

AC 27/2/13

Item no. 4.115

UNIVERSITY OF MUMBAI



Syllabus for sem V & VI

Program: B.Sc.

Course: GEOLOGY

(Credit Based Semester and Grading System with
effect from the academic year 2013–2014)

T.Y.B.Sc. Geology Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2013-2014

Theory

Course	Title	Credits	L / Week
USGE501	Stratigraphy and Geology of India.: Part I	2.5	4
USGE502	Evolution and Classification of Igneous Rocks	2.5	4
USGE503	Structural Geology	2.5	4
USGE504	Remote Sensing and Image processing	2.5	4

Practicals

USGEP05	Practicals of Course USGE501 + Course USGE502	3	8
USGEP06	Practicals of Course USGE503 + Course USGE504	3	8

SEMESTER VI

Theory

Course	Title	Credits	L / Week
USGE601	Stratigraphy and Geology of India Part II	2.5	4
USGE602	Sedimentary and Metamorphic Petrology	2.5	4
USGE603	Engineering and Environmental Geology	2.5	4
USGE604	Photogrammetry, Aerial PhotoInterpretation and Fundamentals of	2.5	4

	GIS		
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Practicals

USGEP07	Practicals of Course USGE601 + Course USGE602	3	8
USGEP08	Practicals of Course USGE603 + Course USGE604	3	8

SEMESTER V

Theory

Course	UNIT		Credits	L / Week
USGE501	Stratigraphy and Geology of India Part I			
	I	Earth's Crustal Structure and Tectonic divisions of India Tectonic Elements of Continents Cratons Folded Mountain Belts. Tectonic Elements of Oceans. Tectonic Divisions of India- Peninsular India. Extra-Peninsular India. Indo-Gangetic Plain.	2.5	1
	II	Precambrian Basement of Indian Peninsula: Precambrian Basement Dharwar Province Eastern Ghats Province Central Indian Province Singhbhum-Orissa Province Aravalli-Bundelkhand Province		1
	III	Proterozoic Formations of Indian Peninsula		1

		Proterozoic History Basement Cover Transition Proterozoic Succession Lower Purana Succession Delhi Supergroup Bijawar and Gwalior Groups Kolhan Group Cuddapah Supergroup Kaladgi and Pakhal Groups Upper Purana Succession Vindhyan Supergroup Kurnool Group Equivalent of Kurnool Group		
	IV	Precambrians of Extra – Peninsula Precambrian of the Tethyan Basement Salkhala Group Vaikrita Group Bhimphedi Group Jutogh Group Daling Group Precambrians of the Lesser Himalaya Western Sector Central Sector Nepal Himalaya Eastern Himalaya		1
USGE502	Evolution and Classification of Igneous Rocks			
	I	The Interior of the Earth: Evidence of the Earth's Composition and Mineralogy: Seismic data, The Geothermal Gradient, Meteorites, Xenoliths. Mantle Petrology; Low Velocity Zone, Pressure and Temperature variations with Depth. Classification and Description of	2.5	1

	<p>Igneous Rocks:</p> <p>The IUGS Classification System, Other aspects of classification; Chemical Classification;</p> <p>Textures of Igneous rocks,</p> <p>Crystallinity, Granularity, Shape of Crystals and Mutual Relations.</p> <p>Equigranular, Inequigranular, Directive and Intergrowth Textures.</p> <p>Terms related to some specific Textures and Microstructures : Perlitic Cracks, Spherulites, Orbicular Structure, Rapakivi Structure, Zoned Crystals, Xenocrysts, Quench Texture, Crystal Pseudomorph, and Cumulus Crystals.</p> <p>Characters of the Common Igneous Rocks: Plutonic and Volcanic types; Examples of Common Igneous Rock Types and their Indian Occurrences.</p>		
<p>II</p>	<p>The Phase Rule and One and Two-Component Systems:</p> <p>Melting Behavior of Natural Magmas, Phase Equilibrium and The Phase Rule, One Component Systems, Two Component (Binary Systems) and Its Petrogenetic Significance.</p> <p>Binary Systems with Complete Solid Solution, Binary Eutectic Systems, Binary Peritectic Systems, the Alkali Feldspar System,</p> <p>Ternary Systems:- Ternary Eutectic</p>		<p>1</p>

	<p>Systems, Ternary Systems with Solid Solution</p> <p>Reaction Series, The Effect of Pressure on Melting Behavior, The effect of Fluid on Melting Behavior. The effects of Pressure on the Melting and Crystallization of Magma; Time and Crystallization; Rock Types and Mode of Occurrence.</p>		
III	<p>The Evolution of Magmas:</p> <p>Differentiation: Fractional Crystallization; Other Differentiation Mechanisms.</p> <p>Magmatic Mixing and Assimilation.</p> <p>Mantle Melting and Generation of Basaltic Magma, Petrology of Mantle, , High-Pressure Experimentation,</p> <p>Melting of the Mantle, Partial Melting, Magma Generation and Differentiation. Generation of Basalts from a Chemically Uniform Mantle.</p>		1
IV	<p>Subduction –Related Activity : Island Arcs, Island Arc Volcanism, Island Arc Volcanic Rocks and Magma Series, The Ophiolite Suite; Calcalkaline and Tholeiite Groups; Petrogenesis of Island Arc Magmas, Plutonic Rocks – Batholiths related to subduction zones.</p> <p>Gabbroic Layered Intrusions; Anorthosites; Alkali Basalts and Nephelinites; Carbonatites, Kimberlites and related Rocks.</p>		1

USGE503	Structural geology		
I	<p>Introduction, Types of Structures, Stress, Strain, Measurements of Stress and Strain, Mechanical Behaviour of Rocks</p> <p>Introduction and Review Structures and Structural Geology Fundamental Concepts Plate Tectonics Nontectonic Structures Primary Sedimentary Structures Sedimentary Facies Dewatering Structures Unconformities Stress Definitions Stress on a Plane Stress at a Point Mohr Construction Mohr's Hypothesis Stress Ellipsoid Strain Definitions Kinds of Strain Strain Ellipsoid Mohr Circles for Strain Simple and Pure Shear Measurement of Strain in Rocks Kinds of Strain Strain Markers Flinn Diagram Mechanical Behavior of Rock Materials Elastic (Hooken) Behavior Permanent Deformation – Ductility Controlling Factors</p>	2.5	1
II	<p>Study of Structures I: Joints and Faults</p>		1

	<p> Joints and Shear Fractures Formation of a Fracture Griffith Theory Joints and Fracture Mechanics Joints in Plutons Fault Classification and Terminology Anatomy of Faults Andersonian Classification Criteria for Faulting Fault Mechanics Anderson's Fault Types Brittle versus Ductile Faults Shear Zones Shear – Sense Indicators Thrust Faults Nature of Thrust Faults Detachment within a Sedimentary Sequence Small – Scale Features of Thrust Sheets Strike – Slip Faults Properties and Geometry Environments of Strike – Slip Faulting Fault Geometry and Other Fault Types Termination of Strike – Slip Faults Transforms Normal Faults Properties and Geometry </p>		
<p style="text-align: center;">III</p>	<p> Study of Structures II: Folds Fold Geometry and Classifications Descriptive Anatomy of Simple Folds Map – Scale Parallel Folds and Similar Folds Recognition of Folds Fold Classifications Based on interlimb angle Chapman classification Hudleston classification Ramsay standard classification Donath and Parker classification </p>		<p style="text-align: center;">1</p>

	<p>Noncylindrical and Sheath Folds Fundamentals of Parallel Folds and Similar Folds Complex Folds Occurrence and Recognition Fold Interference Patterns Recognition of Multiple Fold Phases</p>		
	<p>IV</p> <p>Study of Structures II: Folds-II Fold Mechanics Fold Mechanisms and Accompanying Phenomena Deformation Mechanisms and Strain Theory of progressive evolution of fold shapes in single competent layers. Layer parallel shortening Dependence of fold shape on viscosity contrast in a single layer buckles High competence contrast, Low Competence contrast Zone of contact strain and its interrelationship with buckle folds Change of fold shape with packing distance of competent layers Fold styles in multilayers</p>		1
USGE504	Remote Sensing and Image processing		
	<p>I</p> <p>Concepts of Remote Sensing: Concepts and Foundations of Remote Sensing Definition of Remote Sensing. Energy Sources and Radiation Principles. Energy interactions in the Atmosphere: Scattering, Absorption. Energy interactions with earth surface features: Spectral Reflectance of Vegetation, Soil and Water, Spectral response patterns, Atmospheric Influences on Spectral Response Patterns. Brief history of Remote Sensing from the advent of photography till today's aerial</p>	2.5	1

	and space-based remote sensing systems. The concept of resolution: Spatial, Spectral, Temporal and Radiometric.		
II	Satellite Sensors and Data Space Borne Imaging Systems- The Landsat, IRS, SPOT and High resolution Land Satellites (the characteristics of these satellites- their orbits, their sensors, and their resolutions) Multispectral, Thermal and Hyper spectral Sensing Across track scanning. Along track scanning. Operating principles of Across track Multispectral Scanners. Across track Thermal scanning. Thermal Radiation principles.		1
III	Introduction to Digital Image Processing Introduction. Image Rectification and Restoration. Image Enhancement. Contrast Manipulation. Spatial Feature Manipulation. Multi-Image Manipulation.		1
IV	Digital Imaging classification Image Classification: Supervised Classification. The Classification Stage: Minimum-Distance to Means Classifier, Parallelepiped Classifier, Gaussian Maximum Likelihood Classifier. The Training Stage. Unsupervised Classification. Classification Accuracy Assessment.		1

Practicals

USGEP05	Practicals of Course USGE501 + Course USGE502	3	8
	Stratigraphy and Geology of India, Maharashtra and Mumbai		
	I) Study of common sedimentary, igneous and metamorphic rocks in Hand specimen from different		

	<p>stratigraphic horizons.</p> <p>II) Study of common fossils characteristics of a particular stratigraphic horizon.</p> <p>III) Diagrammatic examples of Lithostratigraphic boundaries and classification.</p> <p>IV) Study of Geological maps with geological history of the area in chronological order.</p> <p>V) Problems:</p> <ol style="list-style-type: none"> a) Stratigraphic sequence from geological section. b) Stratigraphy of a geological section-fossils & radiometric age. c) Characteristics of a Fold & Fault from a geological map. d) Stratigraphic Boundary Problem. e) Understanding Geological Time Scale. <p><u>Megascopic identification and Petrography of Igneous Rocks</u></p> <p>Igneous Textures.</p> <p>Equigranular:</p> <ol style="list-style-type: none"> a. Coarse –grained, Holocrystalline, Panidomorphic. b. Coarse –grained, Holocrystalline, Hypidiomorphic c. Medium –grained, Holocrystalline, Hypidiomorphic d. Medium –grained, Holocrystalline, Hypidiomorphic e. Fine –grained, Holocrystalline, Panidomorphic. (Orthophyric) f. Fine –grained, Holo/ Hemicrystalline, Hypidiomorphic g. Fine-grained, Holocrystalline, Allotriomorphic (Aplitic) h. Fine- grained, Hemicrystalline, Aphanitic, (Felsitic) i. Fine –grained, Holohyaline, 		
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	<p>Aphanitic Inequigranular:</p> <ul style="list-style-type: none"> a. Coarse/Medium/Fine, Holo/Hemicrystalline, Porphyritic b. Coarse/Medium/Fine, Holo/Hemicrystalline, Glomeroporphyritic c. Coarse/Medium, Holo/Hemicrystalline, Ophitic/Subophitic d. Medium/ Fine, Holo/Hemicrystalline, Poikilitic e. Medium/Fine, Holocrystalline, Intergranular f. Medium/Fine, Hemicrystalline, Intersertal g. Medium/Fine, Intergranular-cum-ophitic (Ophimottling) <p>Directive:</p> <ul style="list-style-type: none"> a. Fine, Hemicrystalline/Holohyaline, Banded (Fluidal) b. Fine, Hemicrystalline, Trachytic <p>Intergrowth:</p> <ul style="list-style-type: none"> a. Graphic/Micrographic b. Perthitic c. Granophyric <p>Igneous Mega-Structures</p> <ul style="list-style-type: none"> 1. Vesicular/ Amygdaloidal Lava 2. Blockery/ Clinkery Lava 3. Ropy Lava Surface 4. Columnar Joint Block 5. Flow Banding 6. Glomeroporphyritic Clusters 7. Intrusive Contacts and Xenoliths <p>Igneous Micro-Structures</p> <ul style="list-style-type: none"> 1. Reaction: (a. Corona , b. Myrmekite) 2. Xenolithic 3. Spherulitic/ Variolitic 4. Perlitic Fracture 5. <p>Study of the Texture, Mineral composition, Mode of occurrence, and Association of the</p>		
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	<p>following Rock Types.</p> <ol style="list-style-type: none"> 1. Granite 2. Rhyolite 3. Pegmatite 4. Aplite 5. Quartz porphyry 6. Pitchstone 7. Obsidian 8. Syenite (Hornblende / Biotite) 9. Trachyte 10. Feldspar porphyry 11. Nepheline Syenite 12. Diorite 13. Gabbro 14. Norite 15. Dolerite 16. Basalt (Vesicular/ Non- Vesicular/ Porphyritic, Amygdaloidal) 17. Picrite 18. Peridotite 19. Dunite 20. Anorthosite 21. Carbonatite 		
<p>USGEP06</p>	<p>Practicals of Course USGE503 + Course USGE504</p> <p>Structural Geology</p> <ul style="list-style-type: none"> • Profiles and cross sections of geological maps with showing various structural features: folds, faults, dykes, two series of dipping beds. (8 maps) • Patterns of dipping strata; Three-Point problems. • Thickness and depth of strata • Apparent dips and structure sections of folded strata • Geometrical construction of folds • Trigonometric solution of fault problems • Solution of three-point problems <p>Remote Sensing and Image Processing</p> <ul style="list-style-type: none"> • Data Products and Meta data 	<p>3</p>	<p>8</p>

	<ul style="list-style-type: none"> • Digital Image Processing (using number matrix): enhancement, manipulation and classification. • Digital image processing on Computer <ul style="list-style-type: none"> ○ Display of various types of image formats ○ Pallets and Display elements ○ Georeferencing ○ Image enhancement ○ Image classification 		
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SEMESTER VI
Theory

Course	UNIT	TOPICS	Credits	L / Week
USGE601	Stratigraphy and Geology of India Part II			
	I	Palaeozoic History Tectonic History Palaeozoic Life Precambrian Cambrian Boundary Marine Palaeozoic Formations of India Tethyan Regions Lesser Himalayan Regions	2.5	1
	II	Mesozoic History Tectonic History History of Mesozoic Life Marine Forms Land Forms Permian Triassic Boundary Marine Mesozoic Formations of India Tethyan Himalaya Lesser Himalaya (KrolBelt) Indian Peninsula		1

	<p style="text-align: center;">III</p>	<p>Gondwana Sequence of India Sedimentation and Palaeoclimates Lower Gondwana Sequence Talchir Formations Marine Intercalations Bap and Badhaura Formations Damuda Group Lower Gondwana of Eastern Himalayas Upper Gondwana Sequence Damodar Valley Basin Satpura Basin Rajmahal Hills Mahanadi-Son Valley Basin Pranhita-Godavari Basin</p>		<p style="text-align: center;">1</p>
	<p style="text-align: center;">IV</p>	<p>Cenozoic History Tectonic History Rise of Tertiary Mountains History of Cenozoic Life Boundary Problems Indian Cenozoic Formations Himalayan Palaeogene Succession Himalayan Neogene Succession Indus Belt Deccan Traps Assam –Arakan Region Andaman-Nicobar Islands Northwestern Peninsula Cauveri and Godavari Basins Geology of Maharashtra Geology of the State Geological and Geographical distributions of minerals</p>		<p style="text-align: center;">1</p>
<p>USGE602</p>	<p style="text-align: center;">Sedimentary and Metamorphic Petrology</p>			

	I	<p>Clastic Sedimentary Rocks. The Occurrence of Sedimentary Rocks: Origin, transportation and deposition of sediments. Basin, environment and facies concepts. Provenance. Brief concept about Plate tectonics and sedimentation</p> <p>Sedimentary Texture: Laboratory Techniques, Grain Size, Udden-Wentworth Size Scale, Phi Scale, Grain Size Measurement, Roundness and Shape, Grain to Grain relationship, permeability and porosity.</p> <p>Classification of Sedimentary rocks. Diagenesis.</p> <p>Sandstones and Conglomerates: Field Observations: Textures, Colour, Distance from source, Structures, Mineral composition. Laboratory Studies: Textures, Mineral composition; Recycling of Grains. Classification of Sandstones and conglomerates.</p> <p>Mudrocks: Field Observations: Textures, Structures, Colour, Nomenclature Laboratory Studies: Mineral composition; Bentonites; Mudrocks and Source areas</p>	2.5	1
	II	<p>Non-clastic Sedimentary Rocks</p> <p>Limestones and Dolomites: Field Observations of Limestones: Textures; Noncarbonate Mineralogy; Classification; Structures; Reefs and Palaeoclimate; Diagenesis. Laboratory Studies: Allochemical</p>		1

		<p>and Orthochemical Particles. Sites of Calcium Carbonate Deposition; Modern Reef Environments. Dolomites: Laboratory Studies; Modern Dolomite. Dolomitization.</p> <p>Other Types of Sedimentary Rocks:</p> <p>Evaporites, Origin of Giant Evaporite Deposits; Evaporites and Climate.</p> <p>Bedded Cherts: Phanerozoic Marine Cherts; Phanerozoic Nonmarine Cherts; Precambrian Cherts.</p> <p>Bedded Phosphate Rocks: Origin of Phosphorites.</p> <p>Bedded Iron Deposits: Oolitic Iron Formations; Bedded Iron Formations.</p>		
	<p>III</p>	<p>Introduction to Metamorphic Petrology</p> <p>The Occurrence of Metamorphic Rocks:</p> <p>Recognition of Metamorphic Rocks; Common Metamorphic Rocks.</p> <p>Definition of metamorphism. Factors of metamorphism. P-T limits of metamorphism. Agents of metamorphism – Pressure, Temperature, Fluid phase and time. Classification of metamorphic rocks.</p> <p>Facies and Graphic Representation:</p> <p>The Facies Concept; Equilibrium; The Phase Rule; Graphic Representation.</p>		<p>1</p>

		<p>Metamorphic zone concept and index minerals, grade concept, Isograds.</p> <p>Controls and Processes of Metamorphism: The Controls: Pressure, Temperature and Composition. Metamorphic Processes: Initiation of metamorphism, Contact Metamorphism, Metamorphism of Igneous Rocks, Submarine Metamorphism; Porphyroblasts; Preferred Orientation; The Upper Limit of Metamorphism.</p>		
	<p>IV</p>	<p>Facies Concept in Metamorphism and its Applications</p> <p>Mineral Changes During Metamorphism: Mineral Variation and Metamorphic Facies: Zeolite and Prehnite-Pumpellyite-Metagraywacke Facies, Greenschist Facies, Epidote-Amphibolite Facies, Amphibolite Facies, Granulite Facies, Blueschist Facies, Eclogite Facies, Hornfels and Sanidinite Facies. Mineral Variation Related to Initial Rock Composition: Carbonate rocks, Mudrocks, Mafic Igneous Rocks and Tuffs, Ultrabasic Rocks.</p> <p>Time, Temperature and Deformational Relationships: Porphyroblasts and Tectonism: Pre-tectonic, Syntectonic and Post-</p>		<p>1</p>

		<p>Tectonic Porphyroblasts; More complex situations. Polymetamorphism.</p> <p>Metamorphic Rocks and Global Tectonics:</p> <p>Metamorphism at Transform Faults and Divergent Junctions; Metamorphism at Convergent Junctions, Time of Formation of Paired Belts.</p> <p>A brief study of the petrography of the following metamorphic rocks : Slate, Phyllite, Quartzite, Schist, Gneiss, Granulite, Khondalite, Leptynite, Charnockite, Eclogite, Amphibolite, Migmatite, Blueschist, Breccia, Mylonite, Hornfels.</p>		
USGE603	Engineering and Environmental Geology			
	I	<p>Engineering Properties of Rocks:</p> <p style="padding-left: 40px;">Specific Gravity Porosity Sorption Compressive Strength Tensile Strength Elasticity of Rocks Residual Stress and Shear Stress in Rocks.</p> <p>Rocks as Construction Materials:</p> <p>Types of Rocks used in construction: How are they obtained in nature? Use of Rocks as facing stone. Factors influencing Engineering usefulness of Rocks.</p> <p>Use of Rocks as aggregates: Use of rock as an aggregate in different types of constructions, sources of different grades of aggregates.</p>	2.5	1

		Properties of aggregates (Shape, Size, Surface Texture, Roundness, Coating), Cement aggregate reaction, Thermal effects on aggregate. Highway aggregate, Rail – road ballast, Runway aggregate	
	II	<p>Geological and Geotechnical investigations for Civil Engineering Projects:</p> <ol style="list-style-type: none"> Tunnels: Terminology, Geological conditions for tunnel sites, Tunnels in folded rocks and bedded rocks. Influence of divisional planes, Effects of faults, Crushed zones, Tunnels near slopes, Role of Groundwater in tunneling. Dams and Reservoirs: Geological conditions for the selection of dam and reservoir sites. Terminology associated with dams. Types of dams: Masonary Dams (Gravity Buttress and Arch types), Earthen dams. Types of spillways. Locations of all the important dams and Hydro – electric projects in India. Landslides: Causes, types and prevention of landslides. Influence of divisional planes, effects of faults, Crushed zones. 	1
	III	<p>Environmental Geology</p> <p>Water Resources and Pollution</p>	1

		<p>Water: A brief global prospective, surface water, groundwater, interaction between surface and groundwater, desalination, water management in the future and emerging global water shortage</p> <p>Water Pollution: An overview of water pollution in India, measures of water quality, detailed study of selected water pollutants, surface water pollution and treatment (Acid mine drainage), groundwater pollution and treatment, industrial pollutants – Metals and other inorganic pollutants</p> <p>Consequences of groundwater withdrawal: lowering of water table, compaction and surface subsidence, and salt water intrusion.</p>		
	IV	<p>Soil and Pollution</p> <p>Soils: Introduction to soils, soil profiles, color texture and structure of soils, soil properties, soil fertility, water in soil, soil classification, sediment pollution</p> <p>Environmental impacts of mining related activities, oil spills, environmental impact of coal use and coal mining hazards.</p> <p>Solid waste disposal: sanitary landfills, Incineration and ocean dumping</p> <p>Pollution and its control: Water pollution, air pollution, waste disposal and defining limits of pollution</p>		1
USGE604	Aerial Photo Interpretation and Fundamentals of GIS			
	I	Principles of Aerial Photography	2.5	1

		<p>Early history of aerial photography; Aerial cameras, Film resolution. Electronic Imaging, Aerial Videography. Basic Geometric Characteristics of Aerial Photographs: Geometric types of Aerial Photographs, Taking Vertical Aerial Photographs, Geometric Elements of Vertical Photograph. Photographic Scale. Ground Coverage of Aerial Photographs. Area Measurement on aerial photographs.</p>		
	II	<p>Principles of Photogrammetry: Relief Displacement of Vertical Features in aerial photographs. Characteristics of Relief Displacement, Object height determination from Relief Displacement Measurement. Correction for Relief Displacement. Image Parallax: Characteristics of Image Parallax, Parallax Measurement. Ground Control for Aerial Photography. Mapping with Aerial Photographs: Stereoscopic Plotting Instruments, Orthophotos, Photogrammetric Work Stations. Flight Planning.</p>		1
	III	<p>Aerial Photo Interpretation: Fundamentals of Visual Image Interpretation. Basic Visual Image Interpretation Equipment- Construction and</p>		1

		<p>Working. Land-use/Land cover mapping. Geologic and Soil mapping. Water Resource Applications. Archaeological Applications. Environmental Assessment Principles of Landform Identification.</p>		
	IV	<p>Basics of Geographical Information Systems</p> <p>Definitions of GIS The components of a geographical information system. Basic requirements for a GIS. Data Models: Conceptual models of real world geographical phenomena. Conceptual models of space. Geographical Data models: Vector models of Entities – Simple points, lines and polygons. Raster Data Structures-The grid Cell Data Types: Boolean, Nominal, Ordinal, Integer, Real, Topological. Data Input: Sources of Geographical Data, Geographical data Collectors and providers. Geo-referencing.</p>		1

Practicals

USGEP07	<p>Practicals of Course USGE601 + Course USGE602</p> <p>Stratigraphy and Geology of India, Maharashtra and Mumbai:</p> <p>Study of common sedimentary, igneous and metamorphic rocks in Hand specimen from different stratigraphic horizons. Study of common fossils characteristics of</p>	3	8
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	<p>a particular stratigraphic horizon.</p> <p>Diagrammatic examples of Lithostratigraphic boundaries and classification.</p> <p>Study of Geological maps with geological history of the area in chronological order.</p> <p>Problems:</p> <p>Stratigraphic sequence from geological section.</p> <p>Stratigraphy of a geological section- fossils & radiometric age.</p> <p>Characteristics of a Fold & Fault from a geological map.</p> <p>Stratigraphic Boundary Problem.</p> <p>Understanding Geological Time Scale.</p> <p><u>Megascopeic and Microscopic Identification of Sedimentary and Metamorphic Rocks.</u></p> <p>Sedimentary Textures. (Clastic)</p> <p>Rudaceous (Conglomeratic/ Brecciatic), Arenaceous (Gritty/ Sandy), Argillaceous</p> <p>Sedimentary Structures</p> <ol style="list-style-type: none"> 1. Stratification 2. Current Bedding 3. Graded Bedding 4. Ripple Marks 5. Rain Imprints 6. Concretions/Secretions <p>Metamorphic Textures</p> <ol style="list-style-type: none"> 1. Idioblastic 2. Porphyroblastic 3. Granuloblastic 4. Xenoblastic <p>Metamorphic Structures</p> <ol style="list-style-type: none"> 1. Cataclastic 2. Slaty Cleavage 3. Maculose 4. Granulose 5. Schistose 		
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	<p>6. Gneissose Sedimentary Rocks</p> <ol style="list-style-type: none"> 1. Conglomerate 2. Breccia 3. Grit 4. Sandstone 5. Shale 6. Limestone 7. Fossiliferous Limestone 8. Oolitic Limestone 9. Laterite <p>Metamorphic Rocks</p> <ol style="list-style-type: none"> 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. Eclogite 11. Serpentine 12. Khondolite 13. Charnockite 		
<p>USGEP08</p>	<p>Practicals of Course USGE603 + Course USGE604</p> <p>Engineering Geology</p> <ul style="list-style-type: none"> • Geological maps to demarcate and evaluate the suitability of sites for engineering projects such as Tunnels, Dams and Reservoir construction. • Equal-area net part I <ol style="list-style-type: none"> a. Plotting a line that lies in a plane b. Determining the angle between two lines c. True strike and Dip from apparent dips d. Attitude of intersection of two planes • Equal-area net part II <ol style="list-style-type: none"> a. Determining the angle between two 	<p>3</p>	<p>8</p>

	<p>planes</p> <ol style="list-style-type: none"> b. Determining the orthographic projection of a line on a plane c. Determining the angle between a line and a plane d. Bisecting the angle between two lines e. Bisecting the angle between two planes <p>Photogrammetry and Aerial Photo Interpretation:</p> <ul style="list-style-type: none"> • Test and Exercise for Stereoscopic vision • Determination of Photo Scale and numerical problems on photo scale. • Orientation of Stereographic pair of aerial photographs under a mirror stereoscope and point transfer. Plotting of principal point, flight line and match line. • Construction of stereogram • Handling of a parallax bar and height calculation • Numerical problems on height calculation using measured relief displacement on a single aerial photograph. • Flight Planning: Calculations necessary to develop a flight plan and draw a flight map. • Interpretation of aerial photographs: various landforms, erosion types , horizontally bedded sandstones, shale and limestone. Intrusive igneous rocks, extrusive (lava flows). Aeolian Landforms: transverse sand dunes, longitudinal sand dunes, loess. Glacial landforms: end moraine, basal moraine, drumlins, eskers. Fluvial Landforms: alluvial fans, deltas. Coastal landforms: beach ridges, beach cusps, dunes, surface expressions of anthropogenic activities. 		
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Geological Fieldwork:

As a part of the practical course in the 6th semester, 60 hours of fieldwork in an area outside the Deccan flood basalts has to be carried out. The field work should be aimed at learning the techniques of geological mapping and use of field surveying instruments.

For the purpose of workload, field work may be considered as 4 lecture hours per week.

20 marks per practical course ie. 20 marks out of 100 in course USGEP07 and 20 marks out of 100 in course USGEP08 are to be considered for fieldwork. The marks are for successfully attending the field work and submitting a field report based on individual work carried out on the fieldwork by the learner.

Out of the total of 40 marks for fieldwork, 20 marks are to be assigned by the field instructors for the actual work done during the fieldwork and 20 marks are assigned for the field report submitted by the individual learner.

The balance of 80 marks per practical course are for evaluation and assessment based on the practicals conducted through the course of the semester.

Recommended Books and References

Course: USGE501

1. Kumar Ravindra (1996), Fundamentals of Historical Geology and Stratigraphy of India, 4th ed., New Age International Limited.
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