Rajeev Gandhi Govt. Post Graduate College Ambkapur

Department of Geology

<table>
<tr><td colspan="2">GEOLOGY (B.Sc.)</td><td colspan="2">SEMESER – I</td></tr>
<tr><td colspan="2">COURSE CODE:DSC- GEOL-101</td><td colspan="2">COURSE TYPE : DSC</td></tr>
<tr><td colspan="4">COURSE TITLE : Geodynamics & Geomorphology</td></tr>
<tr><td colspan="2">CREDIT: 03</td><td colspan="2">HOUR:45</td></tr>
<tr><td>THEORY: 03</td><td>PRACTICAL: 00</td><td>THEORY: 80</td><td>PRACTICAL:50</td></tr>
<tr><td colspan="4">MARKS</td></tr>
<tr><td colspan="2">THEORY:100(80+20)</td><td colspan="2">PRACTICAL: 50</td></tr>
<tr><td>Unit – 1
11 Hours</td><td colspan="3">Introduction to Geology:
• Introduction to Geology and its branches and importance, Introduction to solar system: Star, Planet, Satellite, Asteroid and meteorite. Earth in the solar system; size, shape, mass and density, Origin of Earth, Internal structure of Earth, Crust, Mantle and Core, Age of Earth: Various methods of determination of age of the earth.</td></tr>
<tr><td>Unit – 2
11 Hours</td><td colspan="3">Dynamic Earth:
• Concept and theories of continental-drift, Sea floor spreading and evidences, Concept of plate tectonics, tectonic plates, types and plate boundaries, Introduction to paleomagnetism and polar wandering, Mid-oceanicridges, trenches and island arcs.</td></tr>
<tr><td>Unit – 3
11 Hours</td><td colspan="3">Geomorphic Processes:
• Earthquakes: Causes and effects, Earthquake Belts, measurement of Earthquakes. Seismic zones of India, Volcanoes: Types and distribution, Fundamental concepts of geomorphology, Geomorphicalagents and processes of rock weathering.</td></tr>
<tr><td>Unit – 4
12 Hours</td><td colspan="3">Geological Work:
• Geological work of rivers; Fluvial landforms, Geological work of ground water and karst topography, Geological work of wind; Aeolian landforms, Geological work of Glaciers; glacial land forms. Geological work of oceans; coastal landforms, Volcanic landforms, Physiographic and tectonic divisions of India.</td></tr>
</table>

Practical	*1:-Study of models showing various geomorphic features* *2:- Interpretation of various geomorphic landforms & drainage pattern on topographic maps.* *3:- Numbering, indexing of topographic maps on various scales* *4:- Plotting of major mountain ranges, lakes & rivers on outline map of India* *5:- Plotting of seismic observatories on outline map of India* *6:- Plotting of epicenters & magnitude of major earthquakes of Indian subcontinents*
i	1. Holmoes, A. Doris L Holmes Edit., Principles of Physical Geology, Van Nostrand Reinhold, 1978. 2. Mahapatra, G.B., Text book of Physical Geology, CBS, India, 2018. 3. Mathur, S.M., Physical Geology of India, NBT India, 1991. 4. Miller, William J., Physical Geology : An Introduction. D Van Nostrand Co., 5th Ed., 1949. 5. Mukerjee, P.K., Text Book of Geology. World Press Private Ltd, 2013. 6. Thornbury, W.D., Principles of Geomorphology. New Age International. 2nd Edition,196. *7.* Principles of Geomorphology : A.F. Ahmad.
E-RESOURCES	1. https://opentextbc.ca/physicalgeology2ed/front-matte/rdownload-a-pdf/ 2.https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up 3.https://egyankosh.ac.in/ 4.https://sites.google.com/ignou.ac.in/bscgeology 5.SWAYAM – https://swayam.gov.in/explorer?searchtext 6.National digital library – https://ndl.iitkgp.ac.in 7.e-PG pathshala (MHRD) portal, https://egpg.inflibnet.ac.in

<table>
<tr><td colspan="4">GEOLOGY (B.Sc.) SEMESER – II</td></tr>
<tr><td colspan="4">COURSE CODE:DSC- GEOL-102 COURSE TYPE :DSC</td></tr>
<tr><td colspan="4">COURSE TITLE : Mineralogy and Crystallography</td></tr>
<tr><td colspan="2">CREDIT: 03</td><td colspan="2">HOUR:45</td></tr>
<tr><td>THEORY: 03</td><td>PRACTICAL: 00</td><td>THEORY:</td><td>PRACTICAL:50</td></tr>
<tr><td colspan="4">MARKS</td></tr>
<tr><td colspan="2">THEORY:100(80+20)</td><td colspan="2">PRACTICAL:</td></tr>
<tr><td>Unit – 1
11 Hours</td><td colspan="3">Introduction to Crystallography:
• Definition of Mineral and Crystal: Rock forming and ore minerals, Crystal Structures, Unit cells, Elements of crystal. Crystal forms, Crystallographic axes and axial angles, Weiss’s Parameters and Miller’s Indices systems of crystal notations.</td></tr>
<tr><td>Unit – 2
11 Hours</td><td colspan="3">Crystallography:
• Interfacial angle and its measurement, Laws of Crystallography, Crystal symmetry: Plane, axis and center of symmetry, Classification of crystals into systems and classes, Symmetry and forms of normal classes, Twinning in crystals.</td></tr>
<tr><td>Unit – 3
11 Hours</td><td colspan="3">Mineralogy:
• Silicate structures and classification of silicates, Bonding in Minerals, Isomorphism and Solid solution, Polymorphism and Pseudomorphism, Physical properties of minerals.</td></tr>
<tr><td>Unit – 4
12 Hours</td><td colspan="3">Optical Mineralogy:
• Nature of light: reflection and refraction of light, Refractive index, Critical angle. Total internal reflection and Becke’s effect, Double refraction. Nicol prism – it’s construction and working, Polarizing Microscope- its parts & functions, Optical properties of minerals.
Mineralogy:
• Study of Composition, Classification, physical and optical properties of the following Mineral groups – Olivine, Garnet and Mica groups, Pyroxenes and Amphiboles, Feldspars and Feldspathoids, Silica.</td></tr>
</table>

Practical	1:- Study of symmetry elements in crystal models 2:- Study of fundamental forms of normal classes of all seven crystal system 3;- Verification of euler's theorem 4:- Study of physical properties of rock forming minerals 5:- Study of the optical properties of important rock forming minerals using polarizing microscopes. 6:- Geological excursion for seven days
SUGGESTED READINGS	1. Gribble,C.D.;Rutley'sElementsofMineralogy.CBS,2005. 2. FordW.E.;Dana'sTextBookofMineralogy.CBS,2006. 3. Perkins,D.;Mineralogy,PrenticeHallIndia,3rded.2012. 4.Rathore,B.S.;BasicsofCrystallography,MineralogyandGeochemistry.NotionPressIndia,2020. 5. Sharma,R.S.andSharma,Anurag;CrystallographyandMineralogy-ConceptandMethods.Geol.Soc.Ind.,Bengaluru,2013.
E-RESOURCES	1. https://www.mindat.org 2.https://www.mooc-list.com/tags/minerals 3.https://epgp.inflibnet.ac.in/Home 4.https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up 5.https://egyankosh.ac.in/ 6.https://sites.google.com/ignou.ac.in/bscgeology 7.SWAYAM-https://swayam.gov.in/explorer?searchtext 8.National digital library- https://ndl.iitkgp.ac.in 9.e-PG pathshala (MHRD) portal, https://egpg.inflibnet.ac.in

<table>
<tr><td colspan="5">GEOLOGY (B.Sc.) SEMESER – III</td></tr>
<tr><td colspan="5">COURSE CODE: DSC-GEOL-103 COURSE TYPE:DSC</td></tr>
<tr><td colspan="5">COURSE TITLE : Petrology</td></tr>
<tr><td colspan="2">CREDIT: 6</td><td colspan="3">HOUR:90</td></tr>
<tr><td>THEORY: 6</td><td>PRACTICAL: 00</td><td>THEORY: 90</td><td colspan="2">PRACTICAL:00</td></tr>
<tr><td colspan="5">MARKS</td></tr>
<tr><td colspan="2">THEORY:100(70+30)</td><td colspan="3">PRACTICAL: 00</td></tr>
<tr><td>Unit – 1
18 Hours</td><td colspan="4">• Magma: Definition, origin and composition.
• Bowen’s reaction series, magmetic differentiation & assimilation.
• System, phases & component, principles of thermodynamics, Bi-component magma: Albite-Anorthite and Diposide-Anorthite, Tri-component magma: Diopside-Albite-Anorthite.
• Texture, structure and classification of igneous rocks.
• Forms of igneous rocks.</td></tr>
<tr><td>Unit – 2
18 Hours</td><td colspan="4">• Rock association in Time & Space, concepts of rock kindreds.
• Petrographic studies of Acid igneous rocks.
• Petrographic studies of Alkaline igneous rocks.
• Petrographic studies of Basic igneous rock.
• Petrographic studies of Ultrabasic igneous rocks.</td></tr>
</table>

Unit – 3 18 Hours	• Origin, transportation & deposition of sediments. • Dynamics of sedimentary depositional environment: Aeolian, Fluvial, coastal and abyssal environment. • Concepts of sedimentary facies. • Concept of diagenesis. • Textures and structures of sedimentary rocks.
Unit – 4 18 Hours	• Classification of sedimentary rocks. • Petrography of sedimentary rock; rudaceous, aranaceous, calcareous sedimentary rocks. • Metamorphism; definition, agents, facies & grade. • Textures, structures & classification of metamorphic rocks. • Equilibrium & non-equilibrium reactions in metamorphism.
Unit – 5 18 Hours	• Paragenetic diagrams; projective analysis A.C.F. & A.K.F. diagrams. • Progressive metamorphism of Argillaceous rocks. • Progressive dynamo-thermal metamorphism of impure lime-stone. • Progressive dynamo-thermal metamorphism of basic igneous rocks. • Petrographic provinces of India.
PRATICALS	• Diagrammatic representation of various form & structures of igneous, sedimentary & metamorphic rocks. • Megascopic studies of various sedimentary, metamorphic & igneous rocks. • Microscopic studies of various sedimentary, metamorphic & igneous rocks. • Norm calculation. • Diagrammatic representation of petrography provinces of India in outline map of India.
SUGGESTED READINGS	1. Principles of petrology – G.W. Tyrell 2. Petrology – H.William, F.J. Turner & E.M. Gilbert 3. Petrology of igneous & metamorphic rocks of India – S.C. Chattarjee 4. A text book of sedimentary petrology – Verma& Prasad 5. Metamorphism & Metamorphic rocks of India – S.Ray 6. Sedimentary rocks – F.J. Pettijohn 7. Introduction of sedimentary – S.Sengupta 8. Sedimentary environment – H.G.Readings

GEOLOGY (B.Sc.)		**SEMESER – III**	
COURSE CODE: DSE-GEOL-101		COURSE TYPE : DSE	
COURSE TITLE : Igneous Petrology			
CREDIT: 6		HOUR:90	
THEORY: 6	PRACTICAL: 00	THEORY: 90	PRACTICAL:00
MARKS			
THEORY:100(70+30)		PRACTICAL: 00	

Unit – 1 **18 Hours**	**Concept of Igneous Petrology** • Introduction to petrology: Heat flow, geothermal gradients through time, origin and nature of magma.
Unit – 2 **18 Hours**	**Forms** • Classification of igneous rocks. • Texture and Structures of igneous rocks. • Mode of occurrence of Igneous rocks.
Unit – 3 **18 Hours**	**Phase diagrams and petrogenesis** • Binary and Ternary phase diagrams in understanding crystal-melt equilibrium in basaltic and granitic magmas. • Magma generation in crust and mantle, their emplacement and evolution.

Unit – 4 18 Hours	**Magmatism in different tectonic settings** • Magmatism in the oceanic domains (MORB,OIB). • Magmatism along the plate margins (Island arcs/continental arcs)
Unit – 5 18 Hours	**Petrogenesis of Igneous rocks** • Petrogenesis of Felsic and Mafic igneous rocks. • Komatities, Granitoides, Basalt, Gabbros. • Alkaline rocks, Kimberlites and Lamproites.
PRATICALS	• Study of important igneous rocks in hand specimens and thin sections- granite, granodiorite, diorite, gabbro, anorthosites, ultramafic rocks, basalts, andesites, trachyte, rhyolite, dacite.
SUGGESTED READINGS	1. Philpotts, A., & Ague, J. (2009). Principles of igneous and metamorphic petrology. Cambridge University Press. 2. Winter, J.D. (2014). Principles of igneous and metamorphic petrology. Pearson. 3.G.W. Tyrrell. (1926). Principles of Petrology. Springer. 4.Bose M.K. (1997). Igneous Petrology. 5.Myron G.Best (2001). Igneous and Metamorphic Petrology.

GEOLOGY (B.Sc.)		**SEMESER – IV**	
COURSE CODE: DSC-GEOL- 104		COURSE TYPE : DSC	
COURSE TITLE : Structural Geology			
CREDIT: 4		HOUR:75	
THEORY: 3	PRACTICAL: 1	THEORY: 45	PRACTICAL:30
MARKS			
THEORY:75(60+15)		PRACTICAL: 25	

Unit – 1	• Definition and scope of Structural Geology, Study of outcrops, Effects of dip and slope on outcrops. • Identification of bedding, Dip and strike measurement. • Clinometer and Brunton compass. • Recognition of top and bottom of beds. • Concept of rock deformation, Concept of stress and strain ellipsoids.
Unit – 2	• Fold morphology. • Geometric and genetic classification of folds. • Recognition of folds in the field and on geological maps. • Effects of folds on outcrops. • Elementary idea of mechanics of folding.
Unit – 3	• Fault morphology, Slip and separation. • Geometric and genetic classification of faults. • Recognition of faults in the field and on geological maps. • Effect of faults on outcrops. • Elementary idea of mechanics of faulting.
Unit – 4	• Joint morphology; geometric and genetic classification of joints. • Foliation; terminology, kinds, origin and relation to major structures. • Lineation: terminology, kind, origin and relation to major structures. • Salt domes. • Plutons: tectonics & emplacement.
Unit – 5	• Types and recognition of Unconformity. • Outlier and inlier, Overlap &offlap. • Concept of tectonics. • Tectonic framework of Peninsula, Indo-Gangetic Plains and Extra-Peninsular India • Stereographic projection & it use in Structural geology.

PRATICALS	• Fault morphology, Slip and separation. • Geometric and genetic classification of faults. • Recognition of faults in the field and on geological maps. • Effect of faults on outcrops. • Elementary idea of mechanics of faulting
SUGGESTED READINGS	1. Structural Geology – M.P. Billings 2. Theory of Structural Geology; Gokhale, N.W. CBS 3.Exercises on Geological maps and dip-Strike: Gokhale, N.W. CBS 4.Outlines of structural Geology, E.S. Hills 5.Structural Geology – Hobbs, Means and Williams 6.Geological maps – Chiplonkar and Pawar

<table>
<tr><td colspan="3">GEOLOGY (B.Sc.)</td><td colspan="2">SEMESER – IV</td></tr>
<tr><td colspan="3">COURSE CODE: DSEC-GEOL-02</td><td colspan="2">COURSE TYPE: DSEC</td></tr>
<tr><td colspan="5">COURSE TITLE : Sedimentary Petrology</td></tr>
<tr><td colspan="2">CREDIT: 4</td><td colspan="3">HOUR:75</td></tr>
<tr><td>THEORY: 3</td><td>PRACTICAL: 1</td><td>THEORY: 45</td><td colspan="2">PRACTICAL:25</td></tr>
<tr><td colspan="5">MARKS</td></tr>
<tr><td colspan="2">THEORY:75(60+15)</td><td colspan="3">PRACTICAL: 25</td></tr>
<tr><td>Unit – 1</td><td colspan="4">Origin of sediments
Weathering and sedimentary flux; Physical and chemical weathering, soils and palesols.
Sediment granulometry
• Grain size scale, particle size distribution , Environmental connotation; particle shape and fabric.</td></tr>
<tr><td>Unit – 2</td><td colspan="4">Sedimentary textures, structures and environment
• Fluid flow, Sediment transport and sedimentary structure : Types of fluids, Laminar VS. turbulent flow,Particle entrainment , transport and deposition.
• Paleocurrent analysis- Paleocurrent for different sedimentary environment.
• Primary & secondary sedimentary structures.</td></tr>
<tr><td>Unit – 3</td><td colspan="4">Types of Sedimentary Rocks
• Siliciclastic rocks: Conglomerates, sandstones, mudrocks
• Carbonate rocks, controls of carbonate deposition, components and classification of limestone , dolomite & dolomitisation.</td></tr>
<tr><td>Unit – 4</td><td colspan="4">Diagenesis:
• Concepts of diagenesis ,
• Stages of diagenesis ,
• compaction and cementation.</td></tr>
<tr><td>PRATICALS</td><td colspan="4">• Study of important Sedimentary rocks in hand specimens and thin sections. Conglomarete,Limestons,etc.</td></tr>
</table>

SUGGESTED READINGS	1. Philpotts, A., & Ague, J. (2009). Principles of igneous and metamorphic petrology. Cambridge University Press. 2. Winter, J.D. (2014). Principles of igneous and metamorphic petrology. Pearson. 3.G.W. Tyrrell. (1926). Principles of Petrology. Springer. 4.Bose M.K. (1997). Igneous Petrology. 5.Myron G.Best (2001). Igneous and Metamorphic Petrology.

GEOLOGY (B.Sc.)			**SEMESER – V**
COURSE CODE:DSC-GEOL-105			COURSE TYPE :DSC
COURSE TITLE : Palaeontology and Stratigraphy			
CREDIT: 6		HOUR:90	
THEORY: 6	PRACTICAL: 00	THEORY: 90	PRACTICAL:00
MARKS			
THEORY:100(70+30)		PRACTICAL: 00	

Unit – 1 18 Hours	• Palaeontology: Fossils- definition, Essentials for fossilization mode of fossilization. • Uses of fossils; Index fossils & their significance. • Application of palaeontology in the study of stratigraphy, Palaeocology and Palaeo-geography. • Micro palaeontology& their significance. • Study of plant fossils & their significance.
Unit – 2 18 Hours	• Morphology & Geologic distribution of foraminifers &Anthozoa fossils. • Morphology & Geological distribution of Gastropoda and lamellibranchia fossils. • Morphology & Geological distribution or Cephalopoda. • Morphology & Geological distribution orEchinoidae&Brachiopoda fossils. • Morphology & Geological distribution of Triobite and Graptolite fossils.
Unit – 3 18 Hours	• Principles of stratigraphy: Geological time scale. • Basic concept of lithostratigraphic, chronostratigraphic&Biostratigraphic Units. • Structural & Physical Subdivision of Indian Subcontinents. • Distribution, classification & Economic importance orArchaeozoic rocks of India (Dharwar). • Distribution, classification & Economic importance ofBastar&Raoghat group of rocks (Chhattisgarh).
Unit – 4 18 Hours	• Distribution, classification & Economic importance of Vindhya & Chhattisgarh group of rocks. • Stratigraphy, Palaeoclimate, Geographical distribution & economic aspects of Gondwana rocks. • Stratigraphy, distribution and age of Deccan Traps. • Stratigraphy, distribution and fossil contents of Bagh&Lameta Bed. • Distribution, Stratigraphy & Palaeontology of salt Range group of rocks.
Unit – 5 18 Hours	• Distribution, Stratigraphy & Economics of Palaeozoic rocks of Spiti Valley. • Stratigraphy, distribution, Fossil content of Cretaceous rocks of Trichinapalli. • Stratigraphy, distribution, Fossil content and Economics of Jurassic rocks of Kutch-Region. • Distribution, Stratigraphy & Economics importance of Tertiary rocks of Assam region. • Distribution, Stratigraphy &Palaeontological importance of Siwalik group of rocks.

PRATICALS	• Study of Morphology of Fossils belonging to various phyla. • Study of Important plant fossils. • Representation of Litho-units & Stratigraphic Units in out line map of India. • Sketching of physiographic and tectonic divisions of India. • Geological excursion for seven days.
SUGGESTED READINGS	1. Invertebrate Palaeontology – H.Woods. 2. Introduction to Palaentology – A.N. Davis. 3.An introduction to Invertebrate Palaeontology – P.G. Jain & M.S. Anantha Raman. 4.Historical Geology of India – Ravindra Kumar. 5.Geology of India – R.Vidhyanathan&M.Ramkrishne (GSI Publication) 6.Geology of India & Burma – M.S. Krishnan.

<table>
<tr><td colspan="2">GEOLOGY (B.Sc.)</td><td colspan="2">SEMESER – V</td></tr>
<tr><td colspan="2">COURSE CODE:DSE-GEOL-103</td><td colspan="2">COURSE TYPE :DSE</td></tr>
<tr><td colspan="4">COURSE TITLE : ECONOMICS GEOLOGY</td></tr>
<tr><td colspan="2">CREDIT: 4</td><td colspan="2">HOUR:90</td></tr>
<tr><td>THEORY: 4</td><td>PRACTICAL: 00</td><td>THEORY: 90</td><td>PRACTICAL:00</td></tr>
<tr><td colspan="4">MARKS</td></tr>
<tr><td colspan="2">THEORY:100(70+30)</td><td colspan="2">PRACTICAL: 00</td></tr>
<tr><td>Unit – 1</td><td colspan="3">Ores and gangues.
• Ores, gangue minerals, tenor, grade and lodes.
• Resources and reserves- Economic and Academic definitions.</td></tr>
<tr><td>Unit – 2</td><td colspan="3">• Mineral deposits and Classical concept of Ore formation.
• Mineral occurrence, Mineral deposit and Ore deposit. Mining Plutonist and Neptunist concepts of ore genesis.</td></tr>
<tr><td>Unit – 3</td><td colspan="3">• Mineral exploration.
• Exploration and exploitation techniques.
• Remote Sensing,
• Geological mapping at different scales,
• Drilling, Borehole logs and transverse sections.</td></tr>
<tr><td>Unit – 4</td><td colspan="3">• Ore grade and Reserve, assessment of grade, reserve estimation.
• Metallic ore : Important deposits of India.
• Non-metallic ore : Important deposits of India.
• Atomic minerals : Important deposits of India.
• Introduction to gemstones.</td></tr>
<tr><td>PRATICALS</td><td colspan="3">• Megascopic identification:
• Study of microscopic properties of ore forming minerals.
• Preparation of maps : Distribution of important ores and other economic minerals in India.</td></tr>
</table>

SUGGESTED READINGS	1. Guilbert, J.M. and Park Jr. C.F. (1986) The Geology of Ore deposits. Freeman & Co. 2. Batman, A.M. and Jensen, M.L. (1990) Economic Mineral Deposits, John Wiley. 3. Evans, A.M. (1993) Ore Geology and Industrial minerals. Wiley. 4. Sarkar, S.C. and Gupta, A. (2014) Crustal Evolution and Metallogeny in India. Cambridge Publications. 5. Gokhale, K. V.G.K. and Rao, T.C. (1978) Ore deposits of India their distribution and processing, Tara—McGraw Hill, New Delhi.

GEOLOGY (B.Sc.)		**SEMESER – VI**	
COURSE CODE :-GEOL106		COURSE TYPE : DSC	
COURSE TITLE : Earth Resources & Applied Geology			
CREDIT: 6		HOUR:90	
THEORY: 6	PRACTICAL: 00	THEORY: 90	PRACTICAL:00
MARKS			
THEORY:100(70+30)		PRACTICAL: 50	

Unit – 1 **18 Hours**	• Economic Geology & its perspective: Global mineral deposit & resource, Distribution of mineral deposits in time & space. • Classification of mineral deposits, Geological thermometers. • Magmatic & Hydrothermal processes of mineral formation. • Weathering: product & Residual deposit, Oxidation &sulphide supergene Enrichment processes. • Sedimentary processes of mineral formation, Placer deposits.
Unit – 2 **18 Hours**	• Geological, Geographical distribution, mode of occurrence, mineralogy & economic importance of following metallic & non-matallic deposits of India. (i) Iron, Manganes, Chromium, (ii) Copper, Lead, Zinc, (iii) Gold, Aluminium, (iv) Refractory and Fertilizer minerals, (v) Minerals used in cement & chemical industries.
Unit – 3 **18 Hours**	• Coal deposit: Origin, definition & stratigraphy. • Fundamentals of coal petrography, Peat, Lignite, Bituminous & Anthracite Coal deposits of Chhattisgarh. • Origin of Natural-hydrocarbon, migration & accumulation, Types of oil traps: Structural, stratigraphic and composite, Offshore & onshore oil deposits of India. • Radioactive mineral: Mineralogy, Geochemistry, Prospecting techniques, Geological & Geographical distribution of atomic-mineral. • Principles of mineral economics, National mineral policy.
Unit – 4 **18 Hours**	• Engineering geology & its importance, Engineering properties of rocks. • Geological copnditions for establishing of large Dam and Tunnels. • Elementary study of Aerial photographs & satellite Imageries, Application of remote sensing in town-planning. • Hydrologic cycle, Mode of occurrence of ground water, Quality of ground water. • Hydrologic properties of rocks, Classification of Aquifers, Ground water provinces of India.
Unit – 5 **18 Hours**	• Introduction to mineral exploration, Surface & subsurface methods of mineral Exploration. • Prospection methods: Drilling, Sampling & Assaying. • Geophysical prospecting techniques: Gravity, Electrical & Magnetic methods. • Aerial and seismic prospecting methods. • Environmental impacts of over exploitation of mineral resources.

PRATICALS	• Study of important metallic/non-metallic minerals on the basis of physical & optical properties. • Distribution of main metallic/non-metallic deposits within outline map of India. • Magascopic studies of coal & its varieties. • Exercises related with mineral exploration; Reserve calculation, Tonnage factor calculation, Exercises related with drilling. • Study of Aerial photographs with the help of stereoscopes. • Study of satellite imageries. • Study of hydrologic properties of rocks, Preparation of hydrological maps. • Geological excursion for ten days.
SUGGESTED READINGS	1. Economic mineral deposits– A.Bateman. 2. Economic mineral deposits of India – Umeshwar Prasad. 3.Ore-deposit of India – Gokhale&Rao. 4.India's Mineral Resource – S.Krishnaswami. 5.Principle of Engineering Geology &Geotechniques – Krynine& Judd. 6.Groundwater Hydrology – D.K.Todd. 7.Courses in mining Geology – R.N.P.Arogyaswami. 8.Principle& Application of photogeology – S.N. Pandey. 9.Ground water – Assessment, Development & Management – K.R.Karanth. 10.Geophysical methods in Geology – P.V.Sharma. 11.Environmental Geology – K.S. Valdiya (1987).

GEOLOGY (B.Sc.)			**SEMESER – VI**
COURSE CODE: DSE-GEOL-104			COURSE TYPE : DSE
COURSE TITLE : URBAN GEOLOGY			
CREDIT: 4		HOUR:90	
THEORY: 4	PRACTICAL: 02	THEORY: 90	PRACTICAL:30
MARKS			
THEORY:100(70+30)		PRACTICAL: 50	

Unit – 1	**Geology and Society :** • Necessity of Geology in Urban life. • Geology in Urban Constructions. • Geotechnical feature and mapping for subsurface in Metropolitan areas • Building materials, Excavation and cutting in urban areas.
Unit – 2	• Geology and Urban Agriculture. • Soil studies, Chemistry and geochemistry of soil in relation to ground water and fertilizer Effect to pollutants on vegetable contamination.
Unit – 3	• Urban land use. • Site characterization and land use mapping. Geological problems in construction of underground structures in urban areas. • Method, Equipments uses for construction of Tunnel, Importance of Geology. • Urban Water : Sources of water, Water logging in built-up areas, various uses of water. • Waste water Management.
Unit – 4	• Urban wastes and treatment, Geotechnical characterization for waste sites. • Domestic waste, Industrial waste Power production waste, Radioactive waste. • Need for special purpose mapping for selection of waste disposal sites. • GIS Application in Urban development.
PRATICALS	• Map Reading • Case studies of Urban flood problems. • Case studies of urban planning.

SUGGESTED READINGS	1. Huggenberger, P. and Eptin, J. 2011 Urban Geology : Process-Oriented Concepts for Adaptive and Integrated Resource Management. Springer. 2. Lollino, G. et al. (Ed.) Engineering Geology for Society and Territory. Springer. 3. Engineering Geology- Dr. Anil Kumar Mishra, S. Chand 4. vkfFkZd ,oa O;ogkfjd Hkw&foKku& MkW- nhid jkt frokjh

GEOLOGY (B.A.)			**SEMESER – I**
COURSE CODE: GEC-GEOL-101			COURSE TYPE : GEC
COURSE TITLE : Essentials of Geology			
CREDIT: 03		HOUR:45	
THEORY: 03	PRACTICAL: 00	THEORY: 80	PRACTICAL:50
MARKS			
THEORY:100(80+20)		PRACTICAL: 50	

Unit – 1 11 Hours	• Introduction to Geology, scope, sub-disciplines and relationship with other branches of science. • Earth's size, shape, mass, density, rational and evolution parameters.
Unit – 2 11 Hours	• Solar system: Introduction to various planets, Earth in the solar system, origin.
Unit – 3 11 Hours	• Age of the earth; Radioactivity and its application in determining the age of the earth. • Internal constitution of the earth core, mantle and crust, Composition of the earth.
Unit – 4 12 Hours	• Origin and composition of hydrosphere and atmosphere, Origin of biosphere, Origin of oceans, continents and mountains.
Practical	• Study of major geomorphic features • Detailed study topographic sheets • Study of soil profile • Study of distribution of lithostratigraphic units on map of India • Study of major ocean currents of the World

SUGGESTED READINGS	1. Holmes'Principles of Physical Geology.1992.Chapman & Hall. 2. Emiliani,C,1992.pLANETeARTH,Cosmology,Geology and the Evolution of life and Environment, Cambridge University Press. 3. Gross,M.G.,1977.Oceanography:A view of the Earth,Prentice Hall 4.Mahapatra, G.B., Text book of Physical Geology, CBS, India, 2018 5. Mathur, S.M., Physical Geology of India, NBT India, 1991 6.Miller, William j., Physical Geology : An Introduction . D. Van Nostrand Co., 5th Ed.,1949 7.Mukerjee,P.K.,Text Book of Geology. World Press Private Ltd, 2013
E-RESOURCES	1. https://www.mindat.org 2.https://www.mooc-list.com/tags/minerals 3.https://epgp.inflibnet.ac.in/Home 4.https://archive.org/details/in.ernet.dli.2015.233340/page/n15/mode/2up 5.https://egyankosh.ac.in/ 6.https://sites.google.com/ignou.ac.in/bscgeology 7.SWAYAM-https://swayam.gov.in/explorer?searchtext 8.National digital library- https://ndl.iitkgp.ac.in 9.e-PG pathshala (MHRD) portal, https://egpg.inflibnet.ac.in

GEOLOGY (B.A.)			**SEMESER – II**
COURSE CODE: GEC-----GEOL-102			S COURSE TYPE : GEC
COURSE TITLE : Rocks and Minerals			
CREDIT: 03		HOUR:45	
THEORY: 03	PRACTICAL: 00	THEORY:	PRACTICAL:
MARKS			
THEORY:100(80+20)		PRACTICAL: 50	

Unit – 1 11 Hours	• Mineras- Definition, Physical properties of mineral, Mineralogy of the Earth's crust, mantle and core.
Unit – 2 11 Hours	• Nature of light and principles of optical mineralogy, classification of minerals.
Unit – 3 11 Hours	• Definition and types, Basics of rock formation, Igneous rock- magma generation and differentiation.
Unit – 4 12 Hours	• Sedimentary rocks surface processes and sedimentary environments, Metamorphic rocks- types of metamorphism.
Practical	• Study of physical properties of minerals • Introduction to optical microscopy • Study of physical properties of rock • Understanding crystal symmetry via wooden models

SUGGESTED READINGS	1. EarthMaterials-IntroductionToMineralogyandPetrology,CornelisKleinandAnthonyPhilpotts, Cambridge University Press, 2013. 2.UnderstandingEarth(SixthEdition),JohnGrotzingerandThomasH.J.Jordan,2010,W,H,Freemanand company, New York. 3. FordW.E.;Dana'sTextBookofMineralogy.CBS,2006. 4.Perkins,D.;Mineralogy,PrenticeHallIndia,3rded.2012. 5. Rathore,B.S.;BasicsofCrystallography,Mineralogy and Geochemistry.NotionPressIndia,20206.Sharma,Anurag;CrystallographyandMineralogy-ConceptsandMethods.Geol.Soc.Ind.,Bengaluru,2013