Digital Photogrammetry
- Engineering Surveys

8.7 Employment Opportunities

There are employment opportunities in the following areas:

- Survey Department of Ghana
- Ghana Highways Authority
- Large and Small Scale Mining & Allied Companies
- Construction and Irrigation Companies
- Environmental Protection Agency
- Forestry Commission
- The Universities and other Educational and Research Institutions
- Other Governmental and Non-governmental Agencies

8.8 List of Academic Staff and Areas of Specialisation



DEPARTMENT OF GEOLOGICAL ENGINEERING
9 MASTER'S (MODULAR) PROGRAMME IN GEOLOGICAL ENGINEERING

9.1 Title of Programme

The title of the programme is Master's Programme (Modular) in Geological Engineering

9.2 Programme Objectives

Geologists today are looking for new and innovative ways of finding new ore deposits to meet the growing demands of society. Mineral exploitation is associated with environmental problems, and this poses a great challenge to the geologist who must find remedies to avoid ecological disaster as the industry expands.

The Geological Engineering programme recognises these facts and strives to develop new approaches within the framework of a sound quality education.

The Modular Master's Programme aims at producing motivated and highly qualified geologists/geological engineers who can be relied upon to identify and solve the numerous problems confronting the mineral and construction industries in Ghana and the West African sub-region. The programme also aims at providing a firm grounding in basic and advanced concepts and modern methods of mineral exploration, geotechnical engineering and hydrogeology.

It is structured to offer the possibility of continuing education thereby making it possible for practicing earth scientists and/or engineers in the industry to update and upgrade their knowledge and skills in the various areas of specialisation while still on the job.

The main objectives of the programme are:

- To provide an avenue for practicing earth scientists in the mining and related industries to develop and update their knowledge and skills in mineral exploitation, geological engineering and hydrogeology.
- To turn out competent postgraduates with creative thinking and innovation by challenging them to identify and solve problems independently and/or collectively through research.
- To produce competent postgraduate students capable of advanced careers in the minerals and allied industries, universities and research institutions.

9.3 Entry Requirements

- a) The entry requirements for the Master's Degree in Geological Engineering are:
- 1) Applicants must have BSc First Class or Second Class (Upper Division) or its equivalent in Earth Sciences and related Engineering programmes

- from a recognized university.
- 2) All other applicants who do not satisfy (i) above but have degrees in Engineering & Science may be eligible only after passing an interview.
 - 3) Holders of the UMaT Diploma in the Earth Sciences who hold senior positions in an appropriate industry and have at least 5 years professional experience with proven ability in their discipline are eligible for admission.
 - 4) Foreign applicants with proficiency in English language who satisfy the requirements of (i) or (ii) above are eligible for admission after careful consideration of their transcripts and relevant references.
- b) A student may be admitted to participate in any module on non-scoring basis. In this case, he/she may participate in class discussions, do practical work, take examinations and generally enjoy the privileges of a class member. No credit is given either on completion of a module or at a later time. Such a student shall be given the award of either a Certificate of Proficiency if he/she passes the examination or Certificate of Participation if he/she does not take examination or fails the examination.

9.4 Programme Requirements

The Department offers two Master's Degree Programmes. These are:

- i. MSc Geological Engineering Degree Programme
- ii. MPhil Geological Engineering Degree Programme

a) Graduation Requirements

i. MSc Geological Engineering Degree

- A minimum of 45 credit hours is required for the award of MSc Degree. This is made up of a minimum of nine (9) modules (at least 27 credit hours), Graduate Seminar (3 credit hours), Field trip and Report (3 credit hours) and Thesis (12 credit hours).
- Each module runs for a maximum of two weeks (10 working days) duration; examinations in any module shall be taken within a week after completion of the module.
- There shall be a minimum of forty (40) contact hours in each module (4 hr/day).
- A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.

ii. MPhil Geological Engineering Degree

- A student is required to do five (5) core modules outlined in Section 9.5a. In addition, he/she may audit modules recommended by the Supervisor to facilitate the student's research work. The candidate is also required to present at least one seminar.
- The successful defence of a thesis is required for the award of the MPhil

Degree in Geological Engineering. The thesis should be an embodiment of independent research conducted by a student under the guidance of a Supervisor on a significant problem in a chosen area of Geological Engineering.

b) Programme Duration

- Full-time: A maximum of four (4) semesters for coursework and thesis
- Part-time: A maximum of six (6) semesters.

c) Registration

- Full time students will be required to register a minimum of three (3) modules per semester. Students should register modules they intend to participate in by the third week of every semester. Students may, however, pay module participation fee at the time the module is being offered.
- To be of good standing, a part-time student must do, at least, three modules per annum.

9.5 Programme Structure

a) Core and Compulsory Modules

The MSc course work comprises 5 core/compulsory modules namely:

- Operations Research (GL 503)
- Statistical Models (GL 509)
- Financial & Economic Evaluation (GL 506)
- Environmental Management (GL 513)
- GIS & Remote Sensing (GL 552)

In addition, a minimum of 4 other modules must be selected by the candidate in consultation with his/her Supervisor(s).

Computer Applications is compulsory but a candidate may apply for exemption. Applicants without adequate background in geology will be required to register for the module in “Introductory Geology”.

Field trips will be organised and all students will be required to participate in at least one of them. An essential requirement of the modules is that students devote the afternoons to tutorials, practicals or field trips.

b) Content of Modules

The modules to be run, credit hours and module numbers are as follows:

Module No.: GL 173

Name of Module: **Introductory Geology**

Credits: 2

DAY TOPIC

1. Basic Geological Concepts, Principles & Theories
2. Origin and Composition of the Earth, Geologic Time Scale
3. Formation & Properties of the various Rock Types I
4. Formation & Properties of the various Rock Types II
5. Plate Tectonics and Associated Features
6. Surficial Processes (Elements of Weathering, Geomorphology, etc.)
7. Study of Geological Structures
8. Geologic Structures & their Effect on Rock/Soil Strength Parameters
9. Basic Concepts in Economic Geology & Mineral Exploration
10. Geologic Hazards and the Environment

Module No.: GL 351

Name of Module: **Introduction to Computer Applications**

Credits: 2

DAY TOPIC

1. Introduction to PC
2. Basic Hardware Components of the PC
3. Operating Systems Software DOS
4. Operating Systems Hardware (DOSshell, Windows, File Managers and Utilities)
5. Word Processing
6. Data Processing
7. Database
8. Graphics
9. Software Installation and Interfacing
10. Summary

First Year First Semester

Module No.: GL 551

Name of Module: **Ore Deposit Geology**

Credits: 3

DAY TOPIC

1. Orthomagmatic Deposits
2. Disseminated & Stockwork Cu, Mo, W, & Sn Deposits
3. Stratified and Stratabound Deposits
4. Hydrothermal and Vein Deposits (Felsic Associates)
5. Sedimentary Ore Deposits (Fe & Mn)

6. Mineralisation in Space & Time
7. Tectonic Settings as Controls of Mineralisation
8. Geochemistry in Mineral Exploration
9. Isotopic Geology
10. Fluid Inclusion Studies

Module No.: GL 553

Name of Module: **Mineral Exploration Geochemistry**

Credits: 3

DAY TOPIC

1. An overview of Geochemical Methods in Mineral Exploration
2. Sample Preparation & Geochemical Analysis
3. Drainage Sediment Geochemistry
4. Heavy Minerals in Exploration
5. Soil Geochemistry
6. Rock Geochemical Surveys
7. Biogeochemistry
8. Hydro- & Gas-Geochemistry
9. Analytical Chemistry
10. Geochemistry of Gold & Data Interpretation I & II

Module No.: GL 557

Name of Module: **Applied Hydrogeology**

Credits: 3

DAY TOPIC

1. Evaporation, Precipitation, Runoff & Stream flow
2. Properties of Aquifers
3. Theory of Groundwater Flow
4. Applications of Groundwater Flow
5. Regional Groundwater Flow
6. Groundwater Geology
7. Water Chemistry
8. Exploration for Groundwater
9. Groundwater Modelling
10. Case Studies

Module No.: GL 513

Name of Module: **Environmental Management**

Credit.: 3

DAY TOPIC

1. Environmental Impact of Mining (an Overview)
2. Air Quality/Pollution

3. Air Quality Modeling
4. Water Quality/ Pollution
5. Water Quality Modeling
6. Noise
7. Environmental Aspects of Ground Vibrations and Air Blasts
8. Environmental Impact Assessment Methodologies
9. Environmental Impact Assessment Practices
10. Ghana's Environmental Policy

Module No.: GL 503

Name of Module: **Operations Research**

Credits: 3

DAY TOPIC

1. Nature of Operations Research in Mining
2. Linear, the Simplex Algorithm for Integer & Goal Programming
3. Transportation and Assignment Problems
4. Decision Analysis
5. Markov Analysis
6. Simulation
7. Queuing Models
8. Inventory Control Models
9. Production Scheduling Methods - CPM
10. Dynamic Programming

Module No.: GL 509

Name of Module: **Statistical Models**

Credits: 3

DAY TOPIC

1. Basic Statistical Procedures I
2. Basic Statistical Procedures II
3. Regression and Linear Models I
4. Regression and Linear Models II
5. Application to Multiple Regression I
6. Application to Multiple Regression II
7. Application to Multiple Regression III
8. Statistical Inference & Statistical Modelling I
9. Statistical Inference & Statistical Modelling II
10. Use of Transformation, Correlation & its Relationship with Regression

Module No.: GL 559

Name of Module: **Water Resources Management**

Credits: 3

DAY TOPIC

1. Water Resources Management
2. Groundwater Development, Sustainability & Water Budgets
3. Impacts of Groundwater Development on Basin Hydrogeology
4. Water Quantity and Water Hazard Issues
5. Mass Transport and Mass Transfer Processes in Groundwater
6. Water Quality
7. Water Contamination and Pollution
8. Attenuation of Contamination and Groundwater Remediation
9. Water Law
10. Meeting the Challenges of Water Sustainability

First Year Second Semester

Module No.: GL 552

Name of Module: **GIS and Remote Sensing**

Credits: 3

DAY TOPIC

1. Photogrammetry & Introduction to Remote Sensing
2. GIS in Mineral Exploration
3. Spatial Data Models
4. Geological Applications of GIS
5. Data Base Management I
6. Data Base Management II
7. Spatial Interpolation I
8. Spatial Interpolation II
9. Image Processing I
10. Image Processing II

Module No.: GL 558

Name of Module: **Exploration Drilling and Sampling**

Credits: 3

DAY TOPIC

1. Introduction to Exploration Drilling
2. Diamond Drilling; Equipment and Techniques
3. Innovations in Diamond Drilling
4. Deflection & Orientation of Drill holes
5. Ore Sampling
6. Solution of Structural Problems in Drilling with Stereonet I

7. Solution of Structural Problems II
8. Solution of Structural Problems III
9. Sampling: Techniques
10. Sampling: Calculations/Projections

Module No.: GL 560

Name of Module: **Advanced Ore Microscopy**

Credits: 3

DAY TOPIC

1. Introduction; the Ore Microscope
2. Physical Properties of Ore Minerals
3. Optical Properties of Ore Minerals
4. Applications of the Ore Microscope
5. Ore Textures
6. Textures of Ore & Gangue Minerals I
7. Textures of Ore & Gangue Minerals II
8. Textures of Ore & Gangue Minerals III
9. Ionic Sizes, Isomorphism, Polymorphism & Solid Solutions
10. Case Studies

Module No.: GL 556

Name of Module: **Mineral Exploration Geophysics**

Credits: 3

DAY TOPIC

1. Geophysics in Mineral Exploration
2. Regional Gravity and Aeromagnetic Surveys
3. Gamma Ray Spectrometry
4. Principles of EM Prospecting Methods
5. Airborne EM Methods I: "Input"
6. Airborne EM methods II. "Helicopter EM"
7. Ground-Based EM I: Frequency Domain
8. Ground-Based EM I: Time Domain
9. VLF EM
10. Induced Polarisation (IP) Method

Module No.: GL 554

Name of Module: **Industrial Minerals**

Credits: 3

DAY TOPIC

1. Introduction, Concepts, Geological Overview, Mining
2. Processing, Transportation, Marketing of IM's
3. Igneous Materials I

4. Igneous Materials II
5. Igneous Materials III, Presentation of Review Papers
6. Sedimentary Materials I
7. Sedimentary Materials II
8. Sedimentary Materials III/Metamorphic Materials I
9. Metamorphic Materials II
10. IM's of Ghana; Trends, Changes & the Future of IM's

Module No.: GL 562

Name of Module: **Mine Water Hydrology**

Credits: 3

DAY TOPIC

1. Mining and the Water Environment
2. Mine Water Chemistry
3. Hydrology and Mining
4. Physical Impacts of Mineral Extraction on Hydrological Systems
5. Hydrological Issues in Dewatering, Waste Rock Piles & Tailings Dams
6. Hydrology of Abandoned Mines & Rebound Processes
7. Hydrological Intervention in Mine Water Remediation
8. Treatment of Polluted Mine Waters
9. Case Studies I
10. Case Studies II

Module No.: GL 505

Name of Module: **Applied Rock Mechanics**

Credits: 3

DAY TOPIC

1. Basic Concepts in Rock and Soil Mechanics
2. Rock and Soil Tests for Design Analysis (in-situ and Laboratory Testing of Rocks and Soils)
3. Geotechnical Mapping and Rock Mass Classification
4. Stereographic Projection Methods in Rock Mechanics
5. Groundwater, Seepage and De-watering Analysis
6. Stability of Soil and Rock Slopes
7. Design of Underground Excavations and Pillars
8. Foundations Design
9. Dam Foundations and Leach Pads
10. Site Investigation

Module No: GL 572

Name of Module: **Groundwater Engineering**

Credits: 3

DAY TOPIC

1. Groundwater Structure Systems
2. Impacts of Groundwater on Basin Hydrology
3. Groundwater Modeling & Assessment I
4. Groundwater Modeling & Assessment II
5. Groundwater in Engineering Construction
6. Groundwater Instrumentation
7. Groundwater Monitoring Control and Cost
8. Groundwater Seepage and Mitigation
9. Groundwater in Site Investigation
10. Design of Groundwater Drainage Systems

Module No: GL 502

Name of Module: **Mineral Resource Evaluation**

Credits: 3

DAY TOPIC

1. Introduction to Ore Resource Evaluation
2. Theory of Regionalised Variables
3. Statistical Theory and Applications
4. Quantifying the Criteria of Estimation
5. Variography, Practical Production and Modelling of Semi-Variograms
6. ID Regularisation of Variograms; Extension Variance and Estimation Variance
7. Practical- Application of Extension Theory to Block Resource Evaluation; Global Resource Estimation and Estimation Variance I
8. Global Resource Estimation.
9. Optimal Estimation and Kriging II, Volume-Variance and Grade-Tonnage Relationship I
10. Volume-Variance and Grade-Tonnage Relationship II: Case Studies

Module No: GL 506

Name of Module: **Economic & Financial Evaluation**

Credits: 3

DAY TOPIC

1. Nature of and Requirements for Mining Projects, Course Objectives and Expected Outcomes
2. Time Value of Money and Economic Equivalence
3. Estimation of Revenue and Costs
4. Investment Allowances, Mine Taxation and Royalties
5. Financing Alternatives

6. Cash Flow Models and Analysis
7. Investment Decision Methods and Criteria
8. Sensitivity and Risk Analysis
9. Mine Feasibility Study
10. Case Studies

Second Year First and Second Semesters

Module No: GL 515

Name of Module: **Postgraduate Seminar**

Credits: 3

Students will be required to make at least one presentation on the progress and research underway in their areas of specialisation. The seminar will be assessed by a Departmental Panel. All Postgraduate students are required to attend the Seminar(s).

Module No: GL 518

Name of Module: **Field Trip & Report**

Credits: 3

Field trips will be organised and students are required to participate in, at least, one of them. They are required to submit a written report(s) and make oral presentation on it/them

Module No: GL 500

Name of Module: **Thesis**

Credits: 12

An independent research work under the guidance of (a) Supervisor(s) on a topic in the student's area of specialisation. A bound thesis embodying the results of the research will be presented to the Department after an oral defense. A panel will assess this.

10 DOCTOR OF PHILOSOPHY PROGRAMME IN GEOLOGICAL ENGINEERING

10.1 Entry Requirements

- A candidate shall hold a Master's degree or its equivalent, from a recognised institution and shall submit evidence of adequate training and ability to undertake the proposed programme.
- A candidate who does not hold a Master's degree shall first register for a Master's degree by research. If he/she proves himself to be of sufficient caliber by the end of the first year of the programme, he/she may be recommended to register for the PhD degree; this registration shall be deemed retrospective from the date of the original registration for the Master's degree.
- A candidate, who does not satisfy the requirements stated above but is

otherwise adjudged suitable, may be admitted.

For the purpose of assessing his/her suitability, such a candidate may either be interviewed or required to take an entrance examination, or both as directed by the School of Postgraduate Studies on the recommendation of the Departmental Board.

10.2 Programme Duration

A candidate shall pursue full-time programme of study and research for at least two years, except that:

- A candidate fully engaged in advance study and research for his/her degree, who, before registration, was engaged in research to the satisfaction of the Department concerned, may be exempted for not more than one academic year.
- In special circumstances, the Department may recommend that a candidate be allowed to spend not more than one academic year of his/her programme in advanced study research at another institution, provided that his/her work can be supervised in a manner satisfactory to the Department and the School of Postgraduate Studies.
- A full-time candidate who is engaged in research for the degree shall present himself/herself for examination not later than three years from the date of his/her registration.
- A part-time candidate shall present himself/herself for examination not later than four years from the date of registration.

In special cases, an extension of these time limits may be granted on the recommendation of the Department.

10.3 Areas of Research

A candidate may be required to audit appropriate courses/modules and also submit a thesis under the supervision of an academic staff in any of the following areas of research:

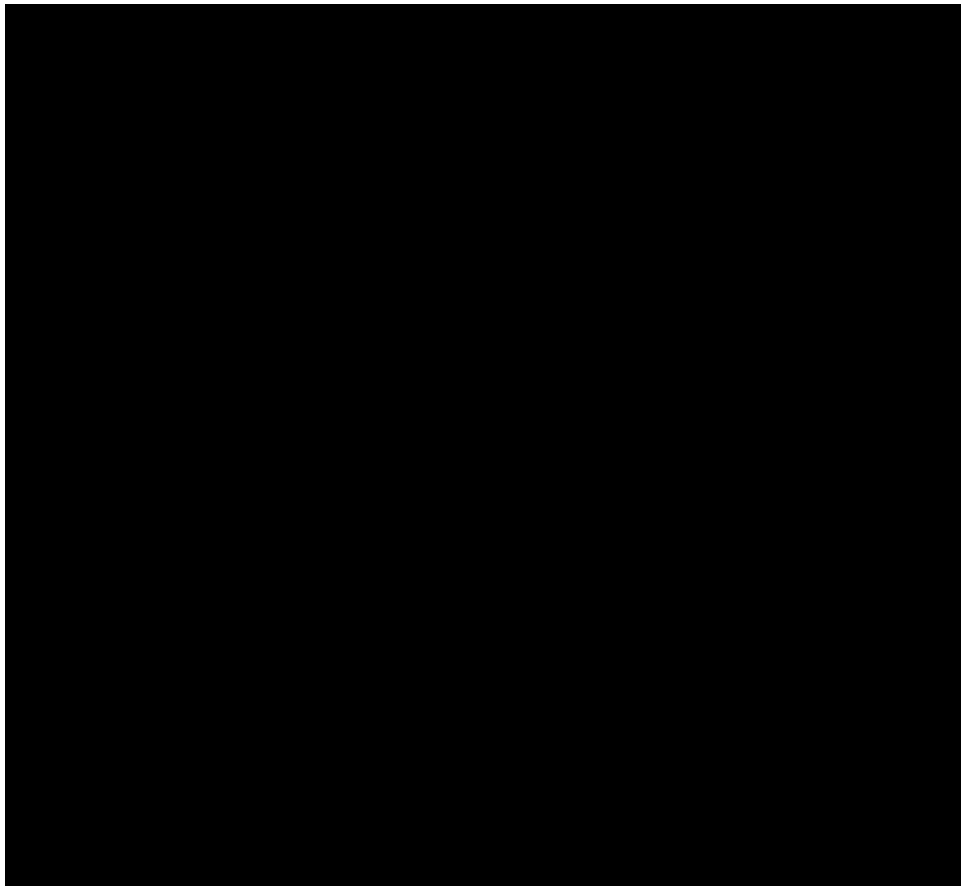
- Mineralogy, Petrology and Geochemistry
- Economic Geology
- Water Resources Management
- Mine Water Remediation
- Environmental Geology and Hydrogeology
- Geotechnical Engineering

10.4 Employment Opportunities

There are employment opportunities in the following areas:

- Large and Small Scale Mining and Allied Companies
- Financial Institutions
- Construction Companies
- Environmental Protection Agencies
- Mines Department
- Minerals Commission
- The Universities and other Educational and Research Institutions
- Geological Survey Department
- National Energy Board
- Water companies
- Other Governmental and Non-governmental Agencies

10.5 List of Academic Staff and Areas of Specialisation



DEPARTMENT OF MINING ENGINEERING
11 POSTGRADUATE DIPLOMA PROGRAMME (PgD) IN MINING ENGINEERING

11.1 Entry Requirements

- 1) Applicants must have BSc First Class or Second Class (Upper Division) in Mining Engineering, relevant Engineering or Earth Sciences from a recognised University.
- 2) All other applicants who do not satisfy (i) above but have degrees in Engineering and Science are eligible only after an interview.
- 3) Holders of the UMaT Diploma who have at least 3 years professional experience and with proven ability in their respective disciplines are eligible for admission.
- 4) Foreign applicants with proficiency in English language are eligible for admission after careful consideration of transcripts, relevant references, etc.

11.2 Programme Requirements

The Department offers a Postgraduate Diploma programme in Mining Engineering.

a) Graduation Requirements

i. Postgraduate Diploma in Mining Engineering Degree

- A minimum of 33 credit hours is required for the award of a Postgraduate Diploma degree. This is made up of a minimum of seven (7) modules (at least 21 credit hours), Postgraduate Seminar (3 credit hours), Field trip & Report (3 credit hours) and Thesis (6 credit hours).
- Each module runs for a maximum of two weeks (10 working days) duration; examinations in any module shall be taken within a week after completion of the module.
- There shall be a minimum of forty (40) contact hours in each module (4 hr/day).
- A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.

b) Programme Duration

The duration of the programme is one year on full-time basis.

c) Registration

- All students will be required to register in at least seven (7) modules for the year.
- Students should register modules they intend to participate in by the third week of every semester. Students may, however, pay module participation

fee at the time the module is being offered.

11.3 Programme Structure

The PgD programme requires that the candidate works on an identified project topic in any of the following mining disciplines:

- Environmental Engineering in Mining.
- Rock Mechanics.
- Geostatistics.
- Blasting and Fragmentation.
- Mineral Economics.
- Mine Management.
- Mine Design and Planning.
- Mine Mechanisation.
- Mine Economics & Financial Evaluation.
- Materials Handling.

12 MASTER'S (MODULAR) PROGRAMME IN MINING ENGINEERING

12.1 Title of Programme

The title of the programme is Master's Programme (Modular) in Mining Engineering.

12.2 Programme Objectives

The mineral industry in Ghana is growing very fast. In recent years several mining companies, both large and small scale, have been set up and a lot more have acquired prospecting licenses in this country.

The viability of this growing industry and the future of Ghana depends largely on the ability of Mining Engineers to:

- Plan, design and evolve satisfactory solutions to the complex issues associated with mining.
- Operate the mines profitably in the face of the ever-changing global economic and social problems.
- Ensure that the mines are operated in an environmentally friendly manner.

The Modular Master's Programme in Mining Engineering is designed to produce highly qualified Mining Engineers capable of meeting the numerous challenges of the growing mineral industry in Ghana and elsewhere.

The programme aims at providing a firm grounding in basic and advanced concepts and modern methods of mining engineering as well as offering a selection of special courses related to developing areas of the subject, particularly those areas of importance to Ghana.

The programme is structured to offer the possibility of continuing education and therefore makes it possible for practicing engineers in the industry to update and upgrade their knowledge and skills in the various areas of specialisation while still on the job.

The main objectives of the programme are:

- To provide an avenue for practicing engineers in the mining and related industries to continue their education.
- To turn out competent postgraduates to meet the current demands of the mineral industry.
- To prepare competent postgraduates for various research institutions.

12.3 Entry Requirements

- a) The entry requirements for the Master's Degree in Mining Engineering are:
- (1) Applicants must have BSc First Class or Second Class (Upper Division) in Earth Sciences or Engineering from a recognised University.
 - (2) All other applicants who do not satisfy (i) above but have degrees in Engineering & Science may be eligible only after passing an interview.
 - (3) Holders of UMaT Diploma who hold senior positions in an appropriate industry and have at least 5 years professional experience with proven ability in their discipline are eligible for admission.
 - (4) Foreign applicants with proficiency in English language who satisfy the requirements of (i) or (ii) above are eligible for admission after careful consideration of transcripts and relevant references.
- b) A student may be admitted to participate in any module on non-scoring basis. In this case, a student may participate in class discussions, do practical work, take examinations and generally enjoy the privileges of a class member. No credit is given either on completion of module or at a later time. Such a student shall be given the award of either a Certificate of Proficiency if he/she passes the examination or Certificate of Participation if he/she does not take examination or fails the examination.

12.4 Programme Requirements

The Department offers two Master's Degree Programmes. These are:

- i. MSc Mining Engineering Degree Programme
- ii. MPhil Mining Engineering Degree Programme

a) Graduation Requirements

i. *MSc Mining Engineering Degree*

- A minimum of 42 credit hours is required for the award of MSc degree. This is made up of a minimum of seven (7) modules (at least 21 credit

hours), Postgraduate Seminar (3 credit hours), Field trip & Report (3 credit hours) and Thesis (15 credit hours).

- Each module runs for a maximum of two weeks (10 working days) duration; examinations in any module shall be taken within a week after completion of the module.
- There shall be a minimum of forty (40) contact hours in each module (4 hr/day).
- A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.

ii. MPhil Mining Engineering Degree

- A student is required to do four (4) core modules outlined in Section 12.5a. In addition, he/she may audit modules recommended by the Supervisor to facilitate the student's research work. The candidate is also required to present at least one seminar.
- The successful defence of a thesis is required for the award of the MPhil Degree in Mining Engineering. The thesis should be an embodiment of independent research conducted by a student under the guidance of a Supervisor on a significant problem in a chosen area of Mining Engineering.

b) Programme Duration

- Full-time: A maximum of four (4) semesters for coursework and thesis
- Part-time: A maximum of six (6) semesters

c) Registration

- Full-time students will be required to register a minimum of three (3) modules per semester.
- Students should register modules they intend to participate in by the third week of every semester. Students may, however, pay module participation fee at the time the module is being offered.
- To be of good standing, a part-time student must do in at least three modules per annum.

12.5 Programme Structure

a) Core and Compulsory Modules

The MSc coursework comprises 4 core/compulsory modules namely:

- Operations Research (MN 503)
- Statistical Models (MN 509)
- Mine Economic & Financial Evaluation (MN 506)
- Environmental Management (MN 513)

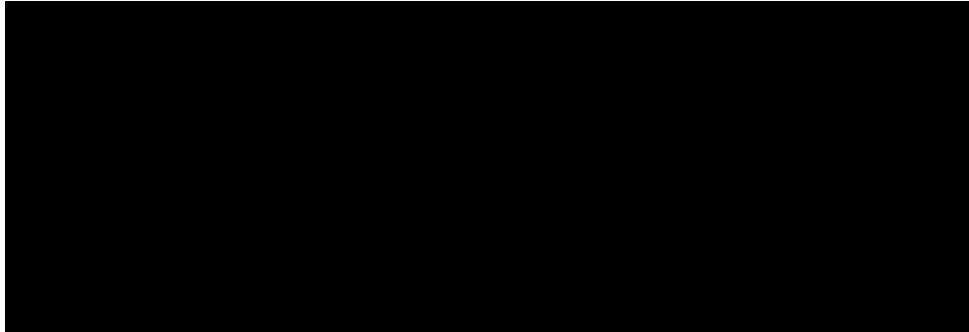
In addition, a minimum of 3 other modules must be selected by the candidate in consultation with his/her Supervisor(s). Introduction to Computer Applications is compulsory but a candidate may apply for exemption. Applicants without adequate mining background will be required to register for the module in *“Introduction to Mining Engineering”*.

Field trips will be organised and all students will be required to participate in at least one of them. An essential requirement of the modules is that students devote the afternoons to tutorials, practicals or field trips.

b) Content of Modules

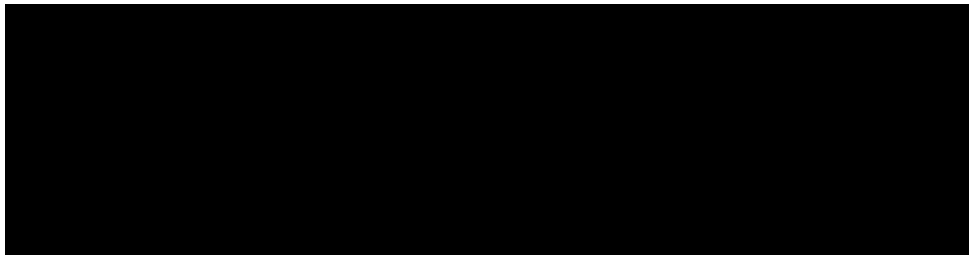
The modules to be run, credit hours and module numbers are:

First Year First Semester Modules



*Preparatory Module ** Pre-requisite Module for non-Mining Engineers

First Year Second Semester Modules



Module No.: MN 261

Name of Module: **Introduction to Mining Engineering**

Credits: 2

DAY TOPIC

1. Mining Terminologies, Stages in the Life of a Mine
Exploration & Units Operations in Mining
2. Principal Development Openings
3. Open Pit Mining
4. Classification of Ore Reserves
5. Sequence of Extracting Ore Blocks or Panels
6. Shaft Sinking
7. Development, Raising and Factors that Affect Level Intervals
8. Explosives
9. Underground Mining Methods
10. Ventilation and Materials Handling

Module No.: MN 351

Name of Module: **Introduction to Computer Applications**

Credits: 2

DAY TOPIC

1. Introduction to the PC
2. Basic Hardware Components of the PC
3. Operating System Software DOS
4. Operating System Software (DOSshell, Windows, File, Managers and Utilities)
5. Word Processing
6. Database
7. Data Processing
8. Graphics
9. Software Installation and Interfacing
10. Summary

First Year First Semester

Module No.: MN 501

Name of Module: **Mine Mechanisation**

Credits: 3

DAY TOPIC

1. Introduction
2. Drilling Machines-Percussive Drills and Rotary Drills
3. Boring Machines, Raise Borers and Tunnel Borers
4. Boring Machines-Tunnel Borers and Blindhole Borers
5. Excavators - Front End Loaders (FEL)

6. Load-Haul-Dump Machines
7. Haulage Trucks
8. Stationary Mine Machinery Pumps and Compressors
9. Hoists
10. Maintenance of Mine Machinery

Module No.: MN 503

Name of Module: **Operations Research**

Credits: 3

DAY TOPIC

1. Nature of Operations Research in Mining
2. Linear, the Simplex Algorithm for Integer and Goal Programming
3. Transportation and Assignment Problems
4. Decision Analysis
5. Markov Analysis
6. Simulation
7. Queuing Models
8. Inventory Control Models
9. Production Scheduling Methods - CPM
10. Dynamic Programming

Module No.: MN 505

Name of Module: **Applied Rock Mechanics**

Credits: 3

DAY TOPIC

1. Basic Concepts in Rock and Soil Mechanics
2. Rock and Soil Tests for Design Analysis in-situ and Laboratory Testing of Rocks and Soils
3. Geotechnical Mapping and Rock Mass Classification
4. Stereographic Projection Methods in Rock Mechanics
5. Groundwater, Seepage and De-watering Analysis
6. Stability of Soil and Rock Slopes
7. Design of Underground Excavating and Pillars
8. Foundation Design for Surface Structures
9. Dam Foundations and Leach Pads
10. Site Investigation for Surface Structures

Module No.: MN 509

Name of Module: **Statistical Models**

Credits: 3

DAY TOPIC

1. Basic Statistical Procedures I
2. Basic Statistical Procedures II

3. Regression and the Linear Models I
4. Regression and the Linear Models II
5. Application to Multiple Regression I
6. Application to Multiple Regression II
7. Application to Multiple Regression III
8. Statistical Inference and Statistical Modelling I
9. Statistical Inference and Statistical Modelling II
10. Use of Transformation; Correlation and its Relationship with Regression

Module No.: MN 511

Name of Module: **Explosives and Rock Fragmentation**

Credits: 3

DAY TOPIC

1. Drilling; Fragmentation Principles and Blasting Theory
2. Explosives; Criteria for Selecting Explosives
3. General Consideration of Geology and Rock Properties on Blast Design and Blast Results
4. Surface Design Bench Blast
5. Underground Blast Design Tunneling, Stopping, etc.
6. Charge Loading, Blast Initiation and Delay Blasting
7. Environmental Effects of Blasting
8. Specialised Blasting Techniques
9. Blasting Economics and Benefits
10. Blast Performance Assessment

Module No.: MN 513

Name of Module: **Environmental Management**

Credits: 3

DAY TOPIC

1. Environmental Impact of Mining (an Overview).
2. Air Quality/Pollution.
3. Air Quality Modeling.
4. Water Quality/ Pollution
5. Water Quality Modeling
6. Noise
7. Environmental Aspects of Ground Vibrations and Airblasts
8. Environmental Impact Assessment Methodologies
9. Environmental Impact Assessment Practices.
10. Ghana's Environmental Policy.

First Year Second Semester

Module No.: MN 502

Name of Module: **Mineral Resource Evaluation**

Credits: 3

DAY TOPIC

1. Introduction to Ore Resource Evaluation
2. Theory of Regionalized Variables
3. Statistical Theory and Applications
4. Quantifying the Criteria of Estimation
5. Variography, Practical Production and Modeling of Semi-Variograms
6. ID Regularization of Variograms; Extension Variance and Estimation Variance
7. Practical-Application of Extension Theory to Block Resource Evaluation; Global Resource Estimation and Estimation Variance I
8. Global Resource Estimation and Estimation Variance II, Optimal Estimation and Kriging I
9. Optimal Estimation and Kriging II, Volume-Variance and Grade-Tonnage Relationship I
10. Volume-Variance and Grade-Tonnage Relationship II: Case Studies

Module No.: MN 504

Name of Module: **Mineral Economics**

Credits: 3

DAY TOPIC

1. Basic Ideas in Economics
2. Theory of Price Determination
3. Competitive Markets
4. Theory of International Trade
5. National Income
6. Money and Monetary Policy
7. Public Finance
8. Investment Criteria
9. Estimating the Cost of Development and Operations of a Mine
10. Mineral Marketing and Mechanisms

Module No.: MN 506

Name of Module: **Mine Economic and Financial Evaluation**

Credits: 3

DAY TOPIC

1. Nature of and Requirements for Mining Projects, Course Objectives and Expected Outcomes

2. Time Value of Money and Economic Equivalence
3. Estimation of Revenue and Costs
4. Investment Allowances, Mine Taxation and Royalties
5. Financing Alternatives
6. Cash Flow Models and Analysis
7. Investment Decision Methods and Criteria
8. Sensitivity and Risk Analysis
9. Mine Feasibility Study
10. Case Studies

Module No.: MN 508

Name of Module: **Surface Mine Planning and Design**

Credits: 3

DAY TOPIC

1. Scope of Surface Mine Planning and Design
2. Definition of Surface Mine Planning and Design Parameters
3. Ultimate Pit Definition and Mining Systems;
Equipment/Production Scheduling
4. Opening-up of a Surface Mine, Environmental Requirements of Surface
Mining Planning and Design
5. Aspects of Computing to Mine Planning and Design
6. Aspects of Ore Reserve Modeling and Simulation of Mineral Extraction
Systems I
7. Aspects of Ore Reserve Modeling and Simulation of Mineral Extraction
Systems II
8. Computer-Aided Design Software Packages for Surface Mining Scheduling
and Evaluation I
9. Computer-Aided Design Software Packages for Surface Mining Scheduling
and Evaluation II
10. Computer-Aided Design Software Packages for Surface Mining
Scheduling and Evaluation III

Module No.: MN 510

Name of Module: **Materials Handling**

Credits: 3

DAY TOPIC

1. Introduction to Aspects of Materials Handling in Mines
2. Materials and their Characteristics
3. Materials Handling Equipment
4. Haulage of Bulk Materials
5. Combined Haulage Systems
6. Transfer and Loading Stations Hoisting

7. Hydraulic Transport
8. Haulage Organisation I
9. Haulage Organisation II

Module No.: MN 512

Name of Module: **Environmental Engineering in Mining**

Credits: 3

DAY TOPIC

1. Airflow through Subsurface Environments
2. Subsurface Ventilation Network
3. Subsurface Ventilation Simulation
4. Subsurface Climate Simulation
5. Human Thermoregulation Modelling
6. Thermal Stress Environments
7. Mine Waste Management
8. Environmental Management of Tailings
9. Rehabilitation of Mine Sites
10. Environmental Issues in Small Scale Mining

Module No.: MN 514

Name of Module: **Underground Mine Planning and Design**

Credits: 3

DAY TOPIC

1. Scope of Underground Mine Design and Planning
2. Design Strategies. Long and Short Term Planning
3. Equipment Selection and Production Scheduling
4. Surface Facilities and Primary Development Layout
5. Design Consideration for Naturally Supported Mining Systems
6. Design Consideration for Artificially Supported Mining Systems
7. Design Considerations for Caving Mining Systems
8. Computer-Aided Underground Mine Design and Planning I
9. Computer-Aided Underground Mine Design and Planning II
10. Case Studies

Module No.: MN 516

Name of Module : **Mine Management**

Credits: 3

DAY TOPIC

1. Strategic Planning, Objective Setting Strategies & Policies
2. Management by Objectives, Exception and Delegation, Decision Making Processes
3. Principles of Organising, Organisational Structural Design and Analysis

4. Financial Statement Analysis
5. Staffing - How to Select an Employee for the Job
6. Matching the Job with Employee Education, Training and Development
7. Effective Motivational Leadership
8. How to Settle Disputes, Handling of Complaints and Grievances. How to Maintain Effective Discipline
9. Direct and Indirect Control Techniques
10. Planning and Controlling Production and Operations Management

Second Year First and Second Semesters

Module No: MN 515

Name of Module: **Postgraduate Seminar**

Credits: 3

Students will be required to make at least one presentation on the progress and research underway in their areas of specialisation. This will be assessed by a Departmental Panel. Postgraduate students are required to attend the seminar(s).

Module No: MN 518

Name of Module: **Field Trip and Report**

Credits: 3

Field trips will be organised and students are required to participate in at least one of them. They are required to submit a written report(s) and make an oral presentation on it/them.

Module No: MN 500

Name of Module: **Thesis**

Credits: 15

An independent research work under the guidance of a Supervisor(s) on a topic in the student's area of specialisation. A thesis embodying the results of the research will be presented to the Department and defended orally. A panel will assess the thesis.

13 DOCTOR OF PHILOSOPHY PROGRAMME IN MINING ENGINEERING

13.1 Entry Requirements

- A candidate shall hold a Master's degree or its equivalent, from a recognised institution and shall submit evidence of adequate training and ability to undertake the proposed programme
- A candidate who does not hold a Master's degree shall first register for a Master's degree by research. If he/she proves himself/herself to be of sufficient caliber by the end of the first year of the programme, he/she may be

recommended to register for the PhD degree; this registration shall be deemed retrospective from the date of the original registration for the Master's degree

- A candidate, who does not satisfy the requirements stated above but is otherwise adjudged suitable, may be admitted

For the purpose of assessing his/her suitability, such a candidate may be interviewed or required to take an entrance examination, or both as directed by the School of Postgraduate Studies on the recommendation of the Departmental Board.

13.2 Programme Duration

Subsequent to registration, the candidate shall pursue a full-time programme of study and research for at least two years, except that:

- A candidate fully engaged in advanced study and research for his/her degree, who, before registration, was engaged in research to the satisfaction of the Department concerned, may be exempted for not more than one academic year.
- In special circumstances, the Department may recommend that a candidate be allowed to spend not more than one academic year of his/her programme in advanced study research at another institution, provided that his/her work can be supervised in a manner satisfactory to the Department and the School of Postgraduate Studies.
- A Full-Time candidate who is engaged in research for the degree shall present himself/herself for examination not later than three years from the date of his/her registration.
- A Part-Time candidate shall present himself/herself for examination not later than four years from the date of registration.

In special cases, an extension of these time limits may be granted on the recommendation of the Department.

13.3 Areas of Research

A candidate may be required to audit appropriate courses/modules and also submit a thesis under the supervision of an academic staff in any of the following areas of research:

- Environmental Engineering in Mining
- Rock Mechanics
- Geostatistics
- Blasting and Fragmentation
- Mineral Economics
- Mine Management
- Mine Design and Planning

- Mine Mechanisation
- Mine Economics & Financial Evaluation
- Materials Handling

13.4 Employment Opportunities

There are employment opportunities in the following areas:

- Large and Small Scale Mining and Allied Companies
- Financial Institutions
- Construction Companies
- Environmental Protection Agencies
- Mines Department
- Minerals Commission
- The Universities and other Educational and Research Institutions
- National Energy Board
- Other Governmental and Non-governmental Agencies

13.5 Available Resources

a) Academic Staff

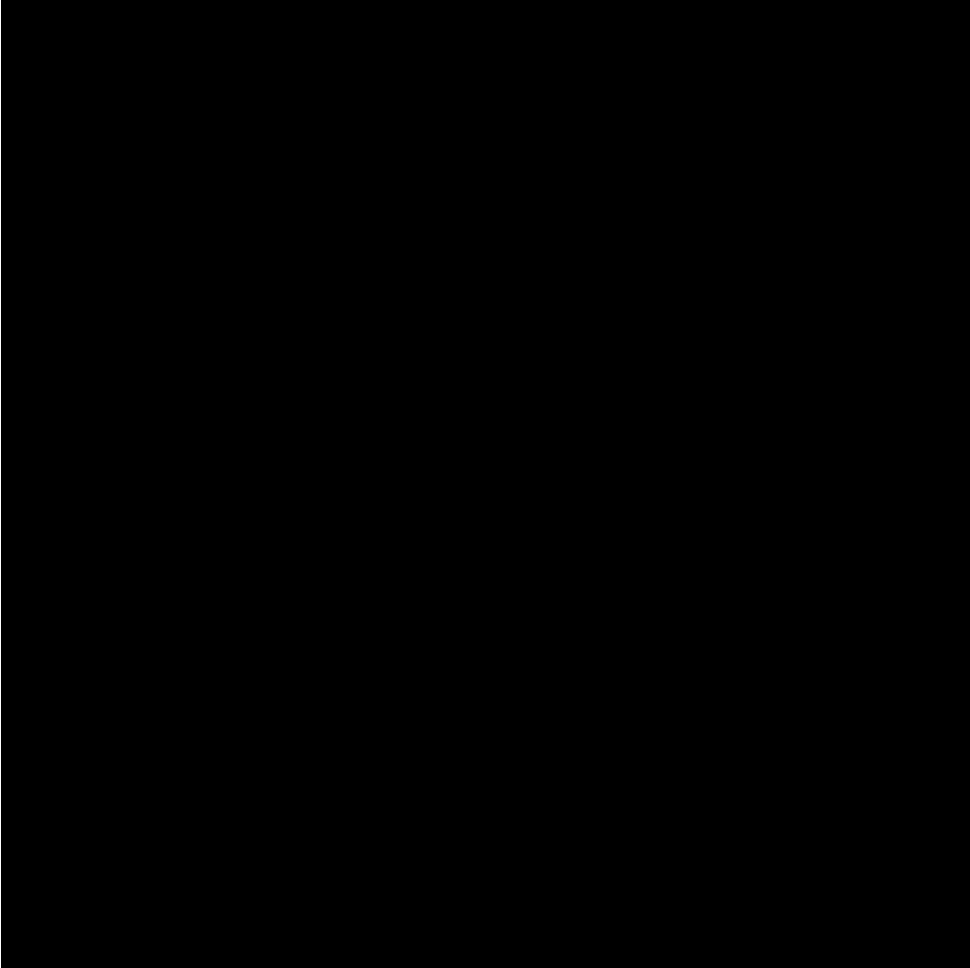
See the list of Academic Staff.

b) Facilities and other Resources

There are up-to-date facilities in the University, the mining and allied industries and other research institutions in the country to allow for a comprehensive and detailed work in the programmes. The facilities include:

- A well-furnished computer centre equipped with PC's and software for research in geology and related disciplines, UMaT Library is equally well equipped
- Petrologic microscopes for transmitted and reflected light microscopy work
- Exploration equipment:-VLF-EM Wadi, Engineering Seismograph, Pundit Machine, Hydrometer
- Analytical Equipment: - Atomic Absorption Spectrophotometer, XRD
- Soil and Rock Mechanics Laboratory
- Mineral Processing Laboratory
- Mine Environmental and Safety Laboratory Explosives Laboratory.

13.6 List of Academic Staff and Areas of Specialisation



DEPARTMENT OF MINERAL ENGINEERING

14 MASTER'S (MODULAR) PROGRAMME IN MINERAL ENGINEERING

14.1 Title of Programme

The title of the programme is Master's Programme (Modular) in Mineral Engineering.

14.2 Programme Objectives

Mineral resources contribute significantly to the economy of Ghana; providing employment and foreign exchange among others. This notwithstanding, the mining industry is faced with technical, environmental and social problems. The available ores are low grade and their mineralogical composition very complex, a situation that results in low recovery and generation of large volume of waste material. The latter presents a real environmental challenge, which undermines public trust for the industry. Furthermore, there are other mineral resources that are least exploited like industrial minerals and there is the need to train human resources for the processing of these minerals.

The programme is therefore designed to:

- Train and upgrade the knowledge of Mineral Engineers to cope with the ore complexities and their inherent environmental issues.
- Enhance the diversification and maximization of mineral processing in Ghana and elsewhere.
- Produce competent postgraduates capable of making a career in research and teaching.

14.3 Entry Requirements

- a) The entry requirements for the Master's Degree in Mineral Engineering are:
- 1) A BSc First Class or Second Class (Upper Division) or its equivalent in Earth Sciences and related engineering programmes.
 - 2) All other applicants who do not satisfy the requirements of (i) above but have degrees in Engineering & Science may be eligible only after passing an interview.
 - 3) Holders of UMaT Diploma in the Earth Sciences, who have at least five (5) professional experience with proven ability in their discipline are eligible for admission.
 - 4) Foreign applicants with proficiency in English language who satisfy the requirements of (i) or (ii) above are eligible for admission after careful consideration of transcripts and relevant references.
 - 5) A student may be admitted to participate in any module on non-scoring basis. In this case, he/she may participate in class discussions, do practical work, take examinations and generally enjoy the privileges of a class member. No credit is given either on completion of a module or at a later time. Such a student shall be given the award of either a Certificate of

Proficiency if he/she passes the examination or Certificate of Participation if he/she does not take examination or fails the examination.

14.4 Programme Requirements

The Department offers two Master's Degree Programmes. These are:

- i. MSc Mineral Engineering Degree Programme
- ii. MPhil Mineral Engineering Degree Programme

a) Graduation Requirements

The following are the requirements for graduation:

i) MSc Mineral Engineering Degree

- A minimum of forty-five (45) credit hours is required for the award of the MSc. Degree. This is made up of a minimum of four (4) compulsory and four other modules (at least 24 credits hours), Graduate Seminar (3 credit hours); Field Trip & Report (3 credits) and Thesis (15 credits).
- Each module runs for a maximum of two weeks (10 working days) duration; examinations in any module shall be taken within a week after completion of the module.
- There shall be a minimum of forty (40) contact hours in each module (4 hr/day).
- A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.

ii) MPhil Mineral Engineering Degree

- A student is required to audit four (4) compulsory modules outlined in *Section 14.5*. In addition he/she may also audit modules recommended by the Supervisor to facilitate his/her research work. The student is required also to present at least one seminar.
- The successful defence of a thesis is required for the award of the MPhil degree in Mineral Engineering. The thesis should be an embodiment of independent research conducted by the student under the guidance of a Supervisor(s) on a significant problem in a chosen area of Mineral Engineering.

b) Programme Duration

- Full-time: A maximum of four (4) semesters for coursework and thesis
- Part-time: A maximum of six (6) semesters.

c) Registration

- Full time students will be required to register a minimum of three (3) modules per semester.
- Students should register modules they intend to participate in by the third week of every semester. Students may, however, pay module participation fee at the time the module is being offered.
- To be of good standing, a Part-time student must enroll in at least three modules per annum.

14.5 Programme Structure

Core and Compulsory Modules

The following courses are compulsory for MSc and MPhil students:

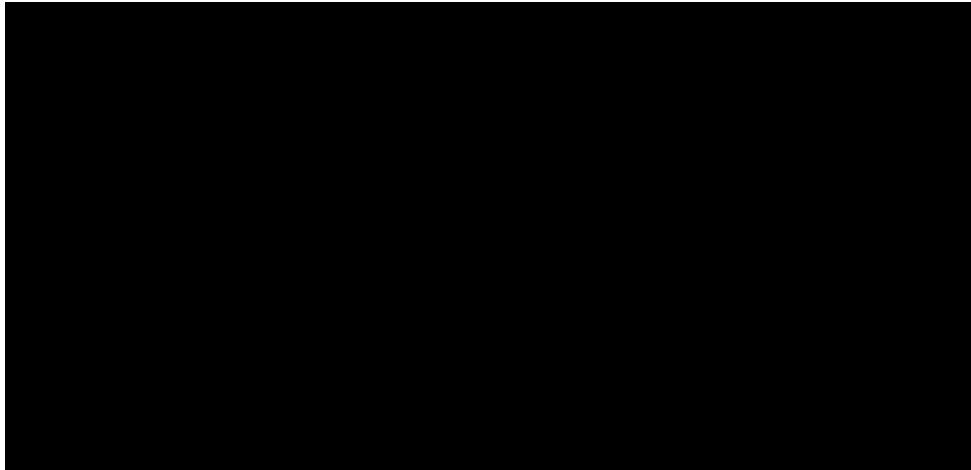
- Operations Research (MR 503)
- Statistical Models (MR 509)
- Economic & Financial Evaluation (MR 506)
- Environmental Management (MR 513).

In addition, each MSc student will select *four* other modules in consultation with his/her Supervisor(s). Introduction to Computer Applications is compulsory but a candidate may apply for exemption. Applicants without adequate mineral engineering background will be required to register for the module in "*Introduction to Mineral Engineering*".

Field trips will be organised and all students will be required to participate in at least one of them. An essential requirement of the modules is that students devote the afternoons to tutorials, practicals or field trips.

b) Course Structure

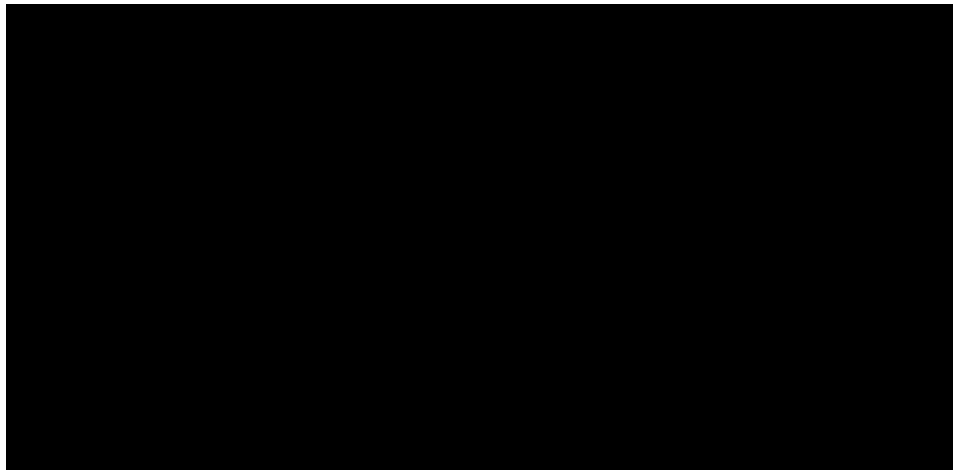
First Year: First Semester Modules



* Preparatory Module

** Preparatory Module for non-Mineral Engineers

First Year: Second Semester Modules



Year Two: Semester One
MR 515 Seminar 3

Year Two: Semester 2
MR 518 Field Trip 3
MR 500 Thesis 15

c) Contents of Modules

Year One: First Semester

Introduction to Computing (2)

Introduction to PC, Basic hardware components of the PC, Operating systems software DOS, Operating systems hardware (DOSshell, Windows, File Managers and Utilities) Word Processing, Data processing, Database, Graphics, Software installation and interfacing and summary.

Introduction to Mineral Engineering (0)

Comminution & classification, concentration processes, leaching, purification and metal recovery.

MR 501 Mineralogy (3)

Introduction to mineralogy of sulphides, oxides, carbonates and chlorides - with special reference to crystal structure. Mineral identification techniques; X-ray diffractometry, X-ray fluorescence, atomic absorption spectrophotometry, ore microscopy, etc. Isomorphism, texture of ores, gangue minerals and grain size defects. Basic laboratory work in ore microscopy. Application of mineralogy to process metallurgy; leaching, roasting, etc.

MN 503 Operations Research (3)

Nature of operational research in mining. The simplex algorithm, linear, integer and goal programming. Transportation and assignment problems. Decision analysis. Markov analysis. Simulation. Queuing models. Inventory control models. Production scheduling methods. CPM. Dynamic programming.

MR 505 Mineral Particle Systems (3)

Creation of particles; brittle fracture theory and review of theories of comminution, crushing and grinding circuit analysis, general method of producing fine powders. Characterization of particles; size analysis methods, evaluation of sizing, data-probability plots. Separation of mineral particles using physical and chemical properties. Agglomeration of particles; forces between microassemblies, technology of agglomeration.

MR 507 Aqueous Processes in Mineral Extraction (3)

Leaching reactions and methods, liquid/solid separation processes. Purification

operations, solvent extraction, ion exchange and reverse osmosis, Metal recovery processes, precipitation, crystallization, electrolysis, etc. and carbon adsorption technology.

MR 509 Statistical Models (3)

Sampling theory and techniques. Basic statistical concepts in data analysis. Special distributions. Estimation theory. Testing hypothesis. Analysis of variance (ANOVA). Regression and correlation analyses. Introduction to multiple regression analysis. Mathematical expectations. Experimental design: the strategy of design, factorial experiments, screening design, Taguchi's robust method.

MR 511 Biotechnology in Mineral Engineering (3)

Some basic concepts of microorganisms: their diversity, habitat, their physiology, metabolism, genetics and their influence on the environment. Nitrogen, carbon, phosphorous and sulphur cycles. The role of microorganisms in processes such as biofilm formation, biocorrosion, mineral leaching, acid rock drainage, biosorption, bioremediation of organic pollutants etc and manipulating environmental conditions to enhance or retard a given process.

MR 513 Environmental Management (3)

Environmental Impacts of Mining (an overview). Air quality/pollution. Air quality modeling; water quality/pollution; water quality modeling. Noise. Environmental aspects of ground vibrations and air blasts. Environmental impact assessment methodologies and practices. Ghana's Environmental Policy.

Year One: Second Semester

MR 502 Precious Minerals Beneficiation (3)

Types of gold ores; Alluvial, Free milling and Complex ores, Treatment processes, lixiviants for leaching of gold, pretreatment processes for complex ores, pressure leaching, bacteria oxidation etc. heap leaching. CIL, CIP processes and Zinc precipitation, electrolysis and refining of gold. Environmental issues of tailings disposal; geochemistry of tailings and cyanide detoxification techniques. Platinum. Artisanal mining; environmental and social impacts, poverty alleviation and conflicts.

MR 504 Non Ferrous Metal Beneficiation (3)

Types of bauxite, The Bayer Process. Production of alumina from non-bauxite sources, Production of aluminum from alumina, Re-finishing of aluminum. Types of copper ores and beneficiation methods; leaching with ammonia and sulphuric acid. Electrolysis and metal recovery. Environmental issues of bauxite, alumina and copper beneficiation. Types of manganese ores; Beneficiation on MnO₂ and

production of manganese compounds from MnCO_3 . Production of ferromanganese.

MR 506 Economic and Financial Evaluation (3)

Nature of requirements for mining projects. Time value of money and economic equivalence. Estimation of revenue and costs; investment allowances; taxation and royalties. Investment decision methods and criteria. Project cash flow and risk. Case study of project feasibility.

MR 508 Industrial Minerals Beneficiation (3)

Production of salt (NaCl) from sea water, indigenous and commercial ponds. Uses of salt in the petrochemical and chemical industries. Production of limestone and cement manufacture. Beneficiation of diamond and kaolin. Heavy mineral sand; ilmenite, rutile, zircon, etc. Environmental issues of industrial mineral production.

MR 510 Mine Waste Management (3)

Types of mine waste; waste rock and tailings. Impoundment structures; selection and design. Tailings deposition methods. Water Management, Sampling and analysis of tailings, Effluent treatment for environmental control and monitoring systems, Decommissioning, reclamation and covers. Case studies of cyanide-bearing tailings and acid rock drainage system.

MR 512 Mineral Process Design and Control (3)

Process flowsheet design; metallurgical accounting and process economics. Selection and sizing of equipment from test data; crushers, grinding mills, gravity concentration, hydrocyclone and flotation cells. Process control and instrumentation.

Year Two: Semester One

MR 515 Seminar (3)

Each student will be required to make at least one seminar presentation on the progress of his/her thesis work. The presentation will be assessed by a Departmental Panel. All Postgraduate students are required to attend the seminar(s).

Year Two: Semester Two

MR 518 Field Trip and Report

Field trips will be organised and students are required to participate in, at least, one of them and shall submit a written report for assessment.

MR 500 Thesis

An independent research work will be carried out by each student on a suitable topic which will constitute a thesis that will be assessed. An oral examination will be conducted on the thesis by a panel of Examiners.

15 DOCTOR OF PHILOSOPHY PROGRAMME IN MINERAL ENGINEERING

15.1 Entry Requirements

- A candidate shall hold a Master's degree or its equivalent, from a recognised institution and shall submit evidence of adequate training and ability to undertake the proposed programme
- A candidate who does not hold a Master's degree shall first register for a Master's degree by research. If he/she proves himself/herself to be of sufficient caliber by the end of the first year of the programme, he/she may be recommended to register for the PhD degree; this registration shall be deemed retrospective from the date of the original registration for the Master's degree
- A candidate, who does not satisfy the requirements stated above but is otherwise adjudged suitable, may be admitted

For the purpose of assessing his/her suitability, such a candidate may be interviewed or required to take an entrance examination, or both as directed by the School of Postgraduate Studies on the recommendation of the Departmental Board.

15.2 Programme Duration

Subsequent to duration, the candidate shall pursue a full-time programme of study and research for at least two years, except that:

- A candidate fully engaged in advanced study and research for his/her degree, who, before registration, was engaged in research to the satisfaction of the Department concerned, may be exempted for not more than one academic year.
- In special circumstances, the Department may recommend that a candidate be allowed to spend not more than one academic year of his/her programme in advanced study research at another institution, provided that his/her work can be supervised in a manner satisfactory to the Department and the School of Postgraduate Studies.
- A Full-Time candidate who is engaged in research for the degree shall present himself/herself for examination not later than three years from the date of his/her registration.
- A Part-Time candidate shall present himself/herself for examination not later than four years from the date of registration.

In special cases, an extension of these time limits may be granted on the recommendation of the Department.

15.3 Areas of Research

A candidate may be required to audit appropriate course(s)/modules and also submit a thesis under the supervision of an academic staff in any of the following areas of research:

- Mine Water Characterization
- Mine Water Management
- Aqueous Processes and Studies
- Water Quality
- Environmental Monitoring and Management
- Gold Benefication
- Biohydrometallurgy
- Environmental Biotechnology
- Geometallurgy
- Acid Mine Drainage
- Microwave Processing
- Plant Design
- Materials Engineering
- Industrial Waste Management

15.4 Available Resources

a) Academic Staff

The Department has qualified staff to manage the programme (see list of academic staff and their areas of specialisation)

b) Equipment

The Department has good laboratory facilities for physical mineral separation. Other facilities needed to run the programme can be accessed from allied industries and universities in the country.

c) Reading Materials

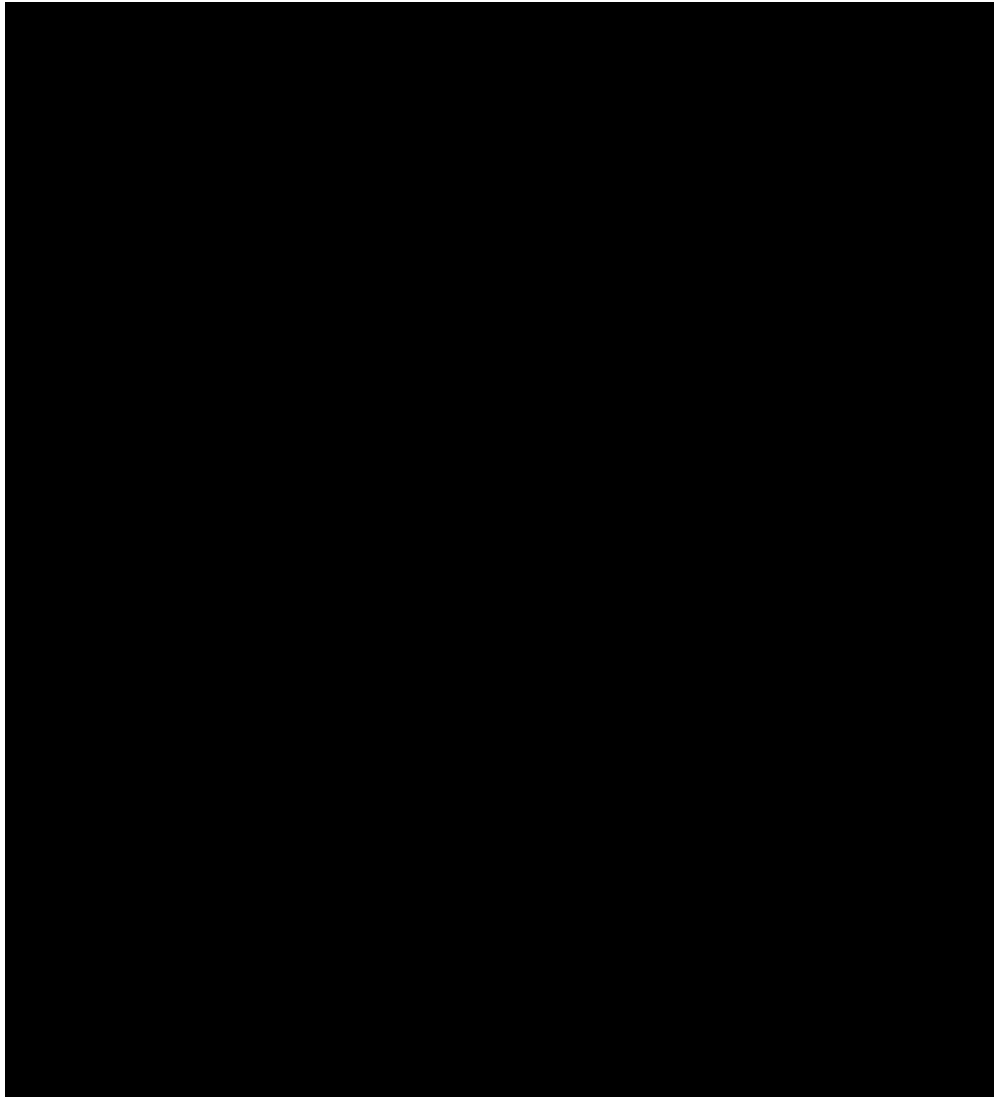
The Department and University libraries have relevant books and computer facilities. Students can use these facilities to access information.

15.5 Employment Opportunities

The are employment opportunities in the following areas:

- The Universities and other Educational and Research Institutions
- Environmental Protection Agencies
- Financial Institutions
- Minerals Commission
- Large and Small Scale Mining and Allied Companies
- Other Government and Non-Governmental Organisations

15.6 List of Academic Staff and Areas of Specialisation



* On study leave.

**DEPARTMENT OF ELECTRICAL AND ELECTRICAL AND ELECTRONIC
ENGINEERING ELECTRONIC ENGINEERING**

**16 MASTER'S (MODULAR) PROGRAMME IN ELECTRICAL AND
ELECTRONIC ENGINEERING ELECTRONIC ENGINEERING**

16.1 Title of Programme

The title of the programme is Masters (Modular) Programme in Electrical and Electronic Engineering

16.2 Programme Objectives

Electrical and electronic engineering is essential for maintaining and developing a modern society. From the production of electricity through the multiplicity of electrical and electronic apparatuses to communications and robotics, electrical and electronic engineering is fundamental to many of the technical systems that are used every day at work and at home. Electrical and electronic engineering is also changing rapidly.

The Masters programme is designed for Electrical/Electronic Engineering graduates who are practicing engineers, designers or industry planners who seek a further understanding of areas of electrical and electronic engineering such as power systems, mechatronics and industrial automation and communications engineering. The programme is intended to equip the student so as to adapt to the challenging demands of the modern electrical and electronic engineering industries.

The main objectives of the programme are to:

- Give candidates professional training in the theoretical and practical aspects of electrical and electronic engineering so as to turn out competent postgraduates to meet the current demands of analysis, synthesis and design of systems of the electrical and electronic engineering industries.
- To provide an academic environment for study and research for the engineer wishing to follow a MSc/PhD programme, in order to contribute in solving the problems of electrical and electronic engineering by the use of appropriate technologies.
- To enrich the capacity of the student to continuously adapt to the constant changes of the state of the art in electrical and electronic engineering

16.3 Entry Requirements

- a) The entry requirements for the Master's Degrees in Electrical and Electronic

Engineering are:

- i. Applicants must have B.Sc. First Class or Second Class (Upper Division) or its equivalent in Electrical and/or Electronic Engineering or in related Engineering disciplines from a recognised University.
 - ii. All other applicants who do not satisfy (i) above but have degrees in engineering & Science may be eligible only after passing an interview.
 - iii. Holders of UMaT Diploma in Mine Electrical Engineering who hold senior positions in an appropriate industry and have at least 5 years professional experience with proven ability in their discipline are eligible for admission.
 - iv. Foreign applicants with proficiency in English language who satisfy the requirements of (i) or (ii) above are eligible for admission after careful consideration of transcripts and relevant references.
- b) A student may be admitted to participate in any module on non-scoring basis. In this case, the student may participate in class discussions, do practical work, take examinations and generally enjoy the privileges of a class member. No credit is given either on completion of module or at a later time. Such a student shall be given the award of either a Certificate of Proficiency if the student takes examinations or Certificate of Participation if the student does not take examination or fails the examination.

16.4 Programme Requirements

The Department offers two Master's Degree Programmes. These are:

- i. MSc Electrical and Electronic Engineering Degree Programme
- ii. MPhil Electrical and Electronic Engineering Degree Programme

a) Graduation Requirements

- i. MSc Electrical and Electronic Engineering Degree
 - A minimum of 45 credit hours is required for the award of MSc. Degree. This is made up of a minimum of eight (8) modules (at least 24 credit hours) in five (5) core modules and at least three (3) other modules which must be selected by the candidate in consultation with his/her supervisor, a Graduate Seminar (3 credit hours), Field Trip and Report (3 credit hours) and a Thesis (15 credit hours).
 - There shall be a minimum of forty (40) contact hours in each module (4 hrs/day).
 - A student may take a module on non-scoring basis. In this case no credit will be given either on completion of a module or at a later time.
- ii. MPhil Electrical and Electronic Engineering Degree
 - A student is required to audit five (5) core modules outlined in Section 17.5a. In addition, the student may audit modules recommended by the Supervisor to facilitate the student's research work. The candidate

is also required to present at least one seminar.

- The successful defence of a thesis is required for the award of the MPhil degree. The thesis should be an embodiment of independent research conducted by the student under the guidance of a Supervisor on a significant problem in a chosen area of Electrical and Electronic Engineering.

b) Programme Duration

- Full-time: A maximum of four (4) semesters for coursework and thesis.
- Part-time: A maximum of six (6) semesters of coursework and thesis.

c) Registration

- Full time students will be required to register a minimum of three (3) modules per semester.
- Students should register modules they intend to participate in by the third week of every semester. Students may, however, pay module participation fees at the time the module is being offered.
- To be of good standing, a part-time student must enroll in at least three modules per annum.

16.5 Programme Structure

a) Core and Compulsory Modules

The MSc course work comprises 5 core/compulsory modules namely:

- Research Methods (EL 501)
- Power System Operation, Protection and Planning (EL 505)
- Economic and Financial Evaluation (EL 506)
- Intelligent Systems in Manufacturing (EL 507)
- Advanced Signal Processing (EL 508)

Introduction to Computer Applications and Computer Applications: C++ and MATLAB/SIMULINK for engineers are compulsory but a candidate may apply for exemption.

Field trips will be organised and all students will be required to participate in at least one of them. An essential requirement of the modules is that students devote the afternoons to tutorials, practicals or field trips.

b) Content of Modules

The modules to be run, credit hours and module numbers are as follows:

Table 1 Programme Modules for the Master's Programmes in Electrical and Electronic Engineering

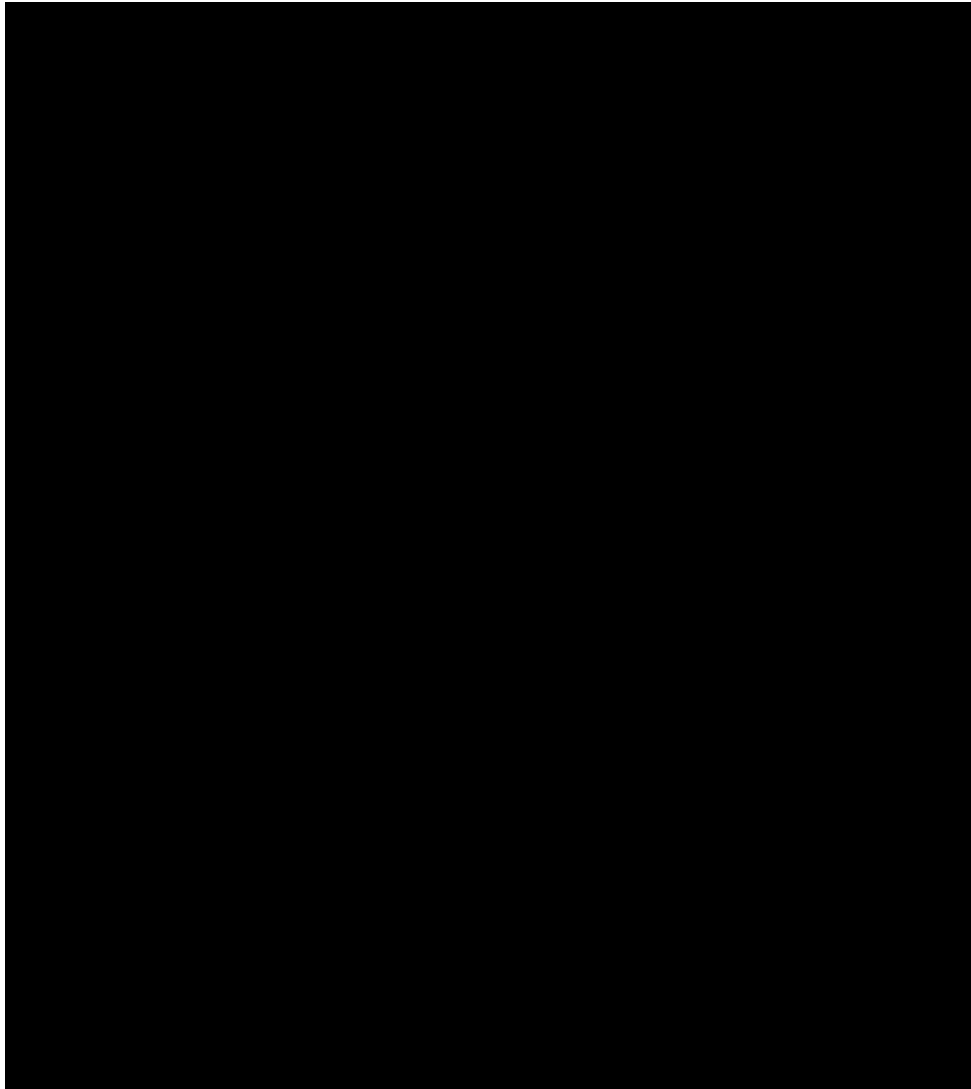
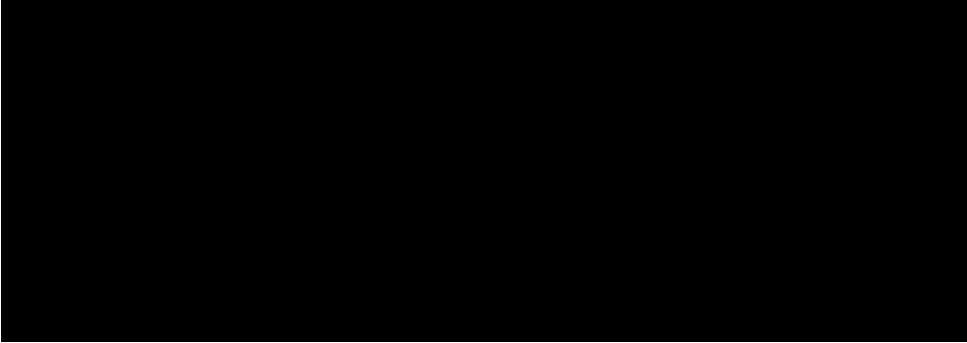


Table 1 Programme Modules for the Master's Programmes in Electrical and Electronic Engineering (continued)



* Preparatory Module

** At least three (3) modules must be selected depending on Supervisor's directives as per student's topic

Module No.: EL 351

Name of Module: **Introduction to Computer Applications**

Credits: 0

DAY TOPIC

1. Introduction to the PC
2. Basic Hardware Components of the PC
3. Operating System Software (DOS)
4. Operating System Software (DOSshell, Windows, File Managers and Utilities)
5. Word Processing
6. Database
7. Data Processing
8. Graphics
9. Software Installation and Interfacing
10. Summary

Module No.: EL 262

Name of Module: **Computer Applications: C++ and MATLAB/Simulink**

Credits: 0

DAY TOPIC

1. Introduction to C++ Programming for Engineers
2. C++ Language Basics (Variables, Statements, Data Types)
3. Control Flow (If/Else Statements, for and while Loops)
4. Object-Oriented Concepts (Classes, Objects, Creating Classes)

5. Arrays, Exceptions, More about OOP, Input/Output, Inheritance, Abstract Classes, Polymorphism
6. Introduction to GUI Programming
7. Introduction to Applets
8. Threads, Vector Class, String Buffer Class
9. Working with Files
10. Analysis of Generation and Network Aspects of Marginal Cost Based on Electricity Markets

Module No.: EL 501

Name of Module: **Research Methods**

Credits: 3

DAY TOPIC

1. Introduction to Research
2. Epistemology and its Implications for Research Methodology and Design
3. Theoretical Framework and Scientific Research Design
4. Qualitative Data Collection and Analysis
5. Principles of Quantitative Data Analysis (Descriptive Statistics)
6. Quantitative Methods
7. Sampling, Questionnaire Design and Methods for Pre-testing
8. Research Proposal for Competitive Research Grant
9. Format of Research Proposal
10. Reporting and Communicating Research Results

Module No.: EL 505

Name of Module: **Power System Operation, Protection and Planning**

Credits: 3

DAY TOPIC

1. Insulation Engineering
2. Protection Systems and Control
3. Diagnosis of Causes and Modes of Power System Failure
4. Performance Prediction and Design of Earthing Systems
5. Measurement and Safety Evaluation of Earthing Systems
6. Introduction to System Planning and Optimization
7. Generation and Transmission System Planning
8. System Expansion Planning and Optimisation
9. Dynamic System Security and Control Optimization using FACTS Devices
10. Forecasting and Scheduling

Module No.: EL 506

Name of Module: **Economic and Financial Evaluation**

Credits: 3

DAY TOPIC

1. Nature of and Requirements for Engineering Projects, Course Objectives and Expected Outcomes
2. Time Value of Money and Economic Equivalence
3. Estimation of Revenue and Costs
4. Investment Allowances, Taxation and Royalties
5. Financing Alternatives
6. Cash Flow Models and Analysis
7. Investment Decision Methods and Criteria
8. Sensitivity and Risk Analysis
9. Feasibility Study
10. Case Studies

Module No.: EL 507

Name of Module: **Intelligent Systems in Manufacturing**

Credits: 3

DAY TOPIC

1. Overview of AI Techniques in Manufacturing: Overview and Survey of AI Techniques that has recently been Applied to Solving/Simulating Activities in Manufacturing Engineering
2. Knowledge-Based systems
3. Expert Systems
4. Fuzzy Logic
5. Artificial Neural Networks
6. Adaptive Neural Controllers and Emulators
7. Commercially Available Systems: Neuralworks Explorer and Neural Works Professional
8. Case-Based Learning/ Reasoning
9. Genetic Algorithms
10. Applications of Intelligent Systems

Module No.: EL 508

Name of Module: **Advanced Signal Processing**

Credits: 3

DAY TOPIC

1. Scalar Random Variables and Stochastic Processes
2. Linear Systems Models
3. Principles of Estimation Theory
4. Signal Modelling and Parametric Spectral Estimation
5. Discrete-time signals and systems

6. Autocorrelation and Cross-Correlation
7. MA and AR Processes, Prediction, DTFT, DFS, DFT, FFT, Filter Specifications
8. Filter Structures and Design
9. C/D and D/C Conversions
10. Multi-Rate Practical Digital Signal Processing and Applications

Module No.: EL 515

Name of Module: **Graduate Seminar**

Credits: 3

Students will be required to make a minimum of one presentation on the progress and research underway in their areas of specialization. The seminar will be assessed by a Departmental Panel. Postgraduate students are required to attend.

Module No.: EL 518

Name of Module: **Field Trip and Report**

Credits: 3

Field trips will be organized and all students will be required to participate in at least one of them. Candidates are required to submit a written report and make oral presentation(s) on it/them. Also, reports on laboratory works shall be defended by the candidate.

Module No.: EL 500

Name of Module: **Thesis**

Credits: 12

The thesis must be an embodiment of independent research work under the guidance of Supervisor(s) on a topic in the student's area of specialisation. A thesis embodying the results of the research will be presented to the Department for assessment and defended orally. A panel of examiners will assess the thesis.

Module No.: EL 503

Name of Module: **Operations Research**

Credits: 3

DAY TOPIC

1. Nature of Operations Research
2. Linear, the Simplex Algorithm for Integer and Goal Programming
3. Transportation and Assignment Problems
4. Decision Analysis
5. Markov Analysis
6. Simulation
7. Queuing Models
8. Inventory Control Models

9. Production Scheduling Methods - CPM
10. Dynamic Programming

Module No.: EL 509

Name of Module: **Statistical Models**

Credits: 3

DAY TOPIC

1. Basic Statistical Procedures I
2. Basic Statistical Procedures II
3. Regression and Linear Models I
4. Regression and Linear Models II
5. Application to Multiple Regression I
6. Application to Multiple Regression II
7. Application to Multiple Regression III
8. Statistical Inference and Statistical Modelling I
9. Statistical Inference and Statistical Modelling II
10. Use of Transformation, Correlation and its Relationship with Regression

Module No.: EL 510

Name of Module: **Microprocessor Systems**

Credits: 3

DAY TOPIC

1. Review of Basic Microprocessor System Design Fundamentals
2. Programming Techniques
3. Hardware of Microcontrollers
4. Digital Signal Processors
5. Memory System
6. Design and Use of Memory Management Unit
7. Virtual Memory Systems
8. Multiprocessors Case Studies
9. Hands-On Laboratory Sessions

Module No.: EL 511

Name of Module: **Computer Control Systems**

Credits: 3

DAY TOPIC

1. Mathematical Background
2. Process Modelling and Identification
3. Simulation Tools
4. Discrete Systems, Stability Analysis
5. Digital Control System Design and Implementation
6. Sensors
7. Control Algorithm Implementation

8. Programme Packages for Identification
9. Case Study
10. Hands-on Session and Laboratory Exercises/Mini Project.

Module No.: EL 512

Name of Module: **Power System Stability, Modelling and Control**

Credits: 3

DAY TOPIC

1. Power quality : Concept, Voltage Fluctuations and Variations
2. Transient Over Voltages
3. Harmonic Distortions
4. Power System Stability
5. Swing Equations and its Solutions
6. Application of Equal-Area Criterion to Switching Transients
7. Instability due to Symmetrical Line-Ground Fault
8. Improvement in the Transient Stability
9. Power System Modelling and Control
10. Power System Control

Module No.: EL 514

Name of Module: **Power Electronics and Industrial Drive Systems**

Credits: 3

DAY TOPIC

1. Introduction to Electric Drives and its Components
2. Fundamentals of Power Semiconductor Controlled Electric Drives
3. DC Motor Drives
4. Speed Control of Electric Drives
5. Switched Reluctance Drives
6. AC Motor Drives
7. Dynamic Model of AC Machine
8. Vector Control
9. Inverter-fed AC
10. Application Case Study

Module No.: EL 516

Name of Module: **Mechatronic System Modelling and Design**

Credits: 3

DAY TOPIC

1. Physical Modelling of Mechanical, Electrical Systems
2. Thermal, Fluid and Mixed Systems
3. Bond Graphs and Response Analysis
4. Overview of a Mechatronic Design Process and Specification Development/
Planning

5. Conceptual, Embodiment, Detail Designs and Integration
6. Application Procedure for Patents
7. Quality Function Deployment, Failure Model and Effect Analysis
8. Pugh Charts
9. Axiomatic Design
10. Case Studies

Module No.: EL 517

Name of Module: **Advanced Robotics**

Credits: 3

DAY TOPIC

1. Position and Orientation Transformations and Robot Kinematics of Position
2. Inverse Kinematics Problem
3. Rigid Body Motion, Robot Kinematics of Velocity, and Robot Statics
4. Robot Trajectory Planning & Kinematic Robot Control
5. Robot Dynamics
6. Properties of the Robot Dynamic Model
7. Robot Position Control
8. Implementation and Robustness Issues
9. Robot Compliance and Force Control
10. Lab: Industrial Robot Demonstrations

Module No.: EL 519

Name of Module: **Factory Automation**

Credits: 3

DAY TOPIC

1. Sensors, Actuators and Switching Elements
2. Programmable Logic Devices and Arrays
3. Pneumatic Valves
4. Logic Operation
5. Design of Sequential Control Systems
6. Programmable Controllers
7. Distributed Control
8. Supervisory Control and Data Acquisition (SCADA) for Factory Automation
9. Modelling and Simulation
10. Case Studies

Module No.: EL 520

Name of Module: **Mobile Communications and Wireless Technology**

Credits: 3

DAY TOPIC

1. Inverse Fourth Power
2. Shadowing and Rayleigh Fading Losses, Narrow Band System Performance,

3. Wide Band System Principles,
4. Multiple Access Techniques for Wireless Communications
5. GSM System
6. UMTS System
7. Wireless Technologies and Data Network
8. Satellite Communication
9. Placement of a Satellite in a Geostationary Orbit
10. Modulation and Multiplexing Techniques for Satellite Links.

Module No.: EL 521

Name of Module: **Microwave Engineering and Optical Communication Systems**

Credits: 3

DAY TOPIC

1. Microwave Power Dividers, Directional Couplers and Hybrids
2. Filter Theory
3. Ferrite Properties, Wave Propagation in Ferrite
4. Noise in Microwave Systems
5. Active Microwave Circuits
6. Characterisation of Microwave Communication Systems
7. Budgets for Terrestrial Microwave Systems
8. Optical Communication Systems
9. Optical Detectors and Optical Sources
10. Advanced Optical Systems

Module No.: EL 522

Name of Module: **Broadcasting Technologies**

Credits: 3

DAY TOPIC

1. Conventional FM Broadcasting
2. Digital Audio Broadcasting (DAB) Techniques
3. Analog TV Transmission
4. Digital Terrestrial TV Broadcasting (DTTB) Techniques
5. Single Frequency Networking (SFN)
6. Digital Satellite TV Broadcasting (DVB-S and ISDB)
7. Digital Cable TV Transmission
8. New Developments in Television Broadcasting
9. Case Study

Module No.: EL 523

Name of Module: **Environmental and Safety Engineering**

Credits: 3

DAY TOPIC

1. Environmental Impact of Industrial Activity (An Overview)
2. Air Quality/Pollution
3. Air Quality Modelling
4. Water Quality/Pollution
5. Water Quality Modelling
6. Noise
7. Ergonomics and Industrial Safety Technology
8. Accident Prevention
9. Laws on Safety
10. Environmental Impact Assessment Methodologies and Practices

17 DOCTOR OF PHILOSOPHY PROGRAMME IN ELECTRICAL AND ELECTRONIC ENGINEERING

17.1 Entry Requirements

- A candidate shall hold a Master's degree or its equivalent, from a recognised institution and shall submit evidence of adequate training and ability to undertake the proposed programme
- A candidate who does not hold a Master's degree shall first register for a Master's degree by research. If he/she proves himself/herself to be of sufficient caliber by the end of the first year of the programme, he/she may be recommended to register for the PhD degree; this registration shall be deemed retrospective from the date of the original registration for the Master's degree
- A candidate, who does not satisfy the requirements stated above but is otherwise adjudged suitable, may be admitted.

For the purpose of assessing his/her suitability, such a candidate may be interviewed or required to take an entrance examination, or both as directed by the School of Postgraduate studies on the recommendation of the Departmental Board.

17.2 Programme Duration

A candidate shall pursue a full-time programme of study and research for at least two years, except that:

- A candidate fully engaged in advanced study and research for his/her degree, who, before registration, was engaged in research to the satisfaction of the

Department concerned, may be exempted for not more than one academic year.

- In special circumstances, the Department may recommend that a candidate be allowed to spend not more than one academic year of his/her programme in advanced study research at another institution, provided that his/her work can be supervised in a manner satisfactory to the Department and the School of Postgraduate Studies.
- A Full-Time candidate who is engaged in research for the PhD Degree shall present himself/herself for examination not later than three (3) years from the date of his/her registration.
- A Part-Time candidate shall present himself/herself for examination not later than four (4) years from the date of registration.

In special cases, an extension up to one (1) year of these time limits may be granted on the recommendation of the Department.

17.3 Areas of Research

A candidate may be required to audit appropriate courses/modules and also submit a thesis under the supervision of an academic staff in any of the following areas of research:

- Power systems protection and control
- Control and design of power electronic circuits for alternative energy systems
- Power system operation, planning, management, optimization and economics.
- Power Quality Studies.
- Distribution System Analysis and Automation
- High-Power Power Electronics.
- Flexible AC Transmission Systems (FACTS)
- Robotics and Control
- Electric Drives.
- Microelectromechanical Systems (MEMS).
- Computer Mechatronics and Artificial Intelligence Systems.
- Industrial Automation Systems.
- Power Systems Analysis and Automation.
- Intelligent Control Systems.
- Stochastic modeling, analysis, optimisation and control problems arising in communication networks and distributed systems.
- Analytical and experimental research in traffic modeling, traffic engineering, and quality of service techniques in communication networks.
- Telecommunications Network control and management.
- Optimal Resource Allocation in Wireless Access Networks.

- Distributed Algorithms for Wireless Ad hoc Networks.

17.4 Employment Opportunities

There are employment opportunities in the following areas:

- Power generation, transmission and distribution industries e.g. VRA, GridCo, ECG
- Manufacturing industries e.g. Kabelmetal, VALCO, Unilever, Aluworks.
- Automated pharmaceutical and allied industries.
- Mining companies.
- Oil and gas industries.
- Universities and other Educational and Research institutions.
- The Ghana Armed Forces.
- United Nations Industrial Development Organisation (UNIDO).
- Project management consulting firms.
- Process and Plant Automation consulting firms.
- Ghana Broadcasting Corporation, TV3, Metro TV, TV Africa, etc.
- Telecommunications industries, e.g. Vodafone, TIGO, MTN, Kasapa, etc.

17.5 Available Resources

a) Academic Staff

See the list of academic staff.

b) Facilities and other Resources

See list of existing facilities.

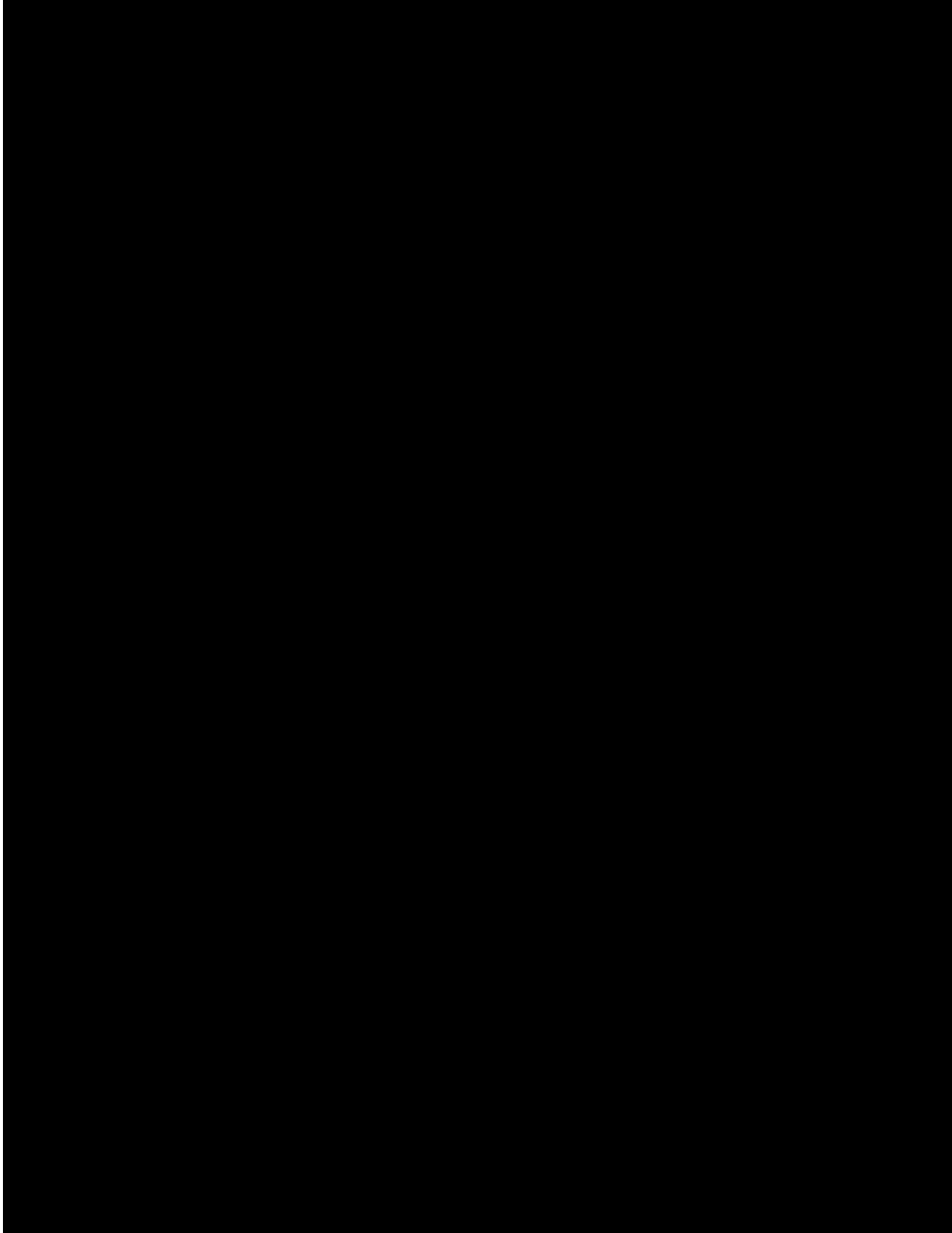
17.6 Resources Needed

See list resources needed to run the programme.

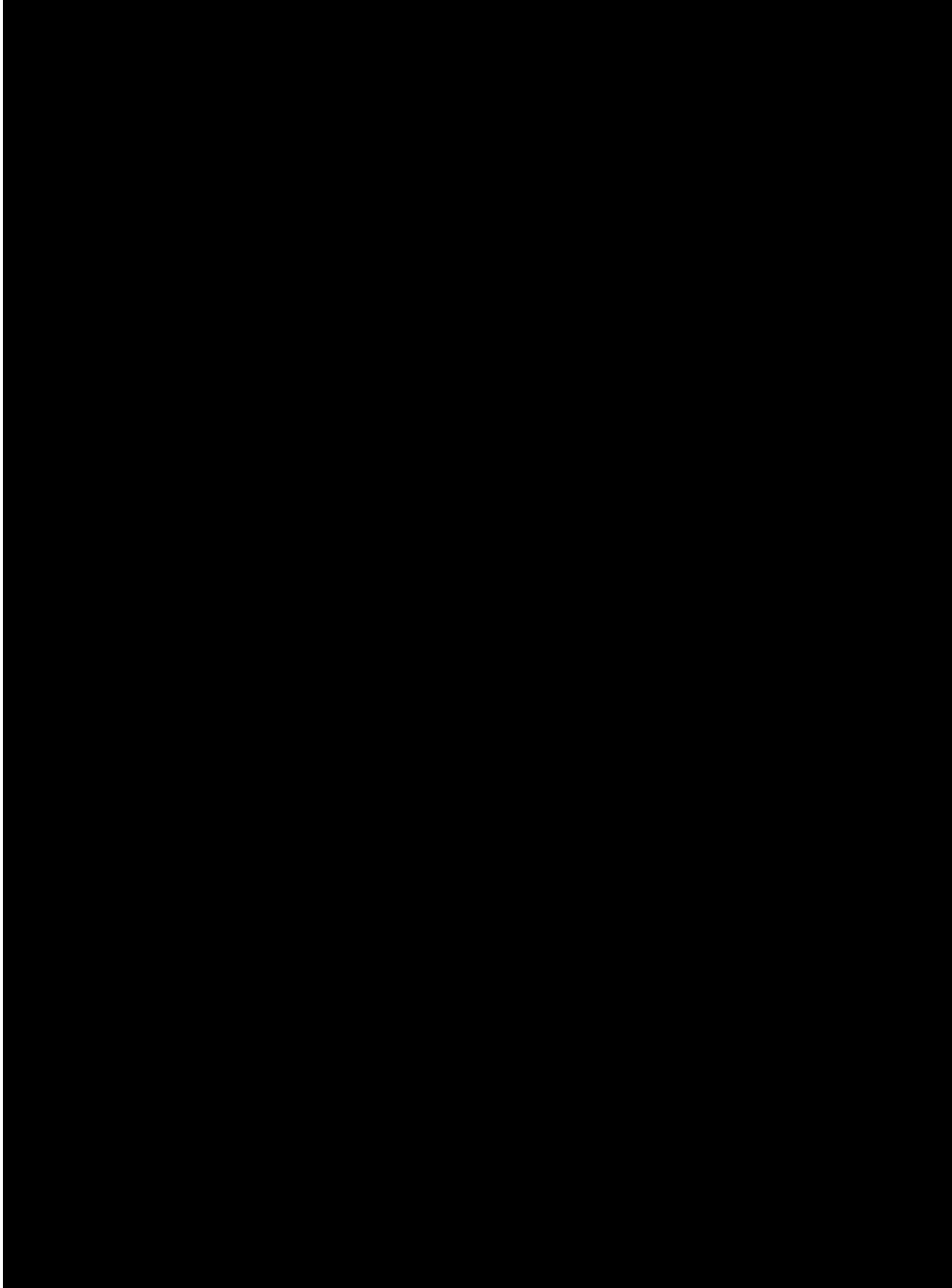
17.7 Cost of Module

Module fees shall be GH¢500.00 (or its dollar equivalent) per module (module fees are subject to changes without notice).

17.5a List of Academic Staff and Areas of Specialization



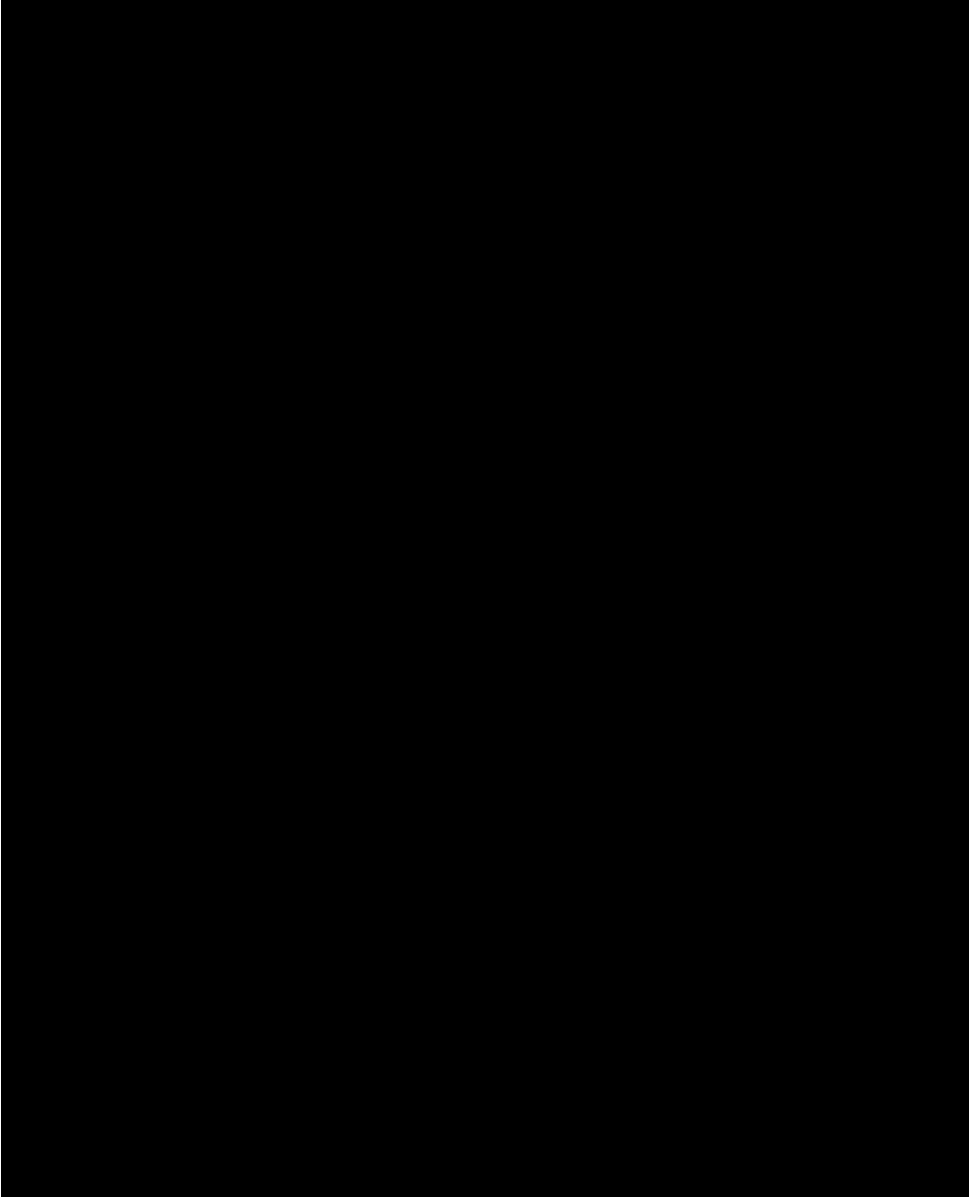
17.5b List of Available Laboratories



17.6 List of Resources Needed

*See List of facilities, equipment, software and reference books

1.76a List of Facilities, Equipment and Software



17.1b List of Reference Textbooks

1. Hyungsung, C. (2003), *Opto-Mechatronics Systems Handbook: Techniques and Applications*, CRC Press, Boca Raton, Florida, 652 pp. ISBN-10: 0849311624, 978-0849311628.
2. Isamann, R. (2009), *Mechatronics Systems – A Short Introduction*, Springer, Berlin Heidelberg, Germany, 564 pp. ISBN: 978-3-540-78830-0.
3. De Silva, C. W. (2010), *Mechatronics: A Foundation Course*, CRC Press Informa LLC, ISBN: 978-1-4200-8211-1.
4. Das, S. (2009), *Mechatronic Modeling and Simulation Using Bond Graphs*, CRC Press Informa LLC, 483 pp. ISBN: 978-1-4200731-4-0
5. Bolton, W. (2008), *Mechatronics: A Multidisciplinary Approach, Fourth Edition*, Prentice Hall, 593 pp. ISBN-13: 9780132407632, 10: 0-13-240763-9
6. Billingsey, J. and Bradbeer, R. (2008), *Mechatronics and Machine Vision in Practice*, Springer Verlag, Germany, 348 pp. ISBN: 978-3-540-74026-1
7. Bishop, R. H. (2007), *Mechatronic Systems, Sensors and Actuators: Fundamentals and Modeling*, Taylor & Francis, 375 pp. ISBN-13: 9780849392580, 0849392586.
8. Rosenberg, R. C., Margolis, D. R. and Karnopp, D. (2006), *System Dynamics: Modeling And Simulation of Mechatronic Systems, Fourth Edition*, John Wiley & Sons Inc., 563 pp. ISBN: 978-0-471-70965-7.
9. Horowitz, P. and Hill, W. (1989), *The Art of Electronics*, Second Edition, Cambridge University Press, Cambridge, United Kingdom, 1125 pp. ISBN-13: [9780521231510](#), [0521231515](#)
10. Stiffler, A. K. (1992), *Design with Microprocessors for Mechanical Engineers*, McGraw-Hill, New York, 594 pp. ISBN 10: 0070613745.
11. Walsh, R. A. (2000), *Electromechanical Design Handbook*, Third Edition, McGraw Hill, New York, ISBN-10: 0071348123 , 13: 978-0071348126
12. Hurricks, P. L., Dimond, S. and Hurricks, P. L. (1994), *Handbook of Electromechanical Product Design*, Longman Publishing Group, United Kingdom, 559 pp. ISBN: 0582040833.
13. Miu, D. K. (1993), *Mechatronics - Electromechanics and Controlmechanics*, Springer-Verlag, New York/Berlin, 252 pp. ISBN: 0387978933, 13: 9780387978932, 978-0387978932.
14. Lynch, K., Choset, H. M. and Hutchinson, S. (2005), *Principles of Robot Motion: Theory, Algorithms, and Implementation*, MIT Press, Massachusetts, USA, 603 pp. ISBN-10: 0262033275, 13: 978-0262033275.
15. Valentine, R. (ed.) (1998), *Motor Control Electronics Handbook*, McGraw-Hill, 704 pp. ISBN-10: 0070668108, 13: 978-0070668102.
16. Lavalley, S. M. (2006), *Planning Algorithms*, Cambridge University Press, 826 pp. ISBN -10: 0521862051, 13: 978-0521862059.
17. Rizzoni, *Principles and Applications of Electrical Engineering*, Irwin Publishing, ISBN-13: [9780256176889](#), [0256176884](#).

18. Alciatore, D. G. and Hystand, M. B. (2007), *Introduction to Mechatronics and Measurement Systems*, Third Edition, McGraw-Hill, 496 pp. ISBN-10: 0072963050, 13: 978-0072963052.
19. Meier, A. V. (2006), *Electric Power Systems: A Conceptual Introduction*, John Wiley & Sons, Inc., Hoboken, New Jersey, Canada 309 pp. ISBN-10: 0471178594 , 13: 978-0471178590.
20. Xiao-Ping Z., Rehtanz, C. and Bikash P. (2006), *Flexible AC Transmission Systems: Modelling and Control*, Springer-Verlag Berlin Heidelberg, 380 pp. ISBN-10: 3540306064, 13: 978-3540306061.
21. Weber, C. (2005), *Uncertainty in the Electric Power Industry: Methods and Models for Decision Support*, Springer Science + Business Media, Inc., 290 pp. ISBN-10: 0387230475 , 13: 978-0387230474.
22. Casazza, J. and Delea, F. (2003), *Understanding Electric Power Systems: An Overview of the Technology and the Marketplace*, John Wiley & Sons, Inc., 211 pp. ISBN-10: 0471446521 , 13: 978-0471446521.
23. Saccomanno, F. (2003), *Electric Power Systems: Analysis and Control*, 728 pp. ISBN-10: 0471234397, 13: 978-0471234395.
24. Bollen, M. H. J. (2000), *Understanding Power Quality Problems: Voltage Sags and Interruptions*, 576 pp. ISBN-10: 0780347137, 13: 978-0780347137.
25. El-Hawary, M. E. (2002), *Principles of Electric Machines with Power Electronic Applications, Second Edition*, 496 pp. ISBN: 978-0-471-20812-9.
26. Krause, P.C., Wasynczuk, O. and Sudhoff, S. D. (2002), *Analysis of Electric Machinery and Drive Systems*, Second Edition, 624 pp. ISBN: 978-0-471-14326-0.
27. Short, T. A. (2006), *Electric Power Distribution Equipment and Systems*, EPRI Solutions, Inc. Schenectady, NY, 310 pp. ISBN-10: 0849395763, 13: 978-0849395765.
28. Dugan, R.C., McGranaghan, M.F., Santoso, S. and Beaty, H.W., (2004), *Electrical Power Systems Quality*, McGraw –Hill, Second Edition, 521 pp. ISBN-10: 007138622X, 13: 978-0071386227.
29. Emadi, A. (2005), *Energy-Efficient Electric Motors, Third Edition, Revised and Expanded*, Marcel Dekker, Inc., New York, 383 pp. ISBN-10: 0824757351 : 978-0824757359.
30. Barzam, A. B. (1977), *Automation in Electrical Power Systems*, Mir Publishers, Moscow, 430 pp. ISBN-13: 978-0824726317.
31. Kothari, D. P. and Nagrath, I. J. (2006), *Modern Power System Analysis*, First Edition, McGraw-Hill, Dubuque, Iowa, 694 pp. ISBN: 0070494894
32. Wood, A.J. and Wollenberg, B.F. (1996), *Power Generation, Operation and Control*, Second Edition, J. Wiley & Sons, New York, 569 pp. ISBN-13: 978-0471586999.
33. Glover, J. D., Sarma, M. S. and Overbye, T. J. (2008), *Power System: Analysis and Design*, Fourth Edition, Thomson Learning, Toronto, Ontario, 752 pp. ISBN – 8131503623.
34. Grainger, J. J. and Stevenson, W.D. (1994), *Power System Analysis*, McGraw-

- Hill, New York, 787 pp. ISBN-13: 978-0070612785.
35. Gupta, B. R. (1998), *Power System Analysis and Design*, Second Edition, S. Chand, New Delhi, 651 pp. ISBN-13: 978-0136919902
 36. Ilic, M. D., Galiana, F.D. and Fink, L. H. (1998), *Power Systems Restructuring: Engineering and Economics*, Kluwer Academic Publishers, Boston, 559 pp. ISBN-13: 978-0792381631.
 37. Casazza, J. and Delea, F. (2003), *Understanding Electric Power Systems: An Overview of the Technology and the Marketplace*, IEEE Press, Piscataway, NJ, 211 pp. ISBN-13: 978-0471446521.
 38. Ashfaq, H. (2009), *Electrical Power Systems*, Fifth Edition, Satish Kumar Jain, New Delhi, India, 694 pp. ISBN-13: 978-0130930835.
 39. Weedy, B. M. (1992), *Electrical Power Systems*, Third Edition, John Wiley and Sons, New York, 538 pp. ISBN-13: 978-1439800270.
 40. Miller, R. H. and Malinowski, J.H. (1994), *Power System Operation*, Third Edition, McGraw-Hill, 271 pp. ISBN-13: 978-0070419773.
 41. Bergen, A. R. and Vittal, V. (1999), *Power System Analysis*, Second Edition, Upper Saddle River, Prentice-Hall, Englewood Cliffs, NJ. 619 pp. ISBN-13: 978-0136919902.
 42. Jean-Claude, S. and Hadjsaid, N. (2009), *Power Systems and Restructuring*, Iste/Hermes Science Pub., 681 pp. ISBN-13: 978-0471495000
 43. Iravani, R. and Yazdani, A. (2010), *Voltage-Sourced Converters in Power Systems: Modeling, Control, and Applications*, John Wiley & Sons Inc., 451 pp. ISBN: 978-0-470-52156-4.
 44. Momoh, J. and Mili, L. (2009), *Economic Market Design and Planning for Electric Power Systems*, John Wiley & Sons, 300 pp. ISBN: 978-0-470-47208-8.
 45. Zhu, J. (2009), *Optimization of Power System Operation*, IEEE, 603 pp. ISBN-13: 978-0470298886
 46. Mazer, A. (2007), *Electric Power Planning for Regulated and Deregulated Markets*, IEEE, 313 pp. ISBN: 978-0-470-11882-5.
 47. Thumann, A. and Franz, H. (2009), *Efficient Electrical Systems Design Handbook*, Taylor & Francis, 396 pp. ISBN-13: 978-1439803004.
 48. Momoh, J. A. (2008), *Electric Power System Applications of Optimization*, CRC Pr I Llc, 608 pp. ISBN-13: 978-1420065862
 49. Anttalainen, T. (2003), *Introduction to Telecommunications Network Engineering*, First Edition, Artech House Publishers, 377 pp. ISBN-13: 978-0890069844.
 50. Bates, R. J. (2002), *Broadband Telecommunications Handbook*, McGraw-Hill Companies, 805 pp. ISBN-13: 978-0071346481.
 51. Behrouz, A. F. (2003), *Data Communications and Networking*, Third Edition, McGraw-Hill, 973 pp. ISBN-13: 978-0072923544.
 52. Craig, H. (2002), *TCP/IP Network Administration*, Third Edition, O'Reilly & Associates Inc., USA, 725 pp. ISBN-13: 978-0596002978.
 53. Dunlop, J. and Smith, D. G. (1994), *Telecommunications Engineering*, Third

- Edition, CRC Press, 593 pp. ISBN-13: 978-0748740444
54. Flood, J. E. and Cochrane, P. (1991), *Transmission Systems*, Institution of Electrical Engineers, 503 pp. ISBN-13: 9780863411489.
 55. Freeman, R. L., (2004), *Telecommunication Systems Engineering*, Dover Publications, 991 pp. ISBN: 978-0-471-45133-4.
 56. Gibson, J. D. (2002), *The Communications Handbook*, Third Edition, CRC-Press, 1616 pp. ISBN-13: 978-0849383496.
 57. Green, J. H. (2006), *The Irwin Handbook of Telecommunications*, Third Edition, McGraw-Hill, 770 pp. ISBN-13: 978-0071370585.
 58. Jeruchim, M. C., Balaban, P. and Shanmugan, K. S. (2000), *Simulation of Communication Systems: Modeling, Methodology & Techniques*, Second Edition, Springer, 924 pp. ISBN-13: 978-0306462672.
 59. Kularatna, N. and Dias, D., (2004), *Essentials of Modern Telecommunications Systems*, Artech House Publishers, 368 pp. ISBN-13: 978-1580534918.
 60. Leon-Garcia, A. and Widjaja, I. (2004), *Communication Networks: Fundamental Concepts and Key Architectures*, First Edition, McGraw-Hill Science/Engineering/Math, 900 pp. ISBN-13: 978-0072503531.
 61. Pearce, J. G. (1981), *Telecommunications Switching*, First Edition, Prentice Hall, 338 pp. ISBN-13: 978-0130333094.
 62. Pecar, J. A. and Garbin, D. A. (2000), *The new McGraw-Hill telecom factbook*, Second Edition, McGraw-Hill Professional, 823 pp. ISBN-13: 978-0071351638.
 63. Sanso, B. (1999), *Telecommunications Network Planning*, The Institution of Engineering and Technology, 270 pp. ISBN-13: 978-0863413230
 64. Scott, L. R. (2001), *Wireless PC-Based Services*, Third Edition Prentice Hall, USA, 449 pp. ISBN-13: 978-0130416643.
 65. Smith, D. R. (2004), *Digital Transmission Systems*, Third Edition, Springer, 808 pp. ISBN-13: 978-1402075872.
 66. Winder, S. (2001), *Newnes Telecommunication Pocket Book*, Third Edition, Newnes, 401 pp. ISBN-13: 978-0750652988.

APPENDICES

APPENDIX 1

A1 Date for Graduation

There shall be two graduation dates for Postgraduate Students, the first in *May* and the second in *December*.

A2 Format for Thesis Synopsis

NAME OF CANDIDATE:

DEPARTMENT:

FACULTY:

TITLE OF PROGRAMME:

DURATION (FULL TIME/PART TIME):

ESTIMATED DATE OF SUBMISSION OF THESIS:

A. THESIS TITLE

B. STATEMENT OF THE PROBLEM

C. OBJECTIVE(S) OF RESEARCH

D. EXPECTED OUTCOMES

E. METHODS TO BE USED

F. FACILITIES TO BE USED FOR RESEARCH

G. NAME OF SUPERVISOR(S)

(Signature): (Signature)

Candidate: Supervisor(s)

Date: Date

Recommended by Head of Department:

Signature:

Date:

A3 Dates for Submission of Thesis Synopsis



(a) MPhil/PhD Programmes (by research)

Submission shall be made not later than the end of the SECOND SEMESTER of the First Year of the Programme.

(b) Master's Programmes (Part Taught and Part Research)

Submission of Synopsis shall be not later than the end of the SECOND SEMESTER of the First Year of the Programme.

(c) Postgraduate Diploma Programme (with Project)

Synopsis shall be submitted not later than the end of the FIRST Semester of the Programme.

A4 Procedure for Complaint and Redress at Postgraduate Level

(a) Grounds for Complaint

A student has grounds for complaint based on any of the following:

- (i) Inadequacy of supervisory arrangement including the non-availability of the Supervisor at crucial times during the course of study and lack of constructive criticism of the work.
- (ii) Lack of satisfactory progress for reasons outside the control of the student including lack of facilities to adequately tackle work required.
- (iii) Lack of effective working relationship between a student and his/her Supervisor(s) including serious difference between the student and Supervisor in the approach to the solution of a problem.
- (iv) Any other reasonable ground acceptable to the Board of Postgraduate Studies.

(b) Procedure for Complaint

A student who has grounds for complaint must:

- (i) Address his/her complaint in writing to his/her Head of Department, (in the first instance)
- (ii) The complaint must contain:
 - An explicit statement of the grounds of the complaint.
 - The stage at which he/she had reached in his/her research at the time of complaint.
 - The expected date of completion of his/her research programme.

(c) Handling of Complaints

- (1)** If a Department fails in the handling of his/her complaint, he/she shall appeal to the Board by addressing his/her complaint in writing to the Dean, School of Postgraduate Studies.
- (2) It shall be obligatory for the Dean of Postgraduate Studies to ask for the Head of Department's comments.
- (3) The Board shall then consider the complaint and take the appropriate decision on it.

APPENDIX 2

PROGRESS REPORTS

SECTION A: STUDENT'S SELF ASSESSMENT

(a) BACKGROUND

1. Full Names:
(Surname first and in capitals)
2. Student ID No.:
3. Department:
4. Faculty:
5. Programme:
6. Status: (a) Full Time () Part-Time ()
- 7 (a) Date of Registration:
(b) Expected Date of Completion:
(c) Date of Deferment of Studies (where applicable):
8. Number of Semesters Completed So Far:
(a) Masters: Semesters
(b) PhD Semesters
9. Title of Thesis:
.....
.....
.....

(b) EVALUATION

10. State status of Study (Tick appropriate boxes in both columns).
(% Completed)
- (1) Course Work* ()
 - (2) Synopsis Defence ()
 - (3) Seminar ()
 - (4) Literature Review ()
 - (5) Field Work ()
 - (6) Laboratory Experiments ()

- (7) Data Analysis ()
- (8) Thesis ()
- (9) Others. Please Specify:
-
-

* List Modules Completed:

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11. Evaluation of my progress

In the past 12 months, I have made (tick appropriate box)

- Satisfactory progress ()
- Unsatisfactory progress ()

If 11 (a) is your answer, then go to Q 14

12. What are the probable reasons for your perceived unsatisfactory progress so far?

(Tick as many boxes as are appropriate)

- (a) () I have to combine my programme with full-time employment
- (b) () Interaction with my Supervisor is less than satisfactory
- (c) () Library and other resources required for my work are not available
- (d) () I need more funds
- (e) Others. Please specify:

.....

.....

13. How do you think the School of Postgraduate Studies can assist you in alleviating the problems ticked in 12?

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14. Student's Signature:

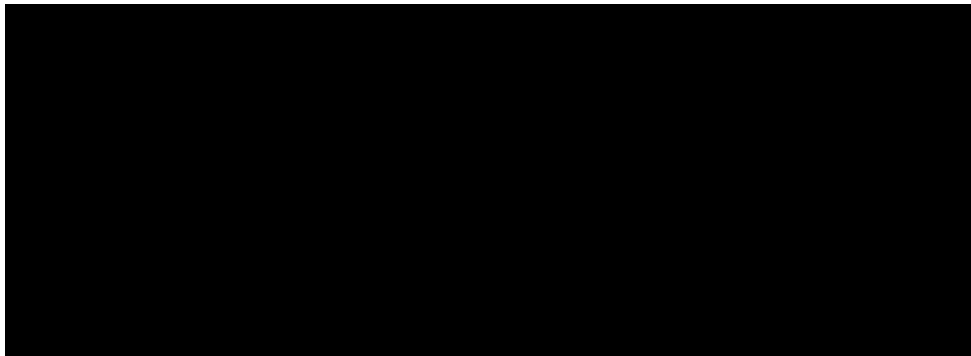
Date:.....

SECTION B: SUPERVISOR'S EVALUATION
(To be completed by Student's Supervisor)

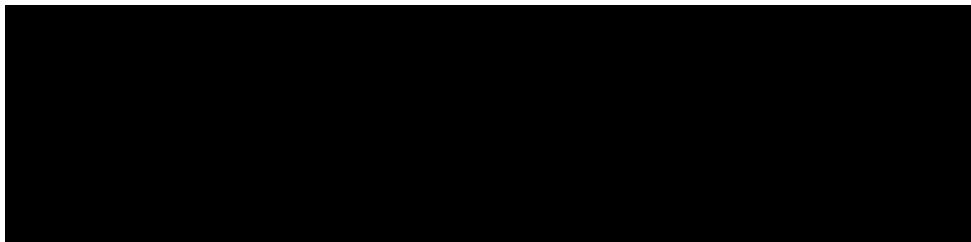
1. Student's Name:

2. I have been supervising him/her since:

3. Evaluation of candidate's research abilities (*Tick appropriate boxes*).



4. Proportion of work done (*Tick appropriate boxes*).



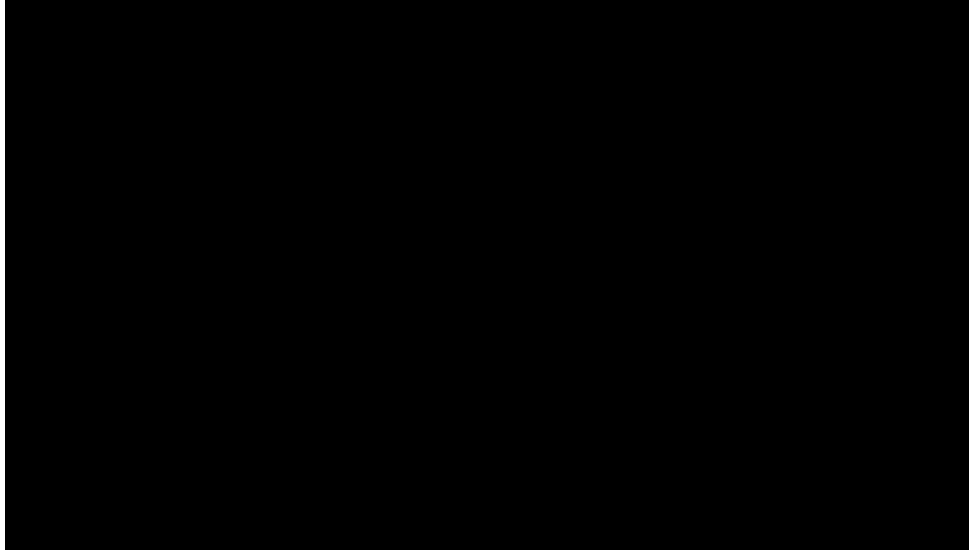
5. Which of the following best summarises the student's performance in the past 12 months?

Satisfactory progress ()

Unsatisfactory progress ()

If you ticked Q5(a) go to Q8

6. If your evaluation of the student's performance suggests that his/her progress has been unsatisfactory, can you please suggest possible reasons?



7. Please suggest how best the student can be assisted in the above ticked problem(s).

.....
.....
.....

8. If the student's current work rate continues, how long might it take to complete the research programme?

(a) Months.....

(b) I Don't know

9. Supervisor's Name:.....

Signature:

Date:.....

SECTION C: DEPARTMENTAL BOARD'S ACTION

(To be completed by the Head of Department)

Having carefully examined the Student's and Supervisor's evaluation of progress in the past year at its meeting held on, bearing in mind the University of Mines and Technology's regulations for Postgraduate Studies, the Board recommends as follows (Tick one of the three alternatives):

- (a) () The student continues with the programme
- (b) () The student be withdrawn from the programme
- (c) () The student be put on probation
- (d) () The student continues with the programme, provided:
(Tick as many boxes as are appropriate).

- (1) () The student spends more time on the research and with the Supervisor(s)
- (2) () The student finds sponsorship or additional funds
- (3) () The student changes research topic
- (4) () A new/additional Supervisor is found
- (5) () Student finds additional resources for the research
- (6) () Others. Please specify:
.....
.....
.....

Head of Department's Name:

Signature:

Date:

Note: Please forward the report directly to the Dean's Office of the Faculty.

SECTION D: FACULTY BOARD'S ACTION

Having carefully examined the Student's, Supervisor's evaluation of progress in the past year and the Departmental Board's recommendation, bearing in mind the University of Mines and Technology's regulations for Postgraduate Studies, the Board recommends as follows (Tick one of the three alternatives):

- (a) () The student continues with the programme
- (b) () The student be withdrawn from the programme
- (c) () The student be put on probation
- (d) () The student continues with the programme, provided:
(Tick as many boxes as are appropriate).
 - (1) () The student spends more time on the research and with the Supervisor(s)
 - (1) () The student finds sponsorship or additional funds
 - (2) () The student changes research topic
 - (3) () A new/additional Supervisor is found
 - (4) () Student finds additional resources for the research
 - (5) () Others. Please specify
 -
 -
 -
 -

Name of Dean:

Signature:

Date: