Bachelor of Science (BS) in Applied Geophysics

(Explore the Earth Beneath Your Feet and Power the Future!)

Course Structure and Curriculum Highlights

Department of Earth Sciences Indian Institute of Technology Bombay

About the Programme

With the rapid advancements in artificial intelligence (AI) and the green energy revolution of the 21st century, there is a growing demand for professionals who deeply understand the Earth and can harness its resources sustainably. Applied geophysics stands at the intersection of natural science, technology, and innovation, making it a key discipline in addressing the challenges of today's world.

Industries such as oil and gas, mining, renewable energy, environmental consulting, and disaster management require skilled experts trained not only in geophysical theory but also in practical, computational, and analytical techniques adaptable to diverse applications.

The BS in Applied Geophysics is a unique program designed to prepare future-ready scientists and engineers who want to blend cutting-edge research with hands-on fieldwork, data analytics, and high-performance computational modelling. This program bridges the gap between traditional core geoscience education and emerging interdisciplinary fields, including renewable energy exploration, carbon capture and storage (CCS), critical minerals exploration, climate change, planetary exploration, and disaster risk and mitigation.

Graduates of the BS in Applied Geophysics will be well-equipped with the knowledge and skills needed to contribute effectively to these sectors and tackle complex geoscientific challenges.

Strong foundations in	Advanced training
physics, mathematics,	In AI, remote sensing,
and earth sciences	and geophysical data
	modelling
Field experiences and	Opportunities for
industry-oriented	research, internships,
projects	and global exposure

Key Features of the Programme

The programme offers an interdisciplinary curriculum that blends core geoscience with advanced data analytics, artificial intelligence (AI), and high-performance computational modelling. It emphasizes hands-on learning through rigorous fieldwork, industrial training, lab experiments, and real-world case studies in the energy and environmental sectors. Additionally, it provides specialized training in high-performance computing (HPC) to process and analyze the large-scale geophysical datasets for both research and industry applications.

Curriculum Highlights

The curriculum is designed to equip students with quantitative, analytical, and computational skills essential for addressing complex geophysical challenges related to natural resources, environmental sustainability, and natural hazards through departmental core courses, labs, and electives. In addition to departmental courses, students will engage with a broad spectrum of institute-wide common (science & engineering) courses, and electives (STEM, HASMED, and flexible), ensuring a well-rounded and versatile academic experience as a part of this BS-programme.



Detailed Course Structure (Semester-wise)

SEMESTER I						SEMESTER II					
		L	Т	Р	С			L	Т	Р	С
GPXXX	Solid-Earth Geophysics (DIC-1)	3	0	0	6	MA110	Maths-2 (two half courses) (Linear Algebra & DE-1)	3	1	0	8
MA105	Maths-1 (two half courses) (Calculus I & II)	3	1	0	8	PH110	Physics (two half courses)	3	1	0	8
CH111	Chemistry (two half courses)	3	1	0	8	CS101	Computer Programming & Utilization	2	0	2	6
CH117	Chemistry Lab	0	0	3	3	PH117	Physics Lab	0	0	3	3
MS101	Makers Space/WS/Drawing				8		Introduction to HASMED (Department: HSS + IDC)				8
	NCC/NSS/NSO				P/ NP		NCC/NSS/NSO				P/ NP
	TOTAL				33		TOTAL				33

SEMESTER III						SEMESTER IV					
		L	Т	Р	С			L	Т	Р	С
CL205	AI and Data Science				6	GPXXX	Introduction to Earth System Science (DIC-2)	3	0	0	6
EC101	HASMED-Core1 (Economics)	3	0	0	6	GPXXX	Potential field theory and Electrical methods of Prospecting	3	0	0	6
GPXXX	Elements of Mineralogy and Petrology	3	0	0	6	GPXXX	Basics of Structural Geology & Stratigraphy	3	0	0	6
GPXXX	Engineering Geology and Hydrogeology	3	0	0	6	GPXXX	Gravity and Magnetic Prospecting	3	0	0	6
GPXXX	Elements of Mineralogy and Petrology Lab	0	0	3	3	DE250	HASMED-Core-2 (Design Thinking)				6
GPXXX	Engineering Geology and Hydrogeology Lab	0	0	3	3	GPXXX	Basics of Structural Geology & Stratigraphy Lab	0	0	3	3
ES250 and HS250	Environmental Studies				6	GPXXX	Gravity and Magnetic Lab	0	0	3	3
	TOTAL				36		TOTAL				36

SEMESTER V						SEMESTER VI					
		L	Т	Р	С			L	Т	Р	С
GPXXX	Earthquake Seismology	3	0	0	6	GPXXX	Seismic Data: Acquisition, Processing and Interpretation	2	1	0	6
GPXXX	Electromagnetic methods of Prospecting	3	0	0	6	GPXXX	Geophysical Well logging	2	1	0	6
GPXXX	Geophysical Data Processing and Analysis	3	0	0	6	GPXXX	(Dept. Elective-1) Geophysical Inversion	3	0	0	6
GPXXX	HASMED Elective-1				6		HASMED Elective-2				6
GPXXX	Earthquake Seismology Lab	0	0	3	3		STEM Elective-I	3	0	0	6
GPXXX	Electromagnetic methods of Prospecting Lab	0	0	3	3	GPXXX	Geological Field work	0	0	2	2
						GPXXX	Geophysical Field work	0	0	2	2
	TOTAL				30		TOTAL				34
	Honors Elective -1				6		Honors Elective -2				6

SEMESTER VII						SEMESTER VIII					
		L	Т	Р	С			L	Т	Р	С
GPXXX	(Dept. Elective-2) Seismic Imaging	2	1	0	6	GPXXX	(Dept. Elective-3) Geo-Spatial Techniques and Process Geomorphology	3	0	0	6
	Flexible Elective – I	3	0	0	6		Flexible Elective – III				6
	Flexible Elective – II				6		Flexible Elective – IV				6
GPXXX	BS Project-1/ Equivalent Elective (STEM/Dept./Institute)	3	0	0	6	GPXXX	BS Project-2/Equivalent Elective (STEM/Dept./Institute)	6	0	0	12
	STEM Elective-II				6		Flexible Elective – V				6
GPXXX	Industrial Training	0	0	2	2						
	TOTAL				32		TOTAL				36
	Honors Elective – 3				6		Honors Elective – 4				6

Note: Geological and Geophysical Field work will be conducted in December at the end of semester V. Industrial Training will take place during summer vacation after Semester VI.

Department Elective Courses									
Autumn	Spring								
Airborne Geophysics	Marine Geophysics								
Seismic Stratigraphy	Geodesy, GPS and Surveying								
Machine Learning Applications in Geosciences	Near-surface Geophysics								
Satellite Geophysics and Applications	Principles of Petrophysics								
Computational Geophysics									