


UNIVERSITY OF MYSORE
Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 01.09.2023

Notification

Sub:- Syllabus and Scheme of Examinations of Earth Science (UG)
(V & VI Semester) with effect from the Academic year 2023-24.

Ref:- 1.This office letter No: AC6/303/2022-23 dated: 28-07-2023.
2.Decision of BOS in Earth Science (UG) meeting held on 05-08-2023.

The Board of Studies in Earth Science (UG) which met on 05-08-2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Earth Science programme (V & VI Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.


Registrar
University of Mysore
Mysore

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Earth Science, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangothri, Mysuru.
5. The Director, PMEB, Manasagangothri, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.



Model Curriculum

Program Name	B.Sc in EARTH SCIENCES	Semester	V
Course Title	Geographic Information System and GPS (Theory)		
Course Code:	ERS A-9 Theory	No. of Credits	04
Contact hours	60 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

	Contents	Hrs
Unit 1	Introduction to GIS, Fundamentals, Functions and Components of GIS. Data and Information. Maps and Spatial Information, Coordinate Systems of the Earth.	15hrs 1 Credit
Unit 2	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).	15hrs 1 Credit
Unit 3	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.	15hrs 1 Credit
Unit 4	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	15hrs 1 Credit

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

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

Course Title	Geographic Information System and GPS (Practical)		Practical Credits	02
Course Code	ERS A-10		Contact Hours	4 Hours per week
Formative Assessment	25 Marks	Summative Assessment	25 Marks	
Practical Content				
<ol style="list-style-type: none"> 1. Introduction to Software and its Tools. 2. Introduction to Satellite Data Products and Maps types. 3. Georeferencing (Image Rectification). 4. Digitization of Maps, Editing the Data. 5. Displaying the data: Classification of Spatial Data. 6. Spatial data Labeling and Creating Map Layout. 7. Geo-Processing Tools: Clip, Union, Dissolve, Merge, Intersect. 8. Buffer Analysis. 9. Introduction about GPS Device. 10. GPS Data Collection and Applications. 				

Pedagogy: Experiential learning, Problem solving, Project

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

References	
•	Concepts and Techniques of Geographic Information Systems - C.P.Lo, Albert K.W.Yeung
•	Principles of Geoinformation systems – Burrough and Rachel
•	Geographical information system and Science – Goodchild and Longley
•	Geographical Information Science, P.S.Roy
•	Geographic Information System – Bhatt
•	John E. Harmon & Steven J. Anderson., The design and implementation of Geographic Information Systems, John Wiley & Sons, 2003.
•	Kang Tsung Chang., Introduction to Geographic Information Systems, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2008
•	Hofmann W.B & Lichtenegger, H. Collins., Global Positioning System – Theory and Practice, Springer-Verlag Wein, New York, 2001.
•	Gunter Seeber., Satellite Geodesy Foundations-Methods and Applications, 2003

Program Name	B.Sc in EARTH SCIENCES	Semester	V
Course Title	Geochemistry and Mining Geology (Theory)		
Course Code:	ERS A-11	No. of Credits	04
Contact hours	60 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

	Contents	45 Hrs
	Geochemistry	
Unit 1	Geochemistry: 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.	15hrs 1 Credit
Unit 2	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 ₂ O, Al ₂ SiO ₅ , Forsterite-Fayalite, and Diopside-Anorthite. Fundamentals of isotope geochemistry.	15hrs 1 Credit
Mining Geology		
Unit 3	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 and mineral processing on environment and human health.	15hrs 1 Credit
Unit 4	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 organisation of mineral industry, valuation of mineral property. Mineral deposits – meaning, specialities. 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.	15hrs 1 Credit

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

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

Course Title	Geochemistry (Practical)	Practical Credits	02
Course Code	ERS A-12	Contact Hours	4 Hours per week
Formative Assessment	25 Marks	Summative Assessment	25 Marks
Practical Content			
<ul style="list-style-type: none"> • Plotting the Geochemical data using suitable discriminant diagrams and interpretation of data. • Models of P-T estimation using suitable mineral pairs. • Construction of P-T diagrams 			

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

Pedagogy: Experiential learning, Problem solving, Project

References

- William M. White, Geochemistry, 2013, Wiley-Blackwell
- Krauskopf, K. B. and D. K. Bird. 1995. Introduction to Geochemistry. New York: McGraw-hill.
- Principles of Geochemistry – Brian Mason
- Geochemistry by Rankama and Sahama
- Rare earth element Geochemistry by Henderson
- Elements of Mining Geology - Young
- Elements of Mining - Lewis
- Mining of mineral deposits - Shevyekov
- Introduction of mining - Stoes
- Principles of Mining Geology, Arogyaswamy
- An Introduction to Mineral Economics by K K Chatterjee
- Mineral Economics by Sinha R.K & Sharma N L, Oxford & IBH

Program Name	B.Sc in EARTH SCIENCES	Semester	VI
Course Title	Ore Genesis and Indian Mineral Deposits (Theory)		
Course Code:	ERS A-13	No. of Credits	04
Contact hours	60 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

	Contents	45 Hrs
Unit 1	Introduction to ore geology in relation to industry, commerce and national economy. Terminologies: Ore minerals, Gangue minerals, tenor of ore, resource and reserves. Strategic and critical mineral, brief introduction to types of ore deposits- stratiform and strata bound, porphyry, SEDOX and IOCG type deposits.	15hrs 1 Credit
Unit 2	Magmatic processes and its types, Contact metasomatism and skarn deposits. Hydrothermal processes: Hydrothermal fluids and their migration and deposition. Cavity filling and replacement deposits.	15hrs 1 Credit
Unit 3	Weathering processes: Residual, mechanical concentrations (placers) Elluvial, Stream and marine deposits. Sedimentation: Fe and Mn Cycles. Oxidation and supergene enrichment: Gossans. Metamorphic deposits, classification of ore deposits- Jenson, Lindgreen and Bateman. Metallogenic Epochs and provinces of India.	15hrs 1 Credit
Unit 4	Metallic deposits of India: Iron, Gold, Manganese, Copper, Lead and Zinc, Chromium and Bauxite deposits. Minerals used as refractories, abrasives, fertilizers, pigments and ceramics.	15hrs 1 Credit

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

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

Course Title	Ore Geology (Practical)			Practical Credits	02
Course Code	ERS A-14			Contact Hours	4 Hours per week
Formative Assessment	25 Marks		Summative Assessment	25 Marks	
Practical Content					
Identification (with the help of physical properties), chemical composition, origin and Indian occurrences of the following Ore minerals and Industrial minerals					
Barite	Bauxite	Biotite	Calcite	Chalcopyrite	Chromite
Cuprite	Dolomite	Fluorite	Galena	Garnet	Graphite
Gypsum	Hematite	Ilmenite	Kyanite	Limonite	Magnesite
Magnetite	Malachite	Muscovite	Psilomelane	Pyrite	Pyrolusite
Serpentine	Sphalerite	Stibnite	Talc	Tourmaline	
Distribution of mineral deposits					
Formation, association and Indian distribution of following ore minerals: Mica, Copper, Manganese, Lead and Zinc, Bauxite, Chromite and Gold					
Numerical Ore reserve estimation					
Microscopic study of important economic minerals.					
Mineral sampling and statistical calculations.					
Calculation of mineral and ore reserves – average thickness of bed, assay value, assay width, specific gravity, tonnage, grade, volume and life of a mine.					

Pedagogy: Experiential learning, Problem solving, Project

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

- The geology of ore deposits - John M. Guilbert and Charles F. Park
- Interpretation of ore textures - Bastin
- Economic Mineral deposits by Jenson and Bateman
- Ore microscopy - Cameron
- Textures of the ore minerals - Edwards
- Ore deposits - Park
- Geology of Mineral deposits - Smirnov
- The ore minerals and their intergrowths - Ramhor
- Ore Petrology - Stanton
- India's mineral resources – Sinha and Krishnaswamy
- Metallic and Industrial minerals - Lamey Carl
- Introduction to India's economic minerals - Sharma

Program Name	B.Sc in EARTH SCIENCES	Semester	VI
Course Title	Geophysics (Theory)		
Course Code:	ERS A-15	No. of Credits	04
Contact hours	64 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

	Contents	Hrs
Unit 1	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	15hrs 1 Credit
Unit 2	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.	15hrs 1 Credit
Unit 3	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).	15hrs 1 Credit

Unit 4	<p>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.</p> <p>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)</p> <p>Principles of Well logging method, instrumentations, operational procedures and interpretations of various geophysical logs: SP, resistivity and micro resistivity, gamma ray, neutron, sonic, temperature, calliper and directional logs.</p> <p>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</p>	15hrs 1 Credit
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Pedagogy: Lectures, Seminars, Industry/Institute Visits, Debates, Quiz, Project and Assignments

References	
1	Introduction to geophysical prospecting - Milton B Dobrin
2	Exploration geophysics – Jakaosku JJ
3	Outlines of geophysical prospecting - A manual for geologists – MBRamachandraRao
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
Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

Course Title	Geophysics (Practical)		Practical Credits	02
Course Code	ERS A-16		Contact Hours	4 Hours per week
Formative Assessment	25 Marks	Summative Assessment	25 Marks	
Practical Content				
<ol style="list-style-type: none"> 1. Geophysical Surveys and their Applications (Magnetic, Gravity, Seismic and Electrical methods) 2. Study and interpretation of Electrical Resistivity Data, methods of resistivity profiling and sounding. Vertical Electrical Sounding and Interpretation of Resistivity Curves. Calculation of apparent resistivity; Curve matching techniques. 3. Interpretation of Magnetic, Gravity and Seismic Data. 				

Pedagogy: Experiential learning, Problem solving, Project

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25 Marks
<i>Formative Assessment as per guidelines are compulsory</i>	

References

- Interpretation of Resistivity Data, US geological survey professional paper 499
- Geophysics for Mineral Exploration: A Manual for Prospectors