

REMOTE SENSING EDUCATION AT UNDERGRADUATE AND POSTGRADUATE LEVELS WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES

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INTRODUCTION

Opportunities for students to specialise in remote sensing are not yet numerous. One of the special difficulties in delineating the system arises from the fragmentation of remote sensing courses among a diversity of established disciplines. The emergence of remote sensing as a multidisciplinary applied field presents many challenges to education. This strong client orientation is manifested in the broad pattern of introductory course offerings. During the last one and half decades, satellite remote sensing has made an impressive impact all over the world regarding the potential applications in exploiting and management of natural resources and engineering. New series of satellites which have been planned for 1990's demand that every science and engineering graduate has to have a sound knowledge of the technology so as to apply it in one's career connected with remote sensing.

This emerging area has changed the concept of measurement and evaluation. The data is pouring in continuously all over the world. It is repetitive and temporal in character. Application of satellite remote sensing requires multidisciplinary approach hence it is appropriate that efforts have to go in formulation of educational curricula both at undergraduate and postgraduate levels in science and engineering courses. In advanced countries especially in U.S.A. many universities have introduced courses at various levels. In developing countries more efforts have to be put in this direction.

REMOTE SENSING, CURRICULA DEVELOPMENT AT UNDERGRADUATE AND POSTGRADUATE LEVELS:

All over the world university education has certain traditional approaches consistent with history and overall background of each university and its aims and objectives. Many universities have got strict procedures for enrolling students into their universities. During the last couple of decades, there is tremendous development in high technologies including space research and satellite remote sensing. Spinoffs of such emerging technologies have many facets and demand entire social structure and population to take part in its development and utility towards human welfare.

As per one of the studies conducted in 1981, there were more than 650 university level courses dealing with remote sensing and image interpretation in U.S.A. and Canada, this included about 130 courses taught in engineering departments especially in Civil Engineering.

Chart 1 gives an overview of university education system where in undergraduate and postgraduate courses are taught. Remote sensing courses have to be incorporated in various undergraduate courses keeping in view the multidisciplinary character of the remote sensing technology and ultimate integrated approach to be followed in operationalisation.

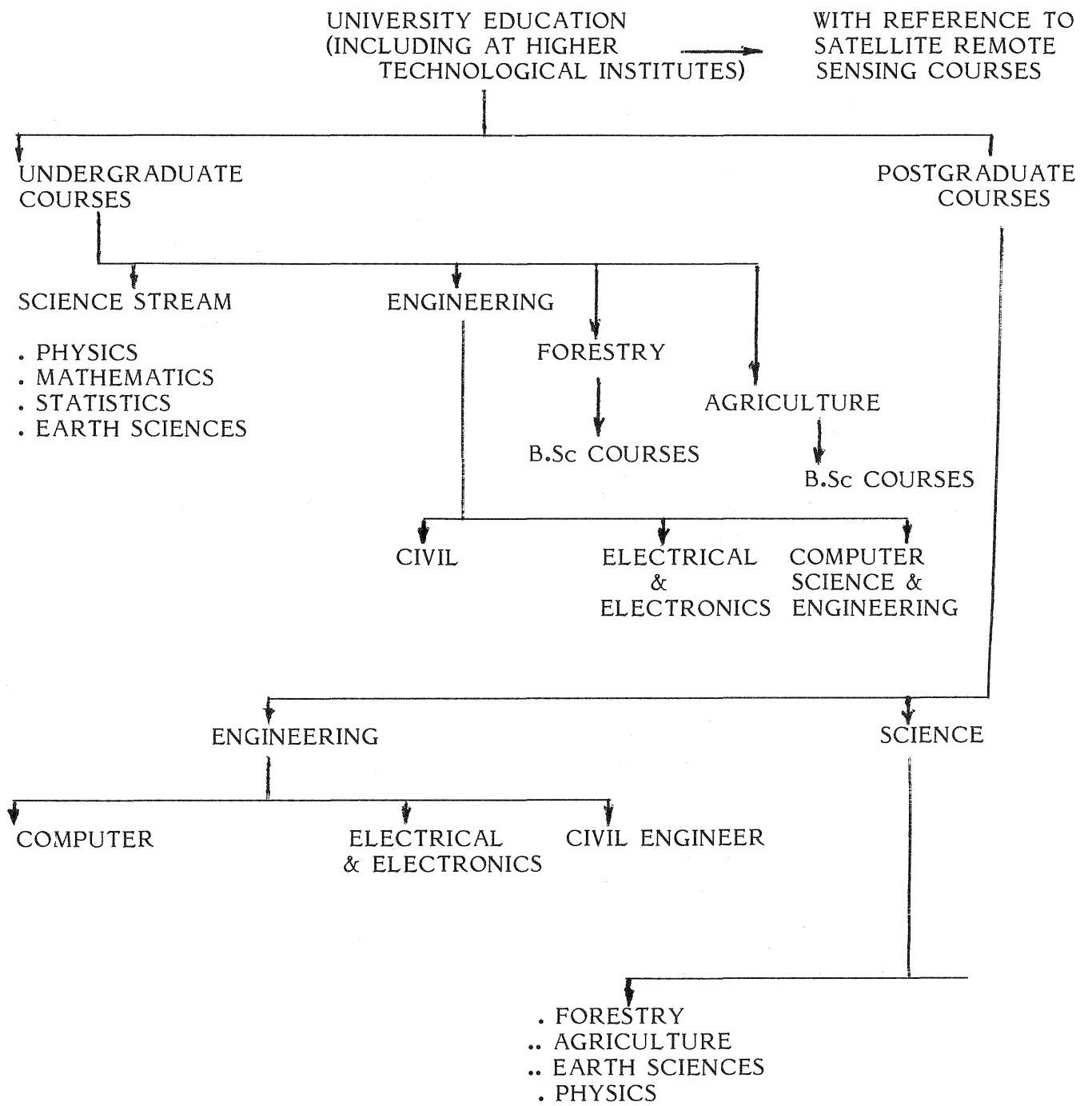


CHART 1.

Presently, precious little has been attempted in the direction of introducing new courses in satellite remote sensing both at undergraduate and postgraduate levels in developing countries such as India. Of course, some universities and institutes in India have made bold attempts in introducing full fledged postgraduate degree programmes in Remote Sensing. Well; such an attempt has been criticised with regard to employment and career opportunities and overall standard of candidates for the courses. One school of thought propogates that only brilliant physicists and mathematicians should enter into the field of space technology and other spinoffs such as satellite remote sensing and its applications. This concept is partially alright for activities connected with basic and fundamental research but when the question of operationalisation of new technology comes up for consideration, the subject encompasses entire society and all user agencies. In the national interest, the system has to be looked into by educationists and technocrats. In view of space technology and remote sensing, taking into consideration of interests of all nations, the problem of education has assumed a worldwide importance regarding satellite remote sensing and its operationalisation. It should be clearly understood that remote sensing is an inherently multidisciplinary technology, a fact which must be recognised, accepted and dealt with in teaching as well as in developing and applying the technology

METHODOLOGY:

Education in the emerging area of satellite remote sensing has to be attacked by the three pronged method. It consists of imparting and introducing special courses at

- i) undergraduate level
- ii) postgraduate level and by
- iii) nonformal education methods for inservice engineers and scientists

i) Undergraduate level : Chart 2 gives general aspect of course work at the undergraduate level.

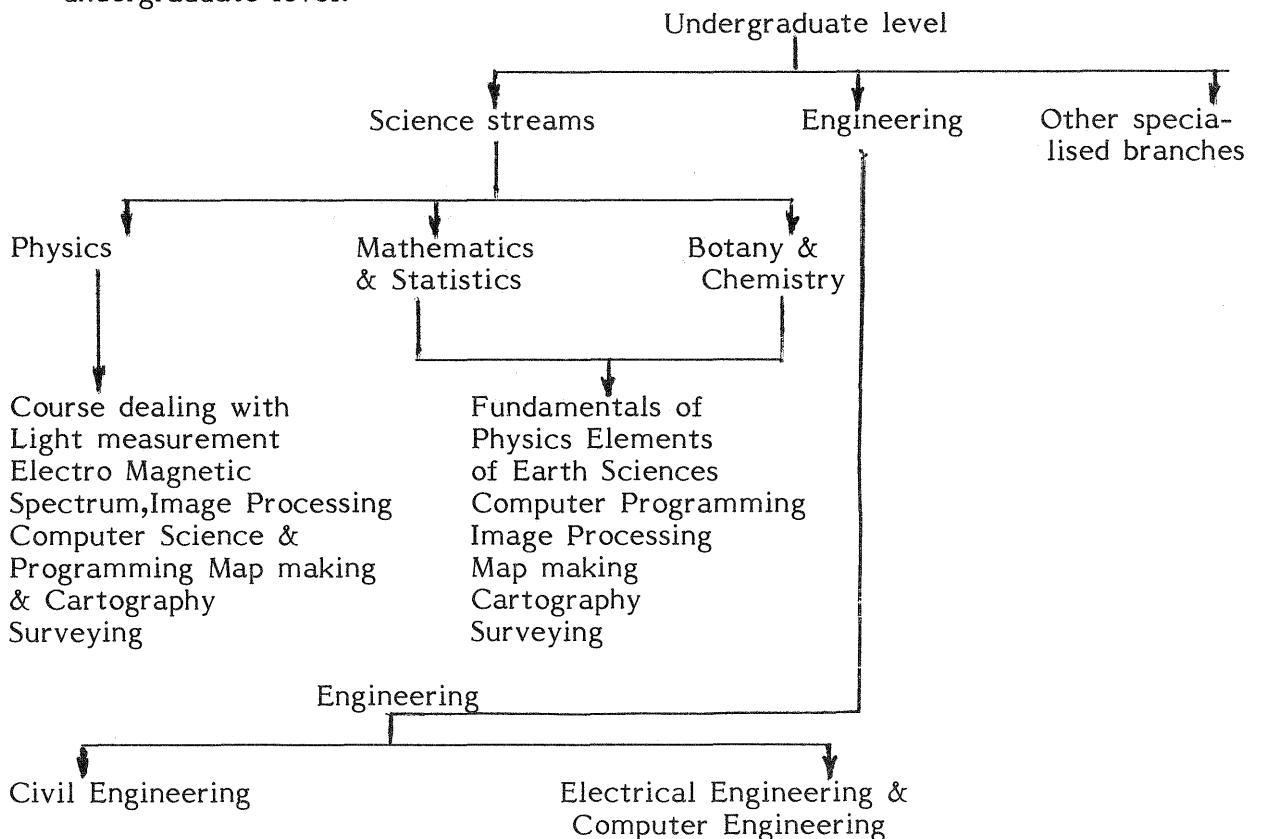


Chart 2

For Civil Engineering branch the following courses are suggested:

- . Physics - Image Processing
- . Computer Science and Programming
- . Cartography

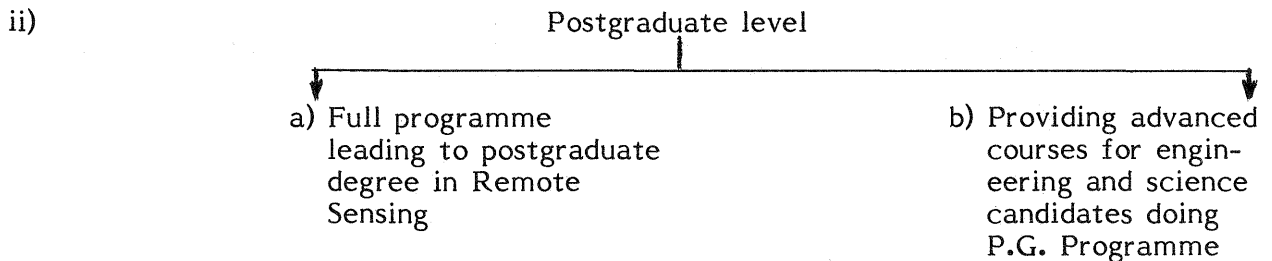
For Electrical & Computer Engineering branch the following courses are suggested:

- . Earth Sciences
- . Natural Resources
- . Interlinks between Image processing & Satellite remote sensing & natural resources

For other specialised branches, the following courses are suggested:

- . Agriculture & Forestry
- . Physics & Image Processing
- . Map making & Cartography
- . Surveying

Considering the overall requirements, courses can be formatted at the undergraduate level. They should be made compulsory so that every undergraduate will have sufficient background to appreciate potentialities of satellite remote sensing



Some of the suggested courses for M.Tech Civil Engineering - Specialisation Remote Sensing.

- a) Fundamentals of Image Interpretation
- b) Photographic systems for Remote Sensing
- c) Instrumentation and Data Communication
- d) Image Processing Techniques
- e) Patter Recognition

Some of the suggested courses for M.Tech in Computer Science - Specialisation Image Processing

- a) Digital Computer Fundamentals
- b) Data Structure and Programming Methodology
- c) Introduction to Image Processing
- d) Image Processing Techniques
- e) Application to Digital Techniques
- f) Pattern Recognition

iii) Nonformal Education: This is an important facet of educational programmes in the coming decades so that a large number of inservice engineers and scientists working in various user agencies will be exposed to emerging technologies such

as satellite remote sensing. Under the programme, courses of different durations can be arranged depending upon client requirements in the areas of fundamentals, such as

- a) Physics
 - b) Mathematics
 - c) Computer programming
- and in themes such as
Water Resources
Mineral Resources,
Forestry, Pedology and Landuse Planning

Courses on the following topics are also suggested

- a) Cartography
- b) Instrumentation
- c) Integrated approach

One of the important courses, which needs to be taught in all facets to all the trainees is geodata base and information retrieval system using remotely sensed data.

CONCLUSION:

The following conclusions can be drawn after studying various aspects presented in the paper pertaining to the remote sensing education at undergraduate and postgraduate levels.

- i) Imparting of education regarding satellite remote sensing and its applications at the undergraduate level and postgraduate level is very necessary in view of useful satellite data which is being received regularly and repetitively with global coverage. Developing countries such as India have to seriously consider introducing of suitable courses at both the levels in the frontier area of satellite remote sensing.
- ii) Nonformal education methods are needed to be given top priority for in-service training programmes for horizontal transfer of satellite remote sensing techniques to user agencies.
- iii) Developed countries have an important role in helping developing countries in the educational programmes by way of infrastructural facilities, teaching aids and expert guidance and financial assistance.

ACKNOWLEDGEMENTS:

The author conveys his thanks to the Head, CSRE for giving all encouragement in writing this paper.

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