



**Dr. Bhimrao Ambedkar University, Agra**  
(Formerly: Agra University, Agra)

**I<sup>st</sup> Year Structure & Syllabus of B.Sc. (Geology)**

Year	Sem.	Course Code	Paper Title	Theory/Practical	Credits
1	I	B090101T	Physical and Structural Geology	Theory	4
1	I	B090102P	Practical: Structural Geology	Practical	2
1	II	B090201T	Mineralogy and Crystallography	Theory	4
1	II	B090202P	Practical: Mineralogy and Crystallography	Practical	2

Name	Designation	Affiliation
<b>Steering Committee</b>		
Mrs. Monika S. Garg, (I.A.S.) Chairperson Steering Committee	Additional Chief Secretary	Dept. of Higher Education U.P., Lucknow
Prof. Poonam Tandan	Professor, Dept. of Physics	Lucknow University, U.P.
Prof. Hare Krishna	Professor, Dept. of Statistics	CCS University Meerut, U.P.
Dr. Dinesh C. Sharma	Associate Professor, Dept. of Zoology	K.M. Govt. Girls P.G. College Badalpur, G.B. Nagar, U.P.
<b>Supervisory Committee-Science Faculty</b>		
Dr. Vijay Kumar Singh	Associate Professor, Dept. of Zoology	Agra College, Agra
Dr. Santosh Singh	Dean, Dept. of Agriculture	Mahatma Gandhi Kashi Vidhyapeeth, Varanasi
Dr. Baby Tabussam	Associate Professor, Dept. of Zoology	Govt. Raza P.G. College Rampur, U.P.
Dr. Sanjay Jain	Associate Professor, Dept. of Statistics	St. John's College, Agra

**Syllabus Developed by:**

S.No.	Name	Designation	Department	College/University
1.	Prof. K K Agarwal	Professor	Geology	University of Lucknow
2.	Dr. Rajesh Singh	Assistant Professor	Geology	University of Lucknow
3.	Dr. Sanjay Shukla	Associate Professor	Geology	BSNV PG College, Lucknow

Programme	Year	Semester	Theory/ Practical	Compulsory/ Elective	Course Title	Credits	Teaching Hours
Certificate	I	First	Theory	Compulsory	<i>Physical and Structural Geology</i>	04	60
			Theory	Compulsory	<i>Practical: Structural Geology</i>	02	60
		Second	Theory	Compulsory	<i>Mineralogy and Crystallography</i>	04	60
			Practical	Compulsory	<i>Practical: Mineralogy and Crystallography</i>	02	60
Diploma	II	Third	Theory	Compulsory	<i>Palaeontology</i>	04	45
			Practical	Compulsory	<i>Practical: Palaeontology</i>	02	90
		Fourth	Theory	Compulsory	<i>Petrology</i>	04	60
			Theory	Compulsory	<i>Practical: Petrology</i>	02	60
B.Sc. Degree	III	Fifth	Theory	Compulsory	<i>Applied Geology and Global Tectonics</i>	04	60
			Theory	Compulsory	<i>Stratigraphy</i>	04	60
			Practical	Compulsory	<i>Field Work</i>	02	60
		Sixth	Theory	Compulsory	<i>Remote Sensing and Environmental Geology</i>	04	60
			Theory	Compulsory	<i>Economic Geology and Ground water</i>	04	60
			Practical	Compulsory	<i>Practical: Economic Geology</i>	02	60

## **Format for developing syllabus for a Subject**

- Subject prerequisites: To study this subject, a student must have had the subject(s) ...**Physics/ Mathematics/ Chemistry/ Biological Sciences** .... in class/12<sup>th</sup>.
- Programme outcomes (POs)  
The Bachelor of Science program in Department of Geology, University of Lucknow is designed with the objective of educating students for success as a geo-scientist having employability in government sector, public sector, private sector, research institutes, or further qualifying JAM or other national examinations so as to pursue further study.
- Programme specific outcomes (PSOs):  
  
Geological excursion would be important components of the B.Sc. Program in Geology for laying a robust foundation to the budding geologists. Students will get exposure of actual rocks during Geological excursion. Students will learn the data collection, measurements and interpretations.
- List of all papers in all six semesters.

Programme/Class: <b>Certificate</b>		Year: <b>First</b>	Semester: <b>First</b>
Subject: <b>Geology</b>			
Course Code: <b>B090101T</b>		Course Title: <b>Physical and Structural Geology</b>	
Course outcomes: After completing the course, student Will learn origin of solar system and Earth Will understand internal structure of Earth Will understand interpretation stress-strain imprinted in earth Will learn the Interpretation of deformed structure Will understand role of weathering agents			
Credits: 4		Core: Compulsory	
Max. Marks: 25+75		Min. Passing Marks: as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 3-0-0			
Unit	Topics		No. of Lectures
<b>I</b>	Introduction to Geology and its scope, Earth and Solar system: origin, size etc., Age of Earth, Earth's atmosphere, Internal Structure and composition of Earth,		7
<b>II</b>	Sea-floor spreading; Basic concepts of Plate -Tectonics, Continental Drift		7
<b>III</b>	Weathering and erosion: factor, types, Erosion, transportation and deposition by wind and their related landforms		8
<b>IV</b>	Erosion, transportation and deposition by rivers and glaciers, and their related landforms;		8
<b>V</b>	Introduction to structural geology; Basic concepts of stress and strain; Study of outcrop; Identification of bedding; Measurement of dip, strike and thickness of beds; Forms of igneous bodies (concordant and discordant)		8
<b>VI</b>	Simple deformational structures: Fold morphology, their geometric and genetic classification, Top and Bottom of Beds		7
<b>VII</b>	Geometric and genetic classification of Faults (Normal, reverse and strike-slip faults); Recognition of faults in the field; Effects of faults on folded beds,		7
<b>VII</b>	Unconformities: their classification, recognition and geological significance, onlap and offlap; Joint and its classification, Lineation and Foliation: basic introduction.		8
<b>Suggested Readings:</b>			
<ol style="list-style-type: none"> <li>1. The Blue Planet: An Introduction to Earth System Science – B.J. Skinner and S.C. Porter. 1995, John Wiley &amp; Sons, Inc. 493p.</li> <li>2. Introduction to Physical Geology – G.R. Thompson and J. Turk. 1998, Saunders College Publishers, Fort Worth. 371p.</li> <li>3. Processes that Shape the Earth – D.M. Thompson. 2007, Infobase Publishing, NY. 116p.</li> <li>4. Physical Geology – L.D. Leet, S. Judson and M.E. Kauffman, (1982). Prentice-Hall Inc. 629p.</li> <li>5. Holme's Principles of Physical Geology – P.MvL.D. Duff, Fourth Edition (1993). Stanley Thornes (Publishers) Ltd.</li> <li>6. Suggested Readings:</li> <li>7. Bailey, B., 1992. Mechanics in Structural Geology, Springer.</li> <li>8. Davis, G. H. and Reynolds, S. J., 1996. Structural Geology of rocks and regions, John Wiley. and Sons.</li> <li>9. Ghosh, S. K., 1993. Structural Geology: Fundamentals, and modern developments, Pergamon Press.</li> </ol>			

10. Leyson, P. R. and Lisle, R. J., 1996. Stereographic projection techniques in structural geology, Cambridge University Press.
11. Passhler, C. and Trouw, R. A. J, 2005. Microtectonics. Springer, Berlin.
12. Pollard, D. D. and Fletcher, R. C., 2005. Fundamentals of structural geology, Cambridge University Press.
13. Ramsay, J. G. and Huber, M. I., 1983. Techniques of Modern Structural Geology: vol.I & II. Academic Press.
14. Ramsay, J. G, 1967. Folding and Fracturing of Rocks, McGraw-Hill Book Company, New York.
15. Rowland, S. M., Duebendorfer, E. and Schiefelbein, I. M., 2007. Structural analysis and synthesis: a laboratory course in structural geology, Balckwell pub.
16. Suppe, J., 1985 The Principles of Structural Geology, Prentice-Hall, Inc., New Jersey,.
17. Twiss, R. J. and Moores, E.M., 2007. Structural Geology. Freeman.
18. Van der Pluijm, B. A. and Marshak, S., 2004. Earth structure: an introduction to structural Geology.

This course can be opted as an elective by the students of following subjects: **Open for all who have science stream in 12<sup>th</sup>.**

Suggested Continuous Evaluation Methods:

**Test: 10 Marks; Presentation: 10, Class participation and activity: 5**.....

Course prerequisites: To study this course, a student must have had the subject ... **Physics/ Mathematics/ Chemistry/ Biological Sciences** ..... in class/12<sup>th</sup>

Suggested equivalent online courses:

Further Suggestions:

Programme/Class: <b>Certificate</b>	Year: <b>First</b>	Semester: <b>First</b>
Subject: <b>Geology</b>		
Course Code: <b>B090102P</b>	Course Title: <b>Practical: Structural Geology</b>	
Course outcomes: After completing the course, student will be able to interpret the geological maps will able to measure the geological data from field		
Credits: 2	Core: <b>Compulsory</b>	
Max. Marks: 25+75	Min. Passing Marks: as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P:0-0-2		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
	Problems on dip, strike; Contour maps and completion of outcrops; study and Interpretation of topographical maps; Use of Clinometer compass Calculation of apparent dip Simple Lithology boundary tracing, Determination of Thickness of bed. Identification of fault and calculation of Throw Identification of Unconformities Identification of fold Some Complex geological maps	60
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. F. H. T. Rhodes, geological maps, the commonwealth and international library.</li> <li>2. G. M. Bennison,1992, an introduction to geological structures and maps, Edward arnold</li> <li>3. Richard j. Lisle,1988, Geological structures, and maps, a practical guide, Amsterdam</li> <li>4. K. R. McClay, 1991, The mapping of geological structures, geological society of London handbook</li> </ol>		
This course can be opted as an elective by the students of following subjects: <b>Open for all who have science stream in 12<sup>th</sup>.</b>		
Suggested Continuous Evaluation Methods: <b>Practical Record: 20 Marks; ; 10, Class participation and activity: 5, Examination:50 Marks</b> <b>Viva-voce: 25marks</b>		
Course prerequisites: To study this course, a student must have had the subject ... <b>Physics/ Mathematics/ Chemistry/ Biological Sciences</b> ..... in class/12 <sup>th</sup>		
Suggested equivalent online courses: .....		
Further Suggestions: .....		

Programme/Class: <b>Certificate</b>	Year: <b>First</b>	Semester: <b>Second</b>
Subject: <b>Geology</b>		
Course Code: <b>B090201T</b>	Course Title: <b>Crystallography and Mineralogy</b>	
Course outcomes: After completing the course, student Will learn the mineral and its types Will understand the crystal formation, form and occurrence Will learn formation of mineral groups and resource		
Credits: 4		Core: <b>Compulsory</b>
Max. Marks: 25+75		Min. Passing Marks: as per rules
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 3-0-0		
Unit	Topics	No. of Lectures
<b>I</b>	Basic idea about crystal, crystal growth and crystallization; Laws of crystallography; Crystal morphology; Crystallographic axes; Elements of symmetry; Crystallographic notations;	7
<b>II</b>	Crystal forms; Habit and classification; Preliminary idea about various types of projection, Crystal aggregate: Twinning and common twin Laws;	7
<b>III</b>	Symmetry and forms of Hexagonal (beryl type and calcite type), Orthorhombic (Barytes type), Monoclinic (Gypsum type), and Triclinic (Axinite type) Crystal Systems	8
<b>IV</b>	Symmetry and forms of Cubic (Galena type, Pyrite type and Tetrahedrite type), and Tetragonal (Zircon type) Crystal Systems	8
<b>V</b>	Definition of mineral; Atomic bonding; Physical properties of minerals: colour, lustre, form, isomorphism, pseudomorphism, polymorphism, hardness, fracture, cleavage, specific gravity, and characters based on heat, electricity and magnetism;	8
<b>VI</b>	Physical properties, chemical composition, occurrences, and uses of minerals belonging to the Silica and Feldspar families, and clay minerals	7
<b>VII</b>	Physical properties; chemical composition, occurrences, and uses of Pyroxene, Olivine, Mica and Garnet families; Amphibole,	6
<b>VIII</b>	Nicol prism; Optically isotropic and anisotropic minerals; Polarisation of light; Optical properties of minerals under polarised light and crossed polars: refractive index, pleochroism, relief, twinkling, birefringence, interference colours, extinction and twinning; Classification of minerals into uniaxial and biaxial minerals	9

**Suggested Readings:**

1. Putnis A. 1992. Introduction to Mineral Sciences, Cambridge publication.
2. Cornelis Klein and Barbara Dutrow, 2007, The manual of Mineral Science, Wiley Publication
3. Mason, B., 1986. Principles of Geochemistry. 3rd Edition, Wiley New York.
4. Rollinson H. 2007 Using geochemical data-evaluation. Presentation and interpretation. 2nd Edition. Publisher Longman Scientific & Technical.
5. Walther John, V., 2009 Essentials of Geochemistry, student edition. Jones and Bartlett Publishers.
6. Publishers.
7. Albarede, F, 2003. An introduction to geochemistry. Cambridge University Press.

This course can be opted as an elective by the students of following subjects: **Open for all who have science stream in 12<sup>th</sup>.**

Suggested Continuous Evaluation Methods:

**Test: 10 Marks; Presentation: 10, Class participation and activity: 5.....**

Course prerequisites: To study this course, a student must have had the subject ... **Physics/ Mathematics/ Chemistry/ Biological Sciences** ..... in class/12<sup>th</sup>

Suggested equivalent online courses:

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Further Suggestions:

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Programme/Class: <b>Certificate</b>	Year: <b>First</b>	Semester: <b>Second</b>
Subject: <b>Geology</b>		
Course Code: <b>B090202P</b>	Course Title: <b>Practical Mineralogy and Crystallography</b>	
Course outcomes: After completing the course, student will see and feel the natural mineral will learn to identify the mineral in hand specimens		
Credits: 2	Core: <b>Compulsory</b>	
Max. Marks: 25+75	Min. Passing Marks: as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 0-0-2		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures</b>
	Verification of Euler's formula; Graphical construction of crystallographic axes of Cubic system; Clinographic projections of typical crystals of Cube, Rhombdodecahedron, Tetrahexahedron, Trapezohedron, Pyritohedron, Tetrahedron, Zircon, Calcite  Determination of physical properties of rock forming minerals: quartz family, Feldspar family, pyroxene family, Amphibole Family, Garnet Family; Mica Family, Identification of important rock forming minerals in hand specimens  Use of polarizing, Optical properties of minerals	60
<b>Suggested Readings:</b> 1. Putnis A. 1992. Introduction to Mineral Sciences, Cambridge publication. 2. Cornelis Klein and Barbara Dutrow, 2007, The manual of Mineral Science, Wiley Publication 3. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York 4. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill. 5. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.		
This course can be opted as an elective by the students of following subjects: <b>No</b>		
Suggested Continuous Evaluation Methods: <b>Practical Record: 20 Marks; ; 10, Class participation and activity: 5, Examination:50 Marks</b> <b>Viva-voce: 25marks</b> .....		
Course prerequisites: To study this course, a student must have had the subject ... <b>Physics/ Mathematics/ Chemistry/ Biological Sciences</b> ..... in class/12 <sup>th</sup> .....		
Suggested equivalent online courses: .....		
Further Suggestions: .....		