

अंतरी पेटवू ज्ञानज्योत



**NORTH MAHARASHTRA UNIVERSITY,
JALGAON**

Syllabus for

T.Y. B.Sc

Semester V and VI

GEOLOGY

w. e. f. June 2014

NORTH MAHARASHTRA UNIVERSITY, JALGAON

T.Y.B.Sc. GEOLOGY SYLLABUS

(W. e. f. June 2014)

Semester V

GI 351 : Structural Geology

GI 352 : Indian Stratigraphy

GI 353 : Mineralogy and Optics

GI 354 : Igneous Petrology

GI 355 : Sedimentary Petrology

GI 356 : Geomorphology

Semester VI

GI 361 : Metamorphic Petrology

GI 362 : Economic Geology

GI 363 : Natural Resources – Minerals and Energy

GI 364 : Geotechniques

GI 365 : Environmental Geology

GI 366 : Hydrogeology

Practicals Semester V and VI

GI 307 : Mineralogy and Igneous Petrology

GI 308 : Metamorphic, Sedimentary Petrology and Indian Stratigraphy.

GI 309 : Structural Geology, Environmental Geology and Hydrology

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus for T. Y. B.Sc. Geology

Semester V

w. e. f. June 2014

G1:351: Structural Geology

Unit No	Topic	Sub-topic	Periods	Marks
I	Mechanical principles	a) Force : Definition, representation, unit, and types (balanced and unbalanced forces) b) Composition and resolution of forces. c) Lithostatic / Hydrostatic pressure, different types of forces. d) Stress and strain: Concept and definition. e) Stages of Deformation: Elastic and plastic deformation of brittle and ductile substances, elastic limit and strength of rocks. f) Stress-strain diagram. g) Factors controlling rock deformation: Confining pressure, temperature, time, solutions, anisotropy and inhomogeneity of rocks.	15	08
II	Mechanics of Plastic deformation	a) Intergranular movements b) Intergranular movements. c) Recrystallization , Reicke's principle.	08	04
III	Fold	a) Definition of synform, antiform, anticlinorium and synclinorium. b) Orientation of fold, i) Dip direction ii) Strike direction. c) Classification of folds based on orientation of hinge line, dip isogone and angle of limb d) Mechanics of folding i) Flexure / flexure slip folding. ii) Flow folding. iii) Shear folding. e) Ultimate causes of folding – Tectonic and non tectonic processes.	12	08
IV	Principles of failure by rupture	a) Force: Definition of tensional, compression, couple and torsional forces. b) Tension and shear fractures. c) Complexity of the mechanics of rupturing. d) Relation of rupture to stress and strain	05	04

V	Fault	a. Genetic classification of faults. b. Mechanics of faulting: i) Mechanics of normal or gravity fault ii) Mechanics of thrust faults with same horizontal stress and increase in horizontal stress. iii) Mechanics of strike-slip faults and movement along transform fault. c. Use of the strain ellipsoid in recognizing movements along faults	15	10
VI	Foliation (Cleavage) and Schistosity	a. Introduction and descriptive terminology. b. Relations of cleavage and schistosity to major structures.	5	3
VII	Secondary lineation	a. Introductions and kinds of secondary lineation. b. Relations of lineation to major structures.	5	3

Reference Books:

1. Structural Geology: M. P. Billings
2. Structural Geology: De Sitter
3. Techniques in Modern Structural Geology: Ramsay and Huber, Vol: 1, 2 & 3 (Academic Press)
4. Fundamental of structural geology – Marshak & Mitra. E.E.E. (PHP)
5. Structural Geology for Petroleum Geologists: Russel
6. Structural Geology – Ghosh, Academic Press
7. Structural and Tectonic Principles: Badgley P. C.
8. Structural Geology: Dennis
9. Theory of Structural Geology- N. G. Gokhale, CBS Publication
10. Analysis of Geological Structures: Prince N. J. and Cosgrove
11. Mechanics in Structural Geology: Bayly B
12. Structural Geology: Fundamentals of Modern Developments: Eds: Pergamon Press
13. Structural Geology of Rocks and region: Davis
14. An outline of Structural Geology: Hobbs B E, Means W. D. & Williams P. F.

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Semester V

w. e. f. June 2014

G1:352: Indian Stratigraphy

Unit No	Topic	Sub-topic	Periods	Marks
I	Introduction	a. Physiographic divisions of India b. Introduction to Indian Stratigraphic Time Scale c. Brief outline of Geology of India with respect to Time scale.	8	4
II	Archaean and Proterozoics.	a. Introduction to Achaean and Proterozoic Time Scale, structure and tectonic activity. b. Description based on stratigraphy, lithology, structure, intrusive activity, fossil and economic importance of i) Dharwar Craton ii) Singhbhum Craton iii) Aravalli Craton (Aravalli and Delhi) iv) Sauser and Sakoli Group c. Proterozoic Sedimentary basins : Description based on stratigraphy, lithology, structure, intrusive activity, fossil and economic importance of i) Vindhyan basin ii) Cuddapah Basin	20	12
III	Gondwana Supergroup.	Description based on stratigraphy, lithology, structure, environment of deposition, intrusive activity, fossil and economic importance of Gondwana Supergroup.	8	6
IV	Mesozoic Formations of India.	a. Introduction to Mesozoic Time scale, Structure, tectonics, Fauna and flora, intrusive activity. b) Jurassic of Kutch – Stratigraphy and lithology and fossils. a. Cretaceous of Trichinopoly - Stratigraphy and lithology and fossils. b. Study of Bagh bed, Lametas. c. Deccan Volcanic Province – Introduction, Field structures of basaltic flows, Regional stratigraphy (subprovince, Main Deccan Plateau – Litho and Chemo stratigraphy), Petrology, Age and duration, Structure and tectonics. d. Brief account of Inter and Intra-trappean beds	12	10

V	Cenozoic Formations in India	a.Introduction to Cenozoic Time scale, Structure, tectonics, Fauna and flora, intrusive activity. B.Tertiary of Assam: Stratigraphy, lithology and fossils.	5	4
VI	Himalayan Geology.	a.Introduction to tectonic setting and structure of Lesser, Central and Higher Himalayan formation. b.Siwaliks – Introduction, stratigraphy and sedimentation, fauna, and lithology.	5	4

Reference Books

1. Singhbhum-Orissa Iron Ore Craton- Sinha Roy
2. Geology of India Vol.I & II, Geological Society of India, Special Publications
3. Geology of Karnataka: Radhakrishna B. P.
4. Geology of States of India – Geological Society of India, Special Publications
5. Geology of Maharashtra: G. G. Deshpande, G Society Spl. Publication
6. Purana Basins of India: G Society Spl Publicatin
7. Geology of Western and Central India: GSI Spl Publication
8. Stratigraphy of Lesser Himalaya: K. S. Valdiya
9. A Geological Time Scale: Brian Harland *et al.*
10. Stratigraphy of India and Burma: M. S. Krishnan
11. Fundamentals of Historical Geology and Stratigraphy f India: Ravindrakumar
12. Precambrian Stratigraphy: V. J. Gupta.
13. Greenstone Belt of South India: Janardhan.

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Syllabus for T. Y. B.Sc. Geology
Semester V
w. e. f. June 2014

G1:353: Mineralogy and Optics

Unit No	Topic	Sub-topic	Periods	Marks
I	Mineral Groups – I	Study of following mineral groups with respect to their Distinguishing characters, paragenesis, alteration products, and Importance of : a) Olivine : Fo – Fa series b) Pyroxene : En – Fs, Di – He, Augite Series c) Amphibole : Tr – Ac, Hbl Series, Cation distribution. d) Feldspar : Alkali Feld., Ab – An Series, Perthites. e) Garnet : Pyralspite, Ugrandite	20	15
II	Mineral Groups – II	Introduction to the following Mineral Groups. i) Zeolites ii) Clay Minerals iii) Feldspathoids	10	6
III	Mineral Groups – III	Structure, Chemistry, Optical and Physical properties, mode of occurrence and uses of : Chlorite, Talc, Staurolite, Fluorite, Apatite, Epidote, Topaz, Calcite, Cordierite, Zircon, Rutile, Sphene and Corundum.	8	5
IV	Optics	a) Refractive Index and Relief, Becke line and its uses. b) Uniaxial and Biaxial indicatrices. c) Explanation of Central uniaxial interference figure and its sign when the section is perpendicular to optic axis. d) Explanation of Biaxial interference figure perpendicular to Acute bisectrix and its sign	16	10
V	Crystallography	a) Elementary Knowledge of spherical and stereographic projections b) Introduction to 32 classes of crystallographic symmetry.	6	4

Reference Books:

1. Mineralogy and Optics – Dana
2. Rutley's elements of Mineralogy – C.D. Gribble
3. Elements of Mineralogy – Mason *et al*
4. Mineralogy and Petrology.
5. Mineralogy- A first cause – J. Sinkankas

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Syllabus for T. Y. B.Sc. Geology

Semester V

w. e. f. June 2014

G1:354: Igneous Petrology

Unit No	Topic	Sub-topic	Period	Marks
I	Igneous rocks and the solid Earth	Igneous rocks in a broad tectonic frame.	2	2
II	Crust and Mantle	Composition and recycling.	4	2
III	Melting of Magma	Temperature -Pressure conditions, generation of magma in their source region, boundary conditions.	15	8
IV	Classification of Igneous rocks	CIPW and IUGS.	8	4
V	Reaction series and its interpretation	Reaction series and its interpretation	8	4
VI	Evolution of Magma	a) Crystal fractionation, Fo-Fa and Fo-Silica systems. Separation mechanisms: i) Gravity settling. ii) Flow differentiation. iii) Flow crystallization. iv) Gas streaming. b) Liquid immiscibility (Silicate-Silicate) c) Contamination -Assimilation with melting and without melting, Significance of contamination d) Mixing of magmas (Similar and dissimilar) e) Role of volatile. f) Melting and crystallization of Ternary system (Di - Ab - An). g) Fractional crystallization of Basaltic magma. h) Petrographic provinces, rock kindreds or associations	23	20

Reference Books:

1. Igneous Petrology: Anthony Hall
2. Igneous Petrology: McBirney
3. Igneous and Metamorphic Petrology: Myron Best
4. Principles of Petrology: G. W. Tyrell
5. Igneous, Metamorphic and Sedimentary Petrology: Ehler and Blatt
6. Igneous and Metamorphic Petrology: Turner and Verhoogen

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Semester V

w. e. f. June 2014

G1:355: Sedimentary Petrology

Unit	Topic	Sub-topic	Periods	Marks
I	Origin of Sedimentary rocks	Introduction a) Brief outline of weathering processes b) Exogeneic rocks (Allogenic) c) Endogeneic rocks (Authigenic)	4	2
II	Fabric	Fabric and frame work	4	2
III	Common Minerals	Abundance of common minerals	4	2
IV	Textural characters of Sedimentary rocks.	1) Concept of size, size terms. 2) Grain size distribution : 1) Grade scale: a) Introduction, b) Udden Scale c) Wentworth Scale d) phi (ϕ scale) e) mesh scale 2) Granulometric analysis : a) Sample collection (semi and consolidated sediments) b) Ro Tap machine (Sieve shaker) c) Cumulative grain size distribution plots (simple graph and arithmetic probability sheet), d) Graphic parameters of size frequency (Mean, Standard Deviation, Skewness, Kurtosis. e) Grain size and Mode of transport : Selective Abrasion, Traction, Saltation, Suspension. f) Grain-size distribution and environment of deposition. 3) Shape and roundness: a)Shape (Form) - Wadell-Zing shape classes b) Roundness - Wentworth - Wadell - Roundness, grain-Petijhon. c) Introduction to Surface Texture of fluvial, marine and Aeolian environments. 3. Sedimentary rock classification: A) Sandstone :1) Properties of Sandstone: a) Framework ,b)Matrix , c)Maturity. 2)Minerals in Sandstone: Quartz, Opal, Chalcedony, Feldspar, Rock fragments, Accessory minerals, Heavy Minerals. 3) Classification of Sandstone By Dott - in Pettijhon 4)Diagenesis of Sandstone - Cementing	28	22

		<p>intrastratal solution matrix.</p> <p>B) Limestone: Genetic classification of limestone (Pettijohn)</p> <p>1) Introduction to Occurrence and petrology of limestones (Carbonate sediments).Minerals in limestone - Carbonate minerals, Silica and silicates.</p> <p>2) Texture and structure of Limestone: i) Allochem (Framework) : a) Oolites, fossil skeletons, intraclasts, pellets, ii) micrite, iii) sparry calcite.</p> <p>3) Classification of Limestones: a) Autochthonous and Allochthonous limestones, b) Classification of Carbonate rocks –by Folk in Pettijohn, and by Dunham in Pettijohn.</p> <p>c) Introduction to Grainstones, Boundstones, Carbonate mudstones, Allochthonous (graded) limestones and Dolomites.</p> <p>d) Diagenesis of carbonate rocks : Cement and cavities, solution, grain growth and compaction</p>		
	Provenance	<p>1. Definition</p> <p>2. Mineral and Source rocks</p> <p>3. Mineral Stability series of Goldich</p> <p>4. Mobility of Oxides</p> <p>5. Weathering Potential Index.</p>	10	6
	Environment of Deposition	<p>1) Introduction</p> <p>2) Concept of sedimentary deposition environment</p> <p>3) Environmental Parameters</p> <p> a) Physical Parameters</p> <p> b) Chemical Parameters</p> <p>4) Classification of Environment – Fluvial (Alluvial), Shore zone, Marine, Glacial</p>	10	6

Reference Books:

1. Sedimentary Rocks: Pettijohn
2. Sedimentology: Leeder
3. Introduction to Sedimentology: Sengupta
4. Stratigraphy and Sedimentation: Krumbein and Sloss
5. Principles of Sedimentology: Friedman and Sanders.
6. Applied Sedimentology: R. K. Sukhatankar

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus for T. Y. B.Sc. Geology

Semester V

w. e. f. June 2014

G1:356: Geomorphology

Unit No	Topic	Sub-topic	Periods	Marks
I	Geomorphology	1. Definition and Introduction to Geomorphology 2. Basic Fundamental concepts in geomorphology. 3. Recap of Weathering process (Agents and types)	10	6
II	Soil	1. Soil formation and types 2. Soil Profile	6	4
III	Role of climate	Role of climate, lithology and tectonics in landscape development	2	-
IV	Landforms	1. River : Mesa and Butte, Divides, Cuesta, Hogback 2. Sea : Longshore deposits (Spits, Bar, Tombolo, Hooks, Lagoons, Tidal flats, marshes) 3. Glaciers : Tarns, Aretes, Horn, Cols, Fjords, Eratics and perched blocks, Outwash plains, Kettle holes, Kames, Eskers, 4. Karst Topography	16	10
V	Genetic classification of streams	1. Phases of drainage network development 2. Genetic classification of Streams 3. Drainage network patterns (dendritic, trellis, rectangular, radial, annular, parallel, irregular) 4. Definition of terms : Antecedent and superimposed river, stream piracy,	10	6
VI	Drainage basin Morphometric analysis	Drainage basin and network characters, 1. Stream Ordering and Bifurcation ratio. 2. Basin area and stream length 3. Drainage texture (frequency and density)	10	8
VII	Applications of Geomorphology	Relation and applications of Geomorphology in: a) Hydrology b) Economic Geology c) Engineering Geology d) Oil Exploration	6	6

Reference Books:

1. Introduction to Geomorphology: Kale, V. S. and Gupta A. G.
2. Principles of Geomorphology: Easterbook, Don J.
3. Geomorphology: Chorley, R. J. Schumm, S. A., Sugden, D. E.
4. Fundamentals of Geomorphology: Rice. R. J.
5. Geomorphology and Hydrogeology: Small, R. J.
6. Principles of Geomorphology: Thornbury
7. Soils and Landforms: Gerrard, A. J.
8. Geomorphology – Savindra Singh, Merut Publication

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus for T. Y. B.Sc. Geology Practicals

w. e. f. from – June-2014

GI 307 : Mineralogy and Igneous Petrology

Semester V : Mineralogy

Unit No	Topic	Sub-topic
I	Mineralogy	<p>1. Study of following minerals for its physical properties, uses, occurrences of: Galena, Sphalerite, Pyrrhotite, Chalcopyrite, Orpiment, Realgar, Pyrite, Fluorite, Halite, Hematite, Magnetite, Pyrolusite, Quartz, Chalcedony, Massive quartz, Varieties of Agates, Rock Crystal, Smoky Quartz, Milky Quartz, Psilomelane, Calcite, Magnesite, Dolomite, Malachite, Barite, Gypsum, Apatite, Olivine, Andalusite, Sillimanite, Biotite, Muscovite, Staurolite, Garnet, Epidote, Beryl, Tourmaline, Augite, Diopside, Tremolite, Actinolite, Hornblende, Wollastonite.</p> <p>2. Hess calculation for Pyroxenes</p> <p>3. Mineral calculation for Feldspars.</p> <p>4. Optics: Optical Properties for at least 15 minerals.</p>
II	Economic Geology	<p>5. Preparation of an ore-mineral map of India for the following: Iron, Manganese, Chromium, Copper, Lead, Zinc And Aluminum.</p> <p>6. Petroliferous basins in India,</p> <p>7. Coal-fields of India</p>

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Syllabus for T. Y. B.Sc. Geology Practicals

w. e. f. from – June-2014

GI 308 : Metamorphic, Sedimentary Petrology and Indian Stratigraphy

Semester V: Sedimentary Petrology and Indian Stratigraphy

Unit No	Topic	Sub-topic
I	Sedimentary Petrology	<p>1. Study of the following Megascopic rocks with regards to their texture/ structure, description, identification and classification, giving their sedimentological significance. Conglomerate, Breccia, Grit, Arkose, Laterite, Bauxite, Speckled sandstone, Varieties of Sandstone, Ferruginous and Carbonaceous Shale, Limestone (Chemical and Organic), Calc-tufa, Calcrete.</p> <p>2. Thin section study of the following sedimentary rocks : Sandstone, Feuginous sandstone Arkose, Nummulitic limestone, Fossileferous limestone and Limestone.</p> <p>3. Interpretation of the sedimentary structures giving their geological significance. 1) Parallel bedding 2) Cross bedding. 3) Graded bedding. 4) Ripple marks. 5) Mud cracks / Sun cracks. 6) Laminations. 7) Tracks and trails.</p> <p>4. Plotting and calculation of the sieve analysis data and environmental interpretation.</p>
II	Paleaontology	<p>6. Study of 25 animal fossil/Shells and 5 plant fossils.</p>
III	Indian Stratigraphy	<p>7. Preparation of maps showing the geographical distributing of the following Stratigraphic units of India.:</p> <ul style="list-style-type: none">a) Dharwar Supergroup.b) Orissa-Singhbhum beltc) Aravalli Super group.d) Cuddapah Supergroup and its equivalents.e) Vindhyan Supergroup and its equivalents.

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Syllabus for T. Y. B.Sc. Geology Practicals

w. e. f. from – June-2014

GI 309 : Structural, Environmental Geology and Hydrology

Semester V: Structural Maps and Problems

Unit No	Topic	Sub-topic
I	Geological Maps	i) Description of the topography and geology of the map. ii) Drawing of a section along a given direction. (maps with one and two series ,one or two Fault, vertical dyke and fold)
II	Structural problems	I) Based on hill slope, true thickness of the bed, vertical thickness, dip of the bed and width of outcrop. II) Three point problems To find Strike, true dip direction and true dip amount of the bed.
III	Geomorphology	Bifurcation ratio of given basin.
IV	Field Geology	Field work for about one week in an area of geological interest, anywhere in India and preparation of field tour report.

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T.Y.B.Sc. GEOLOGY SYLLABUS

(W. e. f. June 2014)

Semester VI

GI 361: Metamorphic Petrology

GI 362: Economic Geology

GI 363: Natural Resources – Minerals and Energy

GI 364: Geo techniques

GI 365: Environmental Geology

GI 366: Hydrogeology

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Syllabus for T. Y. B.Sc. Geology

Semester VI

w. e. f. June 2014

GI 361: Metamorphic Petrology

Unit No.	Topic	Sub Topic	Periods	Marks
I	Metamorphic Petrology	1. Scope of Metamorphic Petrology 2. Definition and types of metamorphic rocks	4	4
II	Controls and process of metamorphic rocks.	1. Controls: Pressure, Temperature and Composition of original rock 2. Metamorphic processes: Initiation of metamorphic processes, preferred orientation, 3. Upper limits of metamorphism.	6	4
III	Mineral changes	1. Mineral changes during metamorphism. 2. Mineral variation in metamorphism 3. Mineral variation related to initial rock composition	6	4
IV	Classification and nomenclature of metamorphic rocks	1. Fabric of metamorphic rocks 2. Classification and nomenclature of metamorphic rocks based on a. Fabric b. Composition c. genesis d. grade and e. Facies	10	6
V	Thermal metamorphism	1. Metamorphic Aureole, Thermal metamorphism of Impure calcareous rocks. 2. Introduction to facies of contact metamorphism.	10	6
VI	Regional metamorphism	1. Barrovian zones. 2. Introduction to Facies of regional metamorphism-and its mineral assemblages	12	8
VII	Stability of metamorphic minerals	P-T boundaries and mineral equations of : Zeolites, Chlorites, Muscovite, Biotite, Staurolite, Garnets, Pyroxenes, Amphiboles, Aluminosilicates	12	8

Reference Books:

1. Metamorphism: Alfred Harker
2. Petrography of the Igneous and Metamorphic rocks in India: S. C. Chatterjee
3. Metamorphic Petrology, Mineralogy and Field aspects: Turner
4. Metamorphism and Metamorphic belts: Miyashiro
5. Petrology (Igneous, Sedimentary and Metamorphic): Blatt and Tracy.
6. Analysis of Metamorphic techniques: Turner and Weiss
7. Metamorphic Petrology: B. Bhaskar Rao

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Semester VI

w. e. f. June 2014

GI 362: Economic Geology

Unit No.	Topic	Sub Topic	Periods	Marks
I	Brief history of use of minerals	Brief history of use of minerals and development of Economic Geology.	4	4
II	Terms	Ore mineral, Tenor of ore, Gangue minerals,	4	4
III	Classification of minerals deposits	Classification of minerals deposits as suggested by: 1)Irving 1908, 2) Lindgren Classification 1911 3) Bateman's Classification	10	6
V	Process of formation of Mineral Deposition.	a) Magmatic Concentration. b) Sublimation. c) Hydrothermal deposition i. openings in rocks ii. hydrothermal alterations iii. cavity fillings iv. metasomatic replacement d) Contact Metasomatism i. Introduction ii. Process and effects e) Sedimentation i. Source of material ii. Solution, transportation and deposition iii. Conditions of deposition f) Evaporation g) Residual and Mechanical Concentration h) Oxidation and supergene enrichment. i) Metamorphism.	36	22
VI	Polymetallic nodules.	Polymetallic nodules.	6	4

Reference Books:

1. Economic Mineral Deposits: Bateman
2. Mining Geology: Mckenstry
3. Ore deposits of India: Gokhale and Rao
4. Mineral Economics: Sinha R K 5. Ore Deposits of India – Prasad, CBS Publication

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Syllabus for T. Y. B.Sc. Geology

Semester VI

w. e. f. June 2014

GI 363: Natural Resources – Minerals and Energy

Unit No.	Topic	Sub Topic	Periods	Marks
I	Coal	1. Origin and varieties 2. Different Classifications, 3. Rank and Grades 4. Distribution of coal in India.	10	8
II	Stratigraphy of Coal fields	Stratigraphy, structure, lithology of: 1. Raniganj, 2. Bokaro, 3. Neyveli lignite.	05	4
III	Petroleum	1. Origin 2. Migration 3. Distribution of oil and gas in India.	10	8
IV	Stratigraphy, structure, lithology of oil fields	Stratigraphy, structure, lithology of oil fields: 1. Upper Assam 2. Bombay High and 3. Cambay Basin	7	4
V	Geothermal Energy	1. Introduction and distribution in India. 2. Types of geothermal systems.	10	5
VI	Nuclear fuels	1. U and Th- Mineralogy, Uses and Distribution.	8	5
VII	Mineral Deposits of India	Geological and geographical distribution, uses and characters of: Metallic : Gold, Manganese, Iron, Aluminum, Lead, Zinc, Copper. Non Metallic : Diamond, Mica, Graphite, Feldspar, Gypsum, Ochre	10	6

Reference Books:

1. India's Mineral Resources: Krishnaswami
2. Indian Minerals: D. N. Wadia
3. Geology of Industrial rocks and minerals: Robert L. Bates
4. National Mineral Policy: G.O.I. Publications

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Syllabus for T. Y. B.Sc. Geology

Semester VI

w. e. f. June 2014

GI 364: Geotechniques

Unit No.	Topic	Sub Topic	Periods	Marks
I	Remote sensing	A. Definition, Scope of Remote sensing B. Electromagnetic spectrum a. Energy interaction in atmosphere b. Adsorption, Transmission, Reflection C. Resolution in Remote Sensing a. spatial resolution b. spectral resolution c. radiometric resolution d. temporal resolution e. pixel D. Sun synchronous and Geo stationary orbits E. Sensors and Platforms Platforms :a. LANDSAT satellite b. SPOT satellite c. CARTOSAT satellite Sensors: a. spectral bands for sensors b. classification c. sensors for UV, Visible, IR, Microwave, multispectral scanner, thematic mapper	20	15
II	Prospecting	A) Criteria and guides forProspecting B) Study of following methods of geophysical prospecting, with reference to physics of the method, working principles of the instruments used and applications. i) Resistivity. ii) Magnetic. iii) Gravity. iv) Seismic (refraction and reflection)	20	12

III	Engineering Geology	i) Engineering properties of rocks, building stones, road materials and their characteristics. ii) Geotechnical investigations for site selection of dam-site, tunnel alignment, bridges, and road ways.	20	13
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Reference Books:

1. General Geology: V. Radhakrishnan
2. Plate Tectonics and Crustal Evolution: Condie
3. Aspects of Tectonics: K. S. Valdiya.
4. Tectonics: E. M. Moores and R. J Twiss
5. Geotectonics: V. V. Belousov
6. Geochemistry: Mason
7. Physical Geology: A. Homes.
8. Global Tectonics: Keray P and Vine F. J.
9. Our Evolving Planet: Bergen, Alma, Mater Fortag
10. Dynamic Himalaya: K. S. Valdiya
11. Geomorphology and Global Tectonics: Summerfield M. A.

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Syllabus for T. Y. B.Sc. Geology

Semester VI

w. e. f. June 2014

GI 365: Environmental Geology

Unit No.	Topic	Sub Topic	Periods	Marks
I	Fundamental Concepts of Environmental Geology	a) Seven fundamental concepts of Environmental Geology	8	4
II	Land as a Resource	i) Land classification - Agricultural land-use pattern, Land productivity, capability, capacity. ii. Human settlement and land use iii. Land use pattern in India iv. Assessment of impact of land use v. Desertification and degradation of land	13	9
III	Soil as a resource	i. Introduction to soil ii. soil conservation	13	9
IV	Water as a resources	i. Water resources of India ii. Groundwater provinces of India iii. Quality of Surface and ground water iv. Water logging and development of alkaline and acidic soils, v. Water management	13	9
V	Natural hazards	Natural hazards, causes and prevention of- i) River flooding ii) Landslides iii) Earthquakes iv) Volcanic activity v) Coastal hazards	13	9

Reference Books:

1. Environmental Geology: K. S. Valdiya
2. Environmental Geology: Edward A. Keller
3. Mining and Environment: Bharat B Dhar
4. Environmental Chemistry: A K De
5. Environmental Geology – Lindgreen
6. Environmental Geology – Savindra Singh

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Syllabus for T. Y. B.Sc. Geology

Semester VI

w. e. f. June 2014

GI 366: Hydrogeology

Unit No.	Topic	Sub Topic	Periods	Marks
I	Introduction:	1. Definition of terms like Hydrology, Geohydrology and Hydrogeology, 2. Scope of groundwater geology. 3. Distribution of water on earth's surface with percentage 4. Utilization of groundwater 5. Groundwater in the Hydrologic cycle and hydrologic properties: precipitation, infiltration, soil moisture, evaporation, transpiration.	12	8
II	Occurrence Distribution and Movement of Groundwater:	1. Origin of Groundwater, 2. Rock Properties affecting groundwater occurrence. 3. Vertical distribution of groundwater. 4. Type of Aquifers : (Aquiclude, Aquifuge, Aquitard), 5. Formations of springs. 6. Types of Wells (Dug, Bore and Tube). Their advantages and disadvantages. 7. Groundwater Movement: Darcy' s Law 8. Permeability, conductivity, transmissivity, storativity, piezometric level.	12	8
III	Watershed Development and resources management strategy	1. Concept of watershed 2. Classification of watersheds 3. Watershed characteristics and multidisciplinary approach to watershed management.	12	8
IV	Groundwater Investigation:	1. Groundwater Investigation: Geologic method, Remote sensing method, 2. Geophysical methods : List of methods and VES method Wenner and Schlumberger method in detail.	12	8
V	Artificial recharge of Groundwater:	Artificial recharge of Groundwater: Surface, subsurface recharging methods used in Deccan Traps (Maharashtra)	12	8

Reference Books:

1. Hydrogeological measurements for watershed research: Wasi Ullah, S. K. Gupta and Dalal S. S.
2. Watershed management in India: J. V. S. Murthy
3. Groundwater: Hydrology: D. K. Todd
4. Groundwater: H. Raghunath
5. Groundwater Assessment, Development and Management: K. R. Karnath
6. Groundwater Surveys and Investigation: Gautam Mahajan



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Syllabus for T. Y. B.Sc. Geology Practicals

w. e. f. June 2014

GI 307: Mineralogy and Igneous Petrology

Semester VI: Igneous Petrology

Unit No	Topic	Sub-topic
II	Igneous Petrology	<p>1. Study of the following Megascopic rocks with regard to their texture, mineral composition, colour index, identification and classification.</p> <ul style="list-style-type: none">a) Varieties of granitesb) Basaltc) Gabbro (Anorthite, norite),d) Felsites,e) Peridotite,f) Lamprophyre, h) Dacitei) Porphyries. <p>2. Thin section study of the following rocks with regard to their texture, mineral composition, colour index, identification and classification.</p> <ul style="list-style-type: none">a) Granitesb) Olivine basaltc) Norited) Anorthositee) Phonolitef) Lamprophyreg) Peridotiteh) Trachytei) Andesitej) Nepheline syenite. <p>3. Description, genesis and significance of the following Megascopic textures / structures: Granitic, Porphyritic, Graphic, Ropy, Glassy, Flow, Columnar, Vesicular, and Amygdaloidal.</p> <p>4. Description genesis and significance of the following textures/structures seen in thin section :</p> <ul style="list-style-type: none">a) Equigranularb) Inequigranularc) Porphyriticd) Intergranulare) Intersertalf) Poikiliticg) Ophitic-Subophitich) Graphici) Flow structure <p>5. CIPW Norm calculation of saturated rocks based on given chemical data.</p>

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GI 308 : Metamorphic, Sedimentary Petrology and Indian Stratigraphy

Semester VI: Metamorphic Petrology

Unit No	Topic	Sub-topic
I	Metamorphic Petrology	<p>1. Study of the following Megascopic rocks with regards to their texture/structure, mineral composition, colour, type of metamorphism, grade and the original rock:</p> <p>Slate, Phyllite, Chlorite Schist, Mica (Biotite) Schist, Hornblende Schist, Staurolite schist, Kyanite Schist, Mica-Garnet Schist, Mica Gneiss, Hornblence Gneiss, Sillimanite Gneiss, Augen Gneiss, Charnokite, Fuschite Quartzite, Banded Haematite Quartzite, Marbles.</p> <p>2. Study of the thin sections of the following rocks with regards to the their texture/ structure, mineral composition, colour, type of metamorphism and grade:</p> <p>Chlorite Schist, Staurolite Schist, Kyanite Schist, Mica Schist, Mica-Garnet schist, Mica Gneiss, Sillimanite gneiss, Augen gneiss, Charnockite, Marble, Quartzite, Slate.</p> <p>3. Interpretation of Microscopic structures giving their geological significance:</p> <p>Granulose, Schistose, Gneissose, Porphyroblastic, Idioblastic.</p>

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GI 309 : Structural, Environmental Geology and Hydrology

Semester VI: Structural Maps and Problems, Environmental Geology and Hydrology

Unit No	Topic	Sub-topic
I	Structural Problems	I) Problems using stereographic projections :-Strike, true dip and apparent dip of a bed. II) problems with true and apparent dip given in ratio
II	Outcrop Completion of the Map	Completion of geological maps (outcrops) with given data. 1. Junction of a bed 2. Based on three points
III	Geochemistry	Determining the following : 1. Total alkalinity of water. 2. Chlorites in water. 3. Total hardness of water.
IV	Hydrology	Vertical Electrical Sounding for Groundwater exploration
V	Field Geology	Field work for about one week in an area of geological interest, anywhere in India and preparation of field tour report.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Job Opportunities for B.Sc Geology Students

- 1. In competitive exams of State and Central Governments as MPSC and UPSC where minimum qualification is Graduate.**
- 2. State and Central Forest departments through exams**
- 3. As a consultant in groundwater exploration, water shed management**
- 4. As a consultant gem and jewelery**
- 5. As a consultant in geotechnical field.**
- 6. As a geologist in different NGOs.**