MAHARSHI DAYANAND UNIVERSITY ROHTAK

Copy of extract of Reso. No. 31 of Executive Council's meeting held on 31-03-2022

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31. Establishment of New Department of Earth Sciences under the Faculty of Physical Sciences

Considered the recommendations of the Faculty of Physical Sciences made vide Reso. No. 4 of its meeting held on 21.02.2022 that the new Department namely, Earth Science be established under the Faculty of Physical Sciences (**Annexure A/36 pages 121-132, already circulated**) and the admission be made only after the requisite number of posts of teaching and non teaching staff are sanctioned and the necessary infrastructure is provided; and the following recommendation of the Academic Council made vide Reso. No. 13 of its meeting held on 28.03.2022:

RESOLVED THAT THE PROPOSAL AS ABOVE BE RECOMMENDED TO THE EXECUTIVE COUNCIL FOR CONSIDERATION AND APPROVAL.

RESOLVED THAT THE RECOMMENDATIONS OF THE ACADEMIC COUNCIL AS ABOVE BE APPROVED.

[ACTION BY D.R. (ACADEMIC)]

(ACADEMIC BRANCH)

Ends. No.AC-I/2022/7493-7561 Dated 19/04/2022

Copy of the above is forwarded to the following for information and necessary action.

1. All Deans of the Faculties, M.D. University, Rohtak
2. All HODs/Directors of University Teaching Departments/Institutes, M.D. University, Rohtak
3. Director, MDU-CPAS, Gurugram
4. Director, IQAC, M.D. University, Rohtak
5. Controller of Examinations, M.D. University, Rohtak
6. Director, University Computer Centre for uploading the same on the University Website
7. Finance Officer, M.D. University, Rohtak
8. Executive Engineer, Engineering Branch, M.D. University, Rohtak
9. A.R./D.R. (R-I,R-II,R-III & R-IV, Secrecy, Conduct and R&S), M.D. University, Rohtak
10. D.R. Estt. (T) and Estt. (N.T.) , M.D. University, Rohtak
11. OSD/PA to Vice-Chancellor/Registrar/Dean Academic Affairs (for kind information of the Vice-Chancellor/Registrar/Dean Academic Affairs), M.D. University, Rohtak.

19/04/22

Superintendent (Academic)

Annexure-A/36

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
(Established under Haryana Act No. XXV of 1975)
'A+' Grade University accredited by NAAC

MINUTES OF THE MEETING OF THE FACULTY OF PHYSICAL SCIENCES HELD ON 21.02.2022 AT 11:00 A.M. IN THE COMMITTEE ROOM OF SWARAJ SADAN M.D.UNIVERSITY, ROHTAK

Member Present:

Chairman

1. Prof. A.S.Maan
2. Prof. Sapna Garg
3. Prof. Ratna Raj Laxmi Malik
4. Prof. Rajeev Kumar
5. Prof. Nasib Singh Gill
6. Prof. Sanjay Kumar Dahiya
7. Prof. Jitender Singh Sikka
8. Prof. Sunieet Gill
9. Prof. Suresh Chander Malik
10. Prof. Rajender Singh
11. Dr. Anil Ohlan, Assistant Professor
12. Dr. Naveen Kumar, Assistant Professor
13. Sh. M.L. Batra, Deputy Registrar (Academic)

1. Confirmed the minutes of the previous meeting of the Faculty of Physical Sciences held on 07.01.2021 (already circulated).

2. Considered the action taken by the Vice-Chancellor in approving the recommendations of the PG Board of Studies in Computer Science & Applications made videReso. No. 2 of its meeting held on 30.09.2021 that the minor changes in the Syllabus of few papers in M.Sc.(Computer Science) be made as per annexure-I page 1-3 with effect from the session 2021-22 (already circulated).

RESOLVED THAT THE ACTION TAKEN BY THE VICE-CHANCELLOR AS ABOVE BE APPROVED.

3. Approved the action taken by the Vice-Chancellor in approving the recommendation of the PG Board of Studies in Computer Science & Applications made vide Reso. No.3 of its meeting held on 30.09.2021 that the nomenclature of the following Courses of MCA 2 year Program be modififed as under from the session 2021-22:-

Program	Existing	Proposed
MCA 2 year, 3rd semester	Industry Internship Report/Project Report/Dissertation-I	Industry Internship/Project-I
MCA 2 year, 4th semester	Industry Internship Report/Project Report/Dissertation- II	Industry Internship/Project-II

RESOLVED THAT THE ACTION TAKEN BY THE VICE-CHANCELLOR AS ABOVE BE APPROVED. FURTHER, RESOLVED THAT THE MATTER BE RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.

4. Considered the recommendations of the Committee made in its meeting held on 24.06.2021 constituted by the Vice-Chancellor that a new Department Earth Science may be established under the Faculty of Physical Sciences (annexure-II, pages 4-14) (already circulated).

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RESOLVED THAT THE NEW DEPARTMENT NAMELY, EARTH SCIENCE BE ESTABLISHED UNDER THE FACULTY OF PHYSICAL SCIENCES AND THE MATTER BE RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.

Further resolved that the admissions be made only after the requisite number of posts of teaching and non teaching staff are sanctioned and the necessary infrastructure is provided.

22/03/22
REGISTRAR

22/3/22
DEAN FACULTY OF PHYSICAL SCIENCES

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

roceedings of Meeting held on 24.06.2021

A meeting of the committee constituted by the Vice-chancellor for establishment of ew Department under the Faculty of Physical Sciences. M. D. University Rohtak was held n 24.06.2021 in the Department of Physics. The committee held deliberations regarding etting up a new Department in Geophysics/Geology and finally resolved that the Department f Earth Sciences be proposed with a mandate to offer Dual Degree (B.Sc./ M.Sc.) programs n Geology/ Geophysics. The committee further decided that these programs shall be largely ased upon the model of institute of national importance and opted to adopt the programs ffered by IISERs. Thereafter, the detailed proposal (enclosed) was finalized and approved or further necessary action.

(A. S. Maan) (Bhagwan Singh) (Rajesh Parmar)

(Rajesh Punia) (Sajjan) (Anil Ohlan)

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

(NAAC 'A+' Grade Accredited University)

PROPOSAL

For

DEPARTMENT OF EARTH SCIENCES

Under the

FACULTY OF PHYSICAL SCIENCES

Vision

- To build professional education and applied research in Hydrocarbon Exploration, Groundwater Exploration, Earthquake studies and seismic hazard zonation for various stakeholders, viz., academia, governance, industry and civil society with special reference to Haryana.
- To encourage young graduates to participate in development of Hydrocaron and water resources in a responsible manner. The Programs offered are aimed at providing trained manpower in the field of Earth Sciences to cater the needs of Exploration and Production (E&P) Industry and service providers in the field and to become an internationally recognized leader in integrating research excellence and education.

Mission

- To offer technology driven dual degree B.Sc. and M.Sc. (Geophysics and Geology) programs.
- Capacity building in Oil/Gas, Groundwater exploration, disaster management and hazard mitigation technologies; viz data collection, software development, developing new technologies. The stakeholders may be from Academia, Government, Semi Government and Industry.
- Consultancy for Government, Industry and Civil Society.

Earth Sciences

Earth science, also referred to as geoscience, is a broad term for the study of the planet earth. There are many disciplines within the earth science, such as geophysics, geology, geography, oceanography, soil science, ecology, atmospheric sciences including meteorology and climatology. Earth science jobs often combine fieldwork with Geographical Information System (GIS), research, modelling and data analysis.

There are several subjects under Earth Sciences, known as sub-disciplines or subspecialties, which focus on particular aspects. These are:

Climate Science, Meteorology, Ocean Science, Mineralogy, Atmospheric Science, Seismology, Disaster Management, Geology, Geophysics, Polar Science and Cryospheric Science, Geo-Engineering, Paleo-Climatology, Biogeochemistry, Geomorphology, Geography, Geomagnetism, Chemical Oceanography, Applied Geophysics, Oceanography, Biogeochemistry, Marine Geophysics, Geoinformatics, Remote Sensing and GIS, Geospatial Studies, Applied Geology, Marine Geology, Environmental Geology, Mountain Geology, Earth and Planetary Science, Oil and Mining, Applied Geoscience, Hydrology etc.

Career Opportunities in Earth Sciences

Earth science is a broad field, and career tracks are generally determined by specialization and level of education obtained. Earth scientists can seek work in hydrology, soil science, meteorology, oil and gas extraction or geology. Employers include government agencies, consulting firms, earth resources and environmental management services and the oil and gas industry. Jobs related to earth science include positions like Geoscientist, Geologist, Hydrologist Meteorologist, Geophysicist, Geohydrologist, etc.

Earth Science comprising the core subject(s) related to Earth structure or processes provides job opportunities in academia, government, environmental consulting, petroleum and mining sector. Higher studies/research work may provide global opportunities in various national/international missions like, Himalayan studies, Ocean drilling program, Arctic Mission, Antarctic Mission or even extraterrestrial studies i.e. comet mission or space exploration program.

Research Centres/ Institutions

Some of the prominent national institutions offering opportunity for placement and/or the study/research work are:

A. National Institutes:

- *CSIR-National Geophysical Research Institute, Hyderabad*
- *Institute of Seismological Research, Gandhi Nagar*
- *Indian Space Research Organization, DoS, Banglore*
- *National Centre for Earth Science Studies, Thiruvananthapuram*
- *National Centre for Antarctic and Ocean Research, Goa*
- *National Centre for Seismology (NCS), MoES*

- *Indian National Center for Ocean Information Services (INCOIS), Hyderabad.*
- *National Centre for Medium Range Weather Forecasting (NCMRWF), Noida*
- *National Institute of Ocean Technology, Chennai*
- *Integrated Coastal and Marine Area Management Project Directorate (ICMAM PD), Chennai*
- *Wadia Institute of Himalayan Geology, Dehradun*
- *National Centre for Seismology, NOIDA*
- *National Institute of Oceanography, Goa*
- *Centre for Marine Living Resources & Ecology (CMLRE), Kochi*
- *India Meteorological Department (IMD), New Delhi*
- *Indian Institute of Tropical Meteorology (IITM), Pune*
- *Department of Earth Science, IIT, Roorkee*
- *Department of Geophysics and Geology, IIT Kharagpur*
- *IIT (ISM), Dhanbad*
- *Centre for Earth Sciences, Indian Institute of Science, Bangalore*
- *School of Earth, Ocean and Climate Sciences, IIT Bhubaneshwar .*
- *Central/ State Ground Water Boards*
- *Central/ Regional/ State Remote Sensing Centers*
- *IISER, Pune*
- *IISER, Kolkata*
- *IISER, Bhopal*

B. Universities:

University of Allahabad; Lucknow University; University of Delhi; Anna University, Chennai; Banaras Hindu University; Aligarh Muslim University; University of Jammu; University of Kolkata; Punjab University, Chandigarh; University of Madras; M. S. University of Baroda; Savitribai Phule Pune University; Kurukshetra University, Kurukshetra; Punjab University Chandigarh; Guwahati University; Presidency University, Kolkata; Kumaun University, Nainital; Sikkim University, Gangtok; Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur; Bharathidasan University, Tiruchirapalli; Mohanlal Sukhadia University, Udaipur; Central University of Karnataka; University of Kerala, Thiruvananthapuram; Jadhavpur University, Kolkata; Annamalai University, Parangipettai; Andhra University, Visakhapatnam; Pondicherry University, Port Blair, Osmania University, Hyderabad;

Scope and Career Prospects:

The most popular occupations for professional career comprise Geophysicist, Geologist, Scientist, Analyst, Assistant Professor/Professor, Scientific officer, Assistant Manager, Consultant, Writer/author, Scientific Journalist/editor, Asst. Director/Dy. Director, Technical officer or specialist, Post-Doctoral Fellowship (PDF), Mining Engineer, Oceanographer, Expeditioner in various organizations such as Petroleum and mining companies, Contracting firms, Consulting geophysics, geology and engineering firms, Governments, educational

institutions, Environment protection firms, Geotechnical firms, Construction and utility companies, Environmental consulting firms, Engineering firms etc.

Geophysics and Geology are the mainstay of Earth Sciences as these provide an insight of the structure and processes involving the Earth and help to understand and utilize the information gained in multiple domains.

Introduction:

A. Geology

Nowadays, a career in Geology is gaining a lot of popularity. It is emerging as a career that opens the doors to a plethora of opportunities for people aspiring to become Geologists. It is the branch of science that deals with the study of the earth, its environment, history, minerals etc. A scientist who studies the earth's crust to obtain an accurate picture of its structure, history, and composition is termed as a Geologist. A Geologist studies the composition of the earth, assesses the natural disasters and its effects on the environment, explores areas rich in under-water resources, oil, natural gas and minerals and determines the quality of soil by conducting geochemical and geophysical tests.

The main function of Geologists is to understand the history of our planet and how its materials, structures, processes and organisms have changed over the period of time. They perform their job by making geologic maps and charts, analyzing aerial photographs, rock samples and other data sources to locate deposits of natural resources, preparing written scientific reports, and conducting laboratory tests on samples collected in the field. Overall, Geologists play a vital role in exploring the mineral wealth and natural resources.

B. Geophysics

Exploration using geophysical methods is a standard procedure to look for hydrocarbon (Oil/Gas) and water resources. Geophysical technology has proven to be effective method in identifying energy resources, preparing for natural disasters and studying environmental effects on ground water. Geophysical methods have been employed during last century and many methods were developed for application in other fields. The development work gained pace in last fifty years and has led to a sea-change in our understanding of methodologies and application. The advent of computers has dramatically altered the landscape of resource exploration. The faster acquisition techniques, more accurate instruments and ever efficient software has dramatically increased our reach to subsurface resources and allowed us to monitor the data in real time. India has been part of the Geophysical revolution in last fifty years. Though the geophysics branch is well established in few niche institutes in India but it is still not widely studied and the true potential of this branch needs to be realized for advancement of technology in context to India's energy and water needs. Keeping in view the importance of this branch, Maharishi Dayanand University, Rohtak, already taken initiative for establishing many market/ industry oriented courses in last few years. The University has now planned to start UG and PG programs in Geophysics which will not only impart education to the students but will also strengthen Research & Development activities in this field. The aim is to provide a platform for advancement and application of current technologies for hydrocarbon, groundwater, mineral exploration and seismic hazard

studies.

Rationale

India is having rapid economic growth phase during last twenty years. The energy sector forms the base on which country's development depends. The water security is also emerging as very important field. Especially in light of environmental changes the "water wars" could very well come out true in future. India was third largest importer of Oil during financial year 2020. However, India was 23rd largest producer of Oil in year 2020. This difference in demand and supply of oil creates various geopolitical challenges for our country. The lack of rapid development in exploration, development and management of resources, have been contributing to:

i. Imbalances in demand and supply.
ii. Dependence on coal as fuel for energy source.

Although significant works has been done in the past to obtain large amounts of geophysical data, our oil demand is constantly more than oil production. Though significantly large data sets have been obtained through geophysical acquisition systems, there remains concern about:

i. Lack of any substantial Oil/Gas discovery in last decade.
ii. Global warming causing depletion of water resources like melting of glaciers, change in river flow etc.
iii. Depletion of groundwater resources in various parts concurrent with dilution in groundwater quality
iv. Need for Integrated Water Resources Mapping for optimal utilization
v. Need for detailed geotechnical studies for disaster mitigation
vi. Seismic Risk reduction/ seismic zonation studies

Keeping this in view, there is a strong need for research, development, and application of geological and geophysical methods to provide quality education to tackle present and future challenges associated with depletion of resources and natural calamities like earthquake. It is the only the advancement of technologies which will help in identifying and securing new reservoirs.

Current Status of Geology and Geophysics in India

India is a vast country with a very large population. The development of society and country is a simultaneous process which has challenges and complexity associated with it. The good quality of life needs basics things: Fresh water supply, Food safety, Electricity supply, Infra structure development, disaster management etc. Each of the above points is associated directly with geophysics field. It is the exploration work that will make sure of future water supplies, fuel for energy supplies, earthquake studies for disaster management and environment applications that will determine the quality of life for future generations. Even future technologies like solar power depends upon rare earth elements like lithium-ion battery which needs cobalt, lithium, nickel etc. The rare-earth metals need to be explored and extracted from the Earth using geophysical technology. In very near future there is likely to be shortage of battery minerals. Mineral exploration is one aspect which cannot be emphasized enough. It is urgent necessity to make coming generations to be future ready. In this rapidly changing scenario the wealth of future generations will depend on the investment made now for ensuring sustainable development. One that secures our future and provides for inclusive

development.

The geology and geophysics industries are presently witnessing tremendous opportunity within the country as the ONGC is carrying out many exploration activities on and off-shore. There are recent exploration projects in Indo-Gangetic plain in Punjab, Haryana and western Uttar Pradesh. The most part of this Indo-Gangetic plain has never been explored before. India is actively trying to move towards gas-based economy from the coal powered economy. This move away from coal and towards Gas will bring huge benefits in curbing greenhouse gases. There was recent collaboration by ONGC and ExxonMobil for the joint technical study and cooperation in frontier areas like deep water and other Petroleum Exploration License (PEL) blocks on east- and west blocks. As the Indian Government strives towards making a shift from coal powered to gas powered economy, geophysics is expected to assume a greater significance in the future. The central government is actively involved in disaster management using expertise from seismology field. The Indian government is actively involved in seismic hazard studies and has taken steps for microzonation study of highly populated areas for hazard mitigation. Central and State Governments have mandated the use of seismic hazard maps in many large scale construction projects.

Course Employability

The Geology and Geophysics fields have a huge potential in India. The Oil/Gas industry forms the main employment stream but there are many jobs in mineral exploration (Gold, Diamond, Uranium, and Potash etc.), groundwater exploration and construction projects. The Ground Penetrating Radar (GPR) is one such application which is required to know subsurface layout of pipelines before any digging activity can take place in construction projects like railway stations, dams, bridges etc. There is a shortage of skilled professionals in this highly specialized field. Indian economy is on a growth trajectory, the applications of geophysics are increasing with economic development. The pervasive use in diverse disciplines ensures a wide variety of employment opportunities which are as follows:

Central/State Governments	Oil and Natural Gas corporation Ltd (ONGC), Oil India Limited (OIL), National Geophysical Research Institute (NGRI), Hyderabad, Wadia Institute of Himalayan Geology, Dehradun, Indian Seismological Research Institute (ISR), Gandhinagar, Indian Meteorological Department (IMD), New Delhi; National Center of Seismology, Ministry of Earth Science, Noida; Central Ground water Board (CGWB), State Ground Water Boards, National Institute of Oceanography (NIO), Central Water Commission, New Delhi, State Groundwater Boards in various states, Coal India Ltd, HSCO, Geological Survey of India (GSI), Indian Bureau of Mines (IBM), Central Ground Water Board (CGWB), Indian Space Research Organization (ISRO), Bharat Petroleum Corporation Limited (BPCL), Minerals and Metals Trading Corporation (MMTC), Bharat Gold Mines Ltd, Mineral Exploration Corporation Ltd, Hindustan Zinc Ltd, Ircon, Hindustan Copper Ltd, National Mineral Development Corporation, Kudremukh Iron Ore company, Steel Authority of India Ltd

Academic Institutions	Oil and natural gas corporation (ONGC), Dehradun is a premier institute, for oil exploration, National Geophysical Research Institute, Hyderabad, Indian Seismological Research (ISR), Gandhinagar, IISER, Pune, IISER, Kolkata, IISER, Bhopal etc. Few academic institutes have post of scientific officer, Research Scientist and Research Associates etc.
Overseas	There is scope for higher education in Geology and Geophysics in countries like USA, Canada, Netherlands, China, France, Germany, and Australia. There is a demand for oil exploration and groundwater exploration professional in USA and middle east.
Private Sector	As fossil fuels are getting consumed for energy supply, the Oil/Gas exploration needs better technologies and greater effort to extract last remaining hydrocarbon from the deeper depths. Geophysicists are often hired as scientists, managers, technologists etc. Many companies like Exxon Mobil, Royal Dutch Shell, Reliance Petroleum, Essar Oil, Cairns Energy, CGG Veritas, and Saudi Aramco explore Oil/Gas or provides services to oil companies. The groundwater is a depleting source and it is expected to generate many jobs in future.
Self-Employment	After obtaining the professional degree, a graduate can start his/her own exploration company as an entrepreneur.

Research & Academic programs Proposed

1	**Name of Center**	**Center of Geophysics**		
	Proposed Courses	Name of course	Duration	Intake
		i. B.Sc.-M.Sc. Dual Degree in Geophysics with an exit option after 3 years as B.Sc. (Pass)	3 year + 2 year	30
		ii. B.Sc.-M.Sc. Dual Degree in Geology with an exit option after 3 years as B.Sc. (Pass)	3 year + 2 year	30
		Ph.D. in Earth Sciences	As per UGC Guidelines	
	Eligibility: Students having Physics and Mathematics in 12th as two major subjects are eligible to apply for this program			

Significance/Expected outcome

Besides teaching and training, focus of the department will be on Research & Development in the field of Oil exploration, Water Exploration, Environment studies, Seismic Hazard, etc. Haryana will be the main focus. However, the coverage area may be expanded beyond State boundaries as per need and requirements of the stakeholders.

Present Status of Geophysics in Indian Universities/ Institutes

Sr. No	Name of University/ Institute	Courses Offered
1.	Kurukshetra University, Kurukshetra	M.Sc. (Tech) in Applied Geophysics – 3 years and Ph. D.
2.	Banaras Hindu University, Varanasi	M.Sc. (Tech) Geophysics – 3 years and Ph. D.
3.	Andhra University	M.Sc. (Tech) Geophysics – 3 years, M. Sc. Marine Geophysics 2 years and Ph. D.
4.	Indian Institute of Technology, Dhanbad	M.Sc. (Tech) in Applied Geophysics – 3 years, Integrated M. Sc. (Tech) – 5 years.
5.	Indian Institute of Technology, Mumbai	M. Tech. Exploration Geophysics – 2 years.
6.	Cochin University of Science and Technology, Cochin	M. Sc. In Marine Geophysics - 2 years and Ph. D.
7	Osmania University	M. Sc. Geophysics - 2 years and Ph. D.
8	Indian Institute of Technology, Roorkee	M. Tech. (Integrated) in Geophysical Technology 5 years and Ph. D.
9	Indian Institute of Technology, Kharagpur	M. Sc. Integrated in Exploration Geophysics 5 years and Ph. D.
10	IISER, Kolkata	B.S.-MS Earth Science
11	IISER, Pune	B.S.-MS Earth Science
12	IISER, Bhopal	B.S-MS Earth and Environmental Science

Infrastructure Requirements:

A. **Manpower**

S. No.	Posts to be created	No. of Posts required	Salary expenditure
1	Professor (01- Geophysics; 01-Geology)	2	As per UGC/State government norms
2	Associate Professor (02-Geophysics; 02-Geology)	4	
3	Assistant Professor (04-Geophysics; 06-Geology; 04-Physics; 04-Mathematics; 02 Geography)	20	
4	Lab attendant	7	
5	Store keeper	1	
6	Clerk/JDEO	1	
7	Peon	2	

B. **Infrastructure**

S. No.	Details of infrastructure
1	**Building Dimensions:** Four Story building having ~400*100 sq. feet area HoD Office; Departmental Office; Seminar Hall; Faculty Rooms (26); Committee Room; Store; Washroom etc. Lecture Hall (07 nos); PG labs (04 nos), UG labs (03 nos) Research Labs (10 nos)
(For Labs/Classrooms) **For Office/Faculty Rooms)**	**For Labs:** Personal Computers (60) Table/Chairs (60 each) For Class Rooms: Table /Chair (60 each) LCD Projectors, Smart Class Boards, Cupboards, Printers, Scanners etc. PC (28nos) including Printer /Scanners Office Tables/ Chairs, Book Shelves, etc. Basic Furniture; CCTVs etc.