

From : 2018-21

**CHOICE BASED CREDIT SYSTEM (CBCS)  
SYLLABUS B.Sc. BOTANY GENERAL**

**Subject code-00**



**NILAMBER-PITAMBER UNIVERSITY, MEDININAGAR  
PALAMU, JHARKHAND=822 101**

## B.Sc. GENERAL Course Structure

### Course Structure and Scheme of Examination of B.Sc. General. Under CBCS

Table No. 21: Scheme of Examination of B.Sc. Programme Under CBCS (For Subjects with Practical Papers)

Sem	Core Course (CC-12) F.M [Mid +End+ Total]/(Credit)	Ability Enhancement Compulsory Course (AECC-2)	Skill Enhancement Course (SEC-4)	Elective: Discipline Specific (DSE-6)
I	DSC 1A = 100/T75+P25 (6) DSC 2A = 100/T75+P25 (6) DSC 3A = 100/T75+P25 (6)	English/ Hindi Communication =100 (2) or NH + MB Communication=50+50 (2)		
II	DSC 1B = 100/T75+P25 (6) DSC 2B = 100/T75+P25 (6) DSC 3B = 100/T75+P25 (6)	Environmental Science = 100 (2)		
III	DSC 1C =100/T75+P25 (6) DSC 2C =100/T75+P25 (6) DSC 3C =100/T75+P25 (6)		SEC 1 T= 100 (2) Or SEC 1= T75 +P25 =100(2)	
IV	DSC 1D =100/T75+P25 (6) DSC 2D =100/T75+P25 (6) DSC 3D =100/T75+P25 (6)		SEC 2 T= 100 (2) Or SEC 2= T75 +P25 =100(2)	
V			SEC 3 T= 100 (2) Or SEC 3= T75 +P25 =100(2)	DSE 1A=100/T75+P25 (6) DSE 2A=100/T75+P25 (6) DSE 3A=100/T75+P25 (6)
VI			SEC 4 T= 100 (2) Or SEC 4= T75 +P25 =100(2)	DSE 1B=100/T75+P25 (6) DSE 2B=100/T75+P25 (6) DSE 3B =100/T75+P25 (6)

**Abbreviations:**

CC=Core Course, SEC=Skill Enhancement Course, DSE= Discipline Specific Elective

DSC 1, 2 & 3 = Three subjects from Science Stream taught in R.U. as per combination made for Maths/Bio group.

DSE 1, 2 & 3 = Discipline Specific Elective of all three subjects opted as core subjects respectively

SEC 1, 2, 3 & 4 = One Skill Enhancement Course from any of the three core courses opted.

**Total Credits in B.Sc. = 120**

*Signature*  
16/01/18

## **B.Sc. General GEOLOGY**

### **COURSE STRUCTURE**

#### **CORE COURSES (CC)**

Sem I DSC-1A :Physical and Structural Geology (Theory:04 Credits + Practicals: 02 credits = 06 credits)

Sem II DSC-1B.: Crystallography and Mineralogy (Theory:04 Credits + Practicals: 02 credits = 06 credits)

Sem III DSC-1C: Petrology (Theory:04 Credits + Practicals: 02 credits = 06 credits)

Sem IV DSC-1D: Straigraphy and Palaeontology (Theory:04 Credits + Practicals: 02 credits = 06 credits)

#### **DISCIPLINE SPECIFIC ELECTIVE (DSE)**

SEM V DSE-1A: Economic Geology and Hydrology (Theory:04 Credits + Practicals: 02 credits = 06 credits)

SEM V DSE-1B. Elements of Applied Geology (Theory:04 Credits + Practicals: 02 credits = 06 credits)

#### **SKILL ENHANCEMENT COURSE (SEC)**

SEC-1 Geomorphology and Geotectonics (02 credits)

SEC-2. Environmental Geology (02 credits)

SEC-3. Geochemistry (02 credits)

SEC-4. Photo Geology and Remote Sensing (02 credits)

#### **ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)**

1. Environment Science (02 Credits)

2. English or Modern Indian Language communication (02 credits)

### **COURSE COMPONENT**

**Sem I DSC-1A :Physical and Structural Geology (Theory:04 Credits + Practicals: 02 credits = 06 credits)**

#### **Physical and Structural Geology (Theory) (4 Credits)**

**Unit-I:** Introduction to geology and its scope, Earth and solar system: origin, size, shape, mass, density and its atmosphere.

**Unit-II:** A brief account of various theories regarding the origin and age of the earth; Brief idea of interior of earth and its composition.

**Unit-III:** Weathering and erosion: factors, types and their effects;

**Unit-IV:** Earthquakes: nature of seismic waves, their intensity and magnitude scale; Origin of earthquake; Volcanoes: types, products and causes of volcanism;.

**Unit-V:** Introduction to Structural Geology; contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop, effects of various structures on outcrop. Clinometer/Brunton compass and its use.

**Unit-VI:** Elementary idea of types of deformation; Folds: nomenclature and types of folds;

**Unit-VII:** Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults;

**Unit-VIII:** definition, kinds and significance of joints and unconformity.

## **Practicals (02 Credits)**

### **• Physical Geology:**

Study of important geomorphological models; Reading topographical maps of the Survey of India; Identification of geomorphic features.

### **• Structural Geology:**

Study of clinometers/Brunton compass; Identification of different types of folds/faults from block models; Exercises on structural problems: preparation of cross section profile from a geological map.

### **• Laboratory record:**

### **• Viva Voce:**

### **Books Recommended:**

1. Arthur Holmes, 1992. Principles of Physical Geology. Chapman and Hall, London.
2. Miller, 1949. An Introduction to Physical Geology. East West Press Ltd.
3. Spencer, E.V., 1962. Basic concepts of Physical Geology. Oxford & IBH.
4. Mahapatra, G.B., 1994. A text book of Physical geology. CBS Publishers.
5. Billings, M.P., 1972. Structural Geology. Prentice Hall.
6. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley
7. Hills, E.S., 1963. Elements of Structural Geology. Farold and Sons, London.
8. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.
9. A Practical Approach. Ganga Kaveri Publ., Varanasi.

## **Sem II DSC-1B.: Crystallography and Mineralogy (Theory:04 Credits + Practical: 02 credits = 06 credits)**

### **Crystallography and Mineralogy (04 credits)**

**Unit-I:** Crystals and their characters:

**Unit-II:** Crystal form, face, edge, solid angle; Interfacial angle and their measurements; Crystallographic axes and angles.

**Unit-III:** Crystal parameters, Weiss and Miller system of notations;

**Unit-IV:** Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

**Unit-V:** Introduction to Mineralogy, Definition and characters of mineral;

**Unit-VI:** Common physical properties of minerals; Chemical composition and diagnostic physical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite.

**Unit-VII:** Polarizing microscope, its parts and functioning; Ordinary and polarized lights; Common optical properties observed under ordinary, polarized lights and crossed nicols.

**Unit-VIII:** Optical properties of some common rock forming minerals (Quartz, Orthoclase, Microcline, Olivine, Augite, Hornblende, Muscovite, Biotite, Garnet, Calcite).

### **Practicals (02 Credits)**

#### **• Crystallography:**

Study of symmetry elements of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

#### **• Mineralogy:**

Study of physical properties of minerals mentioned in theory course. Use of polarizing microscope; Study of optical properties of common rock forming minerals mentioned in theory course.

- **Laboratory record:**

- **Geological Field Training:**

Students will be required to carry out 03 days field work in a suitable geological area to study the elementary aspects of field geology and submit a report thereon.

- **Viva voce:**

**Books Recommended:**

1. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy (Reprints).
2. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
3. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
4. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
5. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
6. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
7. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
8. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.

### **Sem III DSC-1C: Petrology (Theory:04 Credits + Practicals: 02 credits = 06 credits)**

#### **Petrology (04 Credits)**

##### **Igneous Petrology**

**Unit-I:** Magma: definition, composition, types and origin; Forms of igneous rocks; textures of igneous rocks.

**Unit-II:** Reaction principle; Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mix-crystals); Bowen's reaction series.

**Unit-III:** Mineralogical and chemical classification of igneous rocks:.

**Unit-IV:** Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro.

##### **Sedimentary Petrology**

**Unit-V:** Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks;

**Unit-VI:** Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, limestones.

##### **Metamorphic Petrology**

**Unit-VII:** Process and products of. metamorphism; Type of metamorphism. Factors, zones and grade of metamorphism; Textures, structures and classification of metamorphic rocks.

**Unit-VIII:** Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble.

#### **Practicals (02 Credits)**

- **Igneous Petrology:**

Identification of rocks: On the basis of their physical properties in hand specimen; and optical properties in thin sections.

- **Sedimentary and metamorphic Petrology:**

Identification of sedimentary and metamorphic rocks both in hand specimen and thin sections.

- **Laboratory record:**

- **Viva Voce**

**Books Recommended:**

1. Turner, F.J. & Verhoogen, J., 1960, Igneous & Metamorphic petrology. McGraw Hill Co.
2. Bose, M.K., 1997. Igneous petrology. World press
3. Tyrell, G. W., 1989. Principles of Petrology. Methuren and Co (Students ed.).

4. Ehlers, WG, and Blatt, H., 1987. Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers
5. Moorhouse, WW., 1969. The study of rocks in thin sections. Harper and sons.
6. Friedman & Sanders, 1978. Principles of Sedimentology. John Wiley and sons.
7. Pettijohn, F.J., 1975. Sedimentary rocks, Harper & Bros. 3rd Ed.
8. Prasad, C., 1980. A text book of sedimentology.
9. Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.
10. Turner, F.J., 1980. Metamorphic petrology. McGraw Hill.
11. Mason, R., 1978. Petrology of Metamorphic Rocks. CBS Publ.
12. Winkler, H.G.C., 1967. Petrogenesis of Metamorphic Rocks. Narosa Publ

## **Sem IV DSC-1D: Straigraphy and Palaeontology (Theory:04 Credits + Practicals: 02 credits = 06 credits)**

### **Stratigraphy and Palaeontology (04 Credits)**

**Unit I:** Definition, Principle of stratigraphy; Geological Time Scale and stratigraphic classification; Physiographic division of India.

**Unit II:** Study of following Precambrian succession: Dharwar, Singhbhum, Cuddapa, Vindhyan and Delhi Supergroups; Brief idea of Palaeozoic succession of northwestern Himalaya; Triassic of Spiti; Mesozoic type seccession of Kutch; Cretaceous of Tiruchirapalli;

**Unit III:** Study of following type localities: Gondwana and Deccan Trap.

**Unit IV:** Palaeogene-Neogene sequences of northwest Himalaya and Assam.

**Unit-V:** Palaeontology: definition, Fossils: definition, characters, binomial nomenclature in taxonomy, mode of preservation, condition of fossilization and significance of fossils;.

**Unit VI:** Morphology and geological distribution of brachiopods, pelecypods, cephalopods.

**Unit VII:** Morphology and geological distribution of trilobite, echinoidea.

**Unit VIII:** Evolutionary history of horse; Morphology, distribution and significance of Gondwana flora.

### **Practicals (02 Credits)**

I. Morphological characters, systematic position and age of fossil genera pertaining to brachiopods, pelecypods, cephalopods, trilobite and Echinacea.

II. Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

### **Books Recommended:**

1. Wadia, D., 1973. Geology of India. Mc Graw Hill Book co.
2. Krishnan, M.S., 1982. Geology of India and Burma, 6th Edition. CBS Publ.
3. Ravindra Kumar, 1985. Fundamentals of Historical Geology & Stratigraphy of India. Wiley Eastern.
4. Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
5. Swinerton, HH., 1961. Outlines of Paleontology. Edward Arnold Publishers
6. Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution. Vishal Publ.
7. Lehmann, U., 1983. Fossil Invertebrate. Cambridge Univ. Press.
8. Rastogi, 1988. Organic evolution. Kedrnath and Ramnath Publ.

## **DISCIPLINE SPECIFIC ELECTIVE (DSE)**

### **SEM V DSE-1A: Economic Geology and Hydrology (Theory:04 Credits + Practicals: 02 credits = 06 credits)**

#### **Economic Geology and Hydrology (04 Credits)**

**Unit-I:** Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, Critical and essential minerals.

**Unit-II:** Processes of formation of ore deposits; Magmatic, contact metasomatic, hydrothermal, sedimentation, Residual.

**Unit-III:** Study of important metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesite, mica).

**Unit-IV:** Distribution of coal and petroleum in India;

**Unit-V:** Definition of hydrogeology, Hydrological cycle;

**Unit-VI:** Hydrological parameters - Precipitation, evaporation, transpiration and infiltration.

**Unit-VII:** Origin of groundwater; Vertical distribution of groundwater; Types of aquifers; Water bearing properties of rocks - Porosity and Permeability; specific yield, specific retention.

**Unit-VIII:** Surface and subsurface geophysical and geological methods of ground water exploration; Groundwater provinces of India.

### **Practicals (02 Credits)**

#### **• Economic Geology:**

Study of ore and economic minerals in hand specimen; Preparation of maps showing distribution of important metallic and non-metallic deposits and important coal and oil fields of India.

#### **• Hydrology:**

Study of hydro-geological models, Estimation of porosity and permeability from the given data;

Preparation and interpretation of water table maps.

#### **• Laboratory record:**

#### **• Viva Voce:**

#### **Books Recommended:**

1. Brown, C. and Dey, A.K. 1955. Indian Mineral Wealth. Oxford Univ.
2. Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
3. Jense, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
4. Krishnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
5. Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
6. Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributors.
7. Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.
8. Karanth, K. R., 1989. Hydrogeology. Tata McGraw Hill Publ.
9. Raghunath, H. M., 1990. Groundwater. Wiley Eastern Ltd.
10. Subramaniam, V., 2000. Water-Kingston Publ. London.

### **SEM V DSE-1B. Elements of Applied Geology (Theory:04 Credits + Practical: 02 credits = 06 credits)**

#### **Elements of Applied Geology (04 Credits)**

**Unit-I:** Engineering properties of rocks and Soils.

**Unit-II:** Soil and Soil groups of India.

**Unit-III:** Dam, Types and their geological and environmental considerations; Geological problem of reservoirs.

**Unit-IV:** Tunnels: geology, structure, seepage problem and role of water table;

**Unit-V:** Landslides: classification, causes and preventative measures.

**Unit-VI:** Mineral exploration: Elementary idea of geological and geophysical prospecting.

**Unit-VII:** Elementary idea of mining.

**Unit-VIII:** Environmental considerations for mining,.

#### **Practicals**

Surveying by Plane Table; Preparation of engineering geological maps; Engineering properties and identification of building stones. Identification of various models of landslide, tunnel and dam. Study of soil profiles.

• **Laboratory record:**

• **Viva Voce:**

**Books Recommended:**

1. Valdiya, K.S., 1987. Environmental Geology – Indian Context. Tata McGraw Hill.
2. Rajendran S., 2007. Mineral Exploration : Recent Strategies.
3. Dobrin, M.B. & Savit, CH., 1988. Introduction to Geophysical Prospecting, McGraw-Hill.
4. Arogyaswamy, R.N.P., 1973. Courses in Mining Geology. Oxford and IBH Publ.
5. Parasins, D.S., 1997. Principles of applied geophysics. Chapman Hall.
6. Krynine D.P. and Judd W.R., 1957. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
7. Kesavulu, N.C., 2009. A text book of engineering geology. Macmillan P publishing India Ltd.
8. Crozier. M.J., 1989. Landslides: causes, consequences and environment. Academic Press.
9. Readman, J.H., 1979. Techniques in Mineral exploration. Applied Science Publishres.
10. Bell, F.G., 1983. Fundamentals of Engineering Geology. Butterworth and Co.





## **SKILL ENHANCEMENT COURSE (SEC)**

### **SEC-1 Geomorphology and Geotectonics (02 credits)**

#### **Photo Geology and Remote Sensing**

**Unit-I:** Elementary idea about photogeology: electro-magnetic spectrum, types & geometry of aerial photographs; factors affecting aerial photography; types of camera, film and filters; factors affecting scale;

**Unit-II:** Fundamentals of remote sensing; remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils. Application of remote sensing in geoscience and geomorphological studies.

**Unit-III:** Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification.

**Unit-IV:** Introduction to Geographic Information System (GIS); components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing.

#### **Books Recommended:**

1. Bhatta, B., 2008. Remote Sensing and GIS. Oxford, New Delhi.
2. Gupta, R.P., 1990. Remote Sensing Geology. Springer Verlag.
3. Lilleasand, T.M. and Kiffer, R.W., 1987. Remote Sensing and Image Interpretation. John Wiley.
4. Pandey, S.N., 1987. Principles and Application of Photogeology. Wiley Eastern, New Delhi.
5. Sabbins, F.F., 1985. Remote Sensing – Principles and Applications. Freeman.
6. Siegal, B.S. and Gillespie, A.R., 1980. Remote Sensing in Geology. John Wiley.
7. Rampal K.K. 1999. Hand book of aerial photography and interpretation. Concept publication.

### **SEC-2. Environmental Geology (02 credits)**

#### **Geomorphology and Geotectonics**

**Unit-I:** Basic principles of Geomorphology, geomorphological cycles, weathering and erosion; Geomorphic mapping- tools and techniques.

**Unit-II:** Epigene/exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Diastrophism and volcanism, Extraterrestrial processes; Geological work of wind, glacier, river, underground water and ocean.

**Unit-III:** Earth as a dynamic system. Elementary idea of continental drift, sea-floor spreading and mid-oceanic ridges. Paleomagnetism and its application.

**Unit-IV:** Plate Tectonics: the concept, plate margins, orogeny, deep sea trenches, island arcs and volcanic arcs.

#### **Books Recommended:**

1. Allen, P., 1997. Earth Surface Processes. Blackwell
2. Bloom, A.L., 1998. Geomorphology: A systematic Analysis of Late Cenozoic Landforms (3rd Edition). Pearson Education, Inc.
3. Keary, P. and Vine, F.J., 1997. Global Tectonics. Blackwell and crustal evolution. Butterworth-Heinemann.
4. Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology. Orient Longman Ltd.
5. Moores, E and Twiss. R.J., 1995. Tectonics. Freeman.
6. Patwardhan, A. M., 1999. The Dynamic Earth System. Prentice Hall.
7. Summerfield, M.A., 2000. Geomorphology and Global tectonic. Springer Verlag.
8. Valdia, K.S., 1988. Dynamic Himalaya. Universities Press, Hyderabad.
9. WD Thornbury, 2002. Principles of Geomorphology. CBS Publ. New Delhi.

### **SEC-3. Geochemistry (02 credits)**

#### **Environmental Geology**

**Unit-I:** Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere and Man; Earth Material.

**Unit-II:** Energy budget: Solar radiation; Global environments: coastal, riverine, desertic, tropical, cold, polar; Concept of global warming and climate change.

**Unit-III:** Geological hazards: Earthquakes, volcanism, landslides, avalanches, floods, droughts; Hazard mitigation.

**Unit IV:** Resource Management: Energy resources (Conventional and non-conventional), watershed management, landuse planning, management of water resources, land reclamation.

#### **Books Recommended:**

1. Verma, V.K., 1986. Geomorphology Earth surface processes and form. McGraw Hill.
2. Chorley, R. J., 1984. Geomorphology. Methuen.
3. Selby, M.J., 1996. Earths Changing Surface. Oxford University Press UK.
4. Thornbury W. D., 1997. Principles of Geomorphology Wiley Eastern Ltd., New Delhi.
5. Valdiya, K. S., 1987. Environmental Geology - Indian Context. Tata McGraw Hill New Delhi.
6. Keller, E. A., 2000. Environmental Geology. Shales E. Merrill Publishing Co., Columbus, Ohio.
7. Montgomery, C., 1984. Environmental Geology. John Wiley and Sons, London.
8. Bird, Eric, 2000. Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore.
9. Liu, B.C., 1981. Earthquake Risk and Damage, Westview.

### **SEC-4. Photo Geology and Remote Sensing (02 credits)**

#### **Geochemistry**

**Unit-I:** Introduction to geochemistry: basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids; Elementary idea of Periodic Table.

**Unit-II:** Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles;

**Unit-III:** Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks.

**Unit-IV:** Elements of geochemical thermodynamics; Isomorphism and polymorphism; Isotope geochemistry.

#### **Books Recommended:**

1. Hoefs, J., 1980. Stable Isotope Geochemistry. Springer-Verlag.
2. Klein, C. and Hurlbut, C.S., 1993. Manual of Mineralogy. John Wiley and Sons, New York.
3. Krauskopf, K.B., 1967. Introduction to Geochemistry. McGraw Hill.
4. Mason, B. and Moore, C.B., 1991. Introduction to Geochemistry. Wiley Eastern.
5. Rollinson, H.R., 1993. Using geochemical data: Evaluation, Presentation, and Interpretation. Longman