



SOMAIYA
VIDYAVIHAR

K J Somaiya College of Science & Commerce

Department: Geology



K. J. SOMAIYA COLLEGE OF SCIENCE & COMMERCE
UNDER AUTONOMY



Syllabus for the M.Sc. Program

M.Sc.-I

Course: GEOLOGY

**(Credit Based Semester and Grading System with
effect from the academic year 2018–2019)**

M.Sc.– I GEOLOGY Syllabus

Credit Based and Grading System

To be implemented from the Academic year 2018-2019

SEMESTER I

THEORY

COURSE	UNIT	MINERALOGY AND CRYSTAL OPTICS	CREDITS	L/WEEK
PSGEI1	I	Mineral Chemistry	4	8
	II	Crystal Optics		
	III	Introduction to Geothermometry and Geobarometry, Chemical composition of the Earth and its constituent reservoirs		
	IV	Phase Transformation in crustal and mantle rocks		

COURSE	UNIT	STRUCTURAL ANALYSIS AND SYNTHESIS	CREDITS	L/WEEK
PSGEI2	I	Introduction	4	8
	II	Time Relationship and Behaviour		
	III	Mechanics and Measurement of Deformation		
	IV	Diapirs and Salt Domes		

COURSE	UNIT	IGNEOUS PETROLOGY AND VOLCANOLOGY	CREDITS	L/WEEK
PSGEI3	I	Magma and Volcanoes	4	8
	II	Evolution of Magma		
	III	Types and Classification of Magmatic rocks		
	IV	Volcanic Products and Landforms		

COURSE	UNIT	SEDIMENTOLOGY AND SEDIMENTARY	CREDITS	L/WEEK
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PETROLOGY				
PSGEI4	I	Scope of Sedimentology, Processes of Sedimentation, Sedimentary Texture, Sedimentary Structure	4	8
	II	Sedimentary Petrology; Diagenesis		
	III	Sedimentary Environments and Facies; Mixed Environments		
	IV	Tectonics and Sedimentation, Basin Analysis		

PRACTICAL

PSGEIPI1	MINERALOGY AND CRYSTAL OPTICS	4	8
PSGEIPI2	STRUCTURAL ANALYSIS AND SYNTHESIS	4	8
PSGEIPI3	IGNEOUS PETROLOGY AND VOLCANOLOGY	4	8
PSGEIPI4	SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY	4	8

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THEORY

COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
		MINERALOGY AND CRYSTAL OPTICS		
PSGEII	I	Elements of Mineral Chemistry: Chemical elements, electronic configuration, Periodic Table Coordination of ions : Paulings Rule, Isostructuralism Polymorphism,	4	8
	II	Crystal Optics: Optics of Isotropic minerals and optics of Anisotropic minerals Uniaxial and Biaxial crystals: optical Indicatrix, Interference figures , Optic sign determination		
	III	Introduction to Geothermometry and Geobarometry: Introduction to Thermodynamics Phase diagrams: One component diagrams and Two Component diagrams Chemical composition of the earth and its constituent reservoirs. Meteorite evidence, Atomic structure, Isomorphism, Polymorphism and Solid-Solution. Goldschmidt's classification of elements.		
	IV	Phase Transformation in Crustal and Mantle Rocks: Nature, Type of transformation between solids in the crustal rocks and mantle rocks		

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COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
		STRUCTURAL ANALYSIS AND SYNTHESIS		
PSGEI2	I	Introduction Principles of Geological Mapping and map reading, Projection diagrams. Stress Strain Relationships of elastic, plastic, and viscous materials	4	8
	II	Time Relationship and Behaviour Time relationship between crystallization and deformation Structural behaviour of Igneous rocks		
	III	Mechanics and Measurement of Deformation Mechanics of deformation: of folding and faulting, unconformities and basement cover relations, measurement of strain in deformed rocks		
	IV	Diapirs and Salt Domes , behaviour of minerals and rocks under deformation conditions, Diapirs and Salt domes		

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COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
	IGNEOUS PETROLOGY AND VOLCANOLOGY			
PSGE13	I	MAGMA AND VOLCANOES: Magma and volcanoes; Volcanism on Earth, Moon and the terrestrial planets Mechanism of partial melting and Magma generation in the Earth, Chemical compositions and physical properties of magmas Role of volatiles in magma and volcanic eruption Elementary statistics for geochemistry Major, minor and trace elements including rare earth elements, Elements partitioning between mineral and melts Oxide elements conversion	4	8
	II	EVOLUTION OF MAGMA: Generation of Magma Differentiation and assimilation of magma Mg number and other geochemical parameters Fractional crystallization and liquid lines of descents The lever rule, Mineral liquid equilibrium Fractional and batch melting		
	III	TYPES AND CLASSIFICATION OF MAGMATIC ROCKS: Nomenclature and classification of igneous rock AFM and TAS diagrams		

		Magma series, major volcanoes, Radioactivity and geochronology Chemical and isotope fraction Application of Rb-Sr and Sm-Nd isotope geochemistry to rock dating, petrogenesis, and core- mantle evolution Mixing phenomena in elements and isotopes. Application of Geochemistry: Igneous rocks (Partial Melting, Fractional Crystallization)		
	IV	VOLCANIC PRODUCTS AND LANDFORM: central vent landform fissure eruption lava flow features Volcanic eruption and magmatic province of the earth. Volcanic hazards		

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COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
		SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY		
PSGE14	I	Scope of Sedimentology , Source of sediments Processes of Sedimentation: Surface processes, rock weathering; Sedimentary Texture: Grain size and measurement, Analysis and Interpretation of grain-size data.	4	8

		<p>Sedimentary Structures: Structures related to bedform Migration, Current ripple structures; Structures related to flat beds- bedding, preserved bed surface and bed under-surface structures, Deformed bedding structures</p>		
	II	<p>Sedimentary Petrology: Rocks of Mechanical Origin: Rudaceous, Arenaceous, Argillaceous sedimentary rocks; Rocks of Chemical and Biochemical origin: Carbonates and Non Carbonates Volcanoclastic rocks; Diagenesis</p>		
	III	<p>Sedimentary Environments and Facies: Facies Modelling; Marine Environments: Continental Shelf, Continental Slope, Continental Rise; Non Marine Environments: Glacial, Aeolian, Lacustrine, Fluvial Mixed Environments: Barrier Island, Tidal Flats; Deltaic Environment</p>		
	IV	<p>Tectonics and Sedimentation: Sedimentary Basins, Geosynclinal Concept, Plate Tectonics Concept, Plate movement and Basin Formation. Sedimentary rocks (Weathering, Diagenesis) Basin Analysis: Depositional Environment, Palaeo-hydraulic Interpretation in Fluvial Channels, Diagenesis and Maturation, Sediment Chemistry, Basin evolution and Tectonics</p>		

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SEMESTER II

THEORY

COURSE	UNIT	METAMORPHIC PETROLOGY	CREDITS	L/WEEK
PSGE21	I	Metamorphic Textures	4	8
	II	Thermodynamics		
	III	Metamorphism I		
	IV	Metamorphism 2		

COURSE	UNIT	MINERAL RESOURCES AND MINERAL	CREDITS	L/WEEK
PSGE22	I	Introduction and concepts	4	8
	II	Distribution and mode of occurrence of ore minerals		
	III	Indian deposits of non metals		
	IV	Distribution and mode of occurrence of industrial minerals and gemstones		

COURSE	UNIT	PALAEONTOLOGY AND MICRO-PALAEONTOLOGY	CREDITS	L/WEEK
PSGE23	I	Palaeontology	4	8
	II	Vertebrate Fossil		
	III	Plant Microfossils		
	IV	Micro Palaeontology		

COURSE	UNIT	COAL AND PETROLEUM GEOLOGY	CREDITS	L/WEEK
PSGE24	I	Origin and Utilization of Coal	4	8



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	II	Mining of Coal:		
	III	Origin of Petroleum		
	IV	Petroleum Industry of India		

PRACTICAL

PSGE2P21	METAMORPHIC PETROLOGY	4	8
PSGE2P22	MINERAL RESOURCES AND MINERAL ECONOMICS	4	8
PSGE2P23	PALAEONTOLOGY AND MICRO PALAEONTOLOGY	4	8
PSGE2P24	COAL AND PETROLEUM GEOLOGY	4	8

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COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
	METAMORPHIC PETROLOGY			
PSGE21	I	Metamorphic Textures Types of Metamorphism and their textures Metamorphic Structures, Application Metamorphic Rocks (Metamorphic Reactions, P-T-t path).	4	8
	II	Thermodynamics: Phase Rule and Thermodynamics Graphical representation of different Mineral Assemblages Progressive & Retrograde Metamorphism P-T-time of metamorphism		
	III	Metamorphism 1 Facies of Contact and Regional Metamorphism Metasomatism, Metamorphic Facies, P-T Diagrams		
	IV	Metamorphism 2 Migmatisation, Kinematics of Schists Anataxis, P-T-time metamorphism		

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THEORY

COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
	MINERAL RESOURCES AND MINERAL ECONOMICS			
PSGE12	I	Introduction and concepts Mineral economics and its concepts, National Mineral Policy India's status in mineral production	4	8
	II	Distribution and mode of occurrence of ore minerals Distribution, mode of occurrence and origin of building stones. Phosporite deposits, Placer deposits, REE, Strategic, critical and essential minerals. Occurrence and distribution in India of metalliferous deposits: Base metals, Nickel, gold, silver, molybdenum, iron, manganese, aluminium, chromium		
	III	Indian deposits of non-metals Indian deposits of non-metals mica, asbestos, barytes, gypsum, graphite, apatite and beryl		
	IV	Distribution and mode of occurrence of industrial minerals and gemstones Distribution mode of occurrence, origin of gemstones, refractory minerals, abrasives and minerals used in glass, fertilizer, paint ceramic and cement industry		

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SEMESTER I

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COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
	PALAEONTOLOGY AND MICRO PALAEONTOLOGY			
PSGE12	I	Palaeontology A general account of fossils, organic evolution and systematic paleontology. Grade growth and spatial distribution of organisms. Stratigraphy, paleontology and paleoecology	4	8
	II	Vertebrate fossils Major subdivisions of vertebrates. Outline of morphology and skeletal elements of vertebrates. Geological history of vertebrates. Dinosaurs Evolution of horses and elephants Primates and ancestry of man Record of vertebrate fossils of India		
	III	Plant fossils: Gondwana fossils, Inter-trappean fossils and Intra-trappean fossils		
	IV	Micropalaeontology Introduction to micropaleontology Record of microfossils from Phanerozoic rocks of India, Collection, preparation and preservation of microfossils (invertebrate) Foraminifera: foraminifera test, ecology Ostracoda: morphology, ornamentatio and orientation of carapace		

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		Conodonts: characteristics of conodonts, origin Radiolaria: applied micropaleontology, environmental significance Pollens and Spores		
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SEMESTER I

THEORY

COURSE CODE	UNIT	TITLE	CREDITS	L/WEEK
	COAL GEOLOGY AND PETROLEUM GEOLOGY			
PSGEI2	I	Origin and Utilization of Coal: Origin, mode of Occurrence of Coal, Prospecting for Coal Physical and Chemical constituents of Coal, Utilization of Coal Classification and Structural Features of Coal Seams	4	8
	II	Mining of Coal: Sampling of coal in Mines and in the Laboratory; Methods of Coal mining Study of Indian Coals with reference to Geology, grade of coal, economic reserves and future prospects		
	III	Origin of Petroleum: Physical and Chemical properties of Petroleum, Petroleum Traps and Reservoirs Migration accumulation and Geophysical Prospecting of Petroleum		
	IV	Petroleum Industry of India: Study of potential sedimentary basins and oil fields of India, India's position as regards to		

		Petroleum and Natural Gas and future prospects		
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PRACTICAL

MSC-I SEMESTER I

	Course	Title	Credits	2L/Week
PSGEIP12	PSGEIP1	Stoichiometry, Problems in XRD, Mineral Calculation	4	8
	PSGEIP2	Interpretation of geological Maps, Structural problems based on faults and folds		
PSGEIP34	PSGEIP3	Microscopic examination of Igneous Rocks CIPW Norm Calculations, Geochemistry: Variation diagrams and trace element plots Interpretation of differentiation trends by AFM diagrams TAS Calculations		
	PSGEIP4	Megasocpic and Microscopic examination of Sedimentary rocks Sedimentary Mechanical Analysis and Interpretation		

PRACTICAL

MSC – I SEMESTER II

	Course	Title	Credits	2L/Week
PSGE2P12	PSGE2P1	Metamorphic Petrology: Plotting and Interpretation Plotting and Interpretations of AFM/ACF Diagrams of metamorphic rocks	4	8
	PSGE2P2	Ore microscopy: preparation of sample for ore petrography and Petrographic study of polished Ore sample		



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PSGE2P34	PSGE2P3	Paleontology Hand identification of fossils from various Phylla (invertebrate fossils only) along with study of their evolution. Micropaleontology Identification of micro fossils Problems related to the study of coiling, growth stages and Interpretation of palaeontologic plots		
	PSGE2P4	Coal Petrology : Microscopic and Megascopic study of coal; Microscopic study of coal Pellets		



SCHEME OF EXAMINATION PROGRAM :

M.Sc. Semester I & II

THEORY EXAMINATION

I INTERNAL (Continuous Assessment: Class Test, Poster Paper review) : 40 Marks

Term I : 1. Concept Poster (20) OR Review of Paper and
2. Presentation (20) Written Test : (20)

Term II : 1. Four MOOC OR Mini Project (10 each)
2. Presentation (20) and Written Exam (20)

II END SEMESTER:

Theory End Semester Question Paper: 02 and half hours duration 60 Marks 2 1/2 hours

Instruction to Examiners : There will be 5 QUESTIONS of 12 MARKS each

Instruction to Candidates: All questions are Compulsory

Questions will be set from all topics for 12 MARKS with INTERNAL options and 100% choice not exceeding 16 or 18 marks

Question 1 based on unit 1

Question 2 based on unit 2

Question 3 based on unit 3

Question 4 based on unit 4

Question 5 based on units 1 to 4