Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/06 **Date: 01/01/2024**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

B.Sc.-III (Sem. V & VI) as per NEP-2020 (1.0)			
1.	Mathematics	12.	Computer Science (Opt)
2.	Statistics	13.	Computer Science (Entire)
3.	Physics	14.	Information Technology (Entire)
4.	Microbiology	15.	Food Science and Technology (Entire)
5.	Industrial Microbiology	16.	Food Science
6.	Electronics	17.	Food Science and Quality Control (Entire)
7.	Chemistry	18.	Food Technology &Management (Entire)
8.	Sugar Technology (Entire)	19.	Biochemistry
9.	Geology	20.	Biotechnology (Optional/Vocational)
10.	Zoology	21.	Biotechnology (Entire)
11.	Botany	22.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962

A++ Accredited by NAAC (2021) with CGPA 3.52

Structure and Syllabus in Accordance with

National Education Policy – 2020

With Multiple Entry and Multiple Exit

Syllabus for

B.Sc. Part-III

GEOLOGY

(Faculty of Science and Technology)

SEMESTER V AND VI

(To be Implemented from Academic Year 2024-2025)

SHIVAJI UNIVERSITY, KOLHAPUR
NATIONAL EDUCATION POLICY (NEP-2020)
SYLLABUS WITH EFFECT FROM JUNE 2024
Bachelor of Science in Geology

A) BASIC INFORMATION

ORDINANCE AND REGULATIONS: -as applicable to Under-Graduate Degree / Program

1. **TITLE:**Subject Geology
   Optional under the Faculty of Science

2. **YEAR OF IMPLEMENTATION**: Revised Syllabus will be implemented from June 2024 onwards.

3. **PREAMBLE: -**

The revised syllabus includes the foundation, core, and applied components of the course/paper. 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/ PAPER/:**

The course is structured with a view to impart basic as well as advance knowledge of the subject to the students in the light of the present-day scenario in earth science.

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

Model Programme Structure for 3 years Bachelor of Science with MEME Options (160 Credits)

Level	SEM	Discipline Specific Core Courses (DSC) (L + P) (Credits)		Discipline Specific Elective Courses (DSE) (L+P) (Credits)		Ability Enhancement Compulsory Courses (AECC) (L+P) (Credits)	Skill Enhancement Courses (SEC) (L+P)	Total Credits
5	I	C1 (DSC1+DSC2)	4 + 2 = 6			AECC-1 English for Communication (4)	SEC-1 (VBC-1) (Democracy, Election & Good Governance) (2)	30
		C2 (DSC1+DSC2)	4 + 2 = 6					
		C3 (DSC1+DSC2)	4 + 2 = 6					
		C4 (DSC1+DSC2)	4 + 2 = 6					
		Total	24					
	II	C5 (DSC3+DSC4)	4 + 2 = 6			AECC-2 English for Communication (4)	SEC-2 (VBC-2) (Constitution of India & Local Self Government) (2)	30
		C6 (DSC3+DSC4)	4 + 2 = 6					
		C7 (DSC3+DSC4)	4 + 2 = 6					
		C8 (DSC3+DSC4)	4 + 2 = 6					
		Total	24					
Exit Option 1 (Level5): Exit with Certificate Course in Science (with the completion of courses equal to minimum of 60 credits)								

Level	SEM	Discipline Specific Core Courses (DSC) (L + P) (Credits)		Discipline Specific Elective Courses (DSE) (L+P) (Credits)		Ability Enhancement Compulsory Courses (AECC) (L+P) (Credits)	Skill Enhancement Courses (SEC) (L+P)	Total Credits
		C9 (DSC5+DSC6)	4 + 4 =			AECC-3 Env.	SEC-3	28

6	**III**		8			Studies (Theory + Project) (2)	Multidisciplinary (2)	
		C10 (DSC5+DSC6)	4 + 4 = 8					
		C11 (DSC5+DSC6)	4 + 4 = 8					
		Total	24					
	IV	C12 (DSC7+DSC8)	4 + 4 = 8			AECC-4 Env. Studies (Theory + Project) (2)	SEC-4 Multidisciplinary (2)	28
		C13 (DSC7+DSC8)	4 + 4 = 8					
		C14 (DSC7+DSC8)	4 + 4 = 8					
		Total	24					
Exit Option 2 (Level 6): Exit with Diploma in Science (with the completion of courses equal to minimum of 116 credits)								

Level	SEM	Discipline Specific Core Courses (DSC) (L + P) (Credits)		Discipline Specific Elective Courses (DSE) (L+P) (Credits)		Ability Enhancement Compulsory Courses(AECC) (L+P) (Credits)	**Skill Enhancement Courses (SEC) (L+P)**	Total Credits
7	**V**			DSE 1	2 + 2 = 4	AECC-1 English for Communication (4)	SEC-5 Multidisciplinary (2)	22
				DSE 2	2 + 2 = 4			
				DSE 3	2 + 2 = 4			
				DSE 4	2 + 2 = 4			
				Total	16			
				DSE 1	2 + 2 = 4	AECC-2 English for Communication (4)	SEC-6 Multidisciplinary (2)	22
				DSE 2	2 + 2 = 4			
				DSE 3	2 + 2 = 4			

	VI			DSE 4	2 + 2 = 4			
				Total	16			
Exit Option 3 (Level 7): Exit with three years Bachelor of Science (with the completion of courses equal to minimum of 160 credits) OR Continue studiesfor Bachelor of Science with (Honors / Research) four years Degree Programme)								

Fourth Year OR Level – 8

Level	SEM	Discipline Specific Core Courses (DSC) (L + P) (Credits)		Discipline Specific Elective Courses (DSE) (L+P) (Credits)		Ability Enhancement Compulsory Courses (AECC) (L+P) (Credits)	Skill Enhancement Courses (SEC) (L+P)	Total Credits
8	**VII**						SEC-7 Multidisciplinary (2)	20
	VIII						SEC-8 Multidisciplinary (2)	20
Exit Option 4 (Level 8) : Exit with four years Bachelor of Science (Honors / Research) (With the completion of courses equal to minimum of 200 credits)								

Note:

1. For First Year Semester - I, students must select any four DSC courses available at their respective colleges. Same four courses they must continue for Semester - II.
2. For Second Year Semester - III, students must select any three out of four DSC courses selected for first year. Same three courses they must continue for Semester - IV.
3. For Third Year Semester– V, students must select any one DSC course out of three DSC courses selected for second year. Same course they must continue for Semester - VI.

4. For semesters V&VI there shall be Four DSE courses (papers) for each semester.
5. The DSC courses from C1 to C14 each have two papers of 50 marks each with combined passing i.e., minimum 35 marks are required to pass out of 100 marks.
a) Each DSC Course from C1 to C14 shall have two papers of 50 marks (40 marks semester end examination +10 marks internal assessment) with separate passing
b) The examination of each AECC Course shall be of 50 marks (40 marks semester end examination +10 marks internal assessment)
c) Minimum marks for passing DSC and AECC Courses shall be as follows. 1. 14 Marks out of 40 Marks for semester end examination. 2. 4 marks out of 10 marks for internal assessment. d) For SEC-1 and SEC-2 courses there shall be semester end examination of 50 marks whereas minimum marks required for passing these courses shall be 18. The question paper of these courses shall consist of 25 MCQs of 2 marks each.
6. For DSE courses (papers) of Semesters V & VI, there shall be separate passing.
7. Students can exit after Level 5 with Certificate Course in Science (with the completion of courses equal to minimum of 60 credits).
8. Students can exit after Level 6 with Diploma in Science (with the completion of courses equal to minimum of 116 credits).
9. Students can exit after Level 7 with Bachelor of Science (with the completion of courses equal to minimum of 160credits).
10. SEC: Skill Enhancement Courses (2 credits). Students have to select one SEC for each semester from the pool of courses available at their respective colleges
11. VBC: Value Based Courses (1 credit). Students have to study one VBC from Bahai Academy for first semester only.
12. Examination of AECC-3 (Env. Studies) (4 credits) will take place at the end of Semester-IV

FIRST YEAR Geology Semester I and II

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)
	Total	Marks:250 (Credits: 10)

SECOND YEAR Geology Semester III and IV

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)
	Total	Marks:300 (Credits: 12)

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)
	Total	Marks:300 (Credits: 12)

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)
	Total	Marks:300 (Credits: 12)

10. 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.

11. STANDARD OF PASSING: -
As Prescribed under rules & regulation for each degree/programme of Shivaji University, Kolhapur.

12.EXAMINATION SCHEME

Theory: Theoryexamination will be conducted at the end of each semester.

Paper: Duration: 2 Hrs. Marks: 40. Minimum for passing: 35%.

Practical: Practical Examination will be conducted annually towards the end of Second Term of every Academic year.

Duration: 1 Day (6 Hours approx.). Marks: 50. Minimum for passing: 35%.

SHIVAJI UNIVERSITY, KOLHAPUR

NATIONAL EDUCATION POLICY (NEP-2020)

SYLLABUS WITH EFFECT FROM June 2024

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: (20lectures)
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: (20lectures)
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. Krishnaswamy, 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 distributers.
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: (20lectures)

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: (20lectures)

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: (20lectures)

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

Unit-II: (20lectures)

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: (20lectures)

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: (20lectures)

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., MineralExploration: 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/
10. National Digital Library of India: https://ndl.iitkgp.ac.in/
11. Shivaji University Library (E-Resources): http://www.unishivaji.ac.in/library/E-Resources

DSE E- LAB COURSE

Teaching: 30 Practical turns- each of 4 hours (5 lectures of 48 minutes)
Marks 100 (4credits)

(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 orein 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: (20lectures)

Elementary idea about photogeology: electro-magnetic spectrum, types & geometry of aerial photographs; factors affecting aerial photography; types of cameras, 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: (20lectures)

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/
13. National Digital Library of India: https://ndl.iitkgp.ac.in/
14. Shivaji University Library (E-Resources): http://www.unishivaji.ac.in/library/E-Resources

DSE 42F: GEOMORPHOLOGY AND GEOTECTONICS

Marks 50 (02 Credits)

Unit-I: (20lectures)

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

Unit-II: (20lectures)

Earth as a dynamic system Crustal movement, 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. Summerfied, 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/
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 43 F: ENVIRONMENTAL GEOLOGY

Marks 50(02 Credits)

Unit-I: (20lectures)

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: (20lectures)

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. Merril 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/
13. National Digital Library of India: https://ndl.iitkgp.ac.in/
14. Shivaji University Library (E-Resources): http://www.unishivaji.ac.in/library/E-Resources

DSE 44F: GEOCHEMISTRY

Marks 50(02 Credits)

Unit-I: (20lectures)

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: (20lectures)

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 Viley 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/
9. National Digital Library of India: https://ndl.iitkgp.ac.in/
10. Shivaji University Library (E-Resources): http://www.unishivaji.ac.in/library/E-Resources

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

Marks 100 (4credits)

(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.