

# **SHIVAJI UNIVERSITY, KOLHAPUR.**



**Accredited By NAAC with 'A' Grade**

**Revised Syllabus For**

**B.Sc Part- III**

**GEOLOGY**

**Syllabus to be implemented from**

**June, 2020 onwards.**

# Shivaji University, Kolhapur

## Revised Syllabus For Bachelor of Science

1. TITLE : Subject

**GEOLOGY (Part III)**  
Optional under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- Revised Syllabus will be implemented from **June 2020** onwards.

3. PREAMBLE:-

This syllabus of degree course includes foundation, core and applied components of the geology course. The student should get into the prime objectives and expected level of study with required outcome in terms of basic and advance knowledge at examination level.

4. GENERAL OBJECTIVES OF THE COURSE :

(as applicable to the Degree /Subject- Paper concerned)

- 1) To impart basic knowledge in geology
- 2) To develop awareness in the fields of mineral resources, ground water, petroleum
- 3) Introduction to the concepts of Geotectonics
- 4) Fundamental concepts of Origin and Age of Earth
- 5) Study of natural disasters and mitigation measures thereof
- 6) Study of environmental aspects in relation to geology
- 7) Understanding the earth through Remote Sensing
- 8) Understanding the concept of Geological time and geological history of the earth
- 9) Understanding the Evolutionary trends through geological time
- 10) To study the geology and tectonics of the Indian Subcontinent
- 11) To impart basic field training in geology

5. DURATION

- The course shall be a full time course.

6. PATTERN:-

Pattern of Examination will be Semester pattern for Theory papers.. Practical Examination will be on yearly Pattern.

7. ELIGIBILITY FOR ADMISSION :-

As per eligibility criteria prescribed for each course and the merit list in the qualifying examination.

8. MEDIUM OF INSTRUCTION :

The medium of instruction shall be English.

9. STRUCTURE OF COURSE- -----

**FIRST YEAR Geology Semester I and II (NO.OF PAPERS 4 )**

Sr. No.	Subjects	Marks(Credits)
1.	DSC 21A: Physical Geology	Marks: 50 (Credits: 2)
2.	DSC 22A: Structural Geology	Marks: 50 (Credits: 2)
3.	DSC 21B: Crystallography	Marks: 50 (Credits: 2)
4.	DSC 22B: Mineralogy	Marks: 50 (Credits: 2)
	DSC A and DSC B Lab Course	Marks: 50 (Credits: 2)
	<b>Total</b>	<b>Marks:250 (Credits: 10)</b>

**SECOND YEAR Geology Semester III and IV (NO.OF PAPERS-4)**

Sr. No.	Subjects	Marks(Credits)
1.	DSC 21C: Igneous Petrology	Marks: 50 (Credits: 2)
2.	DSC 22C: Sedimentary and Metamorphic Petrology	Marks: 50 (Credits: 2)
3.	DSC 21D: Stratigraphy	Marks: 50 (Credits: 2)
4.	DSC 22D: Palaeontology	Marks: 50 (Credits: 2)
	DSC C and DSC D Lab Course	Marks: 100 (Credits: 4)
	<b>Total</b>	<b>Marks:300 (Credits: 12)</b>

**THIRD YEAR Geology Semester V and VI (NO.OF PAPERS- 8)**  
**Semester V**

Sr. No.	Subjects	Marks(Credits)
1.	DSE 41E: Economic Geology	Marks: 50 (Credits: 2)
2.	DSE 42E: Hydrogeology	Marks: 50 (Credits: 2)
3.	DSE 43E: Applied Geology-Engineering Geology	Marks: 50 (Credits: 2)
4.	DSE 44E: Applied Geology-Prospecting and Mining Geology	Marks: 50 (Credits: 2)
	DSE E Lab Course	Marks: 100 (Credits: 4)
	<b>Total</b>	<b>Marks:300 (Credits: 12)</b>

**Semester VI**

Sr. No.	Subjects	Marks(Credits)
1.	DSE 41F: Photogeology and Remote Sensing	Marks: 50 (Credits: 2)
2.	DSE 42F: Geomorphology and Geotectonics	Marks: 50 (Credits: 2)
3.	DSE 43F: Environmental Geology	Marks: 50 (Credits: 2)
4.	DSE 44F: Geochemistry	Marks: 50 (Credits: 2)
	DSE F Lab Course	Marks: 100 (Credits: 4)
	<b>Total</b>	<b>Marks:300 (Credits: 12)</b>

**10: NATURE OF QUESTION PAPER - COMMON - MENTIONED SEPARATELY:****11. SCHEME OF TEACHING:-**

THIRD YEAR Geology (B.Sc. Part III)

Semester V - Scheme of Teaching

Sr. No.	Subjects	Teaching Scheme (Hrs/Week)		
		Lecture	Practical	Total
1.	DSE 41E: Economic Geology	03	05	08
2.	DSE 42E: Hydrogeology	03	05	08
3.	DSE 43E: Applied Geology-Engineering Geology	03	05	08
4.	DSE 44E: Applied Geology-Prospecting and Mining Geology	03	05	08
	Total	12	20	32

Semester VI

Scheme of Teaching

Sr. No.	Subjects	Teaching Scheme (Hrs/Week)		
		Lecture	Practical	Total
1.	DSE 41F: Photogeology and Remote Sensing	03	05	08
2.	DSE 42F: Geomorphology and Geotectonics	03	05	08
3.	DSE 43F: Environmental Geology	03	05	08
4.	DSE 44F: Geochemistry	03	05	08
	Total	12	20	32

12. SCHEME OF EXAMINATION :-

- Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

13. STANDARD OF PASSING:-

As Prescribed under rules & regulation for each degree/programme of Shivaji University, Kolhapur.

14. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS)

Equivalence of new syllabus given to old syllabus.

Old Syllabus

Paper IX - Dynamics of Earth,

Paper X - Stratigraphy and Palaeontology.

Paper XI – Processes of Formation of Mineral Deposits.

Paper XII- Remote Sensing and Geomorphology.

Paper XIII- Precambrian Stratigraphy of India

Paper XIV- Phanerozoic stratigraphy of India.

Paper XV- Prospecting and Mineral Exploration

Paper XVI- Environmental Geology and Hydrogeology

New Syllabus

DSE 41E: Economic Geology

DSE 42E: Hydrogeology

DSE 43E: Elements of Applied Geology

DSE 44E: Elements of Applied Geology

DSE 41F: Photogeology and Remote Sensing

DSE 42F: Geomorphology and Geotectonics

DSE 43F: Environmental Geology

DSE 44F: Geochemistry

## **B.Sc. Part III GEOLOGY**

(Introduced from June 2020)

**Semester – V**

**DSE-E Theory Course**

**DSE 41E: ECONOMIC GEOLOGY**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores;; Strategic, Critical and Essential minerals. Processes of formation of ore deposits; Magmatic Concentration, Sublimation, Evaporation, Contact Metasomatism, Hydrothermal Processes, Oxidation and Supergene Enrichment, Residual and Mechanical Concentration

### **Unit-II: ( 20 lectures )**

Metallic and non-metallic ore minerals; Study of important metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic (industrial Minerals - gypsum, magnesite, mica); Formation and Distribution of coal and petroleum in India.

### **Books Recommended:**

1. Brown, C. and Dey, A.K.; Indian Mineral Wealth. Oxford Univ.
2. Chatterjee, K.K.; An Introduction to Mineral Economics; Willey Eastern Limited.
3. Gokhale, K.V.G.K. and Rao, T.C., Ore Deposits of India. East West Press Pvt. Ltd.
4. Jense, M.L. and Bateman A.M., Economic Mineral Deposits. John Wiley and Sons.
5. Krishnnaswamy, S., India's Minerals Resources. Oxford and IBH Publ.
6. Deb, S., Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
7. Umeshwar Prasad, Economic Geology. CBS Publishers and distributors.
8. Sharma, N.L. and Ram, K.V.S., Introduction to India's Economic Minerals, Dhanbad.
9. A.I. Lavorsen -Geology of Petroleum, CBS Publishers and Distributers
10. Coal Deposits
11. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
12. MOOCS - NPTEL: <https://nptel.ac.in/>
13. MOOCS - SWAYAM: <https://swayam.gov.in/>
14. National Digital Library of India: <https://ndl.iitkgp.ac.in/>
15. Shivaji University Library (E-Resources): <http://www.unishivaji.ac.in/library/E-Resources>

## **DSE 42 E: HYDROGEOLOGY**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Definition of hydrogeology, Hydrological cycle; Hydrological parameters - Precipitation, evaporation, transpiration and infiltration. Water bearing properties of rocks - Porosity and Permeability, Transmissivity, Specific yield, Specific retention; Origin and sources of groundwater, Vertical distribution of groundwater

### **Unit-II: ( 20 lectures )**

Types of aquifers; Surface ( Geobotanical ) and subsurface geophysical ( Electrical Resistivity Methods) and geological methods of ground water exploration; Movement of Groundwater – Darcy's Law, Groundwater provinces of India.

### **Books Recommended:**

1. Karanth, K. R., Hydrogeology. Tata McGraw Hill Publ.
2. Raghunath, H. M., Groundwater. Wiley Eastern Ltd.
3. Subramaniam, V., Water-Kingston Publ. London.
4. Todd, D.K.; Groundwater; John Wiley and Sons.
5. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
6. MOOCS - NPTEL: <https://nptel.ac.in/>
7. MOOCS - SWAYAM: <https://swayam.gov.in/>
8. National Digital Library of India: <https://ndl.iitkgp.ac.in/>
9. Shivaji University Library (E-Resources): <http://www.unishivaji.ac.in/library/E-Resources>

## **DSE 43 E: APPLIED GEOLOGY – ENGINEERING GEOLOGY**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Building Stones; Engineering properties of rocks and Soils. Soil and Soil groups of India. Geology of Bridge sites; Types of bridges

### **Unit-II: ( 20 lectures )**

Dam, Types and their geological and environmental considerations; Geological problem of reservoirs; Tunnels: geology, structure, seepage problem and role of water table.

### **Books Recommended:**

1. Krynine D.P. and Judd W.R. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
2. Kesavulu, N.C., A text book of engineering geology. Macmillan P publishing India Ltd.
3. Bell, F.G., Fundamentals of Engineering Geology. Butterworth and Co.
4. Parbeen Singh., Principles of Engineering and General Geology.
5. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
6. MOOCS - NPTEL: <https://nptel.ac.in/>
7. MOOCS - SWAYAM: <https://swayam.gov.in/>
8. National Digital Library of India: <https://ndl.iitkgp.ac.in/>
9. Shivaji University Library (E-Resources): <http://www.unishivaji.ac.in/library/E-Resources>

# **DSE 44 E: APPLIED GEOLOGY - PROSPECTING AND MINING GEOLOGY**

**Marks 50(02 Credits)**

## **Unit-I: ( 20 lectures )**

Prospecting ;Elementary idea of geological and geophysical prospecting.

Electrical methods, Magnetic Methods, Seismic Methods, Gravity Methods

Mineral Exploration – Sampling methods- Random sampling, Grab sampling, Coning and Quartering, Pitting and Trenching

## **Unit-II: ( 20 lectures )**

Elementary idea of mining – Winning, Shaft, Hanging Wall, Adit, Drift, Level, Cross cut, Tunnel, raise Winze, Ore Basin, Chute, Stope, Air Crossing; Open cast and Underground mining. Environmental considerations for mining,.

## **Books Recommended:**

1. Valdiya, K.S., Environmental Geology – Indian Context. Tata McGraw Hill.
2. Rajendran S., Mineral Exploration : Recent Strategies.
3. Dobrin, M.B. & Savit, CH., Introduction to Geophysical Prospecting, McGraw-Hill.
4. Arogyaswamy, R.N.P., Courses in Mining Geology. Oxford and IBH Publ.
5. Parasins, D.S., Principles of applied geophysics. Chapman Hall.
6. Readman, J.H., Techniques in Mineral exploration. Applied Science Publishres.
7. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
8. MOOCS - NPTEL: <https://nptel.ac.in/>
9. MOOCS - SWAYAM: <https://swayam.gov.in/>
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## **DSE E- LAB COURSE**

**Teaching : 30 Practical turns- each of 4 hours ( 5 lectures of 48 minutes )**

**Marks 100 ( 4 credits )**

**( Practicals related to above four papers )**

### **Section I**

Economic Geology- Study of ore and economic minerals in hand specimen, Preparation of maps showing distribution of important metallic and non-metallic deposits; Map of Important coal and oil fields of India

### **Section II**

Hydrogeology – Estimation of porosity and permeability from given data; Preparation and interpretation of water table maps

### **Section III**

Engineering Geology – Preparation and study of engineering geological maps; Preparation of maps showing soil types of India

## Section IV

Prospecting and Mining Geology – Determination and evaluation of ore in mines

### **B.Sc. Part III GEOLOGY**

(Introduced from June 2020)

#### **Semester – VI**

#### **DSE-F Theory Course**

### **DSE 41F: PHOTOGEOLOGY AND REMOTE SENSING**

**Marks 50(02 Credits)**

#### **Unit-I: ( 20 lectures )**

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; Fundamentals of remote sensing; remote sensing systems; remote sensing sensors; Importance in Geology – geomorphological features like lineaments, fractures, faults, folds, unconformities and dykes; Igneous, sedimentary and metamorphic terrain identification

#### **Unit-II: ( 20 lectures )**

Types of Indian and Foreign Remote Sensing Satellites, Introduction to Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification. Introduction to Geographic Information System (GIS); components of GIS; integration of GIS with remote sensing.

#### **Books Recommended:**

1. JAE Allum – Photogeology and Regional mapping , Pergamon Publishers.
2. Dr. Masood Siddiqui; Concepts and Techniques of Geoinformatics; Sharda Pustak Bhavan, Allahabad.
3. Bhatta, B., Remote Sensing and GIS. Oxford, New Delhi.
4. Gupta, R.P., Remote Sensing Geology. Springer Verlag.
5. Lilleasand, T.M. and Kiffer, R.W., Remote Sensing and Image Interpretation. John Wiley.
6. Pandey, S.N., Principles and Application of Photogeology. Wiley Eastern, New Delhi.
7. Sabbins, F.F., Remote Sensing – Principles and Applications. Freeman.
8. Siegal, B.S. and Gillespie, A.R., Remote Sensing in Geology. John Wiley.
9. Rampal K.K. Hand book of aerial photography and interpretation. Concept publication.
10. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
11. MOOCS - NPTEL: <https://nptel.ac.in/>
12. MOOCS - SWAYAM: <https://swayam.gov.in/>
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## **DSE 42F: GEOMORPHOLOGY AND GEOTECTONICS**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Basic Concepts of Geomorphology, Slope – geometric properties and classification, geomorphological cyclic concept, Geomorphic erosion cycle of W.M. Davis, Pencks and C.L. King; Epigene/exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Geological work of wind, glacier, river, underground water and ocean.

### **Unit-II: ( 20 lectures )**

Earth as a dynamic system Crustal movements, Types of Mountains; Continental drift, Sea-floor spreading and mid-oceanic ridges. Paleomagnetism and its application; Plate Tectonics: the concept, plate margins, deep sea trenches, island arcs and volcanic arcs; Hot spots and Mantle plumes, Triple Junctions; Tectonic Framework of India.

### **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.
10. Savindra Singh; Principles of Geomorphology.
11. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
12. MOOCS - NPTEL: <https://nptel.ac.in/>
13. MOOCS - SWAYAM: <https://swayam.gov.in/>
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## **DSE 43 F: ENVIRONMENTAL GEOLOGY**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere and Man; Earth Material. Energy budget: Solar radiation; Global environments: coastal, riverine, desertic, tropical, cold, polar; Concept of global warming and climate change.

### **Unit-II: ( 20 lectures )**

Geological hazards: Earthquakes, volcanism, landslides, avalanches, floods, droughts; Hazard mitigation. Resource Management: Energy resources (Conventional and non-conventional),

watershed management, landuse planning, management of water resources, land reclamation.

### **Books Recommended:**

1. Verma, V.K., Geomorphology Earth surface processes and form. McGraw Hill.
2. Chorley, R. J., Geomorphology. Methuen.
3. Selby, M.J., Earths Changing Surface. Oxford University Press UK.
4. Thornbury W. D., Principles of Geomorphology Wiley Eastern Ltd., New Delhi.
5. Valdiya, K. S., Environmental Geology - Indian Context. Tata McGraw Hill New Delhi.
6. Keller, E. A., Environmental Geology. Shales E. Merrill Publishing Co., Columbus, Ohio.
7. Montgomery, C., Environmental Geology. John Wiley and Sons, London.
8. Bird, Eric, Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore.
9. Liu, B.C., Earthquake Risk and Damage, Westview.
10. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
11. MOOCS - NPTEL: <https://nptel.ac.in/>
12. MOOCS - SWAYAM: <https://swayam.gov.in/>
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## **DSE 44F: GEOCHEMISTRY**

**Marks 50(02 Credits)**

### **Unit-I: ( 20 lectures )**

Introduction to geochemistry: basic knowledge about crystal chemistry. Atom and Atomic Structure, Types of chemical bonds; coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids; Elementary idea of Periodic Table. Cosmic abundance of elements; Geochemical evolution of the earth and geochemical cycles;

### **Unit-II: ( 20 lectures )**

Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks. Elements of geochemical thermodynamics; Isomorphism and polymorphism; Isotope geochemistry.

### **Books Recommended:**

1. Hoefs, J., Stable Isotope Geochemistry. Springer-Verlag.
2. Klein, C. and Hurlbut, C.S., Manual of Mineralogy. John Wiley and Sons, New York.
3. Krauskopf, K.B., Introduction to Geochemistry. McGraw Hill.
4. Mason, B. and Moore, C.B., Introduction to Geochemistry. Wiley Eastern.
5. Rollinson, H.R., Using geochemical data: Evaluation, Presentation, and Interpretation. Longman.
6. e-PG Pathshala: <https://epgp.inflibnet.ac.in/>
7. MOOCS - NPTEL: <https://nptel.ac.in/>
8. MOOCS - SWAYAM: <https://swayam.gov.in/>
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**DSE F- LAB COURSE Teaching : 30 Practical turns- each of 4 hours ( 5 lectures of 48 minutes )**

**Marks 100 ( 4 credits )**

**( Practicals related to above four papers )**

**Section I**

Photogeology and Remote sensing- Study of aerial photographs, Determination of scale of photograph by comparison with toposheet; Study of imageries

**Section II**

Geomorphology and geotectonics – Drainage Basin Analysis by Strahler's method- Stream number, Stream Length, Basin area, Basin area ratio, Drainage density and Bifurcation ratio; Identification of geomorphological features from toposheets

**Section III**

Environmental Geology – Preparation and study of environmental geological maps; Map of Seismic zones of India. Other practicals related to Environmental Geology.

**Section IV**

Geochemistry – Determination of type of Pyroxene with the help Hess Diagram; Determination of type of Plagioclase feldspar, Determination of CIPW norms, Determination of Niggli values, Determination of ACF, AKF and AFM

Fieldwork: Geological fieldwork in selected areas for about 15 days under guidance is compulsory. Submission of fieldwork report along with specimens collected is also compulsory.