Proceedings of the IGCP-UNESCO Workshop on Geoscience Education for Natural Resources Management. Joint Publication of UNESCO New Delhi and CAS in Geology, Panjab University, Chandigarh. Eds : Ramesh K. Kakar, Naval Kishore and Naresh Tuli (2004) pp 185-191

REVIEW OF POSTGRADUATE GEOSCIENCES COURSE CURRICULUM AND INTROCUTION OF A NEW PG COURSE IN EARTH RESOURCES AND ENVIRONMENTAL GEOSCIENCES

Kotha Mahender
Department of Earth Science, Goa University, Goa - 403 206

INTRODUCTION

Earth Scientists are continuously challenged by the need to discover, develop and manage natural resources of metallic ores, industrial materials, fossil fuels, construction materials and groundwater; and to use land responsibly for transportation networks, industry and housing. To deal with this and other related issues of the present day, the earth scientists in making require a broad foundation in geosciences, a thorough understanding of specialization and the ability to handle large amount of geo-information. To ensure the propagation of skills in understanding and managing such issues, it is very essential to review the present educational geoscience curriculum and the interdisciplinary programs at various levels. Also there is enough scope for introduction of geosciences at the school level. The present paper discusses the need for the revision of postgraduate geoscience curriculum taking the advantage of the technological developments. It proposes a module based PG course in Earth Resources and Environmental Geosciences.

The educational system has long been under stress at all levels, but movement toward reform - especially reform of science education in general and geosciences education in

particular - is gathering momentum. The geosciences are well suited to lead reforming processes, beginning at the school level, because the geosciences provide a natural window on the world of science. One of the foremost steps in the reform processes of geosciences curriculum development should be the introduction of new postgraduate course in geosciences with a Multimedia Interactive Instruction (MII) approach.

The impact of natural disasters on modern day society is rapidly increasing causing enormous stress to the environment. Problems arising from improper management of natural resources further add to the impacts of natural disaster. The impact of natural disasters can be reduced through a proper disaster management including disaster prevention (hazard and risk assessment, land-use planning and legislation, building codes), disaster preparedness (forecasts/ warning/prediction) and rapid and adequate disaster relief (OAS, 1990; UNDRO, 1991). Mitigation of natural disasters can be successful only when adequate knowledge is obtained through a proper educational curriculum. The postgraduate courses in geosciences offered today are biased towards more academic component rather than an applied nature. Therefore, this will be the right time to modify the course contents as well as course structure according the needs of the present society with the introduction of several new components related to the local and regional problems.

NEED FOR ADOPTION OF TECHNOLOGICAL ADVANCEMENTS AS EDUCATIONAL MEDIA

The availability of new computer and telecommunication technologies enable the educational institutions to offer global access to their training and education programmes.

The trend of the higher education goes to open learning (Latchem, 1998), which means that the learning approach is based on the needs of the student rather than the teaching institution. Multimedia technology and access to the internet has opened a new world in the environment of training confronting teachers and students. Multimedia is an integration of video, audio, text, graphics and animation, which are the common elements of multimedia. The demand for better access and presentation of information has given rise to the need of multimedia. Information technology can play a vital role in the process of educational change as it opens the access to a wealth of information and facilitates the process of inquiry with a high degree of flexibility (Quick and Castro, 1998) which is considered to be vital for the future of training especially developing countries like ours. The courses using multimedia technology provide diverse knowledge transfer capabilities and plenty of interactions to keep the student interested. Education in the geosciences is multifaceted and includes a broad spectrum of activities exposing a wide range of students to scientific principles and practices through discovery- and inquiry-based learning.

Traditional instruction relies on a lot of verbal explanation using the conventional chalk and blackboard and a series of overhead transparencies. The interaction between students and teachers is limited to verbal discussion and feedback leaving no scope to experiment with the medium and to explore a concept in all directions (Pea, 1991). Using the multimedia, the types of interactions are increased, such as, hearing, seeing, moving, thinking, modeling, speaking, writing etc. In the natural process it was found that people retain about 20% of what they see; 30% of what they hear; 50% of what they see and hear; and 80%of what they see,

Table- 1 **Curriculum for Post-Graduate (M.Sc/M.Tech) course in Applied Earth and Environmental Geoscienc**

Year/Term	Module	Papers to offered	Mode of Instruction	
First Semester	Core / Basic (16 Credits)	1. Introduction to Earth Sciences 2. Geomorphology 3. Historical Geology 4 Mineralogy &Geochemistry 5. Structural geology & Geotectonics 6. Petrology (Ig. Sed. Metamorphic) 7 Economic Geology & Mineral resources 8. Mining and Mineral Exploration 9. Advanced Geoscience Instrumentation	Regular Classroom	Student can chose any four papers from this module. This module includes usual laboratory and field exercises. A short field trip of 10 days duration can be planned either during the term or at end of the term
Second Semester	Elective (16 Credits)	1. Remote Sensing & GIS – Introductory Paper 2 Statistics & computer applications 3 Environmental geology 4. Petroleum Geology 5 Industrial Geology 6. Engineering Geology 7. Marine Geology 8 Paper on Local Geology Basin Analysis	Regular Classroom-cum-MII	Student has to compulsorily opt for the first two papers and can have the option to choose any two papers from the remaining. This module also includes usual laboratory and field exercises. Laboratory exercises are oriented towards applications in geology In addition to the regular examinations, student is expected to prepare for a seminar on any topic of his interest.
Third Semester	Specialization (16 credits)	1. Advanced course in Remote Sensing 2. Geographic Information Systems 3. Natural Hazard studies 4 Natural Hazard Management & Risk Assessment 5. Integrated Coastal Zone Management 6. Environmental system analysis & Impact Assessment 7. Land Degradation, Conservation & rehabilitation 8. Mineral Resource exploration & evaluation 9 Soil science-data collection & management. 10. Water Resource management 11. Cartography for earth sciences **Geo-technical studies.**	Multimedia Interactive Instruction Contact-Distance mode	In addition to the first two compulsory courses (sr nos. 1 &2) student has an option to select any two of the remaining The papers offered should also include the case studies. Laboratory exercises & Short duration field trips are to be related to the course offered by the student.
Final Semester	Project Module (16 credits)	Independent Dissertation/Project work. Project work should be based mainly on the papers chosen in core module.	Self / under supervision	Student is expected to undertake a problem related to local/regional interest in consultation with the project co-ordinator. Project work includes collection of data/samples, analysis and interpretation. At the end of the term the thesis/project report is to submitted and defended by the student.

hear and do. Since interactive multimedia systems have the facility for students to see, hear and interact with it, it is ideal tool for the educators to teach and train the students.

The goal of multimedia interactive instruction is to have better communication among the users (the students), the software media and the instructors (teachers). The achievement of multimedia lies in its ability to present rapidly a variety and quality of information to meet the needs of the students as multimedia provides a new dynamic environment for instructors, students and others in presentation of course material more appropriately.

PG COURSE IN EARTH RESOURCES AND ENVIRONMENTAL GEOSCIENCES

To effectively utilize the advances in technological evolution it is the right time for the introduction of module based or tailor made courses in Earth Sciences with specializations in Natural Resource Management, Natural Hazards Management and Geo-informatics. In module based educational curriculum, the student can choose the courses of his interest at least at the final year level. A typical module based postgraduate course curriculum should consists of basic/foundation/core papers at the entry level, elective and specialized papers at the intermediate level and an independent project work under the supervision of teachers/professionals at the final level.

Course Structure

The proposed course consists of three/four modules

1. Foundation/Basic Module - The students admitted to the course are offered a set of basic earth science papers in the first semester that will introduce them to the nature of earth, natural processes and products, and

description of various geological materials and landforms.

2. Programme/Core Modules-During this module students will follow a set core courses in geology to receive more in-depth knowledge and training in geology through a set of papers offered in the second term.
3. Specialization/Elective Module-During this specialization/ free choice module, the students will be free to chose specialized papers to obtain training in applications. Most of the module is based on the Multimedia Interactive Instruction approach.
4. Project Module - During this module the students will be offered a small project related to the local problems and are expected to carry out the field work for the collection of field data and samples, do the laboratory work and to prepare a report.

The detailed list of papers to be offered in each of the above modules along with the minimum requirements is given in Table1. The details of syllabus for Modules 1 and 2 can be found in postgraduate course curricula of many universities which can be modified according the local needs and available facilities. As regards to the detailed syllabus for the Module 3 and 4, the papers offered at Indian Institute of Remote Sensing (Indian Space Research Organization), Dehradun can be adopted with modifications as per the institutional needs.

Flexibility/Free Choice Structure of the Course

The course proposed is to be quite flexible so that it can give opportunity to the student to undertake the program on part-time as well as full-time basis. Also option should be

there for the student to obtain a certificate (if only one module is opted), diploma (if two modules are opted) and a Professional Masters (with the first three modules) and Master's Degree for the completion of all the modules. The course should also provide provision for the students who have completed first module/first two modules/first three modules to join directly the subsequent modules even at later years. This provision helps the in-service candidates for pursuing higher studies. Provision subject to availability of the facilities, should also made possible for the student to opt the module in distance mode with the help of internet (at least the third module which is more Multimedia Interactive Instruction based one).

REFERENCES

Latchem, C., (1998). A Global perspective on flexible delivery in Virtual mobility: New Technologies and Internationalization of higher education. M. van der Wende (ed), NUFFIC June 1998, ISBN 90-5464-029-4, 25-48.

OAS, (1990). Disaster, Planning and Development : Managing natural hazards to reduce loss, Department of Regional Development and Environment Organization of American States, Washington, USA, 80pp.

Pea, R. D., (1991). Learning through multimedia, IEEE Computer Graphics and Applications, July, 58-66.

Quick, S. (1998). A and Claude de Moura Castro. "Lessons from the seminar" in 'Education in the information Age", C. de Moura Castro (Ed.), Inter-American development Bank, New York, ISBN 1-886938-33-4, 9-13.

UNDRO, (1991). Mitigating Natural Disasters, Phenomena, Effects and Options.