

अंतरी ढेटवू ज्ञानज्योत



**NORTH MAHARASHTRA UNIVERSITY,  
JALGAON**

**Syllabus for**

**S.Y. B.Sc  
Semester III and IV**

**GEOLOGY**

w. e. f. June 2013

**NORTH MAHARASHTRA UNIVERSITY,**

**JALGAON**

**S.Y. B.Sc**

**GEOLOGY**

(w.e.f. June 2013)

**Semester-III**

GL 231- Mineralogy

GL 232 - Principles of Stratigraphy

**Semester-IV**

GL 241- Petrology

GL 242 – Structural Geology

**Practical Course**

GL 203- Practical based on Semester III & IV

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus for S.Y. B.Sc**

**Semester III**

**GL 231 - Mineralogy**

**w.e.f. from – June 2013**

Unit No	Topic	Sub topics	Periods	Marks
I	Mineralogy	1. Mineral formation. <ol style="list-style-type: none"> <li>a) Definition of a mineral.</li> <li>b) Major elements constituting minerals</li> <li>c) Ionic size and Ionic radii (Goldsmith's rule, Radius ratio, Coordination number)</li> <li>d) Electrochemical series of metals.</li> </ol> 2. Classification of Minerals based on Cations and Anions 3. Phenomenon of Isomorphism, Polymorphism and Pseudomorphism. 4. Systematic Mineralogy <ol style="list-style-type: none"> <li>A) Silicate structures, chemical composition, physical and optical properties, occurrence and uses of--               <ol style="list-style-type: none"> <li>1. Olivine Group.</li> <li>2. Pyroxene Group</li> <li>3. Amphibole Group</li> <li>4. Mica Group</li> <li>5. Feldspar Group</li> <li>6. Silica Group</li> </ol> </li> </ol>	20	15
II	Gemology	<ol style="list-style-type: none"> <li>a) Introduction, definition, (beauty and rarity&amp; durability)</li> <li>b) Importance and scope of Gemology</li> <li>c) Physical properties (Crystal System, Hardness, Sp.Gr.) and Optical Properties (Colour, Luster, RI and Refraction)of Gemstone</li> <li>d) Physical and Optical properties of: Diamond, Ruby, Emerald, Garnet and Pearl</li> </ol>	11	6
III	Crystallography	<ol style="list-style-type: none"> <li>a) Definition of Holohedral, Hemimorphic, Hemihedral forms.</li> <li>b) Crystallographic axis, symmetry and forms with indices of:               <ol style="list-style-type: none"> <li>i. Cubic system - Pyrite and Tetrahedrite type.</li> <li>ii. Hexagonal system - Beryl, Calcite, Quartz type.</li> <li>iii. Monoclinic system - Gypsum type.</li> <li>iv. Triclinic system - Axinite type.</li> </ol> </li> <li>c) Twin crystals: Definition of twin axis, twin plane and composition plane. Five types of twins (Rutile, Orthoclase, Gypsum, Staurolite and Pyrite).</li> </ol>	20	15
IV	Mineral Optics	<ol style="list-style-type: none"> <li>a) Phenomenon of colour and pleochroism</li> <li>b) Phenomenon of relief and twinkling</li> <li>c) Principle of compensation and interference colors</li> <li>d) Definition of Uniaxial and Biaxial minerals and their sign.</li> </ol>	9	4

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**LIST OF BOOKS (GL 231 – Mineralogy)**

1. Rutley's Elements of Mineralogy (27<sup>th</sup> Edition) – H. H. Read and Revised by D. D Gribble (CBS Publication)
2. Introduction to rock forming minerals: Deer, Howie, Zussman
3. Text book of Geology - Kulkarni et al
4. Optical Mineralogy - Kerr
5. Gemmology - P.G. Read
6. Dana's Textbook of Mineralogy – William E. Ford
7. Minerals and Rocks – Klein
8. Optical Mineralogy – Phillips & Griffen
9. Manuel of Mineralogy (21<sup>st</sup> Edition) – Cornelius, S. Hurlbut Jr., Cornelius Klein ( J. Wiley & Sons)
10. Elements of Mineralogy – Berry, Mason and Dietrich  
(W. H. Freeman and Company)
11. Minerals – Hans R., Wenk and A. Bulakh (Cambridge University Press)
12. Textbook of Geology – Kulkarni et al.(Scintifica Publication, Pune)

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**  
**Syllabus for S. Y. B.Sc**  
**Semester III**  
**GL 232 - Principles of Stratigraphy**  
**w.e.f. from – June 2013**

<b>Unit No</b>	<b>Topic</b>	<b>Sub topics</b>	<b>Periods</b>	<b>Marks</b>
I	Introduction	Definition, branches and importance of Stratigraphy	2	2
II	Stratigraphic Principles	Principles of Stratigraphy	2	2
III	Geologic Systems	Standard systems and Geologic Time Scale (Chronostratigraphy)	4	2
IV	Stratification	Physical, Chemical & Biological controlled stratification	8	5
V	Vertical Succession	Lithologic Uniformity, Heterogenous Succession, Patterned Succession (alternation, varves and cycles)	9	6
VI	Unconformity	Hiatus, Classification of unconformity (Structural and Environmental classification), Evidences of unconformity	8	5
VII	Stratigraphic Classification	a) Introduction b) Rock & Time 1. Concept of Rock Unit 2. Concept of Time Unit (Chronostratigraphic Unit) c) Development of Classification – Two fold & Three fold Time rock division d) Rock Unit (Lithostratigraphic Unit)– Formation, Groups, Members and Beds. e) Time Rock Unit (Chrono-Lithostratigraphic Unit) System, Series and Stages f) Biostratigraphic Unit	9	6
VIII	Lateral Succession	Lateral Succession	9	6
IX	Principles of Correlation	Introduction, Physical and Paleontological evidences of Correlation	9	6

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**LIST OF BOOKS (GL 232 - Principles of Stratigraphy)**

1. Stratigraphic Principles and Practices – Willer J. M (Universal Book – 1960)
2. Stratigraphy and Sedimentation – Krumbein and Sloss
3. Principles of Stratigraphy – Dunbar and Rogers
4. Principles of Stratigraphy – Grabau
5. Basic Concept of Historical Geology – E. W. Spencer
6. Principles of Sedimentology and Stratigraphy – Boggs S. (Prentice Hall – 2001)
7. Textbook of Geology (For S.Y.B.Sc.)– Chakranarayan et al.  
(Scintifica Publication, Pune)
8. Principles of Stratigraphy By Leamon.

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus for S. Y. B.Sc**

**Semester IV**

**GL 241: Petrology**

**w. e. f. from – June-2013**

<b>Unit No</b>	<b>Topic</b>	<b>Sub topics</b>	<b>Periods</b>	<b>Marks</b>
I	Introduction	Introduction, Definition, Branches and Scope.	2	2
II	Igneous Petrology	<ol style="list-style-type: none"> <li>1) Physico - chemical constituents of magma.</li> <li>2) Types of magmas – Primary (Granitic and Basaltic), Secondary magma.</li> <li>3) Crystallisation of Binary Magma.               <ol style="list-style-type: none"> <li>a) Eutectic (Orthoclase-Quartz)</li> <li>b) Solid Solution (Plagioclase)</li> </ol> </li> <li>4) Textures and Microstructures               <ol style="list-style-type: none"> <li>i) Textures – Poiklitic (Ophitic, Subophitic ) Porphyritic( Intergranular , Intersertal)</li> <li>ii) Microstructures - Orbi)cular, Xenolithic, Spherulitic</li> </ol> </li> <li>5) Classification: Tabular classification based on color index, depth of formation, chemical composition, saturation concept and feldspar present showing , Granite, Diorite, Syenite, Gabbro, Dunite, Graphic granite, Pitchstone, Orthoclase porphyry, Pegmatite, Dolerite, Rhyolite, Trachyte, Andesite, Obsidian, Basalt.</li> </ol>	21	14
III	Sedimentary Petrology	<ol style="list-style-type: none"> <li>1. Introduction – Derivation and sources of sediments, Mineral composition of clastic sediments, Concept of Matrix/Cement and its effect on porosity and permeability.</li> <li>2. Classification of Sediment admixture by Shepard.</li> <li>3. Descriptive Sedimentary Petrology based on products of weathering:               <ol style="list-style-type: none"> <li>i) Residual deposits - Laterite and soils.</li> <li>ii) Rudaceous deposits - Conglomerate and Breccia.</li> <li>iii) Arenaceous deposits - Varieties of sandstones, Arenites, Greywacke, Arkose, Grit.</li> <li>iv) Argillaceous deposits - Mudstone, Shale.</li> <li>v) Chemical deposits - Calcareous, Feruginous, Siliceous deposits:</li> <li>vi) Organic deposits - Calcareous, Siliceous, Carbonaceous deposits</li> </ol> </li> <li>4. Chemical and Biogenic structures: Stylolites, Nodules, Concretions, Burrows, Tracks and Trails.</li> </ol>	21	14

Unit No	Topic	Sub topics	Periods	Marks
IV	Metamorphic Petrology	1. Definition and salient features of metamorphism as a process. 2. Metamorphic minerals (Stress and antistress minerals) Influence of original composition, heat, directed pressure and uniform pressure on minerals. 3. Cataclastic metamorphism of Pelitic rocks. 4. Thermal Metamorphism of pure carbonate and arenaceous rocks. 5. Regional metamorphism of argillaceous rocks and basic igneous rocks (Barrowian zones). 6. Metamorphic structures - Idioblastic, Xenoblastic.	16	10

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### **LIST OF BOOKS (GL 241: Petrology)**

1. Principles of Petrology - G.W. Tyrell
2. Igneous and Metamorphic petrology - Elthers and Blatt
3. Sedimentary rocks - F.J. Pettijohn
4. Metamorphic Petrology - R. Mason
5. Petrography - Williams, Turner, Gilbert
6. An Introduction to Metamorphic Petrology – Yardley (ELBS Publication – 1990)
7. Igneous and Metamorphic Petrology – Best M. G. (Wiley Publication – 2002)
8. Principles of Metamorphic Petrology – Vernon R. H. and Clarke G. L. (Cambridge Publication – 2008)
9. An Introduction to Igneous and Metamorphic Petrology – John D. Winter (Prentice Hall – 2001)
10. Igneous and Metamorphic Petrology – Best, Myron G. (Blackwell Science – 2002)
11. Petrology (Igneous, Sedimentary, Metamorphic) – Blatt H. and Tracy R. J. (W.H. Freeman and Co., NewYork – 1996)
12. Igneous, Sedimentary and Metamorphic Petrology – Ehlers E. G. & Blatt H. (CBS Publication – 1982)
13. Petrology – Huang (McGraw Hill Book Co. – 1962)
14. Petrology for Students – Nockold, Knox and Chinner (Cambridge University Press – 1978)
15. Petrogenesis of Metamorphic Rocks – Winkler H. G. F. (Verlag – 1967)
16. A practical Approach to Sedimentology – Roy Lindholm



**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus for S. Y. B.Sc**

**Semester IV**

**GL 242: Structural Geology**

**w. e. f. from - June-2013**

<b>Unit No.</b>	<b>Topic</b>	<b>Sub Topic</b>	<b>Periods</b>	<b>Marks</b>
I	Introduction	a) Definition and its relations with other branches of geology b) Tectonic and Non-tectonic structures	03	2
II	Planar/Linear Structures, Outlier/Inlier	a) Attitude of planar feature – Strike and Dip b) True and Apparent Dip, True and Vertical thickness and width of outcrop of planar features. c) Attitude of Linear Feature (Bearing, Plunge and Rake). d) Outlier and Inlier – Definition e) Clinometer Compass and its uses f) Reading of Toposheets used as base map for Geological mapping.	10	6
III	Folds	a) Definition, causes and parts of fold – axis, axial plane, limb, hinge, crest and crestal plane, trough and trough plane. b) Definition, causes and characters of following types of fold – antiform, synform, anticline, syncline, anticlinorium, synclinorium, symmetrical, asymmetrical, overturned, recumbent, isoclinal, chevron, box, fan, monocline, structural terrace, open, close, drag, plunging fold, Dec'ollement, diapir, disharmonic, Suprataneous fold. c) Recognition of folds by direct observation, plotting attitude of beds on map, topographic studies, drilling and mining data	17	12
IV	Joints	a) Definition and general characteristics of Joints b) Rupturing Under tension, Compression, Couple and torsion c) Geometric and genetic classification of joints	13	8

<b>Unit No.</b>	<b>Topic</b>	<b>Sub Topic</b>	<b>Periods</b>	<b>Marks</b>
V	Faults	a) Definition of fault as a planar zone b) Movement along faults – absolute, relative, translational and rotational c) Slip and separation d) Geometric classification of faults e) Genetic classification of faults f) Recognition of faults in the field	17	12

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**LIST OF BOOKS (GL 242: Structural Geology)**

1. Structural Geology – M. P. Billings (Prentice- Hall -1987)
2. Theory of Structural Geology – N. W. Gokhale
3. Fundamentals of Structural Geology – Park and Blackie
4. An Outline of Structural Geology – Hobbs, Means, Williams
5. Structural Geology – B. S. Sathya Narayanswami
6. Structural Geology of Rocks and Region – Davis G. R. (John Wiley – 1984)
7. Fundamental of Structural Geology – Park R. G. (Chapman and Hall – 2004)
8. Fundamentals of Structural Geology – Pollard D. D (Cambridge University Press – 2005)

**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus for S. Y. B.Sc**

**GL 203: Practicals**

**w. e. f. from - June-2013**

**TERM-I**

<b>Unit No.</b>	<b>Topic</b>	<b>Sub Topic</b>
I	Physical properties of the Minerals	Quartz crystal, Amethyst, Moss Agate, Bloodstone, Opal, Asbestos, Tourmaline, Beryl, Olivine, Augite, Hornblende, Chlorite, Plagioclase, Microcline, Fluorite, Calcite, Barytes, Gypsum, Apatite, Orthoclase. Muscovite, Biotite, Garnet, Talc, Corundum.
II	Physical properties of the Ore Minerals	Graphite, Galena, Pyrite, Hematite, Magnetite, Bauxite, Chromite, Sphalerite.
III	Optical Mineralogy	Microcline, Plagioclase, Garnet, Augite, Calcite, Muscovite, Hornblende, Olivine
IV	Crystallography	Crystallographic axis, elements of symmetry and forms present with indices of- i) Cubic System – Pyrite and Tetrahedrite type ii) Hexagonal System – Beryl, Calcite and Tourmaline type iii) Monoclinic System – Gypsum type
V	Structural Problems	Problems based on the WOC, VT, TT and Dip of Strata with and without Hill slopes.

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**NORTH MAHARASHTRA UNIVERSITY, JALGAON**

**Syllabus for S. Y. B.Sc**

**GL 203: Practicals**

**w. e. f. from - June-2013**

**TERM-II**

<b>Unit No.</b>	<b>Topic</b>	<b>Sub Topic</b>
I	Introduction to Petrology	Introduction to Petrology and Classification tables
II	Igneous rocks	Granite, Graphic Granite, Rhyolite, Synite, Diorite, Andesite, Gabbro, Dolerite, Basalt, Pitchstone, Trachyte
III	Sedimentary rocks	Laterite, Conglomerate, Breccia, Siliceous Sandstone, Ferruginous Sandstone, Shale, Carbonaceous Shale, Mudstone, Limestone, Fossiliferous Limestone, ,
IV	Metamorphic rocks	Quartzite, Striped Marble, Mica-Tourmaline Schist, Actinolite Schist, Biotite Schist, Hornblende Gneiss, Biotite Gneiss
V	Microscopic Petrology	Igneous Rocks – Granite, Graphic Granite, Gabbro, Basalt. Sedimentary rocks– Sandstone, Fossiliferous Limestone Metamorphic Rocks – Quartzite, Marble, Mica-Garnet Schist, Hornblende Gneiss.
VI	Paleontology – Classification, hard part morphology and range	Metatrix, Arca, Ostrea, Pecten, Unio, Conus, Turbo, Turritella, Murex, Cypraea, Physa, Ammonites, Terebratula, Productus, Echinolampas, Hemiaster, Montlivaltia, Isastria, Nummulites, Glossopteris, Gangamopteris, Vertibraria
VII	Structural (Geological) Maps	i) One series inclined beds (2 maps) ii) One series inclined beds with vertical dyke (2 maps) iii) Two series of beds with and without dyke (2 maps) iv) One series inclined beds with fault (2 maps) v) Two series inclined beds with fault ( 1map) vi) One series inclined beds with two fault (1 map)
VII	Field work	Field visit and excursion / Study tour.

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