

**Swami Ramanand Teerth Marathwada University
Nanded.**

FACULTY OF SCIENCE

**SYLLABUS
(CBCS Pattern)**

B.Sc. Geology Third Year

SEMESTER V & VI

[Syllabus progressively effective June- 2018]

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Distribution of credits for B.Sc. Geology (optional)

Under Faculty of Science

B. Sc. III Syllabus structure

Semester Pattern effective from June- 2018

Scheme of B.Sc. Programme Under CBCS

Subject: Geology

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	Marks obtained		Total Marks	Credits
					Internal (CA)	External (ESE)		
V	DECG I (Section A)	Geomorphology and Photo-Geology (P-XII)	03	45	10	40	50	2
	DECG I (Section A)	Engineering and Hydrology (P-XIII)	03	45	10	40	50	2
	DECG I [(Section B) Elective -I]	Environmental Geology (P-XIII)	03	45	10	40	50	2
	DECCGP I [DECG I & II (Section A)]	Practical's based on P- XII & PXIII (P- XVI)	04	10 Practical	10	40	50	2
	SECG-III	SEC III (Anyone Skill from optional)	02	02 + 01 =03	25 (15 + 10)	25 (10+10+5)	50	(2)*
VI	DECG II (Section A)	Stratigraphy of India (P-XIV)	03	45	10	40	50	2
	DECG II (Section A)	Economic Geology and Prospecting (P- XV)	03	45	10	40	50	2
	DECG II [(Section B) Elective -II]	Groundwater exploration and Management (P-XV)	03	45	10	40	50	2
	DECCGP II) [DECG I & II (Section B)]	Practical's based on P- XIV & P-XV (P- XVII)	04	10 Practical	10	40	50	2
	DECCGP - II (Section B)	SEC IV (Anyone Skill from optional)	02	02 + 01 =03	25 (15 + 10)	25 (10+10+5)	50	(2)*
Total credits semester V and VI 12(04)*								

Note: Each credit is of 25 marks and each paper is of 2 credits.

Geomorphology and Photogeology – Paper No. -XII

(Credits -2)

Salient Features: The paper is designed in order to Understand the landforms of various activities of geomorphic agents. The fundamentals and applications of photogeology in geological data interpretation, field mapping etc are beneficial to students.

Utility: Both Geomorphology and Photogeology are interrelated to each other and are useful for preparation of base map.

Learning objectives: i) To identify landforms and their characteristics with reference to different geomorphic agents.

ii) To interpret, process and apply the spatial data for field applications.

Prerequisite: The course paper is essential to have clear cut understanding of the landforms and to have basic information of techniques of Photogeology.

Unit 1: (Periods 20, Marks,25)

Geomorphology -Introduction and concepts of geomorphology, study of geomorphic surface features (land forms) of fluvial, Aeolian, glacial and marine origin.

Unit 2: (Periods 25, Marks,25)

Photogeology-Introduction to aerial photography, satellite imageries and preparation of photogeological maps. Elements of aerial photo interpretation. Stereoscopic vision, orientation of stereoscope, stereo-pairs and stereo viewing of air photos, types of aerial photographs and photo index. Scale of aerial photographs. Application of Aerial photographs in the study of lithology, structure and geomorphology. Introduction to remote sensing and applications in Geology.

Engineering Geology and Hydrogeology Paper No. -XIII

(Credits -2)

Salient Features: The paper is divided in two units comprising Engineering Geology and Hydrogeology. The fundamentals and applications of geological investigation on Engineering projects including dams, tunnels, reservoirs etc. are beneficial to students. The students are also acquainted with the knowledge of the basics of the hydrogeology in day to day life.

Utility: Both Engineering Geology and Hydrology are applied geology topics interrelated to each other and are useful for societal significance.

Learning objectives: i) To acquaint the students with geological applications in Engineering projects.

ii) To understand, evaluate, manage and apply the groundwater condition for practical utility and applications.

Prerequisite: The course paper is essential to have clear cut understanding of the engineering projects and to have basic information of techniques in Hydrogeology.

Unit 1: (Periods 25, Marks,25)

Engineering Geology-Concept and definition of engineering geology and environmental geology. Environmental and geological hazards such as earthquake volcano and mass movement. Environment and geological consideration in the location and construction of engineering structures such as dams, reservoirs and tunnels. Drilling and its application in Engineering geology.

Unit 2: (Periods 20, Marks,25)

Hydrogeology-(Introduction, hydrologic cycle, water table, aquifer and its classification. Aquifer properties such as porosity, permeability, specific yield, specific retention, storativity, hydraulic conductivity. Darcy's law, occurrence of groundwater in igneous, sedimentary and metamorphic rocks. Hydrological prospecting. Concept of watershed. Methods of soil and water conservation.

Elective-1;

Environmental Geology - Paper No. -XIII

(Credits -2)

Salient Features: The paper is divided in two units of Environmental geology. The fundamentals and applications of environmental geology studies are beneficial to students in day to day life.

Utility: The environmental Geology and its applied topics are useful from the societal significance point of view.

Learning objectives: i) To acquaint the students with the basics of environmental geology.

ii) To understand, evaluate, manage and sustain the environmental condition for practical utility and applications.

Prerequisite: The course paper is essential to have understanding of the environment and to have basic information of techniques in environmental geology.

UNIT -I: (Periods -20, Marks – 25)

Environmental Geology: Definition of ecology and environmental Geology. Different ecosystems. Classification of Natural resources. A short account of renewable and non-renewable resources. Environmental problems due to surface geological processes. Causes, hazards and remedial measures relating to landslides, floods, and soil erosion, Impact of wind on environment. Degradation of coastal environment and measures for coastal protection.

UNIT –II:

(Periods -25, Marks – 25)

Influence of deep seated geological processes – Earthquake hazards, Earthquake prediction control and warning. Hazards of volcanism; Techniques of volcanic prediction and human adjustments to volcanic environments. Man as an agent of environmental modifications. Environmental degradation due to mining and mineral processing. Effects of urbanization on surface water, causes for ground water pollution. An outline on Global Warming and Climate changes.

Section-A**(DSEGP-I): Discipline Specific Elective Geology Practical-XVI -(Credits -2)**

- A) Morphometric Analysis of the given Watershed/toposheet.
- B) Identification and description of the Geomorphological models/google maps
- C) Identification of the Structures from aerial photographs
- D) Merits and demerits of the Engineering site from given Geological Structural Contour Map on the basis of Draw section along given section line.
- E) Hydrological Problems.

Record Book

Elective 1: Environmental Geology Practical -II -(Credits -2)

- A) Water analysis.
- B) Soil analysis.
- C) Plotting and interpretation of geochemical data.
- D) Preparation of hazard Zonation map.
- E) Quantification of EIA

Record Book

Section-B**Skill enhancement Course in Geology-III -(Credits -2)****1) Preparation of Geological maps from contour data**

Definition of Contour, structural geology. Geography of area in maps (high ground, hills, valleys saddles etc), terminologies like Dip, strike, outcrop, horizontal and inclined beds. Technique and procedure for Preparation of geological maps from contour maps of the given data at least 5 maps containing dipping strata, fold, fault, joint, unconformity etc.

OR**2) Properties of Soil**

Scope of Course, Soil Composition. Geological survey of subsoil - the method and extent of exploration activities. Genesis of soils, mineralogical composition of soil. Physical properties of soils. The characteristics of the physical state of fine-grained and coarse-grained soils. Soil Structure. Chemical properties of soil samples. Problem Soils (Sensitive, Organic, Expansive, Collapsing, Varved, etc.)

**BSc. III Year Syllabus.
Semester-VI**

(DSEG-II) : Discipline Specific Elective Geology -II

Stratigraphy of India - Paper No. –XIV

(Credits -2)

Salient Features: The paper is designed for the understanding of the geological formations in different parts of India through geological ages from studying the rock strata which will in turn, help in building the geological history of Indian subcontinent.

Utility: The topics on Stratigraphy of India are very important from the point of view of general information on the geology of India and topics are useful for knowledge and understanding India.

Learning objectives: i) To acquaint the students with geological formations all over India.

ii) To understand the time relevance and occurrence of minerals and rock formations of India.

Prerequisite: The paper is essential to have understanding of the geological formations of India.

UNIT – I:

(Periods -25, Marks – 25)

Stratigraphy- I - Principles of stratigraphy, units of stratigraphy, principles of correlation. Occurrence, distribution, classification, lithology and economic importance of following super-groups/groups: Archean of central province, Singhbhum, Eastern Ghats, Delhi, Dharwar, Cuddupah, Vindhyan, Gondwana and Deccan Traps.

UNIT –II:

(Periods -20, Marks – 25)

Occurrence, distribution, classification, lithology and economic importance of super-groups/groups : Geology of Kashmir, Spiti valley and Siwalik, Marine formations of Jurassic of Kutch, Cretaceous of Tiruchirapalli and Tertiary rocks of Assam.

Economic Geology and Prospecting - Paper No. –XV

(Credits -2)

Salient Features: The paper is divided in two units namely Economic Geology and Prospecting. The Unit-I is dedicated to understand the process of formation of economic mineral and their distribution in different parts of India. The second Unit concentrate on the evaluation, extraction and monitoring of the mineral bodies and rock formations through various methods of prospecting.

Utility: Both Economic Geology and Prospecting are applied geology topics interrelated to each other and are useful for societal significance.

Learning objectives: i) To acquaint the students with the process of formation and distribution of economic minerals of India.

- ii) To understand, evaluate, manage and apply the prospecting method for practical utility and applications.

Prerequisite: The paper is essential to have clear cut understanding of the economic minerals and to have basic information of techniques of prospecting.

UNIT –I: (Periods -25, Marks – 25)

Economic Geology: Introduction of economic geology, magma and mineral deposits. Metallic and non-metallic ore deposits. Processes of formation of mineral deposits such as: Magmatic concentration, sublimation, metasomatism, metamorphism, hydrothermal process, supergene sulphide enrichment, sedimentation, residual and mechanical concentration. Occurrence, geological and geographical distribution and uses of following mineral deposits of India: Iron, chromites, copper, manganese, lead & zinc, gold, bauxite, gypsum, asbestos, mica, uranium, precious and semiprecious stones.

UNIT –II: (Periods -20, Marks – 25)

Prospecting: Geological method of prospecting. Geochemical method of prospecting including leakage anomalies and pathfinder elements. Geophysical prospecting (Instrument, field procedure and interpretation) based on magnetic, gravity, electrical, seismic studies.

Elective-1

Groundwater Exploration and Management - Paper No. –XV (Credit 2)

Salient Features: The paper is divided in two units comprising Groundwater Exploration and Management. The fundamentals and applications of geological investigation on groundwater exploration are beneficial to students. The students are also acquainted with the knowledge of the storage, consumption, conservation and management of Groundwater in day to day life.

Utility: Both Groundwater Exploration and Management are applied geology topics interrelated to each other and are useful for societal significance.

Learning objectives: i) To acquaint the students with Groundwater exploration.

- ii) To understand, evaluate and manage the groundwater for future storages.

Prerequisite: The course paper is essential to have clear cut understanding of the groundwater and to have basic information on techniques in Groundwater Exploration and Management..

UNIT –I: (Periods -20, Marks – 25)

Introduction: Definition of Hydrology, Hydrogeology, Scope and application of Hydrogeology. Hydrological Evaporation, Condensation, Precipitation, Infiltration,

Transpiration. Evapotranspiration. runoff, connate water. Ground Water: Origin, Occurrence, and age of groundwater, Vertical distribution of sub-surface water, zone of aeration-soil water, vadose water, capillary fringe. Zone of saturation - water table. Perched water table. Recharge and discharge areas.

Aquifers: Definition of aquifer, Aquitard, Aquiclude, Aquifuge. Properties of Aquifer - porosity, retention of water in rocks, yield of water from rocks (specific yield and specific retention), Darcy's law, permeability, hydraulic conductivity, velocity of groundwater flow, storage co-efficient. Types of aquifers: confined, semi-confined, unconfined. Homogeneous, Heterogeneous. Isotropic and Anisotropic aquifers. Igneous, sedimentary and metamorphic rocks as aquifers.

UNIT –II:

(Periods -25, Marks – 25)

Quality of Ground Water: Physical, chemical and Biological characteristics of groundwater. Suitability of groundwater for drinking, Irrigation and industrial purposes. Pollution of Ground Water; Pollution in relation to urban, industrial and Agricultural sources. Brief account of saline water intrusion. Ground Water Investigations: Scope of investigations, Methods of groundwater explorations, Brief account of Geological, hydrogeological, Geobotanical investigations, Introduction to Remote Sensing techniques. Geophysical Exploration: Basic principles of Geophysical exploration methods; Electrical methods - Schlumberger and Wenner configuration, Resistivity profiling and Vertical Electrical Sounding.

Management Of Groundwater: Groundwater balance, recharge, (natural and artificial) and discharge. Safe yields and over draft. Conjunctive use of surface and groundwater. Utilization of groundwater. Groundwater resource evaluation-water table fluctuation method and rainfall infiltration methods. Ground water provinces of India. Concepts of watershed management.

Section-A

(DSEGP-II) Discipline Specific Elective Geology Practical-XVII -(Credits -2)

- A) Sub-surface information of the area with the help of Resistivity Meter.
- B) Identify and locate the Geological Formations on a given map of India.
- C) Identification and description of the Physical Properties of Ore Minerals.
- D) Describe and locate the occurrence of Ore Minerals in the given map of India.
- E) Field work (minimum of three days) and viva.

Record Book.

Elective 1: Groundwater Exploration and Management Practical-II -(Credits -2)

- A) Sub-surface information of the area with the help of Bore hole data and well inventory.
- B) Groundwater exploration by Resistivity Survey.
- C) Porosity and permeability measurements.

- D) Analysis of rainfall data.
 - E) Preparation of water level contour maps and their interpretation
 - F) Field work and viva.
- Record Book.

Section-B

Skill enhancement Course in Geology-IV -(Credits -2)

1) Preparation of Litho log.

Definition, measurement and interpretation of lithologs:

Field and laboratory techniques in sedimentology: recording of sedimentary structures.

Preparation of lithologs from field data.

Laboratory study of oriented samples of river sediments.

Preparation of litholog from visible vertical section.

Detection of ideal cycle from vertical litholog and analysis of palaeo-current data

Interpretation and correlation of lithology from lithologs.

OR

2) Water table fluctuation

Introduction: Groundwater hydrology, utilization and historical background,

Occurrence and movement of groundwater, origin of groundwater.

Rock properties affecting the movement of groundwater.

Groundwater in hydrological cycle, measurement of groundwater level.

Influence of water level fluctuation on environment.

Theory Question Paper pattern

Faculty of Science

B.Sc. Third Year Sub : Geology Semester-V & VI (ESE)

Time : 02 Hrs

Marks : 40

Note : All questions are compulsory.

Draw neat diagram wherever necessary

Q. No. 1: Attempt any four of the following (From Unit I & II).

8 Marks

- a)
- b)
- c)
- d)
- e)
- f)

Q. No. 2: Attempt any two of the following (From Unit I).

8 Marks

- a)
- b)
- c)
- d)

Q. No. 3: Attempt any two of the following (From Unit II).

8 Marks

- a)
- b)
- c)
- d)

Q. No. 4: Describe/ explain any one of the following (from Unit I & II)

8 Marks

- a)
- b)

Q. No. 5: Write short notes (any two) (From Unit I & II)

8 Marks

- a)
- b)
- c)
- d)

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Practical Question Paper Pattern

Class : B.Sc. Third Year

Subject: Geology

Paper No. XVI

Time-Three Hours

Maximum Marks : 40

- Q.1. Identify and describe the Geomorphologic models from Item No. 1 to 4. 8 marks
- Q.2. Identify the Structures from aerial photographs from Item No. 5 & 6 8 marks
- Q.3 Carry out the Morphometric Analysis of the given Watershed. 8 marks
- Q.4. Select the suitable Engineering site from given Geological Structural Contour Map
and Draw section along X-Y 8 marks
- Q.5 Solve the given Hydrological Problem. 8 marks

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Practical Question Paper Pattern

Class : B.Sc. Third Year

Subject: Geology

Paper No. XVI

Time-Three Hours

Maximum Marks: 40

- Q.1. Find out the sub-surface information of the area with the help of Resistivity Meter. 8 marks
- Q.2 Identify & locate the Geological Formations on a given map of India from
item No.1 to 2. 8 marks
- Q.3 Identify and describe the Physical Properties of Ore Minerals from item No. 3 to 6. 8 marks
- Q.4 Locate the occurrence of Ore Minerals in the given map of India from item No. 7 to 8 8 marks
- Q.5 Field work 4 marks
- Viva 4 marks

Books Recommended:

1. Holms Principles of Physical Geology - D. Duff
2. Geology of India and Burma - M.S. Krishnan
3. Geology of India and Burma - D.N. Wadia
4. Fundamental of Historical Geology - Ravindra Kumar
5. Exploration of Geophysics - V.L.S. Bhimashankaran
6. General and Applied Geophysics - Kaul, Bhattacharya and Sengupta
7. Principles and Applications of Photogeology - Shiv N. Pande
8. Groundwater - H.M. Raghunath

9. Introduction to Geophysical Prospecting - Dorbin
10. Studies of Mineral deposits - Smrinov, Ginzburg and Others
11. Ore Deposits of India - KVGK Gokhale and T.C. Rao
12. Applied Hydrology - C.W. Fetter
13. Economic Mineral Deposits - Bateman
14. Principles of Geomorphology - Thornmbury
15. Engineering Geology - Parbin Singh
16. Mining Geology - Arogyaswami
17. Elements of Hydrology - Vijay Singh
18. Watershed Hydrology - R. Suresh
19. Rainwater Harvesting - K. Meghashyam
20. Geomorphology – Bloom
21. Groundwater hydrology - Todd
22. Hydrogeology - Davis and Dewiest
23. Hydrogeology - Karanth
24. Groundwater Assessment - Development and Management - Karanth
25. Applied principles of Hydrogeology - Mannings.