

PHOTOGRAMMETRY AND REMOTE SENSING EDUCATION
IN AFRICA

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Commission VI/8

Invited Paper
15th Congress, International Society of Photogrammetry
and Remote Sensing (ISPRS), Rio de Janeiro, Brazil
June 17-29, 1984

ABSTRACT

Photogrammetry and Remote Sensing training programmes in African institutions are discussed. Training facilities are also evaluated in the light of modern development. The problems of both human and physical resources for training in photogrammetry and remote sensing are highlighted. The need for the establishment of a Commission for Photogrammetry in Africa under the auspices of the ISPRS is emphasised. The role of such a Commission in the advancement of photogrammetry and remote sensing in Africa is also discussed.

1. INTRODUCTION

Training programmes and courses in Photogrammetry and Remote Sensing are wide spread in African institutions. Majority of these are not well-known even within Africa. There is therefore a need to do a survey of the available training facilities in African institutions. The purpose of this paper is to discuss the result of such a survey conducted through questionnaires sent to various institutions and government survey and mapping departments. The information obtained through the respondents to our questionnaires was supplemented by bulletins, prospectus and calendars published by various institutions and deposited in various libraries which are accessible to this author.

The paper also attempts to discuss the status of remote sensing and Photogrammetry education in each of the countries in Africa where information is available. Training problems related to human and physical resources are also discussed as training facilities are evaluated in the light of modern development. In discussing the status of photogrammetry and remote sensing education in each African country due recognition is given to four categories of training courses. The first three are technician, technologist and professional training courses; the fourth consists of courses taken as part of diploma or degree programmes in Surveying, Geography, Geology, Civil Engineering, Forestry and Cartography.

2. STATUS OF PHOTOGRAMMETRY AND REMOTE SENSING EDUCATION IN AFRICAN COUNTRIES

2.1 NIGERIA

Training courses in Photogrammetry and Remote Sensing (P and RS) started in Nigeria as in most African countries as part of the curriculum in Surveying and Geography. Nowadays P and RS are studied also as part of required courses for Geology, Civil Engineering and Forestry. Tables 1A and 1B reveal that P and RS are an integral part of various technical and degree programmes in Nigerian Colleges of Technology, Polytechnics and Universities. In an analysis by Ayeni (1982), it is observed that Photogrammetry courses constitute between 4-20 percent of the required courses for Surveying in these institutions. It can be observed from Tables 1A & 1B that Remote Sensing is traditionally studied as an integral part of Geography, Geology, Forestry and Agronomy.

Three institutions offering technician training in Photogrammetry are Federal Surveys, (Basic and Advanced Courses), ECA Regional Training Centre for Aerial Surveys, RECTAS (operator's and technician's courses) and Kaduna Polytechnic (National Diploma). Photogrammetric courses taken in these institutions are listed in Table 1B. The minimum entry requirements to these institutions are comparable - that is ^{GCE} credit pass in five subjects including Mathematics, Physics or Geography. The duration and facilities for these courses are shown in Table 10.

Kaduna Polytechnic is the only institution in Africa offering technologist programme leading to Higher National Diploma (H.N.D.) in Photogrammetry. The entry requirement is credit level pass in the National Diploma course (ND). See Ayeni (1982) and Table 10 and 1B for more details.

Professional Training in Photogrammetry is to be found in the postgraduate schools of three Nigerian Universities: University of Lagos, Ahmadu Bello University and University of Nigeria, Enugu. The required courses for M.Sc., M.Phil and Ph.D degrees are listed in Table 1A while the facilities available for the programmes are displayed in Table 11. Entry requirement for these postgraduate programmes is a good honours degree in Surveying.

2.2 GHANA

Photogrammetry is studied as an integral part of the technician, B.Sc. (Geodetic Engineering), PGD (Geodetic Engineering) and M.Sc. (Geodetic Engineering) programmes at the university of Science and Technology in Kumasi, Ghana. Photogrammetric courses required for these programmes are listed in Table 2. The Remote Sensing course is expected to be taken for the B.Sc. (Geography) at the University of Ghana, Legon, (see Table 2). There are no technician, technologist or professional training programmes in Photogrammetry and Remote Sensing in Ghana.

2.3 SOUTH AFRICA

Two photogrammetric courses are required for B.Sc (Survey) at the University of Cape Town, while two courses are listed as postgraduate courses apart from a photogrammetric course for Geologists, (see Table 3). There is an institute of Photogrammetry and Remote Sensing at the University of Cape Town, which was established "to encourage, initiate, co-ordinate and develop teaching and research in the broad field of Photogrammetry and Remote Sensing". University

of Cape Town (1983). Specialist or professional training in photogrammetry is at postgraduate level at Cape Town. Available facilities for M.Sc/Ph.D degree programme in photogrammetry are shown in Table 11. University of Cape Town is one of the few institutions in Africa where close-range photogrammetry is studied. This author could not lay hands on any information regarding photogrammetry and remote sensing courses taken as an integral part of Surveying courses in the University of Witwatersrand, University of Natal and the University of Pretoria,

2.4 KENYA

Two Remote Sensing courses are required to obtain B.Sc (Geography) and M.Sc. (Geology) at the University of Nairobi, Kenya, (see Table 4). The Regional Centre for services in Surveying and Mapping also conducts an average of six short courses with about 20 participants from African countries (mostly from east and central African region). The refresher courses are designed to enlighten the participants on new methods and uses of modern techniques in Cartography, Remote Sensing and Photo-interpretation. Three photogrammetric courses are compulsory for B.Sc.(Surveying) at the University of Nairobi, while one Photogrammetry course and one Remote Sensing course are optional, (see Table 4). Two Photogrammetry courses are also an integral part of the technical diploma (Surveying) programme at Kenya Polytechnic. The University of Nairobi also offers PG diploma programme in Photogrammetry (see course work in Table 4) which extends over only one academic year. Entry requirements are B.Sc. (Surveying) with a minimum of two years postgraduation experience. Nairobi also offers M.Sc. and Ph.D. degrees in Photogrammetry by research.

2.5 MALAWI

An Air Survey course is part and parcel of the Diploma (Survey) programme at the Polytechnic of the University of Malawi. Two Remote Sensing related courses are compulsory for a degree in the Department of Geography and Earth Sciences (see Table 5).

2.6 SUDAN

The University of Khartoum stands out among other African Universities as the University that requires the greatest number of Photogrammetric and Remote Sensing courses for the B.Sc.(Surveying) Programme(see Table 6). There is only one option out of eight such courses. One gets the impression that the B.Sc. (Surveying) has an in-built specialisation in photogrammetry. Photogrammetric courses are also taken during the Diploma (Surveying) programme at Khartoum Polytechnic. The Sudan Survey Department requires photogrammetric courses for the award of certificate in Surveying, Photogrammetry and Cartography.

2.7 ZIMBABWE

Remote Sensing courses taken in the Departments of Geography and Biological Sciences are listed in Table 7.in respect of the University of Zimbabwe.

2.8 TANZANIA

Remote Sensing courses are taken in three Departments (Forestry, Geology and Geography) at the University of Dar-es-Salaam. Three photogrammetric

courses which constitute an integral part of the Surveying diploma programme at Ardhi Institute are listed in Table 8.

2.9 OTHER AFRICAN COUNTRIES

Amongst the other African institutions listed in Table 9 where Remote Sensing is studied, the following centres are well known for running short-term courses, Remote Sensing Centre Academy of Scientific Research in Cairo, Egypt, Ouagadougou Regional Remote Sensing Centre, Upper Volta and Regional Remote Sensing Centre, Kinshasa, Zaire; like the centre in Kenya, they offer short-term refresher courses in Remote Sensing.

3. PROBLEMS FACING EDUCATIONAL INSTITUTIONS

One of the main problems facing African institutions concerned with Photogrammetry and Remote Sensing is lack of adequate facilities for practicals. The equipment available for some institutions are listed in Tables 10 and 11. It should be remembered that some of the institutions cater for over 100 students at the undergraduate level making it practically impossible to have personalised attention in the laboratory. From Tables 10 and 11 only two institutions can boast of a comparator in Africa. Computing devices are also grossly inadequate; even though some universities have high speed computers, these are inefficient. University of Cape Town is the only institution with facilities for close-range photogrammetry. It can be observed from Tables 1-9 that most of the remote sensing courses are actually photo-interpretation oriented. There are no courses on image processing and analysis because of lack of appropriate instrumentations and landsat and radar imagery. Most of the practical exercises are devoted to visual analysis of photographs (mostly black and white). The second general problem plaguing African institutions is dearth of teachers. Many institutions have very impressive programmes but have very few qualified academic staff to implement such programmes. For example, very few postgraduate students have so far been produced from the programmes in Table 11. There is also a general lack of awareness of the importance of photogrammetry beyond topographical mapping and of the role of Remote Sensing in resource exploration, evaluation, and exploitation and resource management.

4. CONCLUSIONS AND RECOMMENDATIONS

The problems discussed above may account for the deficiencies in Photogrammetry and Remote Sensing education in Africa. Specialist courses are very scarce in Africa. For example there are only about 4 institutions training photogrammetric technicians, only one for photogrammetric technologist and only 5 universities with postgraduate training programmes (see Table 10 and 11). The Remote Sensing side is even worse. There are so far no institution at all levels offering certificate, diplomas or degrees in Remote Sensing. A recent survey has revealed that the ratio of Photogrammetric technicians : technologists : professionals in Nigeria is 1:1:11. Most African countries lack adequate manpower to prosecute their topographic mapping programmes in spite of the fact that photogrammetric application is entirely restricted to topographical mapping in these countries. It should be noted that lack of maps creates a serious bottle-neck to national development in Africa.

Although some of the problems discussed will ultimately be solved by various countries, the ISPRS should play its role and make its own contributions towards the development of Photogrammetry and Remote Sensing in Africa. To this end, the author would like to propose the formation of a special

Commission for Photogrammetry and Remote Sensing in Africa (CPRSA). This special Commission, initially under the control of Commission VI, should be established to promote the growth and development of Photogrammetry and Remote Sensing through the following functions:

- a. promote economic, professional and educational activities in Photogrammetry and Remote Sensing;
- b. encourage the formation of new Photogrammetric and Remote Sensing societies in African countries and consolidate and reactivate existing societies,
- c. organise regional or sub-regional symposia, conferences, seminars in Photogrammetry and Remote Sensing so as to create a forum for exchange of ideas and information,
- d. set up a regular publication for disseminating knowledge and information in our field within and outside Africa, and
- e. co-operate with international bodies such as UNESCO, ECA and OAU in soliciting aids, for African institutions and in promoting technical cooperations between African countries and advanced countries.

It is further proposed that a tentative committee consisting of representatives of various African national societies and organisations which are members of ISPRS should be set up to work out some other details in connection with the Commission. The committee should be established only after an appropriate resolution in the General Assembly of ISPRS, has been passed.

A C K N O W L E G E M E N T

The author wishes to express his grateful thanks to various national ISPRS correspondences and other individuals in Africa too numerous to mention, who responded to our questionnaires; without them this paper would not have been written. The author is also grateful to Messrs A. Adetunbi and T. Enunwe for their contributions to the success of this paper. The author is most indebted to the authorities of Lagos University, particularly the Vice-Chancellor and the Chairman, Central Research Committee, for providing the necessary moral and financial support for conducting a survey of African educational institutions.

R E F E R E N C E S

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2. University of Cape Town (1983) Calendar.

TABLE 1A: PHOTOGRAMMETRY AND REMOTE SENSING COURSES
AND PROGRAMMES IN NIGERIAN UNIVERSITIES

1. UNIVERSITY OF LAGOS

(A) PHOTOGRAMMETRY (Semester Units)
Dept of Surveying(a) B.Sc. (Surveying)

SVY 203: Elements of Photogrammetry (3)

SVY 204: Geometric Photogrammetry (3)

SVY 302: Analogue Photogrammetry (4)

SVY 403: Aerial Triangulation (3)

SVY 404: Analytical Photogrammetry (3)

(b) PGD (Surveying)

SVY 502: Introductory Photogrammetry (3)

SVY 503: Geometric Photogrammetry (3)

(c) M.Sc. (Geodesy)/Hydrographic (Surv)

SVY 642: Advanced Photogrammetry (3)

(d) M.Sc. (Photogrammetry) (Surveying)

SVY 600: Adv. Applied Maths Methods I (6)

SVY 610: Adv. Adjustment Computation I (3)

SVY 620: Individual Studies (6)

SVY 630: Group Studies (6)

SVY 631: Adv. Remote Sensing I (3)

SVY 641: Adv. Aerial Triangulation (3)

SVY 644: Adv. Comput. Photogram. I (3)

SVY 661: Adv. Geodetic Surveying (3)

SVY 690: Project Report (8)

(e) M.Phil/Ph.D. (Photogrammetry) (Surv.)

SVY 700: Adv. Applied Maths Methods II (3)

SVY 710: Adv. Adjustment Comput. II (3)

SVY 720: Individual Studies (6)

SVY 730: Group Studies (6)

SVY 744: Adv. Computation/Photo. II (3)

SVY 740: Teaching and Seminar

SVY 800: Research I (M.Phil Thesis)

SVY 900: Research II (Ph.D. Dissertation) (1)

(B) REMOTE SENSING (Semester Units)

Depts of Geography and Surveying

(a) B.A. (Geography)

GRY 103: Elem of Map & Air-Photo Inter.

GRY 216: Elem of Air-Photo & Rem Sen.

GRY 372: Remote Sensing

(a) PG Courses in Geography

GRY 520: Concepts and Foundations of RS

GRY 521: Adv. Air-Photo Interpret.

GRY 522: Microwave Sensing

GRY 523: Remote Sensing from Space

GRY 524: Applied Remote Sensing

(c) M.Sc. (Remote Sensing) (Surveying)

SVY 642: Adv. Photogrammetry (3)

SVY 631: Adv. Remote Sensing I (3)

SVY 632: Adv. Remote Sensing II (3)

2. UNIVERSITY OF NIGERIA

(A) PHOTOGRAMMETRY (Semester Units)
Dept of Surveying(a) B.Sc. (Surveying)

SVY 331: Fundamental Photogram. (6)

SVY 332: Practical Photogram. I (3)

SVY 431: Photogram. Analogue (6)

SVY 432: Pract. Photogram. II (3)

SVY 531: Photogrammetry II (6)

(b) PGD (Surveying)

SVY 331: Fundamental Photogram. (6)

SVY 332: Pract. Photogrammetry (3)

SVY 534: Analogue Photogram. (9)

(c) PGD (Hydrographic Surveying)

SVY 331, SVY 332 and SVY 534

(d) M.Sc. (Surveying)

SVY 635: Photogram. Pract. (6)

(e) M.Sc. (Photogram/Rem Sensing)

SVY 611: Adv. Engr. Surv. (6)

SVY 626: Adv. Adjust. Comput. (6)

SVY 633: Analytical Photogram. (6)

SVY 634: Remote Sen/Holography (6)

SVY 635: Photogra. Practice (6)

SVY 651: Seminar

SVY 661: Research (Thesis)

Electives (Maths, Statistics and
Computer Science) (18)(f) M.Sc./Ph.D. (Photogrammetry)

SVY 533: Analytical Photogram. (6)

SVY 631: Adv. Analytical Photog (6)

SVY 632: Adv. Stereophotogram. (6)

SVY 633: Photo-Interpretation (6)

SVY 634: Remote Sen/Holography (6)

SVY 635: Photogram. Practice (6)

SVY 636: Underwater Photogram. (6)

SVY 637: Special Problems in
Photogrammetry (6)

Research (Thesis)

(B) REMOTE SENSING (Semester Units)(a) B.Sc. (Geography)

GEO 331: Carto and Air-Photo Inter.

(b) B.Sc. (Geology)

GEOL 305A: Photogeology

AHMADU BELLO UNIVERSITY, ZARIA

(A) PHOTOGRAMMETRY (Semester Units)
Dept of Land Surveying(a) B.Sc. (Land Surveying)

LS 103: Photogrammetry I Elements (3)

LS 204: Photogram. II (Geom/Graph (3)

LS 303: Photogram III/Stereo (3)

LS 403: Photogram IV: Triangu (3)

LS 407: Non-topo Photogrammetry (3)

- (b) M.Sc. (Land Surveying)
 LS 504: Photogrammetry (3)
 LS 606: Analytical Photogram. (4)
 LS 607: Photo-Interpretation (4)
4. RIVERS STATE UNIV. OF SCIENCE AND
 TECH, PORT HARCOURT
 Dept of Surveying
 (a) B.Tech. (Surveying)
 TSC 341: Princ. of Photogrammetry (3)
 TSC 342: Photogram-Aerial Photo (3)
 TSC 543: Photogrammetry I (3)
 TSC 544: Photogrammetry II (3)
5. UNIVERSITY OF MAIDUGURI
 Remote Sensing
 (a) B.Sc. (Geography)
 GEO 304: Remote Sensing and Air-
 Photo Interpretation
6. UNIVERSITY OF CALABAR, CALABAR
 Remote Sensing
 (a) B.Sc. (Geography)
 GEO 442: Air Photo and Remote Sen.
 (b) M.Sc. (Geography)
 GEO 541: Remote Sensing Techniques
7. UNIVERSITY OF IFE
B.Sc. (Geography)
 GPY 303: Photo Interpretation
 GPY 427: Vegetation Classification
 and Mapping**
 GPY 438: Adv. Photo Interpretation**
 GPY 430: Photogrammetry**
 ** Elective
8. UNIVERSITY OF SOKOTO
 (a) B.Sc. (Geography)
 GEO 204: Techniques/Methods in Geog.
 GEO 214: Remote Sensing
9. UNIVERSITY OF IBADAN
 (a) B.Sc. (Geography)
 GEO 181: Air Photo-interpretation
- (b) B.Sc. (Geology)
 GEY 216: Structures/Photogeology
 GEY 524: Photogeology and Remote Sensing
 (c) B.Sc. (Forestry)
 FRM 111;* Intr.to Forestry/Management
 FRM 211;* Resource Inventory Measurement
 FRM 254: Aerial Surv and Photogrammetry
 (d) B.Sc. (Agronomy)
 SOS 410;* Soil Survey and Land Evaluation
10. UNIVERSITY OF ILORIN - ILORIN
 (a) B.Sc. (Geography)
 GEO: Air Photo Interpretation
11. UNIVERSITY OF JOST, JOS
 (a) B.Sc. (Geography)
 GEO 495: Remote Sensing
 (b) B.Sc. (Geology)
 GLY 391: Photogeology
12. BAYERO UNIVERSITY - KANO
 (a) B.Sc. (Geography)
 GEO 202: Map Construction/Air-Photo-
 Interpretation
 GEO 313: Remote Sensing
 (b) B.Sc. (Land Management)
 GEO 405* Intro. to Land Survey
 GEO 424* Techniques/Appl. of Land Survey

 * Remote Sensing related course

TABLE 1B: PHOTOGRAMMETRY AND REMOTE SENSING COURSES AND
 PROGRAMMES IN NIGERIAN COLLEGES OF TECHNOLOGY
 AND POLYTECHNICS

Note: ND = National Diploma, HND = High National Diploma

1. KADUNA POLYTECHNIC
 Dept of Topographic Science
 (A) PHOTOGRAMMETRY (Semester Units)
 (a) ND (Surveying)
 S.D1-5: Photogrammetry (6)
 S.D2-6: Photogrammetry (4)
 (b) HND (Surveying)
 S.HD1/3: Photogrammetry (4)
 S.HD2/2: Photogrammetry (4)
- (c) ND (Photogrammetry)
First Year
 P.GD1-1: Principles of Photogram. (15)
 P.GD1-2: Principles of Cartography (23)
 P.CD1-3: Surveying (4)
 P.CD1-4: Maths/Statistics (8)
 P.CD1-5: Physics (4)
 P.CD1-6: English and Gen. Studies (4)

KADUNA POLYTECHNIC (cont'd)

Second Year ND at Kaduna Poly.

- P.D2-1: Analogue Photogrammetry (4)
 P.D2-2: Orientation Methods (8)
 P.D2-3: Aerial Triangulation (4)
 P.D2-4: Rectification & Orthophoto(4)
 P.D2-6: Surveying & Cartography (4)
 P.D2-8: Physics (4)
 P.D2-9: Projects (18)

(2) Professional Diploma(Surveying)

First Year

- ADS.1.2: Topo Surv & Photogram (6)

Second Year

- ADS.2-2: Topo Surv & Photogram (4)

(B) REMOTE SENSING(Semester Units)
 Dept of Environmental Monitoring

(a) Certificate in Photo-Inter.
 (Proposed)

(b) ND (Environmental Monitoring)
 (Proposed)

2. E.C.A. Regional Centre for
 Training in Aerial Surveys, Ile-Ife

(a) Operator's Course

- Revision course in Maths, (6)
- Optics (1)
- Elementary Photogrammetry (4)
- Map Reading & Topography (2)
- Instruments (2)
- Photogrammetric Triang.(2)
- Rectification and Orthophoto.
- Orientation of Aerial Photos
- Basic Land Surveying
- Cartography
- Aerial Photography

(b) Technicians' Course

- Revision Course in Maths (6)
- Optics (1)
- Map Reading and Topography (2)
- Intro. to Photogrammetry (4)
- Radial Triangulation(1)
- Intro.to Aerial Photography(2)

2nd Year

- Mathematics (6)
- Photogrammetry (4)
- Spatial Triangulation (2)
- Rectification and Orthophoto(12)
- Cartography (1½)

(c) Certificate in Photo Interpret.
 (Proposed)

(d) HND (Photogrammetry) at Kaduna Poly.

First Year

- HD.1.1: Aerial Photography (4)
 HD.1-2: Photo Inter/Rem Sensing (4)
 HD.1-3: Semi Analytical Photogram(4)
 HD.1-4: Propagation of Errors/Adj (4)
 HD.1-5: Photogram Instruments (4)
 HD.1-6: Mathematics/Statistics (8)
 HD.1-7: Physics (4)
 HD.1-8: Photogrammetric Projects(18)

Second Year

- HD.2-1: Testing and Adj of Instr(4)
 HD.2-2: Analytical Photogrammetry(6)
 HD.2-3: Photogram Systems &
 Automation (6)
 HD.2-4: Management & Plan in Photog.(4)
 HD.2-5: Photogrammetric Seminars(4)
 HD.2-6: Maths/Computer Programming(4)
 HD.2-7: Practical Projects (21)

3. School of Basic and Advanced Courses
 in Photogrammetry, Fed.Surveys,Lagos

(a) Basic School

- Introduction to Photogrammetry
- Photogrammetry I(Stereoscopy)
- Photogrammetry II(Instruments)
- Photogrammetry III(Templating)
- Photogrammetry IV(Mapping)
- Cartography I (Elementary)
- Cartography II (Marginal Information)
- Cartography III (Practice)

(b) Advanced School

- Orientation of Aerial Photographs
- Radial Triangulation
- Spatial Triangulation
- Adjustment of Aerial Triangulation
- Rectification
- Stereoplotting Instruments
- Mathematics
- Optics
- Mosaicing
- Photogrammetric Mapping

4. Federal Polytechnic, Bida
 ND (Surveying)

SVY 207: Photogrammetry

5. Auchi Polytechnic, Auchi

(a) ND (Surveying)

- LS 162: Elem of Photogrammetry
 LS 261: Stereo Photogrammetry
 LS 262: Metric/Graphical Photogrammetry

- (b) HND (Surveying) at Auchi Poly.
 LS 361: Instrumentation/Orthophoto
 LS 401: Aerial Triangulation
6. College of Tech Ilorin
 (a) ND (S-rveying)
 - Photogrammetry I (Element) (3)
 (b) HND (Surveying)
 - Photogrammetry II (Computational)
7. The Polytechnic, Ibadan
ND (Surveying)
 ESS 212: Photogrammetry I
 ESS 222: Photogrammetry II
8. Federal Survey School, Oyo
 (a) ND (Surveying)
 3500: Elementary Photogrammetry
 (b) HND (Surveying)
 4400: Stereophotogrammetry
 5200: Analogue Photogrammetry
 (c) Postgraduate Dip. (Surveying)
 P.5000: Intro. to Photogrammetry
 P.6700: Instrumentation/Triangulation
9. Federal Polytechnic, Yola
 (a) ND (Surveying)
 - Photogrammetry I
 - Photogrammetry II
10. Yaba College of Technology, Yaba
ND (Surveying) Photogrammetry
11. College of Technology, Owerri
 (a) ND (Surveying)
 SVY 123: Photogrammetry III (3)
 SVY 347: Photogrammetry IV (3)
12. Federal Govt Polytechnic, Akure
 (a) ND (Surveying)
 LS 112: Photogrammetry IV (3)
13. The Polytechnic, Owo
 (a) ND (Surveying)
 SVY 108: Elementary Photogrammetry
 (b) HND (Surveying)
 SVY 303; Photogrammetry II
14. The Polytechnic, Ilaro
ND (Surveying)
 - Photogrammetry I
15. Federal School of Forestry, Ibadan
 - Photointerpretation
 - Remote Sensing

TABLE 2: PHOTOGRAMMETRY AND REMOTE SENSING COURSES IN GHANA

- (A) University of Science and Technology, Kumasi,
 Department of Geodetic Engineering
- | | |
|--|---|
| 1. <u>Surveying Technician Course</u>
GE 121: Basic Photogrammetry I (4)
GE 123: Basic Photogrammetry II (4)
GE 221: Basic Photogrammetry III (4) | 2. <u>B.Sc. (Geodetic Engineering)</u>
GE 171: Photo Interpretation (3)
GE 371: Photogrammetry I (4)
GE 372: Photogrammetry II (4)
GE 471: Photogrammetry III (4) |
| 3. <u>M.Sc. (Geodetic Engineering)</u>
GE 571: Analytical Photogrammetry (8) | 4. PGD (Geodetic Engineering)
Photogrammetry Courses |
- (B) University of Ghana, Legon
 Dept of Geography
 - Techniques and Methods in Geography
 (Air Photo and Remote Sensing)

TABLE 3: PHOTOGRAMMETRY AND REMOTE SENSING COURSES IN SOUTH AFRICA

- (A) University of Cape Town
- | | |
|--|--|
| 1. <u>Department of Surveying</u>
B.Sc. (Surveying)
SUR 318: Photogrammetry A (3)
SUR 421: Photogrammetry B (2)
(option) | 2. <u>PG Courses</u>
SUR 502: Digital Aerial Triangulation
SUR 514: Short Range Photogrammetry |
|--|--|
4. Institute of Photogrammetry and Remote Sensing (for research)
- (B) University of Witwatersrand
 Photogrammetric Courses in the Dept of Surveying
- (C) University of Natal, Durban
 Photogrammetric Courses in the Dept of Surveying
- (D) University of Pretoria
 Photogrammetric Courses in the Dept of Surveying.

TABLE 4: PHOTOGRAMMETRY AND REMOTE SENSING COURSES IN KENYA

(A) University of Nairobi

- Dept of Surveying and Photogrammetry - B.Sc. (Surveying)

1.) B.Sc. Surveying

F.131: Topography

F.233: Photogrammetry

F.331: Photogrammetry

F.33C: Analytical Photogrammetry (B)
(option)F.33D: Remote Sensing and Photo-
Interpretation (option)

*50% of course content is Photointerpretation and Remote Sensing.

2.) Postgraduate Diploma in Geodesy or Photogrammetry Courses

	Hours Per Week		
	Lectures	Practical	Total
Higher Surveying	2	2	4
Computations	2	3	5
Photogrammetry	2	4	6
Minor Project	0	3	3
Management Surveying	2	1	3
Total	8	13	21

3.) M.Sc./Ph.D. Photogrammetry by research

- Dept of Geography

4.) B.Sc. (Geography)S 248; Air Photo Interpretation/
Remote Sensing (optional)S 34H: Adv. Environmental Remote
Sensing - optional(B) Kenya Polytechnic

Dept of Building and Civil Engr.

6. Technician Diploma (Surveying)

- Air Survey (1st year)

- Air Surveying (2nd year)

5.) Dept of Geology

M.Sc. (Geology)

S 458: Geological Field Mapping

S 459: Photogeology

(C) Regional Centre for Services
in Surveying and Mapping- Short-term Courses in Photo-
interpretation and Remote Sensing.

TABLE 5: PHOTOGRAMMETRY AND REMOTE SENSING COURSES AT UNIV OF MALAWI

1.) Department of Geography and Earth Sciences

GE 203; Statistical Mapping Field Techniques and Remote Sensing (3)

GE 404; Bio-geography (half of Remote Sensing).

2.) The Polytechnic

Diploma (Survey)

Air Survey

TABLE 6: PHOTOGRAMMETRY COURSES IN SUDAN

A) University of Khartoum1. Dept of Surveying Engineering (B, Sc.)

SE 314; Photogrammetry I (2) SE 324; Photogrammetry II (2)

SE 412; Photogrammetry II (4) SE 422; Photogrammetry IV (4)

SE 513; Photogrammetry VA (5) SE 514; Photogrammetry VB (4)

SE 515; Remote Sensing (3) SE 524; Selected topics in

Photogrammetry (3) option

B) Khartoum Polytechnic

Faculty of Engineering Studies

- Photogrammetric courses for Diploma in Surveying

C) Sudan Survey Dept, Khartoum, Photogrammetric courses for Certificate
in Surveying Photogrammetry and Cartography.

TABLE 7: REMOTE SENSING COURSES AT THE UNIVERSITY OF ZIMBABWE

1.) <u>Dept of Geography</u> - Photointerpretation and Remote Sensing - Resource Evaluation and Management	2.) <u>Dept of Biological Sciences</u> - M.Sc. (Resource Ecology) - Techniques in Natural Resource Management
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TABLE 8: PHOTOGRAMMETRY COURSES IN TANZANIA

(A) Ardhi Institute, Dar es Salaam LS 1135: Photogrammetry I (3) LS 2135: Photogrammetry II(4) LS 135: Photogrammetry III(3)	(B) University of Dar es Salaam 2.) <u>Dept of Forestry</u> FO 205: Forest Measurement (2)
1.) <u>Dept of Geology</u> GY 125: Photogeology (2) GY 155: Mapping Courses (Geology Mapping) GY 308: Prospecting I (Mapping and Maps)(3)	3.) <u>Dept of Geography</u> GE 202: Remote Sensing and Quantitative Methods(2)

TABLE 9: REMOTE SENSING COURSES IN OTHER AFRICAN INSTITUTIONS

(A) National University of Lesotho Dept of Environmental Science B.Sc. (Appl. Environmental Sciences) Remote Sensing and Photogrammetric related courses.	(B) University College, Botswana Dept of Environmental Science ES 461 - 214 Practical III (application of Photo-interpretation and Remote Sensing in Geographic Studies)
(C) Remote Sensing Centre Academy of Scientific Research, Cairo Egypt.	(E) Regional Remote Sensing Centre Zaire, Kinshasa.
(D) Ouagadougou Regional Remote Sensing Centre - Upper Volta	

TABLE 10: PHOTOGRAMMETRY PROGRAMMES FOR TECHNICIANS AND TECHNOLOGISTS IN AFRICAN INSTITUTIONS

NAME OF INSTITUTION	TECHNICIAN, (Duration)	TECHNOLOGIST Duration	STAFF	STEREOPLOTTER EQUIPMENT
1.) Kaduna Polytechnic Dept of Topographic Science (Nigeria)	H.N.D. (2 yrs)	H.N.D. (2 yrs)	2 MSc 5 Ph Eng 2 HND	1 Wild B8S 1 Wild A8 1 Kern PG2 2 Multiplex
2.) Federal Surveys Lagos (Nigeria)	Basic Cert. (1 yr) Adv. Cert. (2 yrs.)	-	3 MSc 2 Ph Eng	- Wild A10 - 3 Wild A8 - 2 Wild B8S - 2 Kern PG2
3.) E.C.A. Regional Centre for Training in Aerial Survey	Operator's (1 yr) Technician's Cert. (2 yrs)	-	1 Ph.D 2 M.Sc 1 Ph.Eng	2 Wild A8 1 Kern PG2 2 Wild B8S 1 Multiplex
4.) Sudan Survey Dept Khartoum	Cert. in Surv Photo. & Carto.	-	3 M.Sc 3 PGD 2 Dip.	Wild B8S Kern PG2

TABLE 11; PHOTOGRAMMETRIC PROGRAMMES IN AFRICAN UNIVERSITIES

NAME OF INSTITUTION	DEGREES	STAFF	EQUIPMENT AVAILABLE FOR PG PROGRAMME
1. University of Nairobi Kenya	- PG Diploma - M.Sc. - Ph.D.	1 Ph.D **	Wild A8, Wild B8 Tompson Plotter Kelsh Plotter Sanoni Stereometer
2. University of Cape Town, South Africa	- M.Sc/Ph.D	1 Ph.D **	Stereo Comparator Stereoplotters Stereometric Cameras
3. University of Lagos Nigeria	- M.Sc. - M.Phil/Ph.D	2 Ph.Ds	Kern PG2 Wild A8* Wild A10*
4. University of Nigeria Enugu	- M.Sc. - Ph.D.	- M.Sc.	Wild A8 Kern PG2
5. Ahmadu Bello University Nigeria	- M.Sc.	1 Ph.D 1 M.Sc	Wild CP1 Comparator Wild A7 Wild A8

* From Federal Surveys, Lagos

** Information not available for other categories of staff.