



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
 'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್ NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
 2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
 3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
 4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
 5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
 6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
 7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
 8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
 9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
 10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
 11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
 12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

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 ಕುಲಸಚಿವರು.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

Practical Subject



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons) Program

SYLLABUS

Subject: GEOLOGY

[Effective from 2021-22]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,

OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM I

AS PER N E P - 2020

Karnatak University, Dharwad
 Four Years Under Graduate Program in GEOLOGY for B.Sc. (Hons)
 Effective from 2021-22

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formati ve Assess ment Marks	Summ ative Asses ment Marks	Total Marks	Credits
I	DSCC 1	Theory	04hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-1	Theory	03 hrs	42	02 hrs	40	60	100	03
	*SEC-1	Practical	03 hrs	30	02 hrs	25	25	50	02
II	DSCC2	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-2	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

*** Student can opt digital fluency as SEC or the SEC of his/ her any one DSCC selected**

Study Tour/Field work/Resource Mapping / Institution visit/ Project /Viva /Mine Visit/ Report/Sample collection

Study tour forms integral part of the course. Since it is a field oriented course as many number of field visits will help the student to get an exposure in the subject. Observation mind is very important in the case of Geology students. Combined study tour in II, IV and VI Semester has to be arranged. One study tour can be restricted to the State and another as far as possible in different areas so that students will get good collection of rocks, minerals and fossils. The college museum can also be enriched. Field work, Resource mapping, Geological Institution visit, Mine visit etc are part of the study tour. The students may be trained to write field reports. Sample collections collectively and individually have to be encouraged. They have to prepare a detailed report on the assignment carried out and submit it for the examination for evaluation. Project means a small Group work as decided by the Departmental Council to generate a research mind in the student. It can be their observation on the geological work of ground water , stream , wind, waves or detailed observation of a Quarry, landslide area or flood plain or groundwater conservation, waste management, land use pattern, Resource mapping of a Panchayath etc., as decided by the Departmental Council every year.

Without project and study tour report student should not be allowed to take up the Practical examination. All the male and female students should undergo all these trainings. Viva-Voce should be conducted internally and externally.

Name of Course (Subject): GEOLOGY

Programme Specific Outcome (PSO): On completion of the 03/ 04 years Degree in Geology students will be able to:

- PSO 1 :** The study of this paper strengthens student's knowledge with respect to understanding the essentials of the dynamics of earth.
- PSO 2 :** The students will understand the origin and age of our Solar system and planets including earth.
- PSO 3 :** The students will be able to learn the dynamic nature of the Earth processes. They will learn about the geodynamics of the lithosphere, concept of ocean floor spreading, continental drift and plate tectonics.
- PSO 4 :** The course designed for the students of understand geomorphological features of developed during glaciations, circulation of groundwater and oceans and coastal land forms.
- PSO 5 :** To determine possible causes of formation of structures and forces responsible for it. This course also helps to know the relation of structure with tectonics.
- PSO 6 :** Learn how to read geological features occurred by different endogenic process.
- PSO 7 :** Collaborative learning is encouraged during the field training programmes and educational tours
- PSO 8 :** Overall development of an ethical sense and increasing awareness in terms of gender sensitization, cleanliness, environmental protection etc.
- PSO 9 :** Inculcation of value-orientation in students through the promotion of a sensitive attitude towards one's surrounding and culture
- PSO 10 :** Assists students in competitive examination (JAM etc.)

B.Sc. Semester – I
Subject: GEOLOGY
Discipline Specific Course (DSC)

The course GEOLOGY in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practica l	Credits	Instruction hour per week	Total No. of Lectures/Hour s / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessm ent Marks	Total Marks
Cours e-01	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): EARTH SYSTEMS SCIENCES

Course Outcome (CO): After completion of course (Theory), students will be able to:

- CO 1 :** Understand the significance of various branches of Geology, the concept of rock cycle; describe characteristics of earth and its origin in relation to the Solar System.
- CO 2 :** Describe internal structure and composition of the earth.
- CO 3 :** Explain basic concepts of plate-tectonics, ideas of plate boundaries, plate movements and associated geological features.
- CO 4 :** Describe weathering processes and types. Stages of river by Devi's concepts
- CO 5 :** Describe volcanic activity, types of volcanoes, volcanic products and earthquakes, types, causes, effects; elastic rebound theory, seismic waves, scale of measures.

Syllabus- Course 1(Theory): Title- EARTH SYSTEMS SCIENCES	Hrs: 56
Unit-I INTRODUCTION TO EARTH SYSTEM SCIENCES	14 hrs
<p>Concepts of earth system sciences and its branches. Fundamental concepts of the five spheres (lithosphere, hydrosphere, atmosphere, biosphere and cryosphere). Interactions between the five spheres: Hydrologic cycle; Bio-geochemical cycles; Carbon cycle; Hydrosphere and Atmosphere. Atmospheric circulation, Weather and climatic changes. Inter relationships between biological, geological, climatological, and human systems on continents.</p> <p>The universe and solar system: Origin of the universe - Big bang theory. Members of solar system: planets (Terrestrial and gaseous planets), satellite, comets, asteroids, meteorite. Earth in solar system: size, shape, mass and density of the earth. Origin of the Earth: Gaseous hypothesis, Nebular hypothesis, Planetismal hypothesis, Tidal hypothesis, Supernova hypothesis, Interstellar or dust or meteoric hypothesis.</p> <p>Age of the Earth: Geochronology; Absolute and relative methods; (a) Relative Methods- Sedimentation, Salinity method, varve chronology, Rate of cooling of earth. (b) Radiometric dating, half life, method - K-Ar; Rb-Sr; U-Pb, Pb-Pb.</p> <p>Earth's internal structures and its composition: 1. Seismic data, 2. Density studies. Earth's internal layers: Crust, mantle and core- (Lithosphere, asthenosphere, mesosphere and barysphere).</p>	
Unit-II GEOMORPHOLOGY -I	14 hrs

<p>Introduction: Basic concepts of Geomorphology, Definition and scope, geomorphic agents, geomorphic processes; endogenetic (epigene) and exogenetic (hypogene). Weathering - physical, chemical, biological. Soil: Definition, Formation, Types of soils and Soil Profile. Rivers and fluvial landforms: Introduction, Development of rivers - Drainage system and patterns. Stages of rivers: Davi's concept; youth, mature and old. Geological actions: Erosion hydraulic action, abrasion, attrition, solution. Erosional landforms; Pot holes, V-shaped valleys, gorges and canyons, waterfalls and types, river meanders, ox-bow lakes, river terraces, structural benches. Transportation, suspension and solution. Deposition and depositional landforms: alluvial fans and cones, flood plains, natural levees, deltas, channel deposits. Wind and Aeolian landforms: Types of wind-Breeze, Gale, Tempest, Cyclone. Geological action of wind: Wind erosion - Deflation, abrasion, attrition. Erosional features – mushroom rocks, yardangs, Hamda, ventifacts, pedestal rocks, zeugen, and milletseed sands. Transportation, suspension and saltation, traction. Deposition and depositional landforms; Sand dunes and types, Loess.</p>	
Unit-III GEOMORPHOLOGY – II	14 hrs
<p>Glaciers and glacial landforms: Growth and movement of glaciers. Types of glaciers: Mountain or valley glaciers, Piedmont glaciers, continental ice-sheets or ice caps. Geological action of glaciers: Erosional work by glaciers- Plucking/ Excavation, Frost-wedging, Abrasion. Erosional landforms: Whaleback forms. Glacial valley - U shaped valley and V-shaped valley, Crag and Tail, Hanging valley, Cirques, Fiords, Arête, Cols, Horns, Roches Moutonnes. Transportation - glacial drift. Deposition and depositional landforms – Glacial Moraines and types, Drumlins, Kames, Eskers, Outwash plains, Kettles. Groundwater: Meaning and components of groundwater. Geological action of groundwater: Erosion and erosional landforms (lapis, solution holes and associated features, poljes, caves and caverns: valleys of karst topography, n-aturnal bridges). Transportation; solution. Depositional work; concretions, stalactites and stalagmites, Oceans and Coastal landforms: Topography of ocean floor – continental slope, shelf, abyssal zone, mid-oceanic ridges. Geological action of oceans: Agents of coastal erosion; Waves, Tides, Currents and circulation of water. Process of marine erosion, erosional landforms (Headlands and Bays, Sea Cliffs, Wave-cut Terraces, Sea caves, stacks). Transportation. Depositional landforms (Beaches and barriers, wave built terraces, Spits and bars, Tombola). Deep sea water deposits – terrigenous and pelagic deposits. Corals - its types.</p>	
Unit-IV GEODYNAMICS	14 hrs
<p>Introduction to Geodynamics. Origin of oceans, continents and mountains. Continental drift: Sea floor spreading. Concept of plate tectonics. Nature and types of plate margins, Mid-oceanic ridges and trenches. Origin and distribution of Island arcs. Earthquakes: definition, Elements of an earthquake, types of earthquake waves, intensity and magnitude, seismographs and seismometers, causes and prediction of earthquake, Effects of earthquake, Seismic zones of India. Volcanoes: A typical volcano parts, volcanic activity, types of volcanoes, composition of lava, distribution of volcanoes. Volcanic landforms; depressed landforms: Volcanic cone (Cinder Cone), Volcanic craters, Calderas (Caldera Lake). Landforms due to the accumulation of lava: Volcanic mountains, Volcanic plateaus, Volcanic plains, Volcanic necks.</p>	

Books recommended.

1. Holmes' principles of physical geology. Duff, P. M. D., & Duff, D. (Eds.). (1993). Taylor & Francis.
2. Planet earth: cosmology, geology, and the evolution of life and environment. Emiliani, C. (1992). Cambridge University Press.
3. Oceanography: A view of the earth. Gross, M. G. (1977).
4. The Blue Planet: An Introduction to Earth System Science, Brian, J. S., Barbara, W.M., 20103rdEdition, Wiley.
5. Earth Systems: Processes and Issues, Ernst, W.G., 2000. Cambridge University Press.
6. Understanding the Earth System Global Change Science for Application. Sarah, E., Cornell, I., Prentice, C., Joanna, I.H., Catherine, J.D., 2012. Academic Press.
7. Earth System Science: From Biogeochemical Cycles to Global Changes, Jacobson, M., Charlson, R., Rodhe, H., Orians, G., 2000. Elsevier.
8. Earth System Science in the Anthropocene, Ehlers, E., Krafft, T., 2006. Springer.
9. Earth System Science. Jacobson, M. C., Charlson, R. J., Rodhe, H., and Orians, G. H., 2000 San Diego, CA, Academic Press, 523 p., ISBN 0-12-379370-X
10. The Earth System Lee R. Kump, James F. Kasting, and Robert G Crane Prentice Hall, 2nd Ed., 2004

B.Sc. Semester – I
Subject: GEOLOGY
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): **INTERPRETATION OF TOPOSHEETS AND SOIL PROFILING**

Course Outcome (CO): After completion of course (Practical), students will be able to:

CO 1 : Understanding of topographical maps.

CO 2 : Explain what is meant by map interpretation and what procedure is followed for its interpretation.

CO 3 : Describe the commonly used scales for mapping our country used by the Survey of India

CO 4 : Describe contours. Marginal information in Topographical sheets using the Survey of India toposheets

CO 5 : Understanding the Preparation of LU/LC maps.

CO 6 : Describe physiographic models and also using lens stereoscope and mirror stereoscope.

List of the Experiments for 52 hrs / Semesters

1. Introduction to maps. Study of maps. Types of maps. Types of scale.
2. Reading topographical maps of the Survey of India; Detailed study of topographic sheets
3. Preparation of topographical map
4. Identification of drainage patterns
5. Preparation of LU/LC maps.
6. Study of soil profile and determination of soil texture
7. Study of major geomorphic features and their relationships with outcrops through physiographic models and also using lens stereoscope and mirror stereoscope.
8. Field visit to a place of geological/geomorphological interest.

General instructions:

Lab records and it should be duly certified by the concerned Staff member and Head of the Department of Geology. A student should record all the practicals in prescribed laboratory journals.

Each batch should consist of not more than 12 students for the regular practical classes and examination for all classes.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. 05 Marks
2. 05 Marks
3. 05 Marks
4. Viva-- 05 Marks
5. Journal-- 05 Marks

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Porter and Skinner. 1992. Principles of Physical Geology. John Wiley
2. Arthur Holmes. 1992. Principles of Physical Geology, Vol. 1, Chapman and Hall, London
3. Mahapathra G.B. 1994 Text book of Physical Geology C.B.S publishers, Delhi
4. Radhakrishnan. V 1996 General Geology. V.V.P. Publishers, Tuticorin.
5. Parbin Singh 2000 A text book of Engineering and General Geology, S.K.Kataria and sons, Delhi.
6. P.C.Sanjeeva Rao and D.Bhaskara Rao.Text book of Geology 2004.Discovery Publishing House, New Delhi.
7. P.K. Mukerjee. 1997. Text book of Geology. World Press

B.Sc. Semester – I
Subject: GEOLOGY
Open Elective Course (OEC-1)
(OEC for other students)

Course No.	Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-1: Title of the Course: **Basics of Earth System Sciences**

Course Outcome (CO): After completion of course, students will be able to:

- CO 1 :** A basic understanding of the Earth as an holistic system;
- CO 2 :** Knowledge of the main components of the Earth system and their interactions;
- CO 3 :** An appreciation of the implications of human interaction with the Earth system for sustainable management of the planet; and Acquired skills in inquiry-based learning.

Syllabus- OEC: Title- Basics of Earth System Sciences	Total Hrs: 42
Unit-I	14 hrs
Introduction to Earth Sciences with a special focus to Geology, scope, sub-disciplines and relationship with other branches of sciences	
Unit-II	14 hrs
Earth in the solar system, origin Earth's size, shape, mass, density, rotational and evolutionary parameters Solar System- Introduction to Various planets – Terrestrial Planets Solar System- Introduction to Various planets - Jovian Planets Internal constitution of the earth - core, mantle and crust	
Unit-III	14 hrs
Convections in the earth's core and production of magnetic field Composition of earth in comparison to other bodies in the solar system. Origin and composition of hydrosphere and atmosphere Origin of biosphere Origin of oceans, continents and mountains. Age of the earth; Radioactivity and its application in determining the age of the Earth, rocks, minerals and fossils.	

Books recommended.

1. Arthur Holmes, Principles of Physical Geology. 1992. Chapman & Hall.
2. Emiliani, C, 1992. Planet Earth, 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. The Dynamic Earth – Wyllie. P.J
5. The way earth works - Wyllie. P.J
6. D.R. Johnson, M. Ruzek, M. Kalb, What is Earth System Science? Proceedings of the 1997 International Geoscience and Remote Sensing Symposium Singapore, August 4 - 8, 1997, pp 688 – 691

B.Sc. Semester - I
Subject: GEOLOGY
SKILL ENHANCEMENT COURSE (SEC)-I
Title of Paper: GEO-ENVIRONMENTAL STUDIES

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hr	25	25	50

Course Outcome (CO):

After completion of Skill Enhancement course, students will be able to:

- CO 1** : Understanding of Earth environmental segments. Atmosphere (structure and composition), hydrosphere- hydrological cycle.
- CO 2** Describe Environmental Hazards: 1) Natural-Brief, 2) Manmade – Brief.
- CO 3** Understanding of Identification of rocks and minerals in the field and collection of samples.

List of the Experiments for 52 hrs / Semesters

1. Earth environmental segments. Atmosphere (structure and composition), hydrosphere- hydrological cycle. Lithosphere-igneous rocks, sedimentary rocks and metamorphic rocks-rock cycle. Biosphere-chemical composition and classification of living matters.
2. Environmental Hazards: 1) Natural-Brief, 2) Manmade – Brief.

Experiments

3. Identification of rocks and minerals in the field and collection of samples.
4. Importance of water, use and renewable. Physic-chemical parameters of water.
5. Field visit related to polluted areas, testing laboratories and report writing

General instructions:

Lab records and it should be duly certified by the concerned Staff member and Head of the Department of Geology. A student should record all the practicals in prescribed laboratory journals.

Each batch should consist of not more than 12 students for the regular practical classes and examination for all classes

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. 05- Marks
2. 05- Marks
3. 05- Marks
4. Viva- 05- Marks
5. Journal—05- Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Verma. V. K, 1986. Geomorphology Earth Surfaces and Form
2. Valdiya, K.S., 1987. Environmental Geology – Indian Context
3. Balasubramanian, A., 1995, Ecology, Environment and Pollution

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme: 2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.

B.Sc. Semester – II
Subject: GEOLOGY
Discipline Specific Course (DSC)

The course Geology in I semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): **BASICS OF CRYSTALLOGRAPHY, MINERALOGY AND PETROLOGY**

Course Outcome (CO): After completion of course (Theory), students will be able to:

CO 1 : Identify face, form, Axis, symmetry and laws of crystallography.

CO 2 : What is crystallography notation? Describe different symmetry class and morphological forms present in particular symmetry class.

CO 3 : Define mineral and describe physical/chemical properties and optical properties of given mineral.

CO 4 : Describe physical and optical properties of given mineral group.

CO 5 : Explain parts and functions of petrological microscope

CO 6 : Describe physical properties of magma generation in crust and mantle. Add a note on metamorphism and metamorphic rocks.

Syllabus-Course 2 (Theory): Title- BASICS OF CRYSTALLOGRAPHY, MINERALOGY AND PETROLOGY	Total Hrs: 56
Unit-I	14 hrs
Crystallography-Introduction: Definition, Crystal structure and morphology of crystal. Crystallographic axes, axial angles and axial ratio. The unit cell, types of unit cells and Bravais Lattices. Crystal forms, form of symbol and types of forms. Zones, zone symbols and crystal habit. Law of constancy of angle (Interfacial angle and their measurements), a contact Goniometer and its uses, Crystal Parameters, Weiss and Miller system of notations. Symmetry elements; Planes of symmetry, Axes of symmetry and centre of symmetry, Division of different crystals into six crystal systems. Crystal Symmetry and forms of Normal classes of Cubic (Galena type, Pyrite type and Tetrahedrite type), Tetragonal (Zircon type) and Hexagonal Systems (beryl type and calcite type). Crystal Symmetry and forms of Normal classes of Orthorhombic (Barytes type), Monoclinic (Gypsum type) and Triclinic (Axinite type) systems. Introduction to analytical techniques like XRD (X-ray diffraction), SEM (secondary electron microscopy)	

Unit-II	14 hrs
Elements of crystal chemistry and aspects of crystal structures. Minerals: definition and classification, physical and chemical properties of common rock-forming minerals. The optical properties of minerals: Nature of light, reflection and refraction. Introduction to the petrological microscope and systematic description and identification of common rock forming minerals under the petrological microscope. Isotropic and anisotropic substances: uniaxial and biaxial minerals.	
Unit-III	14 hrs
Rock cycle, physical properties of magmas; mode of occurrences: concordant- Sill, Laccoliths, Lopolith. Discordant- Dyke, Batholiths, Stocks and Bosses. Textures: crystallinity, granularity and shape of minerals. a) Equigranular b) Inequigranular and c) Intergrowth Textures. Structures: brief description of Vesicular, Amygdaloidal, Bock and Ropy, Pillow, Flow and Columnar. Classification of Igneous rocks: a) Chemical classification b) Geological occurrences and Textures and c) Mineralogical classification. Differentiation and stages, assimilation. Crystallization of unicomponent and bi-component systems.	
Unit-IV	14 hrs
Sedimentary rocks- origin, grain-size (Wentworth) classification. Siliciclastic sedimentary rocks: sedimentary textures, sedimentary structures. Sedimentary rocks: Sandstones, Conglomerates, Mudstones and shales. Limestones, Dolomites, sandstones and shales. Metamorphic rocks: Metamorphism, agents, and kinds of metamorphism: Dynamic, thermal, dynamo-thermal and plutonic. Common textures and Structures of metamorphic rocks. Zones, concept of metamorphism- Van Hise concept, Becke and Grubenmans concept.	

Books recommended.

1. A Textbook of mineralogy, James D Dana. John Wiley and Sons
2. Optical mineralogy , Verma, P K (2010), Ane books Pvt. Ltd
3. An Introduction to crystallography, Philips, RC,
4. Elementary crystallography, Buerger,
5. Elemental crystallography, JAK Tareen and TRN Kutty,(1989)
6. Principles of Petrology, Tyrrell, T.W Chapman and Hall, UK
7. Igneous and metamorphic petrology , Turner and Verhoogen (1962), , Allied publisher, Bombay

B.Sc. Semester – II
Subject: GEOLOGY
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course -02	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical): **CRYSTALLOGRAPHY, MINERALOGY AND PETROLOGY**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1 As minerals are the basic building blocks of Earth materials, this course is designed to give a fundamental understanding of their classification, structure, and properties.

CO 2 The student will learn the basic principles of crystal chemistry and how this is related to the external form, chemical composition, and physical properties of minerals.

CO 3 Identification, classification and interpretation of the occurrence of rock-forming minerals will be addressed.

List of the Experiments for 52 hrs / Semesters

Topics					No.Pr
1. Study of crystals based of geometrical constants.					1
2. Measurement of interfacial angle using contact goniometer and Verification of Euler's theorem					2
3. Study of holohedral forms of six crystal system.					6
4. Study of Physical properties of rock forming minerals (list-given below)					5
5. Study of the optical properties of important rock forming minerals using polarizing microscope: Quartz, Plagioclase, Orthoclase, Microcline, Biotite, Hornblende, Augite, Hypersthene, Olivine, Garnet, Calcite.					1
6. Visit to field to study the mode of occurrence of minerals.					1
Silicates*		Non-silicates			Native elements
		Hydroxides	----	Hydroxides	
Important rock forming minerals and all are silica		Sulphates	Barite, Gypsum	Sulphides	
				Bauxite, Psilomelane	
				Chalcopyrite, Galena Realgar, Orpiment,	

bearing minerals				Spalerite (& dodecahedral), Cinnabar, Pyrite, Stibnite
	Oxides	Corundum	Oxides	Haematite (& botryoidal, micaceous), Magnetite, Pyrolusite, Chromite
	Carbonates	Dolomite, Calcite, Magnesite	Carbonates	Malachite, Azurite
	Phosphates	Monazite		
	Halides	Rock salt (Halite), Fluorite		
*Silicates		Group	Mineral Name	
Neosilicates		Olivine Group	Olivine	
		Garnet Group	Garnet	
		Al ₂ SiO ₅ Group	Andalusite, Sillimanite, Kyanite, Staurolite	
		Zircon Group	Zircon	
Sorosilicates		Epidote Group	-	
Cyclosilicates		Beryl Group	Beryl	
		Tourmaline	Tourmaline	
Inosilicates	Single Chain Silicates	Pyroxene Group	Augite, Hypersthene	
	Double Chain Silicates	Amphibole Group	Actinolite, Hornblende	
Phyllosilicates		Serpentine Group	Serpentine, Asbestos	
		Clay Minerals Group	Talc, Kaolin	
		Mica Group	Muscovite, Biotite, Phlogopite, Vemiculite	
Tectosilicates		Quartz Group	Quartz	
		Feldspar Group	Orthoclase, Plagioclase, Microcline	
		Feldspathoid Group	Nepheline, Sodalite	
		Zeolite Group	Zeolite	

General instructions:

Lab records and it should be duly certified by the concerned Staff member and Head of the Department of Geology. A student should record all the practicals in prescribed laboratory journals.

Each batch should consist of not more than 12 students for the regular practical classes and examination for all classes.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. 05 Marks**
- 2. 05 Marks**
- 3. 05 Marks**
- 4. Viva—05 Marks**
- 5. Journal—05 Marks**

Total 25 marks

Note: Same Scheme may be used for IA (Formative Assessment) examination

Books recommended.

1. Putnis, A., 1992, An Introduction to Mineral Science, Cambridge University Press.
2. Deer, W. A., Howei, R. A., and Zussman, J., 2013 An Introduction to Rock Forming Minerals (3rd Edition), Mineralogical Society of Great Britain and Ireland.
3. Klein, C., and Butrow, B., 2008, The 23rd edition of the Manual of Mineral Science (4th Edition), John Wiley and Sons.
4. Wenk, H.-R. and Bulakh, A., 2016, Minerals – Their Constitution and Origin (2nd Edition), Cambridge University Press.
5. Nesse, W. D., 2011, Introduction to Mineralogy (2nd Edition), Oxford University Press.

B.Sc. Semester – II
Subject: GEOLOGY
Open Elective Course (OEC-2)
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-2	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: INDUSTRIAL MINERALS

Course Outcome (CO): After completion of course, students will be able to:

- CO 1** Distinguish industrial rocks and minerals among other geological commodities.
- CO 2** Classify and explain the uses of different industrial minerals and rocks
- CO 3** Understand the specifications of industries as regards physical and chemical properties of industrial minerals and rocks.
- CO 4** Carry out efficient exploration of industrial minerals.
- CO 5** Describe Properties, occurrences and distribution of the minerals/rocks in India, with special reference to Karnataka.

Syllabus- OEC: Title- INDUSTRIAL MINERALS		Total Hrs: 42
Unit-I		14 hrs
Introduction to minerals and rocks: Introduction to rock forming and economically important minerals. Principles of rock cycle, origin and classification of economically important mineral deposits.		
Unit-II		14 hrs
Properties of minerals and rocks, and their occurrences: Physical properties, chemical composition, and diagnostic criteria for the identification of minerals. Ore minerals and gangue minerals, tenor and grade of the ore for industrial processing of minerals. Selection criteria followed for quarrying of decorative and dimensional rock blocks/slabs. National mineral policy.		
Unit-III		14 hrs
Properties, occurrences and distribution of the following minerals/rocks in India, with special reference to Karnataka:		
Industry	Minerals	
Jewelry	Gold, diamonds, precious minerals, corals, pearl and opals, sapphires, rubies, and emeralds.	
Metallic	Bauxite, chromite, ilmenite, magnetite, hematite, sphalerite, galena, chalcopyrite and pyrolusite.	

Cement and Refractory minerals	Calcite, lime stone, gypsum, clay minerals, magnesite, graphite, chalk, marble, dolomite, zircon, kaolin, magnesia and alumina minerals,
Ceramics and glass:	Clay minerals, kaolinite, silica sand and bauxite, limestone and feldspar.
Abrasives, and rock and mineral polishing	Industrial diamond, corundum, garnet and quartz magnesite, pumice, and diatomaceous earth
Electronic and electrical	Rare earth elements, mica, wolframite, native metallic minerals, ores of copper, aluminium,
Strategic/defense	Rare earth elements, Ilmenite, monazite, mica, vanadium from magnetite, poly metallic nodules and rock encrustation in the ocean to extract cobalt and nickel.
Chemicals and fertilizers	Barite, calcite, magnesite, asbestos, diatomite, feldspar, gypsum, kaolinite, phosphorite, mica, talc, zeolite, bauxite, chromite, ilmenite, magnetite, hematite, sphalerite, galena, clay minerals chalcopyrite, pyrolusite, pyrite and monazite.
Dimensional and decorative rocks & dimensional stones	Marble, granites, gneiss, dolerite, phyllite, slate, sand stones, sand, gravel, pebble and boulders.
Nanotechnology	Clay minerals, ilmenite, polymorphs of carbon, titanium and anhydrous iron oxide minerals and mineral composite for rare mineral substitutes.

Books recommended.

1. Klein, C and Philpotts (2016) Earth Materials Introduction to Mineralogy and Petrology Cambridge University Press.
2. Jensen M.L. and Bateman, A. (2013) Economic Mineral Deposits, John Wiley & Sons; Revised Edition.
3. National Mineral Policy, 2019 approved by Cabinet of the Government of India <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1566733> Mineral Distribution in India
4. Mineral Distribution in India http://ismenvis.nic.in/KidsCentre/Mineral_Distribution_in_India_13948.aspx
5. Jetli, K.N. and Narindar, K.J. (2011) Mineral Resources and Policy in India.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme: 2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.