KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

ಸ್ವಾತಂತ್ರ್ಯದ ಅಮೃತ ಮಹೋತ್ಸವ

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No. KU/Aca(S&T)/JS/MGJ(Gen)/2023-24/59 Date: 04/09/2023

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳಿಗೆ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್ NEP-2020 ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 104 ಯುಎನ್ಇ 2023, ದಿ: 20.07.2023.
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 2 ರಿಂದ 7, ದಿ: 31.08.2023.
3. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 04/09/2023

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music) /BVA / BTTM / BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS) / BBA & BA ILRD ಸ್ನಾತಕ ಪದವಿಗಳ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020ರ ಮುಂದುವರೆದ ಭಾಗವಾಗಿ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಕೋರ್ಸಿನ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

4/9/23
ಕುಲಸಚಿವರು.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂರ್ತಜಾಲ 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.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

KARNATAK UNIVERSITY, DHARWAD

B.Sc.in GEOLOGY

SYLLABUS

With Effect from2023-24

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM V &VI,

SKILL ENHANCEMENT COURSE(SEC)FOR SEMV

AS PER NE P-2020

Karnatak University, Dharwad
B.Sc.in GEOLOGY
Effective from 2023-24

Sem.	Type of Course	Theory/Practical	Course Code	Course Title	Instruction hour/week	Total hours / sem	Duration Of Exam	Marks			Credits
								Formative	Summative	Total	
V sem	DSCC-9	Theory	**035 GEG 011**	Geographic Information System and GPS (Theory)	04hrs	56	02hrs	40	60	100	04
V sem	DSCC-10	Practical	**035 GEG 012**	Geographic Information System and GPS (Practical)	04hrs	56	03hrs	25	25	50	02
V sem	DSCC-11	Theory	**035 GEG 013**	Geochemistry and Mining Geology (Theory)	04hrs	56	02hrs	40	60	100	04
V sem	DSCC-12	Practical	**035 GEG 014**	Geochemistry (Practical)	04hrs	56	03hrs	25	25	50	02
V sem	SEC-3	Practical	**035 GEG 061**	Employability skills in Geology	04hrs	56	03hrs	25	25	50	02
	Total										**26**
VI Sem	DSCC-13	Theory	**036 GEG 011**	Geophysics (Theory)	04hrs	56	02hrs	40	60	100	04
VI Sem	DSCC-14	Practical	**036 GEG 012**	Geophysics (Practical)	04hrs	56	03hrs	25	25	50	02
VI Sem	DSCC-15	Theory	**036 GEG 013**	Mineral Exploration and Mineral Processing (Theory)	04hrs	56	02hrs	40	60	100	04
VI Sem	DSCC-16	Practical	**036 GEG 014**	Economic Geology (Practical)	04hrs	56	03hrs	25	25	50	02
VI Sem	Internship-1		**036 GEG 091**	Geology Internship				50	0	50	02
	Total										**26**

OBJECTIVES

The B.Sc. Geology program is indented primarily to provide expert education in undergraduate level for students who wish to pursue higher studies in the subject of Geology for acquiring professional careers in the various fields of Geological Sciences such as Mineral and Oil Exploration, Rock and Mineral based Industries, Environmental Science and Hydrology, Hydrogeology, Engineering Geology and other areas associated with Earth Sciences. Being a multidisciplinary integrated nature of modern Earth Sciences, the course utilizes Physics, Chemistry, Biology, mathematics and Computer Science to develop a holistic and basic understanding of our planet Earth. In addition, the program has the following specific objectives.

- Educate students with the basic methods and philosophy used to conduct scientific research, particularly in the field of Geological Sciences.
- Create ability in the students to perform everyday observations and distinguish their observations from their interpretations and to understand that the Earth is dynamic and ever changing, and how these observations have an impact in their daily life.
- Create an ability in students to collect and analyze geologic data and draw conclusions to solve geologic problems in both lab and field.
- Impart a sound understanding of the functioning of the lithosphere, hydrosphere and atmosphere; and understand how technological advances along with the collection of innumerable observational and analytic data over the last 200 years have led naturally to the interpretation that the Earth originated about 4.6 billion years ago, and that its development has been punctuated by several planet-wide events that brought about profound changes in the Earth's habitants – a understanding that leads to an appreciation of our dynamic planet and a more knowledgeable perspective of our fragile environment.
- Develop a basic understanding of the most essential natural and physical processes that have shaped the earth throughout its history and continue to shape the planet and the life on it today.
- Create an ability in students to identify minerals and rocks; distinguish the three major rock groups based on their physical characteristics and modes of formation

and to understand and interpret how they form and also how to acquire geological data in the field.

- Generate awareness about the role that lithospheric plates and their movements play in shaping the earth's land masses and ocean basin, and the internal compositional and mechanical attributes of planet Earth.
- Development, understanding and appreciation of geologic time and to evaluate data in the context of major events and trends in the evolutionary history of plants and animals from the fossil record and ability to reconstruct the biological traits of extinct organisms.
- Understanding of the regional geology of Kerala and India and geographic distribution and geological settings, reserves and resources of major earth resources.
- The ability to plan and manage earth resources and understand a range of issues and problems relating to man's exploitation of such resources.
- Understand the role played by Geological sciences in the fields of Environment and Engineering.
- Impart a good working knowledge of rocks, the physical and chemical characteristics of the common minerals in the non-silicate and silicate mineral groups; fossils – their characteristics and importance and the role of Geology in everyday lives and in the end to the functioning of a modern civilization.
- Create the ability to plan and manage earth resources and understand a range of issues and problems relating to man's exploitation of such resources.

Programme Outcomes of B.Sc. Geology

On completion of the 03 years graduate of B.Sc. Geology programme in Geology students will be able to:

- Megascopically identify rocks, minerals and fossils in the field as well as laboratory.
- Read and interpret geological maps with particular reference to structure and lithology.
- Design and develop geological map, geological cross section and panel diagrams to understand subsurface geology.

- Interpret topographical maps.
- Identify landforms, soil types and their interrelationships.
- Carryout microscopic identification of rocks and minerals.
- Assist in site selections for civil engineering constructions.
- Plan and execute geological field work.
- Understand natural hazard and its impact on the society.
- Assess the environmental impacts in a geologic perspective.
- Develop geological knowledge so as to evolve sustainable living practices.

B.Sc. Semester–V

DisciplineSpecificCourse(DSC)-9

Course Title:**Geographic Information System and GPS**

Course Code:035 GEG 011

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	SummativeassessmentMarks	TotalMarks
DSCC-9	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO1: Define GIS Systems, Spatial data and Geoinformation, Maps, Databases, Spatial databases and spatial analysis, geographic phenomena.

CO2:Become aware of Reference surfaces for mapping, Coordinate Systems, Absolute, relative, network positioning.

CO3: Direct and indirect spatial data capture, accuracy and positioning, data checks and repairs, interpolating discrete and continuous data

CO4:Relate to classification of analytical GIS capabilities, Vector and Raster overlay operators.

CO5:Proximity and flow computations, interpolation, terrain modeling, GIS applications and advances, quantifying error propagation

Unit	Title: GEOGRAPHICAL INFORMATION SYSTEM	56.hrs/sem
UnitI	Introduction to GIS, Fundamentals, Functions and Components of GIS. Data and Information. Maps and Spatial Information, Coordinate Systems of the Earth.	14 Hrs
UnitII	Map Projection: Earth's size and shape in time and space. Properties of Map Projections, Types of basic Projections Classification - Cylindrical, Conical and Azimuthal projections Coordinate System- Geographical Coordinate System, Projected Coordinate System (UTM).	14 Hrs
UnitIII	Raster and Vector Data Models. Spatial Data Structures, Topology, Data quality and errors, Map Algebra. Buffer Analysis. Overlay Analysis. Proximity Analysis. Data Conversions. Surface Analysis.	14 Hrs
	GPS	
UnitIV	Introduction to GPS, History, Satellite Navigations constellations, GPS Errors. Reference Systems and Coordinate systems. Structure of GPS Signal. GPS Observables. Surveying with GPS, Data Processing, GIS and GPS data integration, Navigation with GPS, Atmospheric Effects on GPS Signal, and Applications of GPS	14 Hrs

References:

Sl No	Book Name	Author/Publisher
01	Concepts and Techniques of Geographic Information Systems	C.P.Lo, Albert K.W. Yeung
02	Principles of Geoinformation systems	Burrough and Rachel
03	Geographical information system and Science	Goodchild and Longley
04	Geographical Information Science	P.S.Roy
05	Geographic Information System	Bhatt
06	The design and implementation of Geographic Information Systems	John E. Harmon & Steven J. Anderson., John Wiley & Sons, 2003.
07	Introduction to Geographic Information Systems,	Kang Tsung Chang., Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2008
08	Global Positioning System -Theory and Practice	Hofmann W.B & Lichtenegger, H. Collins. Springer -Verlag Wein, New York, 2001.
09	Satellite Geodesy Foundations-Methods and Applications	Gunter Seeber. 2003

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–V

DisciplineSpecificCourse(DSC)-10

Course Title:Geographic Information System and GPS-Practical

Course Code:035 GEG 012

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessmentMarks	Summative assessment Marks	TotalMarks
DSCC-10	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: Understand the GIS

CO2: To understand Satellite Data Products and Maps types

CO3: To understand Geo-Processing Tools: Clip, Union, Dissolve, Merge, Intersect

Expt. No,	Title:	56.hrs/ sem
1	Introduction to Software and its Tools.	
3	Introduction to Satellite Data Products and Maps types.	
4	Georeferencing (Image Rectification).	
5	Digitization of Maps, Editing the Data.	
6	Displaying the data: Classification of Spatial Data.	
7	Spatial data Labeling and Creating Map Layout.	
8	Geo-Processing Tools: Clip, Union, Dissolve, Merge, Intersect.	
9	Buffer Analysis.	
10	Introduction about GPS Device.	
11	GPS Data Collection and Applications	

FormativeAssessmentforPractical	
Assessment	**Distribution of Marks**
1. Test	15
2. Performance + Lab Record	05
3. Viva-voce	05
Total	**25Marks**
FormativeAssessmentasperguidelines.	

The same shall be used for semester end Examination

B.Sc. Semester–V

DisciplineSpecificCourse(DSCC)-11

Course Title:Geochemistry and Mining Geology (Theory)

Course Code:035 GEG 013

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	Formative AssessmentMarks	Summative assessmentMarks	TotalMarks
DSCC-11	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: To understand evolution of the early Earth from proto-planetary material and its differentiation to present day state.

CO2: To explain element fractionation and how this can be used to understand geochemical processes.

CO3: To demonstrate their ability to obtain, analyze and synthesize information relevant to Geochemistry.

CO4: To understand the chemistry of organic matter.

Unit	Title:Geochemistry	56.hrs
UnitI	Basic concepts and Scope of Geochemistry. Geochemical classification of elements, Age, origin and composition of the universe with special reference to solar system. Biochemical classification of element and geochemical cycles.	14 Hrs
UnitII	**Geochemistry-** Elements, Atoms, and Chemical Bonds, Principles of Geothermobarometry. Energy, and Fundamental Thermodynamic Concepts, Laws of Thermodynamics, Enthalpy, Entropy, Heat capacity and free energy, concept of equilibrium and equilibrium constant. Gibbs phase rule, application to mineralogical system - H_2O, Al_2SiO_5, Forsterite-Fayalite, and Diopside- Anorthite. Fundamentals of isotope geochemistry.	14 Hrs
	Mining Geology	
UnitIII	Introduction, mining terminologies, Classification of mining methods – Alluvial mining methods, open-cast mining methods, Quarrying, Underground mining methods – Open stopes, stoping with supports. Geological parameters for mine planning and designing. Drilling: methods and types of drilling and their uses. Mine safety, mine ventilation, Mining hazards, advantages and disadvantages of surface and subsurface mining. Impact of mining	14 Hrs

	and mineral processing on environment and human health.	
UnitIV	Concept of economics and its importance in national development and economy. Resource scenario of India. Production, demand, supply and substitution of natural resources in global context. Structure and organization of mineral industry, valuation of mineral property. **Mineral deposits –** Meaning, specialties. Mining laws in India, Concept of mineral resources and its estimation, classification of mineral resources – Indian and International mineral legislation National mineral policy, Mineral Conservation: Introduction, Growth and awareness. Methods of conservation. Limitations and scope of conservation.	14 Hrs

References:

Sl. No	Title of the Book	Author and Publication
01	Geochemistry,	William M. White, 2013, Wiley-Blackwell
02	Introduction to Geochemistry.	Krauskopf, K. B. and D. K. Bird. 1995. New York: McGraw- hill.
03	Principles of Geochemistry	Brain Mason
04	Geochemistry	Rankama and Sahama
05	Rare earth element Geochemistry	Henderson
06	Elements of Mining Geology	Young
07	Elements of Mining	Lewis
08	Mining of mineral deposits	Shevyekov
09	Introduction of mining	Stoces
10	Principles of Mining Geology	Arogyaswamy
11	An Introduction to Mineral Economics	K K Chatterjee
12	Mineral Economics	Sinha R.K & Sharma N L, Oxford &IBH

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–V

DisciplineSpecificCourse(DSCC)-12

Course Title:Geochemistry (Practical)

Course Code:035 GEG 014

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	SummativeassessmentMarks	TotalMarks
DSCC-12	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: To understand plotting the geochemical data using suitable discriminant diagrams

CO2: To understand Models of P-T estimation using suitable mineral pairs.

Expt. No,	Title:	56.hrs/ sem
1	Plotting the Geochemical data using suitable discriminant diagrams and interpretation of data.	
2	Models of P-T estimation using suitable mineral pairs.	
3	Construction of P-T diagrams	

Field Visits:

Visit to important field areas showing good geological settings. Some selected areas like: Karighatta, Doddakanya mines, Pegmatite dykes in and around KRS Dam, Holenarasipura, Bageshapura, Chamundi Hills, Hutti Gold Mines, Arasikere areas, Byrapur, Ingaldhal, famous Igneous, Sedimentary and Metamorphic terrains of Karnataka.

FormativeAssessmentforPractical	
Assessment	**Distribution of Marks**
1. Test	15
2. Performance + Lab Record	05
3. Viva-voce	05
Total	**25Marks**
FormativeAssessmentasperguidelines.	

The same shall be used for semester end Examination

B.Sc. Semester–V

Skill Enhancement Course: SEC-3

Course Title:Employability skills in Geology

Course Code: 035GEG061

Type ofCourse	Theory /Practical	Credits	Instructionhour/week	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	Summative assessmentMarks	TotalMarks
SEC-3	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Employability skills in Geology will have Paper A, B and C. Students will choose experiments either from Paper A or B or C but not mixture of all. Principal of the college can also suggest the selection of Paper based on availability of Lab and instruments etc.

Paper A: Remote Sensing and GIS

1. Concepts of Remote Sensing, electromagnetic spectrum, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors.
2. Remote Sensing Platforms and Sensors, IRS and other satellites.
3. Visual interpretation techniques, spectral properties of soil, water and vegetation.
4. Concepts of Thermal and Hyperspectral remote sensing
5. GIS Components, Maps, Types of maps, Map scale, Types of scale, Co- ordinate systems, Map projections, Map transformation, Geo-referencing, GIS Applications in Real life.
6. Data storage, Database structure models, database management system, GIS Data model, vector data, raster data, attribute data, geo-database and metadata.
7. GPS segments, GPS satellite generations, current GPS satellite constellation, control sites.
8. Photo geology: Types & geometry of aerial photographs; factors affecting aerial photography; types of camera, film and filters.
9. Factors affecting scale; Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

Paper B: Geo-Statistics and Computer Applications in Earth Science

1. Sampling, data collection, random variables, probability frequency function & frequency distribution.
2. Measures of central tendency – Averages; Measures of dispersion; and skewness and kurtosis of the given geological parameters.
3. Correlation and regression analysis, Testing of Hypothesis – t-test, F – test, and Chi square test.
4. Introduction to computers, Organization of a computer, concepts of Information Technology, benefits and limitations of IT.
5. Implementation of IT in the field of Geology stake holders and interfaces-Challenges in the geology field induced by I.T.
6. Applications of I.T related to Geophysics, Geochemistry, Remote Sensing, Hydrogeology, Environmental Geology, Mining Geology & Applications to modeling in Geology.

7. Computer applications for calculation of mineral formula using Microsoft excel program, Generation of graphs – line graph Histogram, Pie graph, and Trilinear plots, Petrochemical calculations using IGPET / GDP-Pet software programs. Application of MS Office for geological report generation.
8. Pressure-Temperature calculations using relevant computer programs. Testing of hypothesis with examples from geological populations and discussing their significance.
9. Solving problems using Geological data on measures of central tendency, Frequency distribution, Correlation and Regression.
10. Testing of Hypothesis with the help of open source statistical programs.

Paper C: Water Quality and Management.

1. Collection and preservation of water samples
2. Estimation of water quality parameters such asTesting of Hardness
3. Testing of pH
4. Testing of BOD and COD
5. Testing of Heavy Metals
6. Microbiological Analysis
7. MPN analysis
8. Serial Dilution Method
9. Chromatographic analysis of water

Recommended Books/References

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7th Edition,
2. Geographic Information systems – An Introduction by Tor Bernhard Sen, Wiley India Publication
3. Geostatistics with applications in Earth Sciences, Sarma D.D. Springer Publ., pp.205. • J.-P. Chiles and P. Delfiner,
4. Geostatistics; Modeling spatial uncertainty, Wiley Publ., pp.731. • H. Wackernagel,
5. Multivariate Geo-statistics, Springer Publ., pp.257. • Kitanidis, P.K.,
6. Geo-statistics for Engineers and Earth Scientists, Springer Publ., pp.309. • Robson Wendy,
7. Introduction to Environment Engineering and Science. Gilbert M. Masters and Wendell P. Ela (2017) 3 rd ed. Pearson,
8. Sewage Disposal and Air Pollution Engineering, Garg S.K. (2007) 20th ed, Vol. II, New Delhi, Khanna Publisher.
9. Water Supply Engineering, Garg S.K. (2007) 18th ed, Vol.I, New Delhi, Khanna Publisher.
10. Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy (2003) 4th ed., New Delhi, Tata McGraw-Hill

Examination: Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus.

Distribution of marks: Preparation experiment: Reaction – 03 marks, Calculation of theoretical Yield- 02 mark, Observed yield-12 marks, Journal- 03 marks, Viva- voce – 05 marks, **Total= 25 marks**

B.Sc. in Geology

VI Semester

W. e. f.: 2023-24

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)-13

Course Title:Geophysics (Theory)

Course Code:036GEG011

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	Summative assessmentMarks	TotalMarks
DSCC-13	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO1: After completion of the course, the student will gain first-hand knowledge of geophysical principles and their significance.

CO2: The students will acquire skills to interpret SoI topo sheets and use GPS, to conduct electrical resistivity and other methods for exploration.

Unit	Title:	56.hrs/ sem
UnitI	Solid Earth Geophysics: Introduction to Geophysics and its branches. Temperature variation in the earth and convection currents. Normal gravity field; Clairaut‟s theorem; Shape of the earth; deflection of the vertical, geoid, free-air, Bouguer and isostatic anomalies. Gravity field of earth and Isostasy. Geomagnetism, elements of earth's magnetism: Internal and External fields and their causes, Paleomagnetism, Polar wandering paths, Continental drift, Seafloor spreading and its geophysical evidences. Electromagnetic radiation and propagation of Waves: EM Radiation	14 Hrs
UnitII	Elements of earthquake seismology; focal depth, epicenter, great Indian earthquakes, Intensity and Magnitude scales. Energy of earthquakes. Seismic waves: types and their propagation characteristics, absorption, attenuation and dispersion. Principles of Seismic prospecting, Elastic properties of rocks and minerals, various seismic methods. Principles of electromagnetic seismograph, displacement meters, velocity meters, accelerometers, Broadband Seismometer.	14 Hrs
UnitIII	Principles of Gravity method, geophysical anomalies, regional and local gravity anomalies, instruments, interpretation of gravity anomalies. Principles of Magnetic method, magnetic properties of rocks and minerals, various instruments used in magnetic prospecting, and interpretation of magnetic anomalies. Interpretation of anomalies of simple geometric bodies using gravity and magnetic methods. Electrical properties of rocks and minerals, concepts and assumptions of horizontally stratified earth, anisotropy and its effects on electrical fields, geoelectric and geological sections, D.C Resistivity method. Concept of natural electric field, various electrode configurations, Profiling and Sounding (VES). Types of Sounding curves, Concept of Electrical Resistivity Tomography (ERT).	14 Hrs

UnitIV	SP Method: Origin of SP, application of SP surveys. Induced Polarization (IP) Method: Origin of IP, Membrane and Electrode polarization, time and frequency domains of measurement, chargeability, percent frequency effect and metal factor. Principles of Electromagnetic prospecting, various EM methods: VLF (very low frequency); AFMAG (Audio frequency magnetic) methods; and central frequency sounding; transient electromagnetic methods; magneto-telluric method; geomagnetic depth sounding. (Only working principles, limitation and its application in geology, No derivations and problems) Principles of Well logging method, instrumentations, operational procedures and interpretations of various geophysical logs: SP, resistivity and micro resistivity, gamma ray, neutron, sonic, temperature, caliper and directional logs. Radiometric and Airborne Geophysics: Principles of radioactivity, radioactivity decay processes, units, radioactivity of rocks and minerals, Instruments, Ionization chamber, G-M counter, Scintillation counter, Gamma ray spectrometer	14 Hrs

References:

1. Introduction to geophysical prospecting - Milton BDobrin
2. Exploration geophysics – Jakaosku JJ
3. Outlines of geophysical prospecting-A manual for geologists–M B Ramachandra Rao
4. Geophysical Methods in Geology – P V Sharama
5. Exploration Geophysics for geologist and Engineers – Bhimasanakaran and Gaur
6. Principles of Applied Geophysics – D S Paransis
7. Introduction to Geophysics – C H Howel
8. Fundamentals of Geophysics - William Lowrie
9. Applied Geophysics – W. M. Telford

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)-14

Course Title: Geophysics (Practical)

Course Code:036GEG012

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	SummativeassessmentMarks	TotalMarks
DSCC-14	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Expt. No,	**Title:**	**56.hrs/ sem**
1	Geophysical Surveys and their Applications (Magnetic, Gravity, Seismic and Electrical methods)	
3	Study and interpretation of Electrical Resistivity Data, methods of resistivity profiling andsounding. Vertical Electrical Sounding and Interpretation of Resistivity Curves. Calculation of apparent resistivity; Curve matching techniques.	
4	Interpretation of Magnetic, Gravity and Seismic Data.	

FormativeAssessmentforPractical	
Assessment	**Distribution of Marks**
1. Test	15
2. Performance + Lab Record	05
3. Viva-voce	05
Total	**25Marks**
FormativeAssessmentasperguidelines.	

The same shall be used for semester end Examination

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)-15

Course Title:Mineral Exploration and Mineral Processing (Theory)

Course Code:036GEG013

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	SummativeassessmentMarks	TotalMarks
DSCC-15	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: Explain mineral exploration

CO2: Explain importance of mineral resources

CO3: Describe geological concepts in mineral exploration

CO4: Explain geological mapping and sampling, Geochemical surveys. Subsurface exploration and drilling

CO5: Describe scope and necessity of Mineral Processing and Physical properties of Ores and their importance in Mineral Processing

Unit	Title:MINERAL EXPLORATION	56.hrs/ sem
UnitI	Introduction: Introduction to mineral exploration: Definition and scope of mineral exploration, Importance of mineral resources, Exploration life cycle and stages. Geological concepts in mineral exploration: Rock types and their significance, Plate tectonics and mineralization.	14 Hrs
UnitII	Exploration methods and techniques: Surface geological exploration methods: Geological mapping and sampling, Geochemical surveys. Subsurface exploration and drilling: Diamond drilling, Reverse circulation drilling, Core logging and sampling. Mineral resource evaluation: Classification of mineral resources, Resource estimation methods, Economic and technical considerations.	14 Hrs
	MINERAL PROCESSING	
UnitIII	Mineral Processing: Definition, scope and necessity of Mineral Processing. Physical properties of Ores and their importance in Mineral Processing. Sampling: Definition, purpose, types of sampling and measurements of accuracy of sampling. Simple problems on estimation of recovery and concentration ratio. Definition and measurement of particle size, screening and sub-sieve sizing. Wet and dry sieving. Graphical representation of size analysis data and their applications. Industrial screens and their efficiency. Liberation: Definition, importance and application of ore microscopy in liberation studies and its analysis. Methods of liberation and behavior of locked particles.	14 Hrs

UnitIV	Methods of Separation: Gravity separation, Magnetic separation and Electrical separation. Flotation: Introduction, classification of flotation machines and machine features. Physical aspects of flotation. Electro kinetic phenomenon, Electrical Double Layer at the Solid-Liquid interface. Adsorption and its characteristics, pH, Solid/Liquid ratio. Micro flotation tests, Laboratory flotation tests, Flotation Kinetics and Factors affecting flotation. Dewatering and Drying. Flocculation and dispersion, principles of flocculation and dispersion phenomena. Different types of flocculants used in dewatering techniques, selective flocculation and their applications. Dewatering by gravity sedimentation and by using screens. Applications of dewatering processes in mineral industries. Filtration: Principles and factors affecting the filtration, different types industrial filters, cake filtration. Centrifuging and drying: Different types of thermal dryers and their application, centrifugal sedimentation. Tailing Disposal: Tailing ponds and Design & construction, Types, Industrial applications and water reclamation.	14 Hrs

Pedagogy: Lectures, Seminars, Industry/Institute Visits, Debates, Quiz, Project and Assignments

Reference:

1. Principles of Mineral Dressing: A.M. Gaudin
2. Ore Processing: S.K. Jain
3. Mineral Processing Technology: B.A. Wills
4. Text Book of Ore Dressing: A.F. Taggart
5. Hand Book of Mineral Dressing: A.F. Taggart
6. Mineral Processing – Recent advances and future trends: S.P. Mehrotra & P. Sarkar
7. Laboratory Experiments in Mineral Processing: S. Venkatachalam & Degaleeson
8. Particle Size Measurement: T. Allen
9. Mineral Deposits of the Deep Ocean Floor – by Emery, K.O. and Skinner, Brian J (1977)
10. Geological prospecting and exploration – Kreiter,V.M.
11. Geochemistry in mineral exploration Rose, A.W Hawkes. H.E & Webb J.S. 1979. Academic press

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)-16

Course Title: Economic Geology (Practical)

Course Code:036GEG014

Type ofCourse	Theory /Practical	Credits	Instructionhourperweek	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	SummativeassessmentMarks	TotalMarks
DSCC-16	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: Explain megascopic study of industrial minerals – Abrasives, Refractory, Ceramic, Fertilizer, Chemical minerals, Mineral pigments.

CO2: Describe calculation of mineral and ore reserves – average thickness of bed, assay value, assay width, specific gravity, tonnage, grade, volume and life of a mine.

Expt. No,	Title:	56.hrs/ sem
1	Megascopic study of important economic minerals	
3	Megascopic study of industrial minerals – Abrasives, Refractory, Ceramic, Fertilizer,Chemical minerals, Mineral pigments.	
4	Microscopic study of important economic minerals.	
5	Mineral sampling and statistical calculations.	
6	Calculation of mineral and ore reserves – average thickness of bed, assay value, assay width, specific gravity, tonnage, grade, volume and life of a mine.	

FormativeAssessmentforPractical	
Assessment	**Distribution of Marks**
1. Test	15
2. Performance + Lab Record	05
3. Viva-voce	05
Total	**25Marks**
FormativeAssessmentasperguidelines.	

The same shall be used for semester end Examination

B.Sc. Semester–VI

INTERNSHIP IN GEOLOGY

Course Title: GEOLOGY Internship

Course Code:036 GEG 091

Type ofCourse	Theory /Practical	Credits	Instructionhour/week	TotalNo.ofLectures/Hours /Semester	DurationofExam	FormativeAssessment Marks	Summative assessmentMarks	TotalMarks
NTERNSHIP	**Practical**	**02**				**50**	**0**	**50**

Internship:

A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations for 2 credits. Internships involve working with local industry or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.

Note:

1. 1 credit internship is equal to 30hrs on field experience.
2. Internship shall be Discipline Specific of 45-60 hours (2 credits) with duration 1-2 weeks.
3. Internship may be full-time/part-time (full-time during last 1-2 weeks before closure of the semester or weekly 4 hrs in the academic session for 13-14 weeks). College shall decide the suitable method for programme wise but not subject wise.
4. Internship mentor/supervisor shall avail work allotment during 6th semester for a maximum of 20 hours.
5. The student should submit the final internship report (45-60 hours of Internship) to the mentor for completion of the internship.
6. Method of evaluation: Presentations/Report submission/Activity etc.

Wherever internship is not feasible, the students can to choose project work

Project Work: Plant training in industries/short term work in the department/other: The project work may include in educational institutions/R&D organizations/data mining/review of current literature/theoretical methods/ computer applications.

Experimental work may involve studies on synthesis/measurements/study of properties/ characterization by physical methods/ activities for reported/unreported research or any suitable combination thereof. In case of the students who would work outside the campus, the supervising staff member may visit.

UG programme: 2023-24

GENERAL PATTERN OF THEORY QUESTION COURSE 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 : 10 marks

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 subquestions 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 hoursPrescribed.