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Item No. – 4.1

UNIVERSITY OF MUMBAI



Syllabus for the Interdisciplinary B. Sc. Module: Geology

(Credit Based Semester and Grading System with
effect from the academic year 2014–2015)

Interdisciplinary B.Sc Syllabus - Modules in GEOLOGY
To be implemented from the Academic year 2014-2015

Preamble

The Rational:

The basic thoughts and understanding in the programme of BSc with interdisciplinary science is, many or around 60 % students after their graduation leave higher education and opt for jobs. These jobs are in Government offices, Municipal Corporations, private companies or, in schools as teachers. They are absorbed as science graduates. Even when the students opt for management carriers they are considered as science graduates at entry level. Thus the specialization or the major subject does not have relevance unless the students want to pursue the carrier in the field of research or higher education. Similarly those who enter in jobs of teachers find it difficult to teach other science subjects as required, than the subject of specialization, because they are not exposed to those branches of science.

With all these requirements of job market University has decided to introduce the graduation course in science as BSc interdisciplinary science. In this a learner can take two subjects from science discipline at first year level, from among these one subject can be selected at Second Year and the same will be continued as major subject along with applied component for final year B. Sc. The learner will earn 70 credits as explained in this subject like the existing system. In first year instead of the third subject the learner can opt any subject from the prescribed modules and as per the availability in the college / institute where admitted. These modules can be called as interdisciplinary modules. At the second year level instead of the second minor subject the learner can opt the modules from the interdisciplinary modules. The foundation course is also modified for interdisciplinary science which includes topics like Law, Economics, Sociology, Political Science etc.

Thus the learner will earn 70 credits in the major subject as obtained by any student in current traditional method. The remaining 50 credits can be earned from the interdisciplinary courses. The modules of interdisciplinary courses can be from science branches or arts / commerce / law / fine arts branches.

Interdisciplinary Modules in Geology:

In the present context, Geology as a subject is offered as a Major subject with a combination with subjects like Maths, Physics, Chemistry and Life Sciences. Through the past years, a considerable number of queries regarding the availability of the subject as in combination with other subjects have been asked by the student community. Many free lancers and graduates from other streams (Arts, Commerce, Engineering etc) have satisfied their passion for learning about the subject through the certificate course in Geology offered by our university.

Keeping the spirit and need of an Interdisciplinary BSc in mind, where the learner wishes to gain basic supporting knowledge in an allied field other than his or her specilisation, the syllabus in geology has been framed. The outcome at the end of completion of the first course is to have a learner with the basic knowledge about the history and beginings of the subject of geology, its applications in day to day human life. It will also lay stress on identification of the most

commonly found minerals and rocks. The practicals and the mandatory field work will supplement the theoretical concepts. The knowledge and experience gained by the learner will enable him or her understand the different commercially available rock material used in building construction and also the commonly used minerals as ornamental stones.

If the learner wishes to gain further insights into the subject, he or she can opt to take the second module which is will have module I as a pre-requisite. Module II will deal with concepts of maps, topographical maps from Survey of India, their indexing, interpretation of geological structures from contour configuration. A unit will be dedicated to the understanding of rock structures and their origin. The thirs unit will be on understanding and identifying commonly available fossils. This module too will be supplemented by practicals and mandatory fieldwork.

**Module I
Theory**

Course	Title	Credits	L / Week
USIDGE01	Earths Origin and Introduction to Minerals and Rocks	2	3

Practicals

USIDGEP01	Practicals of Course USIDGE01	1	3
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**Module II
Theory**

Course	Title	Credits	L / Week
USIDGE02	Understanding Maps, Rock structures and Fossils	2	3

Practicals

USIDGEP02	Practicals of Course USIDGE02	1	3
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Detailed Syllabus for Interdisciplinary Courses in Geology
To be implemented from the Academic year 2014-2015

Module I (Detailed Syllabus)
Theory

Course	UNIT		Credits	L / Week
USIDGE01	Earths Origin and Introduction to Minerals and Rocks			
	I	<p>Earth in the Solar System: (15 Lectures)</p> <p>Geology and its perspectives.</p> <p>Earth in the Solar System: Earth's Origin, size, shape, mass, density, rotational parameters.</p> <p>Earth's Internal structure: core, mantle, and crust.</p> <p>Hydrosphere, Atmosphere and Biosphere: characteristics and elemental abundance in each constituent. Convection in the earth's core and production of its magnetic field.</p> <p>Age of the earth.</p>	2	1
	II	<p>Mineralogy: (15 Lectures)</p> <p>Chemical bonds and formation of compounds.</p> <p>Minerals: definition, chemical compositions, classification and silicate structures.</p> <p>Physical properties of minerals: colour, streak, luster, diaphaneity, form, habit, cleavage, fracture, hardness, specific gravity, and electrical and magnetic properties.</p> <p>Isomorphism, polymorphism and pseudomorphism.</p> <p>Mineral groups</p> <p>Introduction to rock forming minerals: Feldspars, Silica,</p>		1

		Pyroxene, Amphibole, Mica, Olivine. Ore-forming and industrial minerals		
	III	Igneous Petrology (15 Lectures) Rocks: definition, their classification. Magma: definition, composition, origin, Mode of occurrences, Intrusive and Extrusive forms. Textures and structures. Classification based on grain size and mineral composition. Metamorphic Petrology Metamorphism: definition, agents and types of metamorphism. Metamorphic minerals: stress and anti-stress minerals, textures and structures. Rock cycle. Sedimentary Petrology Sediments: weathering, transport, deposition, consolidation, diagenesis. Textures and structures. Classification: Terrigenous and Chemical sedimentary rocks.		1

Module I Syllabus for Practicals

Course	Identification of Minerals and Rocks	Credits	L/week
USIDGE P01	<u>A) Identification and description of the physical properties, composition, occurrences and uses of 30 rock forming minerals.</u> 1. Quartz (at least 5 varieties) 2. Feldspar (Orthoclase, Albite, Microcline, Labradorite) 3. Mica (Muscovite, Biotite) 4. Pyroxene (Augite, Hypersthene) 5. Amphibole (Hornblende) 6. Olivine 7. Calcite (atleast 5 varieties) 8. Gypsum 9. Baryte 10. Serpentine 11. Apatite	1	3

12. Beryl
13. Corundum
14. Fluorite
15. Talc
16. Magnetite
17. Hematite
18. Pyrite
19. Chalcopyrite
20. Galena
21. Sphalerite
22. Graphite
23. Apophyllite
24. Stilbite
25. Heulandite
26. Staurolite
27. Garnet
28. Actinolite
29. Malachite
30. Coal (Peat, Lignite, Bituminous, Anthracite)

B) Megascopic identification of Igneous Rocks

1. Granite
2. Rhyolite
3. Pegmatite
4. Syenite (Hornblende / Biotite)
5. Trachyte
6. Diorite
7. Gabbro
8. Dolerite
9. Basalt (Vesicular/ Non-Vesicular/ Porphyritic, Amygdaloidal)
10. Picrite
11. Anorthosite
12. Carbonatite

C) Megascopic Identification of Sedimentary Rocks

1. Conglomerate
2. Breccia
3. Grit
4. Sandstone
5. Shale
6. Limestone

	<p>7. Fossiliferous Limestone 8. Oolitic Limestone 9. Laterite</p> <p><u>D) Megascopic Identification of Metamorphic Rocks.</u></p> <p>1. Quartzite 2. Marble 3. Slate 4. Phyllite 5. Mica Schist (with Staurolite/ Garnet) 6. Actinolite/ Chlorite Schist 7. Mica- Gneiss 8. Hornblende Gneiss. 9. Granulite 10. Serpentinite</p>		
	<p>Fieldwork: One full day local area, where different rocks, soils and their formation is discussed and seen first hand. Students will maintain a Field Diary and the evaluation will be for 30 percent of the marks allocated for the practicals.</p>		

List Of Recommended Reference Books

1. Butz S. (2007) Science of Earth Systems., 2nd edn., Thomas Delmar.
2. Cornelius K. and Hurlbut Jr. S. (1994), Manual of Mineralogy, Twenty first Edition and Minerals and Rocks Exercises in Crystallography, J. Wiley & Sons.
3. Dana J.D. and Ford W.E. (rev. ed.) (2010), Dana’s Manual of Mineralogy, J. Wiley & Sons.
4. Holmes A. (1993), Principles of Physical Geology., ed by David Duff, Nelson Thornes Ltd
5. Read H.H. (Rev. ed. C.D. Gribble) (1988), Rutley’s Elements of Mineralogy” (27TH Edition), CBS Publications.
6. Skinner B.J., Porter S.C. and Botkin D.B. (1999), The Blue Planet., 2nd edn. J. Wiley & Sons.

**Module II (Detailed Syllabus)
Theory**

Course	UNIT		Credits	L / Week
USIDGE02	Understanding Maps, Rock Structures and Fossils			
	I	<p>Cartography: Maps and Topographical maps; latitude – longitude concepts, Datum, map projections, types of maps. SOI map index. Contours and contour reading: Scales and map grids (UTM). GPS: principle and use</p> <p>Field Instruments Techniques: Compass bearings, Brunton Compass and Clinometer compass.its construction and use Understanding Strike and Dip of stratified rocks.</p>		1
	II	<p>Structural Geology: (15 Lectures) Outcrop pattern of horizontal, dipping and vertical strata on various types of topography. Outliers, Inliers. Folds: Definition, Morphology, anticline and syncline. Types of folds: symmetrical, asymmetrical, recumbent, overturned, isoclinal, plunging, doubly plunging, structural dome and basin, monocline, structural terrace, chevron, fan, anticlinorium, synclinorium, Importance of folds. Joints: Definition, geometric classification and importance. Faults: morphology; geometric classification based on relation to affected rocks, angle of dip, apparent movement and relative movement; distributive faulting: horst, graben and step faults; nappes. Unconformities: nature, types and importance; overlap and off-lap.</p>	2	1

	III	<p>Introduction to Palaeontology: Definition and scope of Palaeontology. Processes of fossilization, preservation potential of organisms. Uses of fossils, zone fossils.</p> <p>Morphology of Fossils Study of morphological characters and geological history of the following groups. Arthropoda: Trilobites Coelenterata: Corals (simple corals and compound hexa-corals and octa-corals) Brachiopoda Mollusca: Lamellibranchs, Gastropods, Cephalopods. Echinodermata: Regularia and Irregularia</p>		1
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Module II Syllabus for Practicals

Course	Toposheet Interpretation, Structural map and Identification of Fossils	Credits	L/week
USIDGE P01	<p>A) Interpret and understand contour configuration and the typical underlying geology.</p> <p>B) Draw cross sections along geological maps depicting horizontal and inclined beds. Faulted beds, Beds with dykes intruded. Folded beds, Unconformities</p> <p>C) Identification of the following fossil specimens:</p> <ol style="list-style-type: none"> 1. Trilobites 2. Brachiopods 3. Molluscs - Bivalves, Gastropods Cephalopods. 4. Echinoderms 5. Corals 	1	3
	<p>Fieldwork: One full day local area, where different structures like bedding planes, joints, fractures, and methods of using Brunton, Clinometer compass are discussed and seen first hand. Students will</p>		

	maintain a Field Diary and the evaluation will be for 30 percent of the marks allocated for the practicals.		
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List Of Recommended Reference Books

1. Billings M.P. (1987), Structural Geology., 3rd edn, Prentice-Hall, India Pvt. Ltd
2. Clarkson E. (1993), Invertebrate Palaeontology and Evolution, Chapman and Hall
3. Compton R.R. (1985), Geology in The Field., J. Wiley& Sons
4. Dasgupta, A.,(2005), Introduction to Palaeontology, 1st Edn, World Press
5. Ray Anis. K, (2008), Fossils in Earth Sciences, Prentice Hall of India
6. Robinson. A, Morrison. J, Muehrcke. P, Kimerling. A, Guptill. S (1995), Elements of Cartography, 6 ed, J. Wiley & Sons.