

SRI VENKATESWARA UNIVERSITY:: TIRUPATI

SVU COLLEGE OF SCIENCES

DEPARTMENT OF GEOLOGY



Syllabus for M.Sc. GEOLOGY

Choice Based Credit System (CBCS)

(w.e.f. the Academic Year 2021-2022)

DEPARTMENT OF GEOLOGY
S V U COLLEGE OF SCIENCES
SRI VENKATESWARA UNIVERSITY
TIRUPATI

P.G. DEGREE PROGRAMME (CBCS) REGULATIONS – 2016

AMENDED AS PER NEP – 2020

Vision of the Department

The Geology department of the University seeks to provide the highest levels of education through continuous revision and expansion of our educational, research, and outreach programs in order to produce well-trained, competent, academic and professional geoscientists capable of responding to societal needs.

Mission of the Department

The Geology Department will develop in each student, critical thinking, enthusiasm, initiative and the necessary skills to become lifelong students of Earth Sciences. Emphasis will be placed on learning basic concepts and techniques through research, in an environment that promotes the development of professionals with social, cultural and humanistic sensibility as well as profound ethical values. In this way, the department will contribute to the enrichment of science and society through the creation and dissemination of new knowledge through scientific research.

About the Program

Sri Venkateswara University offers M.Sc., Geology programme,

under Choice Based Credit System (CBCS). The CBCS enables the students to select choice of subjects as per her /his interest and requirement. Acquiring knowledge in the related discipline is advantageous to the students. The CBCS program is framed in such a way that to impart more Knowledge in the field of Geological sciences.

Geology is an inter-disciplinary subject which enables to understand the earth processes and its treasures. It incorporates inputs from almost all science disciplines. Geologists are mainly involved in the exploration and extraction of natural resources viz., minerals, rocks, fossil fuel and water. In the fast growing world geologists will have to play a vital role in building the nation. Geologists can also engage in geological research, which has immense potential in the current scenario.

PROGRAMME OBJECTIVES

1. Education and Training: Provide an excellent preparation for a career in professional practice in industrial or environmental Earth Sciences, research in Geosciences, and specialist areas of other physical and natural sciences.
2. Communication Skills: Skills to communicate in written, numerical, graphical and verbal forms, in ways that are appropriate to different audiences and indifferent situations, ranging from scientific and industry reports, to group and individual oral presentations, and from blogs and outreach articles, to news articles and essays.
3. Critical Thinking: Acquire an understanding of the concept in geology and related disciplines and an ability to understand, integrate, and extend it so that all fundamental geological concepts are accessible.
4. Problem Solving: Skills to recognise and articulate a problem and then apply appropriate conceptual frameworks and methods to solve it.
5. Analytical Reasoning: A broad knowledge base in geology and related disciplines such as chemistry, physics, biology and mathematics needed to provide insight into these Earth processes
6. Research – Related Skills: Develop a research design, which has an appropriate problem related to earth sciences but may incorporate some scientific methods, ability to plan and write a research paper.

7. Self and Time Management: Time management skills are developed through interaction with the assessment process for submission of continuous assessment material.
8. Leadership and Team Work: Ability to contribute effectively to team objectives and interact productively with others both in project-related settings and in meetings.
9. Scientific Reasoning: Develop a systematic understanding of both core areas and advanced topics in the study of the Earth and view the Earth from new and challenging perspectives of time, space, process and pattern.
10. Digital Literacy: Ability of advanced Word skills and advanced GIS, statistics, databases, spreadsheets, digital drawing through online workbooks and workshops
11. Moral and ethical values: The degree to which every student engages with these themes will vary but it is important that all think especially about ethical issues.
12. Life – long Learning: Ability to blend academic and practical skills and to transfer such skills to other domains of one’s life and work.

Program Educational Objectives (PEOs)

- 1. Creative, innovative educators and learning facilitators, who master geological Science, have the ability to use information technology to keep up with developments in geological science.**
- 2. Reviewers of geological problems, both experimentally and/or literature studies and publish the results in scientific forums and journals.**
- 3. Examiner of problems related to the earth sector (extraction, mitigation, and conservation) factual and applicable, providing solutions to these earth problems conceptually.**
- 4. Planning and implementing staff in the exploration-production/extraction industry, and mitigation and conservation of geological resources.**
- 5. Entrepreneurs whose business fields are related to commodities or equipment in the extraction, mitigation, and conservation of geological resources.**

6. Staff to heads of agencies related to regulation, supervision, and policy makers in the extraction, mitigation and conservation of geological resources.

Program Educational Outcomes

1. To develop an in-depth knowledge and skills in qualitative and quantitative research methods through laboratory, field and web modes of learning.
2. Recognize the need for sustainable use of earth resources, and value environmental, indigenous and other community perspective on geological activities.
3. Apply geological knowledge and critical thinking skills to identify a problem and to describe a strategy for handling.
4. Synthesize geological data on arrange of spatial and temporal scales to make interpretations that allow for scientific uncertainty.
5. Work effectively and professionally in multidisciplinary teams as a member and a leader and be able to manage and analyze complex ethical issues.

Program Specific Outcomes (PSOs)

1. Learn the essential properties of Earth's components, including its core, mantle, asthenosphere, lithosphere, atmosphere, hydrosphere, and biosphere and also demonstrate mastery of the conceptual framework for understanding earth system processes and the development of earth's features overtime.
2. Acquiring geologic data in the field, laboratory, satellites and big data from data banks, analyzing and interpreting the data through application of scientific method.
3. Capable of applying advanced and current concepts and methods of the geosciences to formulate and solve complex geological problems.
4. Students are capable of understanding the impact of a geo-engineering solution in global and societal context.

- 5. Apply knowledge and techniques from allied fields, including mathematics, chemistry, physics, biology, geoengineering, and computing, to solve geological constraints in societal context.**

SRI VENKATESWARA UNIVERSITY: : TIRUPATI
SVU COLLEGE OF SCIENCES
MASTER OF SCIENCE
DEPARTMENT OF GEOLOGY
P.G. DEGREE PROGRAMME (CBCS) REGULATIONS – 2016
AMENDED AS PER NEP – 2020

SEMESTER – I

S.No.	Components of Study	Title of the Course	Title of the Paper	Credit Hrs / week	No. Of Credits	IA Marks	Sem End Exam Marks	Total
1	Core	GEO.101	Crystallography and Mineralogy	6	4	20	80	100
2		GEO.102	Igneous Petrology	6	4	20	80	100
3	Compulsory Foundation	GEO.103a	Structural Geology	6	4	20	80	100
		GEO.103b	Fundamentals of Geophysics	6	4	20	80	100
		GEO.103c	Micropalaeontology & Oceanography	6	4	20	80	100
4	Elective Foundation	GEO.104a	Geomorphology	6	4	20	80	100
		GEO.104b	Meteorology & Climate Change	6	4	20	80	100
		GEO.104c	Energy Resources	6	4	20	80	100
5.	Practical - I	GEO.105P	Crystallography and Mineralogy & Structural Geology and Geotectonics/ Fundamentals of Geophysics/ Micropalaeontology & Oceanography	6	3	15	60	75
6	Practical - II	GEO.106P	Igneous Petrology & Geomorphology/ Meteorology & Climate Change/ Energy Resources	6	3	15	60	75
7	Practical - III	GEO.107P	Geological Field Survey and Training Programme	6	2	10	40	50
	Total			42	24	120	480	600
8	Audit Course	Human Values and Professional Ethics - I		0	0	100	0	0

Note:

- 1) *Students have to choose one paper each from Compulsory Foundation and Elective Foundation.*
- 2) *MOOC online courses will be available in the SWAYAM and SWAYAM PRABHA MHRD web portal. Interested students may register for MOOC with the approval of the DDC but it will be considered for the award of the grade as open elective only giving extra credits.*

SEMESTER – II

S.No.	Components of Study	Title of the Course	Title of the Paper	Credit Hrs / week	No. Of Credits	IA Marks	Sem End Exam Marks	Total
1	Core	GEO.201	Sedimentary Petrology	6	4	20	80	100
2		GEO.202	Stratigraphy and Palaeontology	6	4	20	80	100
3	Compulsory Foundation	GEO.203a	Geochemistry and Isotope Geology	6	4	20	80	100
		GEO.203b	Marine Geology	6	4	20	80	100
		GEO.203c	Computer Applications and Geostatistics	6	4	20	80	100
4	Elective Foundation	GEO.204a	Remote sensing and GIS	6	4	20	80	100
		GEO.204b	Environmental Geology	6	4	20	80	100
		GEO.204c	Gemology	6	4	20	80	100
5.	Practical - I	GEO.205P	Sedimentary Petrology & Geochemistry and Isotope Geology/ Marine Geology/ Computer Applications and Geostatistics	6	3	15	60	75
6	Practical - II	GEO.206P	Stratigraphy and Palaeontology & Remote sensing and GIS/ Environmental Geology/ Gemology	6	3	15	60	75
7	Practical - III	GEO.207P	Geological Field Survey and Training Programme	6	2	10	40	50
	Total			42	24	120	480	600
8	Audit Course	Human Values and Professional Ethics - II		0	0	100	0	0

Note:

- 1) *Students have to choose one paper each from Compulsory Foundation and Elective Foundation.*
- 1) *MOOC online courses will be available in the SWAYAM and SWAYAM PRABHA MHRD web portal. Interested students may register for MOOC with the approval of the DDC but it will be considered for the award of the grade as open elective only giving extra credits.*

SEMESTER - III

S.No.	Components of Study	Title of the Course	Title of the Paper	Credit Hrs / week	No. Of Credits	IA Marks	Sem End Exam Marks	Total
1	Core	GEO.301	Metamorphic Petrology	6	4	20	80	100
2		GEO.302	Economic Geology and Mineral Economics	6	4	20	80	100
3	Generic Elective	GEO.303a	Watershed Management	6	4	20	80	100
		GEO.303b	Photogrammetry					
		GEO.303c	Dimensional stones and Construction materials					
4	Practical - I	GEO.304P	Metamorphic Petrology, Economic Geology and Mineral Economics & Watershed Management / Photogrammetry / Dimensional stones and Construction materials	6	2	10	40	50
5	Skill Oriented Course	GEO.305	Surveying and Field Geology	6	2	10	40	50
6	Practical - II	GEO.306P	Surveying and Field Geology	6	2	10	40	50
7	Practical - III	GEO.307P	Geological Field Survey and Training Programme	6	2	10	40	50
8	Open Elective	GEO.308a	Earth System Processes	6	4	20	80	100
		GEO.308b	Medical Geology					
Total				42	24	120	480	600

Note:

- 1) Students have to Choose One Paper under Generic Elective.

SEMESTER – IV

S.No.	Components of Study	Title of the Course	Title of the Paper	Credit Hrs / week	No. Of Credits	IA Marks	Sem End Exam Marks	Total
1	Core	GEO.401	Hydrogeology and Engineering Geology	6	4	20	80	100
2		GEO.402	Mineral Exploration and Ore Beneficiation	6	4	20	80	100
3	Generic Elective	GEO.403a	Mining Geology	6	4	20	80	100
		GEO.403b	Digital Image Processing					
		GEO.403c	Water Resources Management					
4	Practical - I	GEO.404P	Hydrogeology and Engineering Geology, Mineral Exploration and Ore Beneficiation & Mining Geology / Digital Image Processing / Water Resources Management	6	2	10	40	50
5	Multi Disciplinary Course / Project Work	GEO.405	Environmental Impact Assessment and Management/ Project Work	6	4	20	80	100
6	Practical - II	GEO.406P	Geological Field Survey and Training Programme	6	2	10	40	50
7	Open Elective	GEO.407a	Fuel Geology	6	4	20	80	100
		GEO.407b	Natural hazards and Disaster Management					
	Total			42	24	120	480	600

Note:

- 1) Students have to Choose One Paper under Generic Elective.
- 2) The project work shall be evaluated at the end of the IV semester with 80 marks for the report and 20 marks for the Viva-Voce with a maximum of 100 marks.

I SEMESTER

CORE: GEO.101

CRYSTALLOGRAPHY AND MINERALOGY

Course Objectives:

1. To give students the description of elements of crystallography, crystal structures, symmetry and symmetry functions of different crystal systems and respective minerals.
2. To identify the mineralogical composition of geological materials in order to help to reveal their origin and evolution.
3. Describe the concepts of optical phenomena in thin sections of minerals.
4. Aims to provide knowledge on the structural, chemical identification of the common rock forming minerals and demonstrative how minerals make up Igneous and Metamorphic rocks.

UNIT – I:

Elements of crystallography – Derivation of the 32 crystal classes - Hermann – Maugin symbols -Twinning in crystals – X-ray crystallography.

UNIT – II:

General principles of optics: Refringence – Birefringence, pleochroism, Extinction and measurements of extinction angles, Optical ellipsoids (a) Fresnel's ellipsoid and (b) Fletchers indicatrix, optic axial angle and optic sign, Interference figures – Uniaxial and Biaxial figures, and optic anomalies.

UNIT – III:

Structure of silicates - Isomorphism and Polymorphism - Structure, Chemistry, physical and optical characters and paragenesis of the following mineral groups: Quartz, Feldspars, Feldspathoids, Aluminium silicates, Garnet, Epidote, Olivine, Pyroxene, Amphibole, and Mica.

UNIT – IV:

Structure, chemistry, physical and optical characters and paragenesis of the following Ore minerals: Iron, Aluminium, Copper, lead, and Zinc - Study of the following minerals: Beryl, Apatite, Spene, Tourmaline, Talc and Spinel.

Course Outcomes

1. Students will be able to describe crystal structures, crystal symmetry and twinning
2. Students will learn the use of X-ray crystallography to determine the arrangement of atoms in a crystal.
3. Students will be able to identify the mineralogical composition of geological materials by studying some of the optical properties and techniques in order to reveal their origin and evolution.
4. Students will get thorough knowledge about the physical chemical and optical characteristics of minerals which could lead to the discovery of new uses for Earth's mineral resources.

Textbooks/Reference Books:

1. Paul F. Kerr, 1959: Optical Mineralogy; McGraw-Hill Inc., U.S.
2. A.N. Winchell, 2011: Elements of Optical Mineralogy: An Introduction to Microscopic Petrography, Nabu Press.
3. F.C. Phillips, 2011: An Introduction to Crystallography; Read Books Publ.
4. F.D. Bloss, 1961: An Introduction to the methods of Optical Crystallography; Harcourt School.
5. R.C. Emmons, 1959: The Universal stage; Geological Society of America.
6. W.E. Ford, 1932: Dana's Text Book of Mineralogy; CBS Publishers.
7. Keith Frye, 1974: Modern Mineralogy; Prentice-Hall Inc.
8. W.A. Deer, R.A. Howie, J. Zussman, 2013: An Introduction to Rock-forming minerals, Mineralogical Society of Great Britain & Ireland.

CO – PO Mapping:

POs → COs ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	L								
CO2	M	L	M	L								
CO3	M	L	M	L								
CO4	H	L	H	M								

H: High; M: Medium; L: Low

MODEL QUESTION PAPER
(Revised syllabus w.e.f. 2021 – 2022 for campus students)
M.Sc. DEGREE EXAMINATION – 2022
FIRST SEMESTER
SUBJECT: GEOLOGY
PAPER I - GEO.101: CRYSTALLOGRAPHY AND MINEROLOGY

Time: 3hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Twinning in crystals.
2. Symmetrical Elements.
3. Optical Anomalies.
4. Birefringence.
5. Chain Silicates.
6. Polymorphism.
7. Petrogenesis of Iron
8. Explain physical properties of Tourmaline

SECTION – B

Answer ALL questions. All Questions carry equal marks *4 X 15 = 60 M*

9. a) Derivation of 32 crystal classes

(or)

b) What is twinning in crystals? Explain types of twinning in crystal systems.
10. a) Describe and briefly explain uniaxial and biaxial figures.

(or)

b) Briefly explain Fresnel's ellipsoid with neat sketch.
11. a) Describe briefly the silicate structures with neat sketches.

(or)

b) Physical and optical properties of pyroxene Group.
12. a) Briefly explain the physical, chemical characters and petrogenesis of the Lead and Zinc ore minerals.

(or)

b) Briefly explain the physical, chemical characters and petrogenesis of the Copper ore minerals.

CORE: GEO.102

IGNEOUS PETROLOGY

Course Objectives

1. Knowledge on origin, physical and chemical characteristics and types of magma.
2. To impart knowledge on igneous processes, formation, structures, textures and classification of Igneous rocks – historic perspective and the IUGS system.
3. To understand the Bowen's reaction series and its application to petrogenesis of Igneous rocks by different magmatic processes.
4. To understand the phase equilibrium and crystallization of Uni, Binary and Tertiary systems.
5. To understand the physical and chemical processes that produce the different Igneous rocks types and their petrogenesis and distribution in the earth's crust and mantle.

UNIT – I

Introduction to Magmas - Origin, characteristics and types of magma – Physical Properties of Magma – Bowen's Reaction Principle – Magmatic differentiation: Partial Melting, Fractional crystallization, Volatile transport, Liquid immiscibility, Magma mixing and Assimilation.

UNIT – II

Introduction to Igneous Petrology – Formation of Igneous rocks - Structures and Textures of Igneous rocks - Classification of Igneous rocks: Mode and Norm, CIPW Classification, IUGS system, The Irvine – Baragar classification.

UNIT – III

Gibbs Phase Rule – Lever Rule - Phase Equilibria in Igneous Systems; Phase Rule to the One (Uni) Component Systems – Two (Bi) Component Systems; Binary System with complete Solid Solution, Binary Eutectic System, Binary Peritectic Systems, The Alkali Feldspar System – Three (Tri) Component Systems; Di-Ab-An, Di-Fo-Si, Di-Fo-An, and Fo-An-Si.

UNIT – IV

Petrogenetic Significance of Igneous textures - Petrography and Petrogenesis of major Igneous rock types with examples of Ultramafic, Komatite, Basalt, Anorthosite, Layered intrusions, Granites, Alkaline rocks, Carbonatites, Lamprophyres, Ultramafic related rocks, Pegmatites and Kimberlites.

Course Outcomes

1. Acquire knowledge on the evolution of magma by different processes takes place from origin to emplacement with respect to different tectonic settings.
2. Explain Igneous processes, formation, structures, classification and significance of texture in explaining rock history.
3. Obtain knowledge on the crystallizing phase equilibrium of multi component magma system.
4. Identify different Igneous rocks both in hand specimens and thin sections in terms of their petrogenesis by studying the petrographic characteristics.

Textbooks/Reference Books:

1. Carmichael, Ian S. E, Turner, Francis J and Verhoogen, John, 1974: Igneous petrology, McGraw-Hill, New York.
2. John, D. Winter, 2001: An Introduction to Igneous and Metamorphic Petrology, Prentice Hall Inc.
3. Ronald, D. Frost and Carol, D. Frost, 2014: Essentials of Igneous and Metamorphic Petrology, Cambridge University Press.
4. Myron, G. Best, 2003: Igneous and metamorphic petrology, 2nd edition, Blackwell Publishing Company.
5. Hughes, C.J., 1982: Igneous petrology, Elsevier Science Publishing Company.
6. Chatterjee, S.C., 1974: Petrography of the igneous and metamorphic rocks of India, McMillan Co. Of India, Madras.
7. D.W. Hyndman, 1986 – Petrology of Igneous and Metamorphic rocks, 2nd Edition, McGraw-Hill Co., New York.
8. Francis, J. Turner and Verhoogen, 2004: Igneous and metamorphic Petrology, CBS Publishers.
9. Philpotts A.R. and J. Jay Ague, 2009: Principles of igneous and metamorphic petrology, 2nd edition, Cambridge University Press.

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CO1	M	L	M	L	M							
CO2	M	L	M	L	M							
CO3	M	L	M	L	M							
CO4	H	L	H	M	M							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

**M.Sc. DEGREE EXAMINATION - 2022
FIRST SEMESTER
SUBJECT: GEOLOGY
PAPER II – GEO.102: IGNEOUS PETROLOGY**

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Bowen's Reaction Principles
2. Fractional Crystallization
3. Columnar Joints
4. Irvine – Baragar Classification
5. Gibbs Phase Rule
6. Lever Rule
7. Komatite
8. Kimberlites

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Describe the Origin, characteristics and types of magma
OR
b) Explain the Magmatic differentiation processes
10. a) Describe briefly the Igneous rock classifications
OR
b) Describe the textures of Igneous rocks with neat sketches
11. a) Describe the application of phase rule to the Unicomponent system
OR
b) Explain the phase equilibrium in the Di-Fo-Si system.
12. a) Give a note on Petrogenetic Significance of Igneous textures
OR
b) Explain the petrography and petrogenesis of Basalt

COMPULSORY FOUNDATION: GEO.103a

STRUCTURAL GEOLOGY

Course Objectives

1. To understand how earth's rocks deform at different levels of the lithosphere and develop basic appreciation of rock deformation at different conditions and scales to understand the difference between brittle and ductile deformation regimes.
2. To study the diverse and types of structures in the field to uncover information about the history of deformation (strain) in the rocks to understand the stress field, with emphasis on the regional geology.
3. To understand the tectonic aspects and characteristic features of plutons and to understand the origin of cleavage, schistosity, lineation and their relation to major structures.
4. To understand the Shear zones and their characteristics and textural features typical of Shear zones

UNIT - I

Concept of Stress and Strain: Analyses of Stress and Stress ellipsoid; Analyses of Strain and Strain ellipsoid - Types of Deformation - Mechanics of Plastic Deformation. – Factors controlling behaviour of Materials – Failure by Rupture; Experimental data, Relation of Rupture to Stress, Relation of Rupture to Strain.

UNIT – II

Description of Folds – Nomenclature of Folds – Fold Systems – Recognition of Folds – Mechanics of Folding – Description and Classification of Faults; Criteria for recognition of Faults; Mechanics of Faulting - Normal Faults - Thrust Faults – Strike-Slip Faults – Causes of Folding and Faulting.

UNIT – III

Geometric and Genetic classification of Joints - Unconformities – Salt Domes – Tectonic aspects of Plutons - Emplacement of Large Plutons – Introduction to Cleavage and Schistosity; Terminology for Cleavage and Schistosity; Origin of Cleavage; Relation of Cleavage and Schistosity to Major Structures – Nature of Lineation; Relation of Lineation to Major Structures and Origin.

UNIT – IV

Shear Zones – General Characteristics; Geometries; Types of Shear Zones; Mylonites and Types of Mylonites; Strain in Shear Zones; Crystallographic Preferred Fabrics; Foliation Patterns; Mica Fish; Rotation of Inclusions; Pressure Shadows and Types of Pressure Shadows; Geometry of Fibres; Determining Sense of Shear from Pressure Shadows and Fibres; Porphyroclasts and Porphyroblasts.

Course Outcomes:

1. Able to demonstrate a basic understanding of stress, strain, rheology of earth's lithosphere and comprehend how to describe and classify brittle and ductile structures.
2. Able to describe, identify and analyze the folds, faults and joints and their effects on outcrop pattern.
3. Measure, plot and interpret structural field data and can relate these to geological Maps and knows how to read geological maps and geological cross-section.
4. Obtain knowledge of shear zone characteristics and textures which are usually highly Mineralized zones.

Textbooks/Reference Books:

1. Badgley, P.C. 1965: Structural and Tectonic principles, Harper & Row; First Edition
2. Bayly B. 1992, Mechanics in Structural geology, Springer Verlag.
3. Billings M.P. 1968: Structural geology, printice-Hall of India, Private Ltd., New Delhi.
4. George, H. Davis and Stephen, J. Reynolds 1996: Structural geology of rocks and region, 2nd Edition, John Wiley & Sons, Inc. New York.
5. Blen, A Van Dar Pluijm and Stephen Marshak 1955: Earth Structure, 2nd Edition, W. W. Norton & Company.
6. Gass, I.G, Peter, J. Smith and Wilson. R.C.L., 1971: understanding the Earth, Artemis Press.
7. Hobbs, B.E, Means, W.D. and Williams P.F., 1976: An outline of Structural geology. John Wiley & Sons, Inc, New York.
8. Ramsay, J.G., 1967: Folding and fracturing of rocks. Mcgraw-Hill, New York, USA.

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CO1	M	L	M	L								
CO2	M	L	M	L								
CO3	M	L	M	L								
CO4	H	L	H	M								

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

**M.Sc. DEGREE EXAMINATION - 2022
FIRST SEMESTER
SUBJECT: GEOLOGY
PAPER III – GEO.103a: STRUCTURAL GEOLOGY**

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Stress ellipsoid
2. Types of Deformation
3. Recumbent and Isoclinal Folds
4. Types of faults on the basis of Rake of the net slip
5. Genetic classification of Joints
6. Types of Schistosity
7. Types of Shear zones
8. Porphyroclasts

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Explain in detail the Mechanics of Plastic deformation
OR
b) Discuss the Experimental data on Failure by Rupture
10. a) Describe the nomenclature of folds with neat sketches
OR
b) Explain the Criteria for recognition of faults in the field
11. a) Define Unconformity and Explain different types of Unconformities with sketches
OR
b) Discuss relation of Cleavage and Schistosity to major structures
12. a) Explain how to Determine Sense of Shear from Pressure Shadows and Fibres
OR
b) Describe the Foliation patterns in shear zones

COMPULSORY FOUNDATION: GEO.103b

FUNDAMENTALS OF GEOPHYSICS

Course Objectives

1. To understand the interrelationship between geology and geophysics
2. To know how geophysics helps to explain geodynamical features of the earth
3. To understand the general and exploration geophysics
4. Basic concepts of geophysical methods and integrated approach

UNIT –I

Gravity methods: Gravity potential and field due to different simple bodies and structures - Field procedure - Bouguer gravity anomalies, interpretations & field-cases - Applications of the gravity method.

UNIT - II

Magnetic methods: Magnetic properties of rocks, geomagnetic field, field procedure, measurement of magnetic anomalies, interpretation - Applications of the magnetic method - Seismic method: Seismic waves and wave propagation, Wave attenuation and amplitude - Seismic refraction surveying, layered earth refraction studies - Seismic reflection surveying

UNIT – III

Electrical method: Self potential, earth resistivity, different arrays, profiling & sounding techniques, interpretation & field cases - Induced polarization - Telluric & electromagnetic methods - Ground Penetrating Radar (GPR).

UNIT – IV

Subsurface geophysical methods, Borehole logging: Drilling and its effects on the formations - The measurement of strata dip, borehole inclination and diameter - The self-potential log, Resistivity logs, Radioactivity logs, The sonic log, The temperature log.

Course Outcomes

1. Get knowledge on fundamentals and relationship between geology and physics
2. Acquire knowledge on how geophysics helpful in understanding and explaining the geodynamical features of the earth.
3. Understanding the basic concepts of geophysical methods such as gravity, magnetic, electrical and other sub-surface geophysical methods and integrated approach

Textbooks/Reference Books:

1. El Arabi H. Shendi, 2007; Introduction of Geophysics
2. Lowri, W., 2007: Fundamentals of Geophysics, Cambridge University Press.
3. Dobrin, M.B and Savit, C.H., 1988. Introduction to Geophysical Prospecting, McGraw-Hill.
4. Grant, F.S. and West, G.F., 1965. Interpretation Theory in Applied Geophysics, McGraw Hill, New York.
5. Murthy, L.Y.R. and Mishra, D.C., 1989. Interpretation of Gravity Magnetic Anomalies in Space and Frequency Domain, AEG publication, Hyderabad, India
6. Nettleton, L.L., 1976. Gravity and Magnetism in Oil Prospecting, McGraw Hill.
7. Parasnis, D.S., 1966. Mining Geophysics, Elsevier.
8. Patra, H.P. and Mallick, K., 1980. Geosounding Principles Vol. I Time layering Geoelectric Soundings. Amsterdam: Elsevier.
9. Telford, W.M., Geldart, L.P. and Sheriff, R.E., 1990. Applied Geophysics Cambridge
10. Alan, E. Mussett, Khan, M.A. 2000. Looking in to the earth: An introduction to geological geophysics, Cambridge University Press.
11. Telford, W.M., Geldart, L.P. and Sheriff, R.E., 1990. Applied geophysics. Cambridge University Press.

CO – PO Mapping:

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CO1	M	L	M									
CO2	M	L	M									
CO3	M	L	M									
CO4	H	L	H									

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FIRST SEMESTER

SUBJECT: GEOLOGY

PAPER III - GEO 103 b: FUNDAMENTALS OF GEOPHYSICS

Time: 3 hrs

Max.Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Gravity potential
2. The law of Universal Gravitation
3. Seismic waves
4. Brief note on Geomagnetism
5. Electromagnetic Noise
6. Briefly explain the Electrical Properties
7. Define Apparent Polar Wandering
8. Self-Potential log.

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Enumerate the Interpretation of Gravity Anomalies
OR
b) Explain the Seismic Reflection Surveying
10. a) Write a note on Bouguer gravity anomalies. Describe the applications of Gravity method
OR
b) Give a brief account on Magnetic Surveying Instruments
11. a) Explain in detail the Vertical Electrical Sounding (VES) Method with neat sketch
OR
b) Explain the Constant separation traversing interpretation method with diagram
12. a) Explain in detail the drilling and its effects on the formations
OR
b) Give an account on Resistivity and Radioactivity logs.

COMPULSORY FOUNDATION: GEO.103c

MICROPALAEONTOLOGY AND OCEANOGRAPHY

Course Objectives

1. To give the students basic knowledge of microfossils and their geological applications. It will provide an extended basis for more advanced studies in paleontology and stratigraphy of basin developments.
2. To gain knowledge about the (palaeo) environmental and (palaeo) climatic meaning. Skills development on methods and techniques of biostratigraphy and palaeobiology, applied to the microfossils.
3. To know the techniques in Applying Micropaleontology in hydrocarbon exploration
4. To give an overview of the science of oceanography and how it is practiced to integrate all specific concepts of oceanography into a multidisciplinary analysis of the Earth

UNIT - I

Definition and scope of the subject; Relationship of micropaleontology with ocean sciences; Modern field and laboratory techniques in the study of microfossils (collection, sampling and processing techniques, scanning electron microscopy and mass spectrometry); A brief account of the concepts and methods for the development of micropaleontological indicators useful in reconstruction of history of past, environmental changes and biostratigraphic correlation.

UNIT - II

Types of Microfossils - Calcareous Microfossils: (i) Foraminifera - Planktic foraminifera, their modern biogeography, outline of morphology, significance in Cenozoic oceanic biostratigraphy and paleoceanographic, paleoclimatic interpretations; Benthic foraminifera - their brief morphology and application in bottom water paleoceanography and paleobathymetric reconstructions; Larger foraminifera, their outline of morphology and application in Indian stratigraphy; (ii) Calcareous nannofossils - outline of morphology, modern biogeography and their application in oceanic biostratigraphy and paleoceanographic, paleoclimatic reconstructions; (iii) Ostracoda - outline of morphology and wall structure, their significance in environmental studies and oceanic biostratigraphy; (iv) Pteropoda - a brief introduction, application of pteropods in reconstruction of the Quaternary oceanography and climate; A brief introduction of calpionellids and calcareous algae.

UNIT - III

Siliceous Microfossils: Radiolaria, diatoms and silicoflagellate; outline of morphology, modern biogeography, their environmental significance and application in biostratigraphy - Phosphatic Microfossils: Conodonts; outline of morphology, paleoecology, geological

significance and biological affinities; Stratigraphic significance of conodonts with special reference to India - Application of Micropaleontology in hydrocarbon exploration - Determination and correlation of paleofacies by microfossils - Interpretation of sea floor tectonism from micropalaeontological evidence.

UNIT - IV

History of development of oceanography - Sampling of modern ocean biogenic flux including sediment trap sampling - Methods of measuring properties of sea water - Temperature and salinity distribution (horizontal and vertical) in ocean waters - Dissolved gases in sea water; factors affecting the concentration of gases in sea water - Carbon dioxide equilibria, precipitation and dissolution of carbonates – Biological, chemical, physical interactions in the oceans - Oxygen minimum layer in the ocean - concept of thermohaline circulation; formation of bottom waters - water masses of the world oceans.

Course Outcomes

1. Obtain knowledge of the main systematic groups of microfossils, its distribution and (palaeo) environmental and (palaeo) climatic meaning. Skills development on methods and techniques of biostratigraphy and palaeobiology, applied to the microfossils
2. Application of knowledge and understanding: Collect, organize and analyze descriptive data of microfossils and associated sedimentary materials using adequate concepts, methodologies and techniques.
3. Acquire knowledge in applying the micropalaeontological techniques in the exploration of hydrocarbons.
4. Get knowledge on the principles involved in the generation of waves and tides and evaluate their effects on coastal processes and marine ecosystems. Summarize the major physical and chemical properties of seawater and how each affects marine life.

Textbooks/Reference Books:

1. P.K. Saraswati and M.S. Srinivasan (2016): Micropaleontology: Principles and Applications, Springer.
2. Arnold (2002): Quaternary Environmental Micropaleontology (Ed. Simon K. Haslett), Oxford
3. B.U. Haq and, A. Boersma (1998). Introduction to Marine Micropaleontology, Elsevier.
4. P.R. Pinet (1992): Oceanography: An introduction to the Planet Oceans, West Pub, Co
5. Bignot, G. (1985): Elements of Micropaleontology; Graham and Trotman Ltd., London.
6. David Tolmazin (1985): Elements of Dynamic Oceanography, Allen and Unwin
7. Grant Gross, M. (1977): Oceanography; A view of the Earth, Prentice Hall.
8. John Houghton (1997): Global Warming, Cambridge Univ. Press.

9. Jones, T.P. and Rowe, T.P. (1999): Fossil plants and spores, Modern Techniques, Geological Soc. of London.

CO – PO Mapping:

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CO1	M	L	M	L								
CO2	M	L	M	L								
CO3	M	L	M	L								
CO4	H	L	H	M								

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

SECOND SEMESTER

SUBJECT: GEOLOGY

PAPER III - GEO 103c: MICROPALAEONTOLOGY AND OCEANOGRAPHY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Scope of Micropalaeontology
2. Sampling techniques of Microfossils
3. Brief morphology of Benthic Foraminifera
4. Application of Foraminifera in Paleobathymetric reconstruction.
5. Brief morphology of Radiolaria
6. Conodonts
7. Salinity in ocean waters
8. History of development of Oceanography

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Give a brief note on the field and laboratory techniques in the study of microfossils
OR
b) Write a brief note on the concepts and methods useful in the environmental changes and Biostratigraphic correlation
10. a) Discuss the significance of Foraminifera in oceanic biostratigraphy interpretations.
OR
b) Give an outline of morphology and wall structure of Ostracoda and environmental significance.
11. a) Discuss the modern biogeography of Diatoms and application in biostratigraphy
OR
b) Explain the application of microfossils in hydrocarbon exploration
12. a) Brief the history of development of Oceanography and explain the methods of measuring properties of sea water.
OR
b) Explain the concept of Thermohaline and formation of bottom waters.

ELECTIVE FOUNDATION: GEO. 104a

GEOMORPHOLOGY

Course Objectives

1. To understand the processes that shape the landforms around us and how these depend on climate, tectonic regime outline.
2. To understand and apply geomorphological concepts to problems of slope instability and try to identify the factors responsible for landslide occurrences in various environments and techniques to minimize the mass wasting.
3. To know the evolution of landforms and depositional and erosional landforms of various geological agents.
4. Application of geomorphological concepts in economically important projects.

UNIT – I

Historical background of geomorphology –Fundamentals of geomorphic concepts – Geomorphic significance of weathering; soils and its profile, formation of soils – Mass wasting and its geomorphic significance; creep, solifluction, patterned ground, earth flows, mud flows, debris avalanches, landslides, subsidence forms

UNIT - II

Evolution of landforms; endogenous and exogenous forces, role of lithology, peneplanation, rejuvenation of landforms – Fluvial geomorphic cycle; streams and valleys, valley development, classification of valleys – Drainage patterns and their significance; types of drainage patterns – Morphometric analysis of the drainage basin.

UNIT – III

Depositional and erosional landforms; Fluvial, Aeolian, Glacial, and Coastal – Karst topography - Topography of Ocean floors; geomorphic features on continental shelves and slopes, submarine canyons, classification of sea valleys – Topography of Deep sea floors – Theories and origin of Barrier Reefs and Atolls.

UNIT – IV

Introduction to Paleogeomorphology; Relict land forms – Buried land forms – Exhumed land forms – Application of Geomorphology to Hydrology, Economic geology, Engineering projects and Oil Exploration.

Course Outcomes

1. Able to explain conceptual approaches in geomorphology.
2. Able to describe land forms and land forming processes in different climate zones and tectonic regimes.

- 3 Able to explain different theories and models for landscape evolution.
- 4 Obtain knowledge in recognizing and minimizing the mass wasting.
5. Able to apply geomorphological concepts in economically important projects

Textbooks/Reference Books:

1. Holmes. A, (1972): Principles of Physical Geology, The English language Book society and Nelson
2. Thornbury. W.D, (2004): Principles of Geomorphology, 2 Edition, CBS Publishers and Distributors Pvt. Ltd., New Delhi
3. Robert, S.A. and Sujanne, P.A., (2010): Geomorphology – The mechanics and chemistry of landscapes. Cambridge University Press.
4. Huggett Richard John (2007): Fundamentals of Geomorphology. 2nd Edn, Taylor & Francis.
5. Bloom. A.L., (1992): Surface of the Earth. Prentice Hall India, New Delhi.
6. Savindra Singh, (1998): Geomorphology, CBS Publishers and Distributors Pvt. Ltd., New Delhi
7. Kale, V.S., and Gupta, A. (2005): Introduction to Geomorphology. Orient Blackswan Pvt. Ltd.

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CO2	M	L	M	L	M							
CO3	M	L	M	L	M							
CO4	H	L	H	M	M							

H: High; M: Medium; L: Low

MODAL QUESTION PAPER
(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022
FIRST SEMESTER
SUBJECT: GEOLOGY
PAPER IV – GEO.104a: GEOMORPHOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Fundamentals of Geomorphic Concepts
2. Describe the formation of Soils
3. Explain Valley formation and Valley development
4. Role of lithology in evolution of landforms
5. Fluvial erosional land forms
6. Origin of Barrier Reefs and Atolls
7. Write a note on Buried land forms
8. Significance of Geomorphology in Economic Geology

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Explain the Geomorphic significance of Weathering and describe major soil groups
OR
b) Describe Mass Wasting and its significance in geomorphology
10. a) Give a brief note on Fluvial Geomorphic Cycle
OR
b) Explain types of Drainage Patterns with neat sketches
11. a) Explain the depositional features of Glaciers with neat sketches
OR
b) Describe in detail the topography of Deep Sea Floors
12. a) Define Palaeogeomorphology and describe its characteristic features
OR
b) Give a detailed account on Application of Geomorphology to Oil Exploration

ELECTIVE FOUNDATION: GEO.104b

METEOROLOGY AND CLIMATE CHANGE

Course Objectives

1. To produce graduates who possess quantitative, scientific reasoning skills that can be applied to atmospheric problems.
2. To understand the skills for interpreting and applying atmospheric observations and knowledge of the atmosphere and its evolution.
3. Learn explain short- and medium-term weather forecasts based on sound meteorological principles.
4. To understand the physical basis of the natural greenhouse effect and the way various human activities are increasing emissions of the natural greenhouse gases.
5. To understand and explain the causes of climate change

UNIT - I

Meteorology: branches and applications - Energy spectra of sun and earth, long wave radiation, Global radiation balance, Solar energy - Atmosphere: Composition and structure of atmosphere, Layered structure of atmosphere – influences of air temperature, Surface temperature, daily cycle of temperature, annual cycle of temperature - Precipitation processes.

UNIT - II

El Nino: Introduction, upwelling. El Nino, La Nina events and consequences: Detection and prediction of El Nino - Weather forecasting: Persistence, trends, climatology, analog and numerical weather prediction methods - Forecasting surface features: Anti cyclone, cyclone, cold front and warm.

UNIT - III

Climate Change: Introduction, definition - Classification of climate; - Climatic changes through geological time, Assessing climate change, Human intervention on climate change - Greenhouse effect, greenhouse gases, Climatic change and global warming, Kyoto protocol.

UNIT - IV

Causes of climate change: Ocean circulation pattern, Changes in compositions of atmosphere, Changes in solar radiation - Impact of climate change: Rising of CO₂, impact on atmospheric circulation & weather pattern – biosphere – hydrosphere – Sea level changes, Adaptation provinces.

Course Outcomes

1. Possess scientific reasoning skills that can be applied to atmospheric problems and learn to explain short- and medium-term weather forecasts based on sound meteorological principles.

2. Explore El Nino impact and interpret weather forecasting.
3. Appraise climate change and predict it from geological records.
4. Explore impact of climate change.

Textbooks/Reference Books:

1. Alan, H. Strahler and Arthur, N. Strahler 1992: Modern Physical Geography, Fourth Edition, John Wiley & Sons. Inc
2. Alan Strahler and Arthur Strahler (2002): Physical Geography, 2nd edition, John Wiley & Sons Inc.
3. Byers (2005), Meteorology, The Encyclopedia of Britannia, 15th Ed.
4. Dorothy J. Meeritts and Andrew De (1997): Wet & Kirsten Menking, Environmental Geology – W.H. Freeman and Company, New York
5. Horace General, (1994): Meteorology, McGraw Hill., New York
6. John, M. Das (1995): The Monsoons, National Book House Trust, New Delhi (Third Edition)
7. Rev. Fr. S. Ignacimuthu (2010): Environmental Studies, MJP, Publishers,
8. Travis Hudson (2012): Living with Earth-An Introduction to Environmental Geology, PHIL earming Private Ltd.

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MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FIRST SEMESTER

SUBJECT: GEOLOGY

PAPER IV - GEO 104b: METEOROLOGY AND CLIMATE CHANGE

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Define Meteorology and explain scales in Meteorology
2. Energy Spectra of Sun and Earth
3. Composition of Atmosphere
4. El Nino
5. Climatology
6. Green House effect
7. Changes in Solar Radiation
8. Sea level changes

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Explain the branches of Meteorology and its applications
OR
b) Give a detailed note on Earth's Radiation Balance
10. a) Define El Nino and explain its events and consequences
OR
b) Explain the Weather Forecasting methods
11. a) Explain the effects classification of Climate
OR
b) Give an account on Climatic changes through geological time
12. a) Explain the causes of Climatic change
OR
b) Give a detailed note on impact of climate change

COMPULSORY FOUNDATION: GEO.104c

ENERGY RESOURCES

Course Objectives

1. To understand the basics of renewable energy sources like Solar, Wind, Wave, Coal, Petroleum and Atomic energy.
2. To assess the formation and distribution of reserves of Sources of Energy
3. To develop skill to characterise the energy resources based on feasibility

UNIT – I

Historical perspective of the Energy and its use – Principles of Renewable Energy – Solar Radiation and Green house Effect – Solar Water Heating - Solar Thermal Applications – Hydropower – Wind Resource and Wind Power Technology - Biomass Resources from Photosynthesis – Bioenergy Technologies - Wave Power; Tidal-current and Tidal-range Power - Types of geothermal source - Applications, Exploration, Distribution of geothermal energy - Geothermal sources in India: Future scenario

UNIT – II

Coal: Physical, chemical and optical properties of coal - Changes in properties of coal with metamorphism - Classification of coal in terms of Rank, Grade and Type – Petrology and Palynology of Coal - Conditions of formation of coal and coal seams - Industrial utilization of coal - Coal resources of India.

UNIT – III

Petroleum: Composition and physical characteristics of petroleum, fuels and other by-products of petroleum -Source rock types and examples – Origin and migration of petroleum – Entrapment of petroleum– seal rocks; structural traps; stratigraphic traps – petroleum resources and reserves – Petroliferous basins of India - exploration and exploitation of petroleum.

UNIT – IV

Concept of atomic energy - Radioactive minerals - Mode of occurrence and association of atomic minerals in nature - Geochemical abundance of radioactivity in crustal rocks, Productive geological horizons of atomic minerals in India - Nuclear raw material resources of India - Usage of nuclear energy.

Course Outcomes

1. Explain about Renewable Energy resources and importance.
2. Able to understand the types and its characteristics of energy resources
3. Analyse the potential of energy sources and their scope and limitations.

Textbooks/Reference Books:

1. John Twidell and Tony Weir, 2015: Renewable Energy Resources, Routledge.
2. Renu Dhupper, 2015: Textbook of Energy Resources and Management, CBS Publishers.
3. Andrew, L. Simon, 1975: Energy Resources, Elsevier Inc.
4. Kothari, D.P. et. al., 2011: Renewable Energy Sources and Emerging Technologies, Prentice Hall, India.
5. Navani J.P., and Sapra Sonal, 2015: Non-conventional Energy Resource; S. Chand & Company.

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CO2	M	L	M									
CO3	M	L	M									
CO4												

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FIRST SEMESTER

SUBJECT: GEOLOGY

PAPER III - GEO 104 c: ENERGY RESOURCES

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Energy and its Uses
2. Solar Radiation
3. Impact of metamorphism on Coal
4. Physical and Optical properties of Coal
5. Composition and Physical characteristics of Petroleum
6. Origin of Petroleum
7. Geochemistry of Uranium
8. Usage of Nuclear Energy

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Give an account on Hydropower energy and technology
OR
b) Explain the Wind resource and Wind power technology
10. a) Explain in detail the classification of Coal
OR
b) Describe in detail the Coal resources of India
11. a) Explain the effects of geological agents on the properties of Reservoir rocks
OR
b) Give an account on Entrapment of Petroleum
12. a) Give an account on geochemical abundance of radioactivity in crustal rocks
OR
b) Give a detailed note on nuclear raw material resources of India

PRACTICAL SYLLABUS

PRACTICAL I – GEO.105P:

CRYSTALLOGRAPHY AND MINERALOGY AND STRUCTURAL GEOLOGY

Course Objectives:

1. To give students the description of elements of crystallography, crystal structures, symmetry and symmetry functions of different crystal systems and respective minerals.
2. To identify the rock forming minerals megascopically.
3. To identify the rock forming minerals microscopically.
4. Aims to study the optical properties of minerals.

CRYSTALLOGRAPHY AND MINERALOGY SYLLABUS

1. Crystallography: Identification of crystal models of 32 crystal classes and their crystals.
2. Megascopic Identification of rock forming minerals.
3. Microscopic Identification of rock forming minerals.
4. Determination of Optic axial angle ($2V$).
5. Determination of Optic orientation ($Z^{\wedge}C$).
6. Determination of extinction angle
7. Determination of Anorthite content of the Plagioclase

Course Outcomes:

1. Students will be able to describe crystal structures, crystal symmetry and twinning.
2. Able to identify and study the physical and optical properties of the different rock forming minerals both megascopically.
3. Students will get thorough knowledge about some of the optical properties and techniques of the minerals to reveal their origin and evolution.

Course Objectives:

1. Trained in determining the thickness of the ore body, and structural problems related to attitude of the rock formations.
2. Trained to determine the simple problems related to structural features of the rocks.
3. Trained to understand the structural field data and knows how to read geological maps and geological cross-sections.

STRUCTURAL GEOLOGY

8. Structural Problems concerning Dip and strike
9. Estimation of thickness – Depth of ore body.
10. Determination of Throw/Heave/Stratigraphic separation etc., related to faults.
11. Preparation and interpretation of Geological maps and sections
12. Preparation of contour diagrams.
13. Recording and plotting of field data

Course Outcomes:

1. Able to determine and solve the problems related to various structural features of the rock strata/ore body related to their thickness, strike and dip and enable the industry giving an idea how to extract the minerals economically.
2. Able to Measure, plot and interpret structural field data and can relate these to geological maps and knows how to read geological maps and geological cross-section.

PRACTICAL II – GEO.106P:

IGNEOUS PETROLOGY AND GEOMORPHOLOGY

Igneous Petrology Practical:

Course Objectives:

1. To impart knowledge on the megascopic and microscopic identification and study of various physical as well as optical properties of different types of igneous rocks.
2. To do modal analyses of important igneous rocks to determine the quantitative mineralogy, classification and petrography.
3. Gain knowledge on how to do CIPW norm classification of igneous rocks and variation diagrams to understand the evolution of igneous rocks.
4. Learn how to draw Discriminate diagrams of Pearce and Cann.

IGNEOUS PETROLOGY SYLLABUS

1. Megascopic and microscopic examination of igneous rocks.
 - a) Different types of granites, pegmatites, syenites, anorthosites, dunites, peridotites, pyroxinites, basalts, andesites, rhyolites, trachytes, phonolites, kimberlites, dolerites, lamprophyres.
2. Modal analysis of some important igneous rocks and their classification.
3. Calculation of CIPW Norm
4. Variation diagrams: Harker and Niggli

5. Discriminate diagrams of Pearce and Cann.

Course Outcomes:

1. Students will be able to identify and study the various igneous rocks megascopically and microscopically to determine the physical properties, mineralogical composition, textural characteristics to classify the igneous rocks.
2. Acquire knowledge of doing modal analyses of igneous rocks to determine the quantitative mineralogy, classification, and petrography.
3. Able to do CIPW norm calculations to classify the igneous rocks and also interpret the evolution of igneous rocks by drawing variation diagrams of Harker and Niggli.
4. Able to draw discriminate diagrams to understand the tectonic affinity of volcanic igneous rocks.

Geomorphology Practical:

Course Objectives:

1. Knowledge about the study of topographic sheets and understand the physiographic features of an area and also knows contour variations and elevations of the study area.
2. Knows about preparation of drainage basin maps and morphometric analysis of the drainage basin.
3. Learn about the calculation of slope of an area and preparation of slope map.

GEOMORPHOLOGY SYLLABUS

1. Study of topographic sheets and preparation of physiographic description of an area
2. Study of soil profile of any specific area
3. Study of contour variations and elevations on toposheets.
4. Identification, classification and preparation of drainage basin map on toposheet.
5. Morphometry analysis of the drainage basin:
 - a. Linear aspects
 - b. Aerial aspects and
 - c. Relief aspects.
6. Calculation of slope and preparation of slope map of a basin

Course Outcomes:

1. Able to study and interpret the topographic sheets and physiographic features of an area.

2. Acquire knowledge about the preparation of drainage basin maps and able to do morphometric analysis of drainage basin to assess and manage both ground and surface water resources.
3. Able to do calculation of slope and preparation of slope map for the detailed evaluation of particular site in terms of slope stability.

PRACTICAL III – GEO.107P:

GEOLOGICAL FIELD SURVEY AND TRAINING PROGRAMME

Course Objectives:

1. Identification and petrogenetic characteristics of minerals and rocks in the field.
2. Identification of various geological structures such as folds, faults, unconformities and joint systems of different rock formations in the field.
3. Able to identify and study various soil profiles and various landforms in the field.

Syllabus:

1. Identification and petrogenetic studies of minerals and rocks in the field.
2. Study of attitude of geological formations in the field.
3. Identification of folds, faults, unconformities and joint systems of the geological formations in the field.
4. Identification and study of various landforms in the field.
5. Observation of profiles of various soils in the field.
6. Preparation of field report (draft) incorporating the above said geological characteristics in the field.

Course Outcomes:

1. Identify, observe the different minerals and rocks in the field and study the petrogenetic properties of the rocks.
2. Students will be able to identify and interpret the different structural features present in the geological formations under the different geological conditions in the field.
3. Able to study various soil profiles and various landforms in the field in order to improve and maintain the sustainability of our environment and predict and reduce the impact of contemporary earth surface processes that lead to natural hazards (such as landslides)

Audit Course:

HUMAN VALUES AND PROFESSIONAL ETHICS – I

Course Objectives

- 1 To provide Human Values and Ethics relating to Religion, Business, Law, Media and Environment.
- 2 To provide in depth knowledge about the Moral and ethical values to interpretation in their day to day activities of life.

UNIT – I

Definition and Nature of Ethics - Its relation to Religion –Politics –Business Law - Medicine and Environment - Need and Importance of Professional Ethics – Goals – Ethical Values In various Professions.

UNIT – II

Nature of Values - Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values - Analysis of basic moral concepts: rights, ought, duty, obligation, justice, responsibility and freedom, Good behaviour and respect for elders, Character and Conduct.

UNIT – III

Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya (Non Possession) and Aparigraha (Non- stealing), Purusharthas (Cardinal virtues), Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desire), Moksha (Liberation).

UNIT – IV

Bhagavad Gita - Niskama karma. (b) Buddhism; The Four Noble Truths – Aryastanga marga, (c) Jainism - mahavratas and anuvratas - Values Embedded in Various Religions, Religious Tolerance, Gandhian Ethics.

UNIT – V

Crime and Theories of punishment - (a) Reformative, Retributive and Deterrent (b) Views on Manu and Yajnavalka.

Course Outcomes

- 1 After completion of this course the students will be able to know the importance of Ethics and Human Values in various professions.
- 2 Students also will get in depth knowledge and understanding of moral values and ethical code of the Indian Society. Especially embedded in various scriptures.

Textbooks/Reference Books:

1. Join, S. Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D Irwin Inc.
3. “Management Ethics – Integrity at work’ by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H Titus: Ethics for Today
6. Maitra. S.K. Hindu Ethics
7. William. Lilly: Introduction of Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manava Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed.) G.C. Haughton.
10. Susruta Samhita: Tr.Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit Series, Vol I, II & III, Varansi, Vol 100, 16-20, 21-32 and 74-77 only.
11. Charaka Samhita: Tr. Dr. Ram Karam Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series office, Varanasi I, II, III Vol I PP 183-191.
12. Ethics: Theory and Contemporary Issues, Barbara Mackinnon, Wardsworth/Thomson Learning 2001.
13. Analyzing Moral Issue, Judith, A Boss, Mayfield, Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed) John H Piet and Ayodyha Prasad, Cosmo Publications.
15. Text Book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C., Sharma Ethical Philosophy of India Nagin & Co, Jalandhar.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2	M	L										
CO3	M	L										
CO4	H	L										

H: High; M: Medium; L: Low

II SEMESTER

CORE: GEO.201

SEDIMENTARY PETROLOGY

Course Objectives

1. Aim is to study ‘Sediments’ to derive information on the depositional conditions which acted to deposit rock unit.
2. To establish the relation of the individual rock units in a basin to understand the evolution of the sedimentary sequences.
3. To learn different sedimentary environments.

UNIT- I:

History of Sedimentology – Nature and Origin of Sedimentary Rocks – Sedimentary Processes: Subaerial Weathering Processes and Products, Submarine Weathering Processes and Products – Fundamentals of Fluid Flow – Particle Transport by Fluids – Particle Transport by Sediment Gravity Flows.

UNIT – II

Sedimentary Textures: Grain Size, Particle Shape, Fabric – Sedimentary Structures: Internal Organization and Structure of Beds, Bedding Plane Markings and Structures, Deformed and Disturbed Bedding, Stromatolites and Other Biogenic Structures, Diagenetic Structures.

UNIT – III

Petrogenesis of Sedimentary Rocks: Texture, Structure and Petrography of Clastic, Volcaniclastic, Conglomerates, Breccias, Sandstone and Shale – Non-Clastic: Limestone - Sedimentary Environment and Facies: Concept - Sedimentary Facies association methods – Characteristics of Continental-Desert, Fluvial, Glacial, Lacustrine and Deltaic Environments - Marine Littoral and Barrier complex Depositional Environment.

UNIT – IV

Basin Analysis, Tectonics and Sedimentation: Mechanisms of Basin Formation, Plate tectonics and Basins, Techniques of Basin Analysis, Applications of Basin Analysis – Sedimentary Basins of India.

Course Outcomes

1. Able to identify different sedimentary rocks in both hand specimens and thin section and derive information on the depositional conditions and environments.
2. Able to study the sequence of sedimentary rock strata and describe the tectonic framework of sedimentation to understand the earth’s history including palaeoclimatology and history of life.

Textbooks/Reference Books:

1. Leeder, M., 1999. Sedimentology and Sedimentary Basins From Turbulence to Tectonics. Blackwell, Oxford.
2. Lindholm, R., (1988) A practical approach to Sedimentology. Blackwell publication.
3. Gary Nicols, (2009): Sedimentology and Stratigraphy, 2nd Edn., Wiley-Blackwell.
4. Pettijohn, F.J., (1975) Sedimentary rocks. Harper and Row Publ., New Delhi
5. Selley, R.C.,(2000) Applied sedimentology, 2nd Edn., Academic Press,.
6. Sengupta, S.M, (2007), Introduction to Sedimentology, CBS Publishers & Distributors, New Delhi.
7. Sam Boggs. Jr. (2009): Petrology of Sedimentary Rocks, 2nd Edn., Cambridge University Press.
8. Sam Boggs, Jr. (2006): Principles of Sedimentology and Stratigraphy, 4th Edn., Prentice Hall, New Jersey.
9. Donald. R. Prothero, and Fred Schwab (2014): Sedimentary Geology, 3rd Edn, W.H. Freeman & Company, New York.

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POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2	M	L										
CO3	M	L										
CO4												

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

SECOND SEMESTER

SUBJECT: GEOLOGY

PAPER I – GEO.201: SEDIMENTARY PETROLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Brief note on Origin of Sedimentary Rocks
2. Fundamentals of Fluid Flow
3. Explain factors to determine the Shape of the grains in Sedimentary rocks
4. Ripple Marks
5. Classification of Sandstones
6. Concept of Sedimentary facies
7. Sediments of Tide dominated Shelves
8. Mechanisms of Basin formation

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Describe the Sedimentary processes
OR
b) Explain the process of Particle Transport by Sediment Gravity Flows.
10. a) Explain the techniques used in Measuring the Size of the Siliciclastic grains
OR
b) Describe the classification of Sedimentary rocks based on Stratification and Bedforms.
11. a) Explain the Diagenesis of Carbonate Sedimentary rocks
OR
b) Explain in detail the Depositional Environment of Fluvial Systems
12. a) Explain the Depositional setting, Sedimentary processes and Sediment characteristics of Carbonate deposits
OR
b) Give a Brief note on Sedimentary Basins in India

CORE: GEO.202

STRATIGRAPHY AND PALAEOONTOLOGY

Course Objectives

1. To make the students to understand basic principles and nomenclature of Stratigraphy methods of Stratigraphy correlation and geological time scale.
2. To know the classification, lithology, structures of major stratigraphic units with economic importance.
3. Major stratigraphic boundary problems with reference to India.
4. To acquire skills on identification, classification and documentation of palaeobiota.
5. Acquire knowledge on morphology, classification and evolutionary trends of invertebrate fossils.
6. Describe evolutionary, separation and classification of different microfossils and application of micropalaeontological techniques in hydrocarbons exploration.

UNIT-I:

Recent developments in stratigraphic classification - stratigraphic nomenclature-lithostratigraphy, biostratigraphy and chronostratigraphy - Archaean cratonic nuclei of Peninsular India (Dharwar, Singhbhum, and Aravalli cratons) - Proterozoic mobile belts (Central Indian Tectonic Zone, Aravalli-Delhi and Eastern Ghats).

UNIT- II:

Brief account of classification, lithology, structures and fossil content with economic importance of Archaean, Puranas - Phanerozoic stratigraphy of India, Tertiary, Siwaliks and Indo-Gangetic alluvium - Concept of sequence stratigraphy - Rates of sediment accumulation - Unconformities.

UNIT- III:

Fossil record and geological time scale - Modes of preservation of fossils and concept of taphonomy; evolutionary trends in Trilobites, Gastropods, Mollusca, Cephalopoda, Brachiopoda, and Echinodermata – Micropaleontology: methods of preparation of microfossils - Morphology of microfossil groups (Foraminifera, Ostracoda) - Gondwana plant fossils and their significance.

UNIT- IV:

Applications of paleontological data in stratigraphy, paleoecology and paleoclimatology - Environmental significance of fossils - Use of microfossils in interpretation of sea floor tectonism - Application of micropaleontology in hydrocarbon exploration - Oxygen and Carbon isotope studies of microfossils and their use in paleoceanographic and paleoclimatic interpretation.

Course Outcomes

1. Students would have acquired comprehensive knowledge on principles of Stratigraphy, correlation methods classification of stratigraphic units, tectonic framework of India and Geological timescale.
2. Ability to give an account of various stratigraphic units and give stratigraphic column distribution in India, fossil content and economic importance of given geological formation.
3. Apply standard stratigraphic codes while preparing geological reports
4. Describe morphology, classification, evolutionary trends of Invertebrate fossils with geological and geographic distribution and paleoecological and paleo-environmental relevance.
5. Ability to identify, classify and describe the morphology of the invertebrate fossils and plant fossils.
6. Application of fossils in establishing the age of the rock unit, correlation with other area, and Use of fossil in finding mineral deposits.
7. Ability to apply micropalaeotological techniques in hydrocarbon exploration.

Textbooks/Reference Books:

1. Krumbein, W.C. & Solss, L.L., 1951; stratigraphy and Sedimentation; W.H. Freeman and company.
2. Carl, O. Dunbar & John Rodgers., 1957: Principles of Stratigraphy; John Wiley.
3. M.S. Krishnan, 2012: Geology of India & Burma; CBS Publishers
4. Wadia, D.N., 1953: Geology of India, ST. Martin's Press Inc., New York.
5. Ravindra Kumar, 1985: Fundamentals of Historical Geology and stratigraphy; New Age Publishers
6. R.C. Mehdiratta: Geology of India, Pakistan, Bangladesh & Burma.
7. Purana basins of peninsular India – published by geological society of India, Bangalore.
8. Gondwana of India, Special volume Published by Gondwana society of India.
9. Geo karnataka, Centenary Volume, Published by Mysore geological department.

CO – PO Mapping:

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CO1	M	L	M	L	M	M	L					
CO2	M	L	M	L	M	M	L					
CO3	M	L	M	L	M	H	M					
CO4	H	L	H	M	M	H	L					

H: High; M: Medium; L: Low

MODEL QUESTION PAPER
(Revised Syllabus w.e.f.2021-2022 for campus Students)
M.Sc., DEGREE EXAMINATION-2022
SECOND SEMESTER
SUBJECT: GEOLOGY
PAPER II – GEO.202: STRATIGRAPHY AND PALAEOONTOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Lithostratigraphy
2. Biostratigraphy
3. Economic importance of Vindhya
4. Indo-Gangetic alluvium
5. Concept of Taphonomy
6. Mode of preservation of fossils
7. Uses of microfossils
8. Palaeoclimatic interpretation

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

- 9 a) Give an account of recent developments in stratigraphic classification and its nomenclature
(OR)
b) Write an essay on Archaean cratonic nuclei of Peninsular India
- 10 a) Brief an account of classification, lithology, structures and its fossil content with economic importance of Cuddapahs
(OR)
b) Write an essay on phanerozoic Stratigraphy of India
- 11 a) Describe the morphological characters and time range of evolutionary trends in Trilobites
(OR)
b) Briefly explain the fossil record and geological time scale
- 12 a) Write an essay on role of foraminifera in hydrocarbon exploration
(OR)
b) Give an account of environmental significance of fossils and trace fossils

COMPULSORY FOUNDATION: GEO.203a

GEOCHEMISTRY AND ISOTOPE GEOLOGY

Course Objectives

1. This course first lays out the basic principles and techniques of modern geochemistry,.
2. Understanding processes in aqueous systems and the behaviour of trace elements in magmatic systems.
3. Introduces radiogenic and stable isotope geochemistry and illustrates their application to such diverse topics as determining geologic time, ancient climates. The focus then broadens to the formation of the solar system, the Earth, and the elements themselves.

UNIT- I:

Definition, scope and development of geochemistry - Geochemical classification of elements; Goldschmidt's classification of elements - Fractionation of elements in minerals/rocks - Geochemical principles - Geochemical cycle – Meteorites: classification, mineralogy, age and origin.

UNIT-II:

Chemical composition and characteristics of atmosphere, lithosphere, hydrosphere - Fick's laws of diffusion and activity composition relation (Roult's and Henry's law) - Application of trace elements in petrogenesis - Principles of equilibrium and Rayleigh fractionation - REE patterns, Eh and pH diagrams and mineral stability

UNIT- III:

Cosmic abundance of elements - Geochemical evolution of the earth - Distribution of major, minor and trace elements in crust and mantle - Mantle reservoirs - Geochemistry of water and water-rock interaction.

UNIT-IV:

Isotope geology: Isotopes and the periodic table - Stable Isotopes: Oxygen Isotopes, Sulfur Isotopes, Carbon Isotopes – Radioactivity and geochronology and brief outline of Rb-Sr, K-Ar and radiocarbon (C^{14}) systems.

Course outcomes

1. Understand the behaviour of elements in a geochemical context and relate this knowledge to how elements redistribute within the Earth.
2. Learn to interpret and explain interactions between Earth reservoirs.
3. Understand and interpret the major processes that form and modify the Earth's crust and mantle.
4. Use isotopes to trace geological processes and age date specific events.

Textbooks/Reference Books:

1. Manson, B. and Moore, C.B. 1991: Introduction to Geochemistry, Willey Eastern.
2. Krauskopf, K.B., 1967: Introduction to Geochemistry. McGraw Hill.
3. Faure. G., 1986: Principles of Isotope geology. John Wiley.
4. Henderson, P., 1987: Inorganic Geochemistry, Pergamon Press.
5. Arthur H. Brownlow, 1979. Geochemistry. Prentice-Hall, Inc. Englewood Cliffs, N.J

CO – PO Mapping:

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CO4	H	L	H	M								

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MODEL QUESTION PAPER
(Revised Syllabus w.e.f.2021-2022 for campus Students)
M.Sc., DEGREE EXAMINATION-2022
SECOND SEMESTER
SUBJECT: GEOLOGY
PAPER III – GEO.203a: GEOCHEMISTRY AND ISOTOPE GEOLOGY

Time: 3 hrs

Max. Marks:80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Scope of Geochemistry
2. Geochemical principles
3. Structure of Atmosphere
4. Applications of Trace elements
5. Cosmic abundance of elements
6. Mantle reservoirs
7. Sulfur Isotopes
8. Dating method of K-Ar

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. (a) What are Meteorites? Give a detailed account on the classification and mineralogy of Meteorites.
Or
(b) Describe the Geochemical classification of elements.
10. (a) Explain the structure, composition and characteristics of atmosphere.
Or
(b) Write an essay on principles of equilibrium Rayleigh fractionations.
11. (a) Give an account of Geochemical evolution of Earth?
Or
(b) Briefly explain the distribution of major, minor and trace elements in crust and mantle.
12. (a) What are stable Isotopes? Describe the carbon and sulfur Isotopes. Add a note on its importance in the Geological studies.
Or
(b) What is radioactivity? Write a detailed note on Rb-Sr and K-Sr systems.

COMPULSORY FOUNDATION: GEO.203b

MARINE GEOLOGY

Course Objectives

- 1.To introduce the basic knowledge on ocean environment and processes associated in it.
- 2.To understand the Ocean floor tectonics
- 3.To develop skills to classify Coastal morphology
- 4.To estimate the sediments and marine deposits

UNIT – I

History of Marine Geology ,Waves, tides, currents, turbidity currents, long shore currents, rip currents, circulation - Wave Action: wave reflection, refraction and diffraction – Seiche and tsunamis – Coastal Zone Morphology (Estuaries, deltas, bays, raised beaches, features of wave erosion and deposition, tombolos, mudbanks) – Deep sea Morphology (Continental shelf, Continental slope, abyssal plains, seamounts, guyots, fracture pattern.

UNIT – II

Littoral processes – Evolution of headlands and bays – Beaches – Raised and sunken features – Evolution and classification of sea coasts and shore lines: Terrestrial, lacustrine, Shallow marine, deep sea - Siliciclastic versus carbonate sedimentation - Deep ocean silica burps - shelf-to-basin transport phenomena turbidities and gravity flows – Submarine groundwater discharge.

UNIT – III

Causes of marine regression and transgression – Description of important regressions and transgressions in the geological past – Eustasy – Origin and distribution of ocean basins – Palaeoceanography - Ocean floor tectonics: Characteristics of Oceanic Plate – Geologic processes along Oceanic Plate boundaries – Seafloor Spreading – Evidence – lithospheric plates – Divergent plate boundaries – Trenches as convergent plate boundaries – Subduction zones– Transform fault boundaries.

UNIT – IV

Marine sedimentation – Sources, types and distribution of marine sediments – Transport of sea bottom sediment – Rate of deposition – Mineral resources: Marine phosphorite, glauconite, barium sulphate concretions, Polymetallic nodules– Gas hydrates – Beach placers: Terrigenous, Biogenic and Chemical Types – Placer Deposits - Distribution of temperature, salinity and density - Coastal zone regulation in India – India as Pioneer Investor in Seabed mining

Course Outcomes

- 1.Explain different types of the world oceans and their fundamental properties;
- 2.Classify and explain the physiographic provinces of the oceans
- 3.Understand the physical and other geological processes going on in the world ocean
- 4.Interpret the various types of data and manage the coastal environments.

Textbooks/Reference Books:

1. King, C.A.M., (1975): Introduction to Marine Geology and Geomorphology. Edward Arnold, London.
2. Radhakrishnan,V., (1996): General Geology, V.V.P. Publishers, Tuticorin.
3. Seabold, E. and Berger, W.H., (1982): The Sea Floor, Springer Verlag.
4. Kuenen, Ph. H., 1950. Marine Geology. John Wiley and Sons.
5. Shepard, F.P., (1978): Geological Oceanography, Heinmann, London.
6. Harper and Row. Kurekian, K.K., 1990: Ocean, Prentice Hall. New Jersey.
7. Svedrup, J.F., (1969): The Ocean, A Scientific American book, W.H. Freeman and company, San Francisco.
8. Kennett, J.P. (1982): Marine Geology. Prentice Hall., New Jersey.
9. Weisberg, C.P. (1979): Oceanography. McGraw Hill., New York.

CO – PO Mapping:

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CO1	M	L	M	L								
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MODEL QUESTION PAPER
(Revised Syllabus w.e.f.2021-2022 for campus Students)
M.Sc., DEGREE EXAMINATION-2022
SECOND SEMESTER
SUBJECT: GEOLOGY
PAPER III – GEO.203b: MARINE GEOLOGY

Time: 3 hrs

Max. Marks:80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Turbidity currents
2. Features of Wave erosion
3. Evolution of Beaches
4. Evolution of terrestrial shorelines
5. Sea-floor Spreading
6. Trenches
7. Types of Marine sediments
8. Gas Hydrates

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. (a) Explain the coastal zone morphology.
Or
(b) Describe the Deep sea morphology
10. (a) Explain the Evolution of Headlands and Bays
Or
(b) Describe the evolution and classification of Sea coasts.
11. (a) Explain in detail the causes of marine transgression and regression
Or
(b) Describe the origin and distribution of Ocean basins
12. (a) Write an essay on marine mineral resources
Or
(b) Explain the coastal zone regulations in India

COMPULSORY FOUNDATION: GEO.203c

COMPUTER APPLICATIONS AND GEOSTATISTICS

Course Objectives

1. To introduce the basic knowledge of Computer applications and statistics related to Geology
2. To understand various methods to store and analyze the geological data using computer applications
3. To develop skills to interpret the geological data based on statistical methods
4. To estimate the quantity of geological resources to assess the economic importance.

UNIT – I

Documentation in MS Word - Working with basic formulas and tables in MS Excel
- Preparation of presentation in MS Power Point – Image manipulation and drawing

UNIT – II

Database Management Systems – open source softwares used in earth sciences

UNIT – III

Statistical applications:

Frequency Distribution, frequency curve and its characteristics – Mean, Median and Mode, Relationship between mean, median and mode - Cumulative frequency: Characteristics of cumulative frequency curve, Applications of cumulative Frequency curves.

UNIT - IV

Variance, Standard Deviation, Covariance, Coefficient of variation, Skewness and kurtosis - Binomial distribution: Characteristics, Approximating, uses. Sampling - Simple Random sampling, Restricted Random sampling – Grid sampling, Stratified sampling, Cluster sampling.

Course Outcomes

1. Comprehend the database related to field geological data
2. Prepare and Interpret graphical and pictorial data
3. Exposure to some selected softwares related to geology

Textbooks/Reference Books:

1. D. D. Sharma, 2002: Geostatistics with applications in Earth Sciences, Capital Publishing Company, New Delhi.

2. Saroj, K. Pal, 1998: Statistics for Geoscientists, Concept Publishing Company.
3. Rajaraman, V. 2014: Introduction to Computers; PHI Learning.
4. Rons Mansfield, 2001: Working in MS Office, McGraw Hill.
5. Singh, M.P.: Computer Fundamentals, Foundation Publishing House.

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CO4	H	L	H									

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

SECOND SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.203c: COMPUTER APPLICATIONS AND GEOSTATISTICS

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks 4 X 5 = 20 M

1. what is mail merge
2. write four short cuts in word
3. What are types of Databases
4. Name some open source software used in Geology
5. Mean
6. Median
7. Standard Deviation
8. Sampling plan

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) List the steps for formatting of text and tables MS Word.

OR

b) Explain the steps to prepare a chart in Excel using with assumed monthly rainfall data of two rain guage stations for ten years
10. a) Discuss the characteristic properties of a database

OR

b) Write the uses of some softwares used in geological investigations
11. a) What are the characteristics of a frequency curve? Applications of cumulative frequency curves

OR

b) Define a frequency distribution. Write the importance of frequency distribution
12. a) Differentiate the Skewness and Kurtosis

OR

b) Write the characteristics of grid sampling and stratified sampling

ELECTIVE FOUNDATION: GEO.204a

REMOTE SENSING AND GIS

Course Objectives

1. To learn basics of aerial remote sensing and its applications.
2. To understand the physics of electromagnetic spectrum and learn satellite remote sensing.
3. To learn characteristic features of Multi spectral remote sensing present satellites of world and application of Remote Sensing for important economically deposits.
4. To have training in GIS components models and applications.

UNIT- I:

Basic concepts and fundamentals of aerial photography - Scale of photography, Aerial cameras, factors influencing image quality, side lap and overlap, mosaicing of Aerial photographs, stereoscopy, estimation of dip and slope - Aerial photo interpretation for Geology; Techniques of interpretation; Recognition elements, Convergence of evidence for interpretation of Geology.

UNIT- II:

Basic concepts and fundamentals of Remote sensing - Electromagnetic energy and its sources - Interaction of EM radiation with atmosphere - Interaction of EM radiation with earth's surface - Atmospheric windows - different spectral regions useful for Remote sensing.

UNIT- III:

Sensors – platforms, Multispectral Remote sensing in Micro wave regions, Remote sensing in Thermal infrared regions, remote sensing satellites and their pay load characteristics - Application of remote sensing for gold, diamond and groundwater exploration.

UNIT- IV:

GIS: Hardware and software in GIS – spatial and non spatial data, Raster and vector data structures – Data conversions - Comparison of raster and vector data - Elements of GIS: Data capture, Verification and processing, data storage - Data base management systems: Types, merits and demerits - Data manipulation analysis and spatial modelling – Output format and generation.

Course Outcomes

- 1 Develop knowledge in basics of Remote Sensing interpretation keys and applications.
- 2 Formulate the relationship between EMR and satellite Remote Sensing.
- 3 Application for Remote Sensing for important economic deposits.
- 4 Operate GIS data model and demonstrate GIS techniques for various applications.
- 5 Apply RS and GIS techniques to analyze the various geological materials.

Text books/Reference Books:

1. Sabbins, F. F., 2007: Remote sensing – Principles and application; Waveland Print, INC.
2. Richard, G. Ray, 1960: Aerial photographs in Geologic interpretations, Report, USGS, U.S. Govt. Print. Off.
3. Bandat, H.F.V. 1962: Aerogeology; Gulf Publ. Co., Houston, Texas.
4. Victor, C. Miller. 1961: Photogeology; McGraw – Hill, New York.
5. Siegal, B.S & Gillespie, A. R. (eds), 1980: Remote sensing in Geology; John Wiley.
6. Aronoff, S., 1989: Geographical Information System: A management perspective. DDL Publication, Ottawa, 1989.
7. Burrough, P.A., 1986: Principles of Geographic Information System for Land resource assessment, Oxford University Press, New York

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CO2	M	L	M	M	M							
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CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

SECOND SEMESTER

SUBJECT: GEOLOGY

PAPER IV – GEO.204a: REMOTESENSING AND GIS

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Side lap and overlap.
2. Mosaic.
3. EMR.
4. Atmospheric Windows.
5. Remote sensing satellites.
6. Active and Passive remote sensing.
7. Raster and Vector data.
8. Elements of GIS.

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Explain aerial photography, mosaicing of aerial photographs, and stereoscopy.
(OR)
b) Recognition elements of Aerial photographs with reference to geology.
10. a) Interaction of EM radiation with atmosphere.
(OR)
b) Explain briefly about the atmospheric window regions useful for remote sensing.
11. a) Give a detail account of different remote sensing platforms and their limitations .
(OR)
b) Applications of Remote sensing techniques in Ground water Exploration.
12. a) Explain various kinds of GIS data.
(OR)
b) Give an account of open source GIS softwares and their applications.

ELECTIVE FOUNDATION: 204b

ENVIRONMENTAL GEOLOGY

Course Objectives

1. To understand natural hazards and its impacts
2. To prepare students towards environmental concerns, issues, and impacts of climate change
3. To find the ways to deal with environmental problems associated mainly various types of pollutants
4. To apply the knowledge for efficient environmental decision-making, management and sustainable development.

UNIT – I

Fundamental concepts of Environmental Geology – Internal structure of the Earth – Plate tectonics and Environmental Geology – Rocks and Minerals – Ecology and Geology: Ecology for Geologists, Geology and Biodiversity, Ecological Restoration - Hazards, Disasters, and Natural Processes – Evaluating Hazards: Linkages, Disaster Prediction and Risk Assessment – The Human response to Hazards – Global Climate and Hazards – Population Increase, Land Use Change and Natural Hazards.

UNIT – II

Earthquakes: Magnitude and Intensity, Plate Boundary Earthquakes, Earthquake Processes, Earthquake Shaking, Earthquake Cycle, Earthquakes Caused by Human Activity, Earthquake Risk and Prediction – Tsunami: Effects of Tsunamis and Linkages to other Natural Hazards, Minimizing the Tsunami Hazard – Volcanic Activity: Volcanism and Volcanoes, Volcanic Features, Volcanic Hazards – Forecasting Volcanic Activity.

UNIT – III

Rivers and Flooding: Streams and Rivers, Sediments in Rivers – River Velocity, Discharge, Erosion, and Sediment Deposition, Effects of Land use Changes, Channel Patterns and Flood Plain Formation, River Flooding, Urbanization and Flooding, Nature and Extent of Flood Hazards, Adjustments to Flood Hazards – Landslides: Slope Processes and Types of Landslides, Slope Stability, Human use and Landslides, Minimizing the Landslide Hazard – Coastal Hazards: Coastal Processes, Coastal Erosion, Coastal Hazards and Engineering Structures, Human Activity and Coastal Erosion, Perception of adjustment to Coastal Hazards.

UNIT – IV

Water Pollution: An Overview of Water Pollution, Water Pollutants, Surface water Pollution and Treatment, Groundwater Pollution and Treatment, Water Quality Standards, Wastewater Treatment – Air Pollution: Historical Overview, Public

Health Importance of Air Pollution, Sources and Types of Air Pollutants, Industrial Air Pollution, Risk Assessment, Air Pollution Prevention and Control - Mineral Resources and Environment: Minerals and Human use, Geology of Mineral Resources, Environmental Impact of Mineral Development, Recycling Mineral Resources.

Course Outcomes

1. Explain different aspects of environment and local, regional and global environmental problems.
2. Classify and explain the environmental pollution and disaster control technologies
3. Prepare, interpret and implement environment projects

Text Books/Reference Books:

2. Edward, A. Keller (2012): Introduction to Environmental Geology, Pearson Prentice Hall, New Jersey, USA.
3. Bennett, M.R. B., Doyle, P. (1997) Environmental Geology By. John Wiley & Sons, New York.
4. Rekha Ghosh and D.S., Chatterjee: Environmental Geology – Geosystems Protection in Mining Areas, Capital Publ. Co., New Delhi.
5. Carla W. Montgomery WCH Wm. C, (1989). Environmental Geology, Brown Publishers Dubuque, Iowa
6. Chiras, D.D, (1989) Environmental Science – A framework for decision making, Addison – Wesley Publishing Company. New York.,
7. Davis, N. et. al., (1976) Environmental Geosciences, John Wiley and sons, New York.,
8. Detwiler, T.R, (1971) Man's Impact on Environment, McGraw Hill
9. Keith, L. H. (1996) Principles of Environmental Sampling. ACS Professional Reference book, Amer. Chem. Soc., Washington DC.
10. Khoshoo, T. L. (1988) Environmental Concerns and Strategies By. Ashish Publ. New Delhi.
11. Montgomery, C.W., (1989) Environmental Geology, Brown publications.,
12. Ray, P.K. and Prasad, A.K. (1995) Pollution and Health. Wiley Eastern Publ., New Delhi.
13. Strahler, A.N.,(1973) Environmental Geology, John Wiley and sons, New York.
14. Subramanian,V. (2002) A Textbook in Environmental Science, Narosa Publishing House, New Delhi
15. Valdiya, K.S. (1987) Environmental Geology – Indian Context. McGraw Hill Publ.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

1. Analyses procedures for a few elements and compounds of water

MODEL QUESTION PAPER
(Revised Syllabus w.e.f.2021-2022 for campus Students)
M.Sc., DEGREE EXAMINATION-2022
SECOND SEMESTER
SUBJECT: GEOLOGY
PAPER IV – GEO.204b: ENVIRONMENTAL GEOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Concept of Environmental geology
2. Ecology for geologists
3. Earthquake magnitude
4. Types of volcanoes
5. Effects of landuse changes due to rivers
6. Types of landslides
7. Water pollutants
8. Sources of air pollutants

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. (a) Describe in detail the relationship of Geology and Biodiversity
Or
(b) Write an essay on global climatic changes and hazards.
10. (a) Explain the earthquake processes, risk and mitigation measures.
Or
(b) What is Tsunami? Explain its prediction and hazards
11. (a) Describe the river flooding and Geomorphological changes
Or
(b) Write in detail about the coastal hazards
12. (a) Explain the water pollution processes and waste water treatment
Or
(b) Explain industrial air pollution, risk assessment and measures of control

ELECTIVE FOUNDATION: GEO.204c

GEMOLOGY

Course Objectives

1. To learn origin, classification, and gemstone resources and their stratigraphic units in india.
2. To learn and examine the nature, quality and rarity of the gemstones
3. To understand the physical and optical properties of gemstones
4. To give an idea about the gemstone testing instruments
5. To gain knowledge and to provide skills to become a successful gemmologist

UNIT – I

Introduction to Gemology – Relation to Mineralogy and Crystallography - Lithological association of Gemstones in India–What is a Gem: Precious and Semi-Precious Stones– Gem- bearing stratigraphic Units in India – Gemstone Resources of India.

UNIT – II

Criteria for recognition of gemstones – Virtues of gemstones; Colours, Optical Properties, Hardness, Fractures, Inclusions, Zoning, Brittleness, Pleochroism, Clarity, Amenability for cutting and polishing – 4 C's – Processing of gemstones – Styles of Cutting; Cabochon cut, Rose cut, Brilliant cut, zircon cut, step, trap or emerald cut and mixed cuts.

UNIT – III

Determination of various physical properties in the laboratory: Hardness, Specific gravity, Reflectivity and Reflectance, Dispersion, Lustre, Streak – Measurement of Refractive index – Colour distinction - Enhancement and treatments – enhancement methods: coloured and colourless impregnation, Dyeing, Bleaching and its identification - Methods of treatment – Laser drilling, Irradiation, Heat treatment, Surface modifications, Diffusion treatment and its identification – Composites; Types, Classification and Identification.

UNIT – IV

Uses of gemstones in jewellery, medicine, health and customs –Important Gem Species: Diamond, Corundum, Ruby, Beryl, Chrysoberyl, Cat's Eye, Alexandrite, Topaz, Spinel, Garnets, Tourmaline, Peridot, Zircon, Varieties of Quartz Group – Sphene, Feldspar, Lapis Lazuli - Synthetic Gems.

Course Outcomes

1. The course is focussed on a comprehensive learning in gemology
2. Understands the formation, classification and properties to final the grading and evaluation.
3. Knowledge in order to identify original gemstones and stimulants
4. Acquire skills which will be useful to them in gem industry

Textbooks/Reference Books:

1. Karanh, R.V. (2000): Gem and gem industry in India, Memoir 45, Geological Society of India, Banglore.
2. Anderson, B.W (1990): Gem testing (10th edition), Butterworth Scientific, London.
3. Babu, T.M., (1998):Diamonds in India, Geological society of India, Bangalore
4. Hall, C. (1994): Gemstone, Dorling Kindesley, London.
5. Deer, W.A., Hure, R. A. and zussman, S. (1992). An Introduction to rock forming minerals, ELBS, London.
6. Kerr, P.F. (1997): Optical mineralogy, 4th Ed. McGraw Hill Book & Co, New York,
7. Peter Read (1991): Gemmology 2nd Ed., Butter worth - Heinemanu Ltd. Lundu.
8. Peter Read: Gems 5th Ed. Butterworth, London
9. Richard Laddicoat (1987), Handbook of gem identification - G.I.A.
10. Santa Monica., Edward Gubelin (1986): Photo Atlas of Including Gem Stones – ABC Edition, Zurich, Gem Testing 10th Ed.
11. Anderson, B.W. (1990): Gemstone Enhancement 2ndEdition, Butterworth Scientific London.
12. Nassau, K. (1994): Gemstone Enhancement; Butterworths, London.
13. Webster, Robert, 1980: Gems, 5th Ed, Butterworths, London.
14. Hall, C., Gemstones.
15. Dorling Kindersley, (1994): Read, P. Gemmology. Butterworth Heinemann,
16. O’ Donoghue, M. (1999): Identification of Gemstones.

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CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

**M.Sc. DEGREE EXAMINATION - 2022
SECOND SEMESTER
SUBJECT: GEOLOGY
PAPER IV – GEO.204c: GEMOLOGY**

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Scope of Gemology
2. What is a Gem?
3. Describe Importance of colours in Gemstones
4. Discuss the presence of inclusions in Gemstones
5. Impregnation in gemstones
6. Physical properties of gemstones
7. Polymorphs of Carbon
8. Medicinal uses of Gems

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Write an essay on distribution of Gemstones in India
(OR)
b) Give an account of Gem- bearing stratigraphic Units in India
10. a) Briefly explain the Virtues of gemstones
(OR)
b) Discuss about Processing of gemstone
11. a) Write an essay on Determination of various physical properties in the laboratory
(OR)
b) Explain Enhancement methods
12. a) Write about Mineral Chemistry, structures and color variations in Diamond
(OR)
b) Uses of gemstones in jewellery, medicine, health and customs.

PRACTICAL I – GEO.205P:

SEDIMENTARY PETROLOGY & GEOCHEMISTRY AND ISOTOPE GEOLOGY

Course Objectives:

1. Megascopic identification of sedimentary rocks by studying their physical and chemical properties.
2. To impart knowledge of granulometric analysis of sediments.
3. Understand the petrographic features of clastic and non-clastic rocks.
4. Study the facies characteristics for the construction of facies succession and depositional models.
5. To impart knowledge on separation, study and analysis of heavy minerals from the unconsolidated sediments.

SEDIMENTARY PETROLOGY SYLLABUS

1. Megascopic study of sedimentary rocks and their identification through characteristic features.
2. Granulometric analysis of unconsolidated sediments and interpreting their modes of transport, and environments of deposition.
3. Petrographic study of clastic and non-clastic rocks and interpreting textural properties, depositional environments and diagenesis.
4. Separation and analysis of heavy minerals from unconsolidated sediments and understanding provenance.
5. Construction of facies succession and depositional models with facies characteristics.

Course Outcomes:

1. Students will be able to identify the different sedimentary rocks megascopically and microscopically to understand the petrographic characteristics and interpret textural properties and determine the depositional environments and diagenetic processes.
2. Able to do granulometric analysis of unconsolidated sediments and interpret their modes of transport and environments of deposition.
3. Able to do separation and analysis of heavy minerals from the sediments and understand the Provenance.
4. By studying facies characteristics able to construct facies succession and depositional models of sedimentary formations.

GEOCHEMISTRY AND ISOTOPE GEOLOGY

Course Objectives:

1. Impart knowledge of chemical analyses of rocks and minerals by various methods.
2. To do chemical analyses of waters and representation of water analyses through graphical methods.
3. To impart knowledge of classification of groundwater for various purposes.
4. Knowledge to estimate organic matter in soils and water.

SYLLABUS

1. Methods of the chemical analysis of rocks and minerals.
 - Spectrophotometric methods
 - Flame photometric methods
 - Titrimetric methods.
2. Chemical analysis of water samples.
3. Graphical representation of water analyses data and classification of natural waters.
4. Classification of groundwater for use in drinking, irrigation and industrial purposes.
5. Estimation of organic matter of soils and water.

Outcomes:

1. Able to do chemical analyses of minerals and rocks by using various methods such as Spectrophotometric method, Flamephotometric method and Titrimetric method.
2. Able to do chemical analyses of waters and classify the groundwater for use in drinking, irrigation and industrial purposes through graphical methods.
3. Able to estimate the organic matter in soils and waters in the laboratory.

PRACTICAL II – GEO.206P:

STRATIGRAPHY AND PALAEOONTOLOGY & REMOTESENSING AND GIS

STRATIGRAPHY AND PALAEOONTOLOGY

Course Objectives:

1. Study of rocks from Precambrian terrain of India.
2. Study India map to demarcate the boundaries of the Precambrian terrains and also study stratigraphic and palaeogeographic maps with reference to India..
3. Preparation of lithological characters of various stratigraphic units and learn correlation techniques.

SYLLABUS

1. Study of rocks in Hand specimens from Precambrian terrain of India.
2. Showing boundaries of the Precambrian terrains of India on map.
3. Stratigraphic and Palaeogeographic maps with special reference to India.
4. Identification of stratigraphic rocks in hand specimen.
5. Preparation of lithology and their correlation, correlation problems.
6. Morphological descriptions, systematics and illustrations of representative fossils belonging to Trilobita, Gastropoda, Cephalopoda, Brachiopoda, and Echinodermata.
7. Interpretation of palaeoclimate and palaeoenvironment based on fossil data
8. Biostratigraphic zonal assignment.
9. Identification of source reservoir and facies with fossil data.

Course Outcomes:

1. Able to describe the rock successions and their interpretation in terms of a general time scale. It provides a basis for historical geology, and its principles and methods have found application in such fields as petroleum geology.
2. Able to study India map and demarcate the boundaries of the Precambrian terrains of India.
3. Able to correlate lithological characters of various stratigraphic units to establish which sedimentary strata are the same age at distant geographical areas by means of their stratigraphic relationship..

REMOTESENSING AND GIS

Course Objectives:

1. Analyze satellite data using image processing techniques
2. Analyze aerial stereo pairs (aerial photos) using stereoscopes.
3. Perform image pre-processing and post-processing techniques
4. Classify satellite data for thematic mapping

SYLLABUS

1. Aerial photo interpretation: Scale, height and slope from the aerial photos; study of inclined and vertical photographs.
2. Interpretation of satellite images – False colour composites.
3. Visual image interpretation and extraction of thematic layers.
4. Identification of structures and lineaments.
5. Study of land use and land cover and demarcation of drainage basin.
6. Identification of Rock types and minerals.
7. GIS softwares – ARC INFO, ARC-GIS, ILWIS etc.,
8. Preparing data sets for input in GIS environment.
9. Analysis and manipulation of data in GIS.
10. Integration of spatial and temporal data.

Course Outcomes

- 1) Develop knowledge in basics of Remote Sensing interpretation keys and applications.
- 2) Formulate the relationship between EMR and satellite Remote Sensing.
- 3) Application for Remote Sensing for important economic deposits.
- 4) Operate GIS data model and demonstrate GIS techniques for various applications.
- 5) Apply RS and GIS techniques to analyze the various geological materials.

PRACTICAL III – GEO.207P:

GEOLOGICAL FIELD SURVEY AND TRAINING PROGRAMME

Course Objectives:

1. Study of different sedimentary rocks in the field and sedimentation processes in the sedimentary basins.
2. Study the gradation process of the sediments and identification of various stratigraphic sequences of the geological formations.
3. Knowledge of collection and study of shell organisms in the coastal areas.
4. Knowledge on the techniques of collection of water and rock samples in the field.

5. Observe the ground truth verification of thematic maps prepared based on the satellite data in the field.

Syllabus:

1. Identification of Sedimentary rock formations and study of sedimentation processes in the Sedimentary basins.
2. Study of sorting or gradation process of the sediments.
3. Identification of various stratigraphic sequences of the geological formations.
4. Identification, study and collection of shell organisms in the coastal areas.
5. Collection of water samples from various sources and also rock samples for geochemical analysis in the laboratory.
6. Ground truth verification of thematic maps prepared based on the satellite data.
7. Preparation of field report (draft) incorporating the above said geological characteristics in the field.

Course Outcomes:

1. Able to identify and study the different sedimentary rocks in the field and do gradation process of the sediments to identify the various stratigraphic sequences of the geological formations.
2. Able to do systematic collection of water and rock samples in the field for the geochemical analyses to classify the water and rocks.
3. Able to do ground truth verification in the field of different thematic maps prepared by using the satellite data of an area.

AUDIT COURSE:

HUMAN VALUES AND PROFESSIONAL ETHICS – II

Course Objectives

1. To provide the knowledge about the value oriented education, Medical ethics, family values and ethics and Moral code of Indian society.
2. To provide the business ethics, environmental and social ethics followed and practiced in Indian society.

UNIT – I

Value Education: Definition, Relevance to present day – Concept of Human Values: Self introspection, Self esteem - Family values: Components, Structure and responsibilities of family - Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society - Caring for needy and elderly – Time allotment for sharing ideas and concerns.

UNIT – II

Medical ethics: Views of Charaka, Sushruta and Hippocrates on moral responsibility of medical practitioners - Code of ethics for medical and healthcare professionals – Euthanasia - Ethical obligation to animals - Ethical issues in relation to health care professionals and patients - Social justice in health care, human cloning, problems of abortion - Ethical issues in genetic engineering and Ethical issues raised by new biological technology or knowledge.

UNIT – III

Business ethics: Ethical stands of business, Immoral and illegal practices and their solutions - Characterizes of ethical problem in management, ethical theories, causes of unethical behaviour, ethical abuses and work ethics.

UNIT – IV

Environmental ethics: Ethical theory, Man and nature, Ecological crisis, Pest control, Pollution and waste - Climate change, Energy and population, Justice and environmental health.

UNIT – V

Social ethics: Organ trade, Human trafficking, Human rights violation and social disparities - Feminist ethics: Surrogacy/pregnancy, Ethics of media, Impact of Newspapers, Television, Movies and Internet.

Course Outcomes

- 1 After completion of this course the students will be able to follow and practice good behaviour with human values and moral support to their elderly family members.
- 2 They also aware and get knowledge about medical ethics how the doctors will behave with patients, what type of ethics should be followed by business people. They also get in through knowledge about the protection of environment social ethics like family ethics, the role of print and electronic media in prevention and protection of Human rights in Indian society.

Textbooks/Reference Books:

1. Join, S. Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D Irwin Inc.
3. “Management Ethics – Integrity at work’ by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold, H. Titus: Ethics for Today
6. Maitra, S.K. Hindu Ethics
7. William Lilly: Introduction of Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manava Dharama Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed.) G.C. Haughton.
10. Susruta Samhita: Tr. Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit Series, Vol I, II & III, Varansi, Vol 100, 16-20, 21-32 and 74-77 only.
11. Charaka Samhita: Tr. Dr. Ram Karam Sarma and Vaidya Bhagavan Dash, Chowkamba Sanskrit Series office, Varanasi I, II, III Vol I PP 183-191.
12. Ethics: Theory and Contemporary Issues, Barbara Mackinnon, Wardsworth/Thomson Learning 2001.
13. Analyzing Moral Issue, Judith, A Boss, Mayfield, Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed) John H Piet and Ayodhha Prasad, Cosmo Publications.
15. Text Book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C. Sharma., Ethical Philosophy of India Nagin & Co Julundhar.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

III SEMESTER

CORE: GEO.301

METAMORPHIC PETROLOGY

Course Objectives

1. To propant knowledge on metamorphic processes, kinds of metamorphism, classification nomenclature, structures and textures of metamorphic rocks.
2. Metamorphic grades, zones, facies and facies series. Mineralogical phase rule and phase diagram.
3. Contact and Regional metamorphism faccies and their mineral assemblages and genesis of granulites and charnockites.
4. Metamorphic differentiation processes and origin of migamtites and study the classic regional metamorphic regions of the world and paired metamorphic belts.
5. Mineralization associated with metamorphic processes.

UNIT - I

Introduction to Metamorphism – Limits of Metamorphism - Metamorphic processes - Kinds of Metamorphism - Agents of Metamorphism. - Classification and Nomenclature of Metamorphic rocks. - Structures and Textures of Metamorphic rocks.

UNIT – II

Grades and Zones of Metamorphism – Concepts, Classification and Description of Metamorphic Facies – Mineralogical Phase Rule – Graphical Representation of Metamorphic Mineral Parageneses; Compositional Plotting, ACF, AKF, AFM phase diagrams

UNIT – III

Contact Metamorphic Facies: Hornfels, Sanidinite – Regional Metamorphic Facies: Zeolite, Greenschist, Blueschist, Amphibolite, Granulite, Eclogite – Genesis of Granulites and Charnockites - Anatexis and Origin of Migmatites - Regional Metamorphism and Paired Metamorphic Belts.

UNIT – IV

Metamorphic Reactions in Carbonate Rocks: Metamorphism of Siliceous Dolomitic Limestones, Formation of Wollastonite - Metamorphism of Pelitic Rocks –Metamorphism of Ultramafic Rocks – Metamorphism of Mafic Rocks

Course Outcomes

1. Identify metamorphic minerals in thin section and interpret met textures and able to comment on met grade and types of metamorphism.
2. Describe identify and classify metamorphic rocks in hand samples based on mineral assemblages and textures.
3. Plotting quantitative and qualitative mineral and mineral to infer the metamorphic conditions and processes study of metamorphic rocks on chemical system.
4. Establish relation between metamorphism and plate tectonics.
5. Establish metamorphic reaction principles of economically important ores and minerals associated with metamorphic processes.

Textbooks/Reference Books:

1. John, D. Winter, 2001: An Introduction to Igneous and Metamorphic Petrology, Prentice Hall Inc.
2. Ronald, D. Frost and Carol, D. Frost, 2014: Essentials of Igneous and Metamorphic Petrology, Cambridge University Press.
3. Myron, G. Best, 2003: Igneous and metamorphic petrology, 2nd edition, Blackwell Publishing Company.
4. Chatterjee, S.C., 1974: Petrography of the igneous and metamorphic rocks of India, McMillan Co. Of India, Madras.
5. B. Bhaskara Rao, 1986– Metamorphic petrology, CRC Press
6. Turner F.J., 1981: Metamorphic petrology, McGraw-Hill
7. Congillan, 1982: Metamorphic Geology, London : Allen &Unwin,
8. Francis, J. Turner and Verhoogen, 2004: Igneous and metamorphic Petrology, CBS Publishers.
9. Winkler H.G.F. 1976:Petrogenesis of metamorphic rocks, Springer-Verlog, New York, Inc.
10. Philpotts, A.R. and J. Jay Ague, 2009: Principles of igneous and metamorphic petrology, 2nd edition, Cambridge University Press.
11. Bruce, W.D. Yardly, 1989 – An introduction to metamorphic petrology, Prentice Hall.
12. D.W. Hyndman, 1986 – Petrology of Igneous and Metamorphic rocks, 2nd Edition, McGraw-Hill Co., New York.

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CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER I – GEO.301: METAMORPHIC PETROLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Limits of Metamorphism
2. Kinds of Metamorphism
3. Mineralogical Phase Rule
4. Zones of Metamorphism
5. Contact Metamorphic Facies
6. Blueschist Facies
7. Describe Formation of Wollastonite
8. Role of CO₂ in Very low-grade Metamorphism of Mafic rocks

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Describe the role of Agents in Metamorphism
OR
b) Describe the textures of metamorphic rocks with neat sketches
10. a) Explain the classification and description of Metamorphic Facies.
OR
b) Describe the construction and plotting of mineral paragenesis in ACF diagram
11. a) Describe the Contact metamorphic Facies
OR
b) Explain the genesis of Granulites
12. a) Explain the Metamorphism of ultramafic MgO-SiO₂-CO₂-H₂O System.
OR
b) Explain the Metamorphism of Pelites at Very-low and Low-Grade metamorphism

CORE: GEO.302

ECONOMIC GEOLOGY AND MINERAL ECONOMICS

Course Objectives

1. Various processes of formation of economic mineral deposits
2. To understand the genetic controls exerted by physical and chemical processes on ore formation in various geological settings through geological time scale.
3. Geology, mineralogy, occurrence genesis and distribution of metalliferous deposits with case studies.
4. Geology, occurrence genesis and distribution of coal petroleum and other industrial minerals.

UNIT- I:

Processes of formation of mineral deposits – magmatic concentration, metasomatism, hydrothermal process, sedimentation, residual and mechanical concentration, oxidation, supergene enrichment, sublimation, evaporation.

UNIT- II:

Ore deposition - physical and chemical controls of ore fluids and their migration - Metallogenic epochs and provinces with special reference to India - Classification of mineral deposits; UNFC Classifications - Mineralization through geological time scale.

UNIT- III:

Geology, nature of occurrence, mineralogy, genesis and distribution of the following ore deposits with case studies of Iron, Chromite, Copper, Pb-Zn and Bauxite - Geology, nature of occurrence, genesis and distribution of Coal and Petroleum deposits - Magnesite deposits - Mica deposits - Baryte deposits - Asbestos deposits - Mineral resources of Andhra Pradesh.

UNIT – IV

Mineral economics and its concepts - Tenor, grade and specification - Strategic, critical and essential minerals – National mineral policy.

Course Outcomes

- 1 This course has links directly with industry and share the knowledge about a wide range of ore deposits.
- 2 Offers a detailed study of origin of economic mineral deposits its identification properties and distribution in India.
- 3 Comprehensive knowledge in reflection light optic and ore textures.

- 4 Acquire practical knowledge on microchemical techniques for identification ores and estimation of ore reserves.

Textbooks/Reference Books:

1. Mead L. Jenson, Bateman, A. M. 1981: Economic Mineral deposits – John Wiley, New York.
2. Krishna Swamy, S. and Sinha, R.K. 1988: India’s Mineral resources – Oxford & IBH, New Delhi.
3. K.V.G.K. Gokhale, 1973: Ore deposits of India, Thompson Press (India) Publ.
4. R.K. Sinha & N.L. Sharma. 2019: Mineral Economics, 4th Edn, Oxford & IBH, New Delhi.
5. Paul Ramdohr, 1970: Ore minerals and their intergrowth, Elsevier
6. R.L. Stanton, 1972: Ore petrology, McGraw-Hill Book Company, New York.
7. Charles, F. Park, Jr., and Roy, A. Macdiarmid, 1964: Ore deposits, W.H. Freeman & Co.

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H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER II – GEO.302: ECONOMIC GEOLOGY AND MINERAL ECONOMICS

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Sublimation.
2. Mechanical concentration.
3. Metallogenic epochs.
4. Objectives of UNFC Classification.
5. Copper deposits of Andhra Pradesh.
6. Economic significance of Mangampeta.
7. Objectives of National Mineral Policy.
8. Tenor and Grade.

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Classification of mineral deposits with reference to Bateman
(OR)
b) Briefly explain about oxidation and supergene enrichment process with a neat diagram.
10. a) Give a detailed account of UNFC Classification.
(OR)
b) Give a brief note on Mineralization through geological timescale.
11. a) Explain briefly about chromite deposits of India.
(OR)
b) Nature of occurrence, genesis and distribution of Coal and Petroleum deposits in India.
12. a) Explain the role of essential minerals in mineral economics of a country .
(OR)
b) History of National Mineral Policy and its importance.

GENERIC ELECTIVE: GEO.303a

WATERSHED MANAGEMENT

Course Objectives

1. To provide basics of watershed management
2. To apply the mitigation techniques of land erosion
3. To develop water harvesting techniques based on the terrain conditions
4. To implement the approach of people's participation in watershed management

UNIT-I

INTRODUCTION OF WATERSHED

Objectives of watershed development - Characteristics of watershed – Principles of watershed – Effects of watershed on community – Delineating the watershed – Basic data on watersheds –Need for watershed development – Watershed development programmes in India – Watershed Atlas

UNIT-II

EROSION, DEGRADATION and LAND MANAGEMENT

Types and Factors affecting erosion - Effects and control methods of erosion - Estimation of soil loss due to erosion - Universal soil loss equation –Degradation agents – Impact of the degradation of watersheds– Land use and land capability studies - Management of Agricultural, Forest, Grassland and wild land - Reclamation of saline and alkaline soils.

UNIT-III

WATER HARVESTING: Concept of Rainwater harvesting - water harvesting structures - Guidelines for construction of harvesting structures – Success stories of water harvesting structures –Role of peoples participation in construction and management of harvesting structures– Rain water harvesting from roof top

UNIT-IV

PLANNING AND MANAGEMNT

Elements of watershed management – Planning and Implementation of watershed Management activities – Multidisciplinary approach for watershed management – Impact of watershed Management.

Course Outcomes

1. Explain the importance of watershed management
2. Classify and explain the different water harvesting techniques
3. Use modern tools for land erosion control
4. Develop or improve the people's participatory approach for sustainable development and management of watersheds.

Textbooks/Reference Books:

1. Rajora, R., (1998), Integrated Watershed Management, Rewat Publications, New Delhi.
2. Tideman, E.M., (1996): Watershed Management: Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi.
3. Lal. S., (2004), Watershed Development, Management and Technology, Mangal Deep Publications.
4. Paranjape, S. et. al., (1998), Watershed Based Development: A Source Book, Bharat Gyan Vigyan Samathi, New Delhi.
5. Suresh, R., (2002), Soil and Water Conservation Engineering, Standard Publishers and Distributers, Delhi.
6. Kakade, B.K., (2002), Soil and Water Conservation Structures in Watershed Development Programs, BAIF Development Research Foundation, Pune.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.303a: WATERSHED MANAGEMENT

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Four objectives of Watershed management
2. Principle of watershed
3. Types of erosion
4. Control methods of erosion
5. Advantages of Rainwater harvesting structures
6. Types of harvesting structures
7. Elements of Watershed management
8. Impact of watershed management

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Discuss the Characteristics of watershed management
OR
b) Explain the importance of watershed management
10. a) What is a soil loss equation and discuss in detail
OR
b) List the degradation agents of watersheds.
11. a) Write the selection criteria of check dams with neat sketch
OR
b) Discuss the role of harvesting structures in groundwater resources
12. a) Discuss the significance of planning and implementation of watershed management
OR
b) Write the multidisciplinary approach of watershed management

GENERIC ELECTIVE: GEO.303b

PHOTOGRAMMETRY

Course Objectives

1. To provide basics of photogrammetry and its application in geological surveying
2. To apply the techniques of photo interpretation
3. To perform basic computations of distance and heights of the objects
4. To implement the GPS based survey approach

UNIT – I

Basic concept of Photogrammetry – Principle – Types of photographs – Geometric elements of aerial photographs– Scale –Planning & Execution of Photographic Flights– Aerial mosaics -Stereoscopy–Determination of horizontal ground length, direction and angles from photo coordinates - Relief and Tilt Displacement on vertical aerial photographs –Elements of aerial photo interpretation..

UNIT – II

Introduction to Analytical Photogrammetry: Image measurements, Control points, Collinearity condition, Coplanarity condition, Space resection by collinearity, Space intersection by collinearity, Analytical Stereo model, Analytical Interior Orientation, Analytical Relative Orientation, Analytical Absolute Orientation, Analytical Self-calibration.

UNIT – III

Principles of digital photogrammetry –Digital Terrain Model generation – Image correlation – Image matching – Digital Orthophoto generation - Image measurements, Orientation procedures, Epipolar geometry,–DEM quality assessment –Applications of Digital photogrammetry in GIS –Link between GIS and Digital Photogrammetry.

UNIT - IV

Establishing horizontal & vertical controls, Ground control surveys by GPS, Pass Points for Aerotriangulation, Sequential construction of Strip model from Independent models, Aerotriangulation by simultaneous Transformations, Bundled Adjustment by GPS control, Triangulation with Satellite images, Computational strategies for triangulation - Principles of LIDAR and its applications.

Course Outcomes

1. Explain the importance of photogrammetry and its relationship to land surveying and mapping
2. Classify and prepare maps on different scales
3. Use stereoscope to interpret the elements on the aerial photographs

Textbooks/Reference Books:

1. Wilfried Linder, 2006: Digital Photogrammetry – A Practical course, 2nd Edition, Springer.
2. Paul, R. Wolf and Bon A. Dewitt, 2000: Elements of Photogrammetry (3ed), McGraw Hill
3. Morris M. Thompson, Editor-in-Chief, 1966: Manual Photogrammetry
4. J. Chris. McGlone, Edward, M. Mikhail, James, S. Bethel, 2004: Manual of Photogrammetry, American Society for Photogrammetry and Remote Sensing, Bethesda, Maryland, USA.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.303b: PHOTOGRAMMETRY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Types of Photographs
2. Stereoscopy
3. Collinearity condition
4. Image measurement
5. Image matching
6. Epipolar Geometry
7. Explain GPS
8. Pass points for Aerotriangulation

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Note on basic concepts of Photogrammetry. Explain planning and Execution of Photographic flights.

OR

b) Describe in detail the elements of aerial photo interpretation.
10. a) Explain Collinearity and Coplanarity conditions in Photogrammetry

OR

b) Give a brief note on various analytical orientations
11. a) Define Digital photogrammetry. Explain the generation of Digital Orthophoto.

OR

b) Discuss the applications of Digital Photogrammetry in GIS.
12. a) Describe the Ground control surveys by GPS.

OR

b) Write an essay on principles of LIDAR and its applications.

GENERIC ELECTIVE: GEO.303c

DIMENSIONAL STONES AND CONSTRUCTION MATERIALS

Course Objectives

1. To introduce the knowledge on dimensional stones and construction materials
2. To classify dimensional stones and construction materials
3. To inquire suitability of the dimensional stones of construction materials

UNIT – I

Dimensional Stones: Criteria for selection of Dimensional Stones, Importance of Dimensional Stones in Archaeological Monuments – Dimensional Stone: Indian Scenario – Granite Industry in India – Dimensional Stones through Geological Time Scale – Granite Trade in South India.

UNIT – II

Dimensional Stone Varieties – Characteristics of Dimensional stone –Distribution of Dimensional Stones in India –Distribution of Dimensional Stones in Andhra Pradesh – Export and Import Qualities.

UNIT – III

Construction Materials: Varieties of Construction Materials – Ornamental and Construction Materials in Indian History – Distribution of Building Materials in Andhra Pradesh – Conservation of Commercial Rock Deposits/Monumental/Building Stones.

UNIT – IV

Engineering properties of rocks, Behaviour of rock on application of stresses: Stress and its type; Strain and its type Application of Strain and stress curve; Mohr's Circle and Stress Transformation.

Course Outcomes

1. Explain the distribution of dimensional stones and occurrence of construction materials
2. Classify dimensional stones and construction materials
3. Assess the suitability of various dimensional stones and construction materials

Textbooks/Reference Books:

1. Blyth, F.G.H. and Defreites, M.A., 1984: A Geology for Engineers
2. Krynine, D.P. and Judd, W.R., 1957: Principles of Engineering Geology.
3. Bell, F.G., 1999: Geological Hazards, Routledge, London.
4. Vikram, K., 1986: Directory of Dimensional Stones.
5. Raman, P.K., Mineral Resources of Andhra Pradesh.
6. Information Dossier on Regional Evaluation of Dimension Stone Granite in Andhra Pradesh, 1999: Geological Survey of India, OPAP.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.303c: DIMENSIONAL STONES AND CONSTRUCTION MATERIALS

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Meaning of Dimensional stones
2. Types of natural stones
3. Dimensional stones in Rayalaseema Region
4. Some examples of Dimensional stones
5. Conservation of commercial rock Deposits
6. Construction Materials
7. Stress and Strain in Rocks
8. Stress curve

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x15 = 60 M*

9. (a) Write an essay on criteria for selection of Dimensional stones.
Or
(b) Describe the importance of Dimensional stones Archaeological monuments.
10. (a) Briefly explain the various types of the Dimensional stones in Andhra Pradesh and Telangana
Or
(b) Write an essay on export and import qualities of Dimensional stones in India.
11. (a) Briefly explain the Ornamental and Construction materials in Indian History.
Or
(b) Distribution of Building Materials in Andhra Pradesh.
12. (a) Explain the Engineering Properties and Behaviour of the Rocks.
Or
(b) Write an essay on Mohr's circle and Stress Transformation.

PRACTICAL I – GEO.304P:

METAMORPHIC PETROLOGY & ECONOMIC GEOLOGY AND MINERAL ECONOMICS

METAMORPHIC PETROLOGY

Course Objectives:

1. To study physical and optical properties and determination of mineralogical composition and textural characters.
2. Learn to arrange metamorphic rocks according to the facies of metamorphism.
3. Learn to construct and interpretation of ACF, AKF and AFM diagrams.

SYLLABUS:

1. Megascopic and microscopic examination of metamorphic rocks.
 - a. Different types of schists, gneisses, amphibolites, granulites, eclogites, slates, marbles and quartzites
1. Arranging metamorphic rocks according to the facies of metamorphism.
2. Construction and interpretation of ACF diagrams.
3. Construction and interpretation of AKF and AFM diagrams.

Course Outcomes:

1. Able to determine the physical and optical properties, mineralogical composition and textural characteristic of metamorphic rocks determining the conditions under which the rock has formed, which can give valuable insight into its geologic past.
2. Able to arrange metamorphic rocks according to their facies of metamorphism.
3. Able to construct and interpret ACF, AKF and AFM diagrams to know relative proportions of the oxides of alkalis (A), iron (F), and magnesium (M) in metamorphic rocks and to show how metamorphic mineral assemblages vary as a function of rock composition within one metamorphic facies

ECONOMIC GEOLOGY AND MINERAL ECONOMICS SYLLLABUS:

Course Objectives:

- 1.To provide the basics of hydrological properties of rock, aquifers, source of groundwater pollution and artificial recharge structures
- 2.To analyze the quality of water
- 3.To design the groundwater movement
- 4.To conduct groundwater investigations
- 5.To insist on the management of groundwater and methods of groundwater recharge

Syllabus:

1. Megascopic study of structures and fabrics of different Ore minerals and Industrial minerals.
2. Mineralogical and textural studies of common Ore minerals Under Ore microscope and their paragenetic significance.
3. Microchemical techniques for identification of Ores.
4. Exercises on mine sampling and determination of tenor and estimation of Ore reserves.
5. Analyze data on mineral production, use and export

Outcomes:

- 1). This course has links directly with industry and share the knowledge about a wide range of ore deposits.
- 2). Offers a detailed study of origin of economic mineral deposits its identification properties and distribution in India.
- 3.). Comprehensive knowledge in reflection light optic and ore textures.
- 4). Acquire practical knowledge on microchemical techniques for identification ores and estimation of ore reserves.

SKILL ORIENTED COURSE: GEO.305

SURVEYING AND FIELD GEOLOGY

Course Objectives

1. To provide basic knowledge on chain, compass, plane table , theodolite, other field equipment and Aerial photographs
2. To analyze the Measurement techniques, aerial photographs and equipment used in land surveying
3. To design and problem solving skills in surveying using surveying equipments and techniques.
4. To demonstrate knowledge and understanding of the geological report

UNIT- I:

Scales, Measurement of distances with the survey instruments - Chain survey: Principles, offsets, cross staff, obstacles in chaining Compass Survey - Prismatic Compass - Surveyors' compass: Traverse with chain and compass-Methods of plane tabling, the two point problems, and the three point problems.

UNIT- II

Principles of leveling, Different type of level, Classification of leveling - Measurement of angles, Heights and Distances using Theodolite - Traverse survey with the Theodolite - Principle of Total station; Measurement of Distance, Area, Height, Angles, Gradients, Traversing, Contouring using Total station - Applications of using Total Station

UNIT- III

General basics of field geology - Field equipment and Safety – Introduction to field observations at different scales – The Field Notebook - Plotting Geological features on a Base map – Recording Palaeontological Information, Structural Information, Features of Sedimentary rocks, Igneous rocks and Metamorphic rocks.

UNIT- IV

Mapping geological features on Aerial Photographs – Geological mapping with the Alidade and Plane Table – Making a geological map from Aerial photographs – Preparing Geological reports - Making a Geological Map – Recording Numerical data and use of instruments in the field – Photography and Sampling.

Course Outcomes

- 1 Understand the use of different surveying instruments, field equipment, aerial photographs and their use.
- 2 Compute the area and earthwork for different works by using surveying instruments
- 3 Analyze surveying techniques, tools, survey data and geological reports
- 4 Prepare contour maps, geological maps and reports
- 5 Solve survey issues using proper survey and interpretation.
- 6 Use appropriate modern tools in surveying and mapping

Textbooks/Reference Books:

1. T.P. Kanetkar and S.V. Kulkarni: Surveying & Levelling, Vol. I, R Agor Books.
2. B.C. Punmiya, 2017: Surveying and Levelling, McGraw-Hill Education.
3. Robert, R. Compton, 1962: Manual of field geology, John Wiley & Sons, New York.
4. Frederick, H. Lahee, 1961: Field geology, McGraw-Hill Company, New York.

CO – PO Mapping:

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CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

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M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER IV – GEO.305: SURVEYING AND FIELD GEOLOGY

Time: 3 hrs

Max. Marks: 40

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks 4x 3 =12M

1. Types of scales
2. Principle of surveying
3. Classification of levelling
4. Scale in theodolite
5. Basic field kit for geologists
6. List of uses with clinometer
7. Elements of aerial photographs
8. Importance of geological report

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 7 = 28 M

9. a) What are the sources of errors in chain survey? What precautions would guard against them?
OR
b) Enlist the obstructions in a compass survey and explain the methods to overcome them.
10. a) How would you set up plane table at a station? Explain the various steps of setting.
OR
b) Explain in detail the temporary adjustments of a dumpy level
11. a) Write the uses of field kit for geologist. Discuss the procedure of sampling procedure and field note preparation.
OR
b) List the basic elements to be noted and measured in the field for various geological surveys.
12. a) What is a base? Discuss the structural elements useful in geological projects
OR
b) Discuss the scale of aerial photographs and their applications

PRACTICAL II – GEO.306P:
SURVEYING AND FIELD GEOLOGY

Course Objective:

Objectives

1. To provide basic knowledge on chain, compass, plane table , theodolite, other field equipment and Aerial photographs
2. To analyze the Measurement techniques, aerial photographs and equipment used in land surveying
3. To design and problem solving skills in surveying using surveying equipments and techniques.
4. To demonstrate knowledge and understanding of the geological report

Syllabus:

1. Plotting of area using Cross staff
2. Determination of area by radiation method using compass
3. Longitudinal and cross-sectioning of a road profile using levelling instrument
4. Measurement of heights and distances using theodolite
5. Determination of areas using theodolite
6. Contouring using total station
7. Identification of the rocks and their outcrop pattern in the field
8. Measurement of attitude of beds in and around engineering project site / mining area.
9. Identification of the landforms and geological information using toposheets of an engineering project site / mining area.

Course Outcomes:

- 1) Understand the use of different surveying instruments, field equipment, aerial photographs and their use.
- 2) Compute the area and earthwork for different works by using surveying instruments
- 3) Analyze surveying techniques, tools, survey data and geological reports
- 4) Prepare contour maps, geological maps and reports
- 5) Solve survey issues using proper survey and interpretation.
- 6) Use appropriate modern tools in surveying and mapping

PRACTICAL III - GEO.307P:

GEOLOGICAL FIELD SURVEY AND TRAINING PROGRAMME

Course Objective:

1. Geology is the one of the most interesting subject about mother earth which can be best studied on field.
2. Fieldwork is an important part of Geology as it provides many of the data on which our knowledge of the Earth and its evolution along with that of life through time.
3. It can be considered as the glue that binds together all of the different subdisciplines within the study of our planet.
4. Geological field work is important to understand rocks in their natural environment and their natural relationship to one another. It seeks to describe and explain the surface feature and underground structure of the lithosphere based upon observations and inferences.

Syllabus:

1. Observation of metamorphism in the geological formations.
2. Identification and study of Para and Ortho metamorphic activity in the metamorphic rocks.
3. Study of association and occurrence of economic minerals in the mining areas.
4. Identification of various Rain water Harvesting structures and their impact studies in a basin.
5. Field visit to quarry of dimensional stone mining areas to understand the mining procedures and processes.
6. Field exposure to latest equipments in the mining areas.
7. Preparation of field report (draft) incorporating the above said geological characteristics in the field.

Course Outcomes

1. Fieldwork is an important part of Geology as it provides many of the data on which our knowledge of the Earth and its evolution along with that of life through time.
2. It can be considered as the glue that binds together all of the different subdisciplines within the study of our planet.
3. Fieldwork enables students to develop their understanding of different perspectives on social, political or ecological issues, enabling them to clarify and justify their own values whilst learning to acknowledge and respect other people's values

OPEN ELECTIVE: 308a

EARTH SYSTEM PROCESSES

Course Objectives

1. To explore the fundamental interactions of the geosphere, hydrosphere, atmosphere and biosphere.
2. The unit is designed to provide a strong scientific foundation for understanding and contextualizing studies of the environment, human impacts and sustainable practice and management of resources.

UNIT – I

Introduction to various branches of Earth Sciences - Solar System: Origin of Solar system, Meteors and Meteorites - Age of the Earth –Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Plate Tectonics, Landslides, Volcanoes.

UNIT – II

Sea waves, Tides, Ocean currents - Geological work of seas and oceans - Tsunami and its causes, Warning system and mitigation.

UNIT – III

Hydrogeology: Hydrological cycle, Aquifers – Groundwater fluctuations and Groundwater composition - Glaciology: Glacier types, Different types of glaciers, Landforms formed by glacier - Rock, Mineral, Batholiths, Dyke, Sill, Folds, Faults, Joints, Unconformity.

UNIT – IV

Structure and composition of atmosphere, Atmospheric circulation, Green house effect and global warming, Carbon dioxide sequestration - Geological work of wind –Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Course Outcomes

1. The interaction between the Earth's spheres, relevant processes and environmental changes.
2. Knowledge and understanding Recapitulate processes in the different spheres.
3. Describe the connections and feedback between the Earth's spheres.
Explain the connection between Earth System processes and global environmental changes.

4. A basic understanding of the Earth as an holistic system knowledge of the main components of the Earth system and their interactions
5. The interactions between biological, chemical, and physical processes that shape and define the Earth System.

Textbooks/Reference Books:

1. Holme's 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.

CO – PO Mapping:

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CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

THIRD SEMESTER

SUBJECT: GEOLOGY

PAPER V – GEO.308a: EARTH SYSTEM PROCESSES

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Meteorites
2. Seismic waves
3. Sea waves
4. Tsunami
5. Land form
6. Unconformity
7. Global warming
8. Atmosphere

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Write an essay on classification and types of Meteorites
(OR)
b) Describe the theory of Plate tectonics
10. a) Explain in detail the geological work of seas
(OR)
b) Define Tsunami. Explain its causes and mitigation measures
11. a) Define a fault, write an essay on the classification of faults
(OR)
b) Define a glacier. Discuss the types and geological activities of glaciers
12. a) Write an essay on global warming and its mitigation.
(OR)
b) Write an account of the composition and structure of atmosphere

OPEN ELECTIVE: 308b

MEDICAL GEOLOGY

Course Objectives

1. To provide knowledge and skills on the interpretation of the geological impact on geographical distribution of diseases in the environment, and on human and animal health
2. To understand the basics of minerals and their influence on human health, flora and fauna.
3. To assess the occurrence of various elements and its cyclic movement through the abiotic-biotic environment

UNIT-I

General characteristics of tropical, subtropical environments - Rock weathering and soil formation - Weathering and formation of secondary minerals - Chemistry of weathering of ultra-basic rocks - Fundamental Relationship of Public Health and Geological Processes - Environmental Biology - Natural Distribution and Abundance of Elements - Anthropogenic Sources - Uptake of Elements on Chemical and Biological Perspective and its functions - Geological Impacts on Nutrition.

UNIT-II

Radon in Air and Water, Arsenic in Groundwater and the Environment - WHO and BIS Standards for drinking water - Fluoride in Natural Waters, soils, sediments, plants - Bioavailability of fluoride, Dental fluorosis, Skeletal fluorosis, Water Hardness and Health Effects, Geochemical basis for tropical endomyocardial fibrosis (EMF) - Effect of water hardness on urinary stone formation 58 (urolithiasis) - Types of stones: Calcium oxalate, Calcium phosphate, Uric acid, Magnesium ammonium phosphate stones, Cysteine.

UNIT-III

The iodine cycle in the environment - Iodine in drinking water, Iodine in food, Iodine Deficiency Disorders (IDD), Endemic cretinism, Goitrogens - The nitrogen cycle, Nitrate as fertilizers and environment, Nitrogen loading in rice fields, Nitrates from human and animal wastes, Nitrates and Methemoglobinemia, Nitrates and cancer - Bioavailability of Elements in Soil - Selenium Deficiency and Toxicity in the Environment - Natural Aerosolic Mineral Dusts and Human Health - Animals and Medical Geology - The Impact of Micronutrient Deficiencies in Agricultural Soils and Crops on the Nutritional Health of Humans.

UNIT-IV

Environmental Toxicology; Environmental Epidemiology, Environmental Medicine, Environmental Pathology, Speciation of Trace Elements - Techniques and Tools of GIS in Human Health Studies, Investigating Vector - Borne and Zoonotic Diseases with Remote

Sensing and GIS - Mineralogy of Bones, Inorganic and Organic Geochemistry Techniques - Histochemical and Microprobe Analysis in Medical Geology.

Course Outcomes

1. Explain about relationship of human Health and Geological Processes.
2. Able to understand the importance of the Water quality standards and impact of micronutrient deficiencies in soils and crops on human health
3. Analyse the interaction of abundance of elements and geological effects.

Textbooks/Reference Books:

- 1.C.B., Dissanayake and R. Chandrajith (2009): Introduction to Medical Geology, Springer, London
2. H. Catherine, W. Skinner, Antony R. Berger (2003). Geology and Health: Closing gap, Oxford Univ. press, New York.
3. Iosif, F. Volfson, (2010): Medical Geology: Current Status and Perspectives, 2010, Russian Geological Society (ROSGEO) Publisher. Moscow.
4. K.S. Valdiya, (2004): Geology, environment, Society, University press (India), Hyderabad.
5. Lawrence K. Wang, Jiaping Paul Chen, Yung-Tse Hung, Nazih K. Shammass., (2009): Heavy Metals in the Environment, CRS Press, Taylor & Francis Group, Boca Raton, FL
6. M.M. Komatica., (2004): Medical Geology, Vol.2, Effects of geological environment on Human health, Elsevier, U.K.
7. Olle Selinus, B., Elsevier (2003): Essentials of Medical Geology (2005), Academic Press., U.K.
8. Olle Selinus, B., Finkleman, R.B., Jose, A. Centeno (2010): Medical Geology - Regional synthesis (2010), Springer, London.
9. Scott S. Olson., (1999) International Environmental Standards Handbook , CRC Press, London.CKE
10. William N. Rom., (2012). Environmental Policy and Public Health - Air Pollution, Global Climate Change, and Wilderness, by John Wiley & Sons, Inc. Published by Jossey Bass A Wiley Imprint.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER V - GEO.308b: MEDICAL GEOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

6. Natural distribution of elements
7. Rock weathering and soil formation
8. Skeletal fluorosis
9. Effect of water hardness on human health
10. Iodine cycle in drinking water
11. Nitrates and its health effects
12. Environmental medicine.
13. Mineralogy of bones

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

14. a) Explain the weathering processes and products. Give a note on fundamental relationship between human health and geological processes
OR
a) Write an essay on natural distribution and abundance of elements
10. a) Explain the Geochemical basis for tropical endomyocardial fibrosis (EMF)
OR
b) Discuss the WHO and BIS standards of drinking water of Radon, Arsenic and Fluoride
11. a) Explain the Iodine cycle and give a note on Iodine Deficiency Disorders
OR
b) Write an essay on Bioavailability of elements in soils.
12. a) Give a note on techniques and tools in GIS on human health studies
OR
b) Explain the Histochemical and Microprobe Analysis in Medical Geology

IV SEMESTER

CORE: GEO.401

HYDROGEOLOGY AND ENGINEERING GEOLOGY

Course Objectives

1. To provide the basics of hydrological properties of rock, aquifers, source of groundwater pollution and artificial recharge structures
2. To analyze the quality of water
3. To design the groundwater movement
4. To conduct groundwater investigations, to insist on the management of groundwater and methods of groundwater recharge
5. Role of geologist in engineering projects geological consideration for the selection of sites for major engineering projects.

UNIT – I

Precipitation, Runoff, Infiltration, Evaporation, Transpiration- Hydrological properties of rocks- Origin, Occurrence and Vertical Distribution of Ground water – Classification of aquifers - Geological Formations as Aquifers – Springs - Darcy's Law, Cone of Depression – Hydrographs - Water Table Contour Maps - Dispersion of Groundwater Tracers - Water Quality Standards: Analyses and Interpretation.

UNIT - II

Groundwater Exploration: Surface and Subsurface Geological, and Geophysical Methods of Groundwater Exploration - Hydrogeomorphic Mapping using various Remote Sensing Techniques - Artificial Recharge of Groundwater - Conjunctive use of Surface and Ground water.

UNIT – III

Role of geologist in the engineering projects - Engineering properties of rocks - physical characters of building stones, concrete and other aggregates –Rock as a Construction material – Geological consideration for the construction of dam and Reservoir sites -Types of dams, remedial measures for failure of dams and reservoirs - Case histories of some major dams: Nagarjuna Sagar, Srisaïlam and Bhakrañangal.

UNIT – IV

Geological considerations in the selection of tunnels.–tunnelling – remedial measures for failure of dams and reservoirs–Influence of geological conditions on foundations and design of buildings - Geological considerations for the construction of roads/ highways and bridges - seismicity in India - geological consideration for earthquake resistant structures - Problems of groundwater in engineering projects.

Course Outcomes

1. Apply the knowledge of geological formations and the hydrological properties of rocks
2. Analyze the suitability of water for domestic, irrigation and industrial purposes
Conduct geological and geophysical investigations and give recommendations for drilling of borewells.
3. Explain causes of pollution of groundwater give remedial measures to the society.
4. Use modern methods and appropriate techniques to carrying out geophysical studies and artificial recharge methods
5. Students will get critical knowledge on evaluation of geological condition at the major engineering project sites.

Textbooks/Reference Books:

1. Schward and Zhang, 2003: Fundamentals of Groundwater, John Willey and Sons.
2. Todd, D.K., 2004: Ground Water Hydrology, John Wiley & Sons, New York.
3. Davies, S.N. and De-West, R.J.N., 1966: *Hydrogeology*, John Wiley & Sons, New York.
4. Raghunath, H.M., 1987: *Ground Water*, Wiley Eastern Ltd., Calcutta.
5. Driscoll, F.G., 1988: *Ground Water and Wells*, UOP, Johnson, Div. St. Paul. Min. USA.
6. Fetter, C.W., 1984: *Applied Hydrogeology*, McGraw-Hill Book Co., New York.
7. Fitts, C.R., 2013: *Groundwater Science*, Academic Press.
8. Freeze, R.A. and Cherry, J.A., 1979: *Groundwater*, Englewood Cliffs, New Jersey: Prentice-Hall.
9. Karanth, K.R., 1987: *Groundwater: Assessment, Development and Management*, Tata McGraw - Hill Pub. Co. Ltd.
10. Krynine & Judd., Principles of Engineering Geology and Geotectonics (Mc Graw Hill)
11. Parbin Singh., Engineering and General Geology
12. Blyth., Geology of Engineers (ELBS)
13. Sathya Narayanswami, B.S., Engineering Geology (Dhanpat Rai & Co.)
14. Rangwala, S.C., Engineering Materials

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER I – GEO.401: HYDROGEOLOGY AND ENGINEERING GEOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

10. Infiltration and Transpiration
11. Darcy's law
12. Vertical Electrical Sounding
13. Well logging
14. Physical characters of Building stones
15. Types of Dams
16. Briefly explain seismicity in India
17. Geological considerations for the construction of Bridges

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Explain the hydrological properties of rocks

(OR)

b) Describe in detail the occurrence and vertical distribution of groundwater

10. a) Explain the Electrical Resistivity method of groundwater exploration

(OR)

b) Discuss the characteristic features of Conjunctive use of groundwater

11. a) Describe the engineering properties of rocks

(OR)

b) Discuss the geological considerations for the selection of site for the dam construction

12. a) Discuss the geological conditions for the foundation and design of buildings

(OR)

b) Give a detailed note on problems of groundwater in engineering projects

CORE: GEO.402

MINERAL EXPLORATION AND ORE BENEFICIATION

Course Objectives

1. Knowledge on energy resources and guides to locate ore bodies.
2. To enhance knowledge on various methods of exploration.
3. Knowledge on geophysical methods for ore reserve estimation
4. To impart knowledge on Ore beneficiation processes and techniques.

UNIT – I:

Conservation of minerals - Renewable and non-renewable resources - Guides to locate ore bodies: Physiographic, Lithologic, Mineralogical and Structural guides.

UNIT- II:

Stages of Exploration; Scope, Objectives and Methods of Prospecting - Regional Exploration: Geological, Geochemical and Geobotanical Methods - Geologic aspects of Drilling - Types of Drills - Drilling methods: Planning, Selection of Sites, Angle and Direction of Bore-holes.

UNIT – III

Methods of sampling - Weighting of samples and calculation of average grades - Mathematical and Statistical Methods - Ore Reserve Estimation - Geophysical Methods: Ground and Airborne Surveys; Gravity, Magnetic, Electrical and Seismic Methods of Mineral Exploration.

UNIT - IV

Ore Deposition - Physical and Chemical Controls of Ore fluids and their migration - Metallogenic Epochs and Provinces with Special reference to India – Ore beneficiation Processes - Physical Concentration Methods – Pre-treatment Processes: Drying, Calcination, Roasting, Agglomeration – Extraction via Flotation: Heap Leach Process, Smelting.

Course Outcomes

- 1 This course linked to industry and acquires knowledge on techniques to locate ore bodies, methods for mineral exploration and geologic aspects of drilling.
- 2 Acquire knowledge on geophysical methods for Ore reserve estimation.
3. Acquire knowledge on Ore beneficiation processes and techniques.

Textbooks/Reference Books:

1. Gokhale, K.V.G.K., and Rao, T.C., 1978: Ore deposits of India, Thompson Press, India.
2. Paul Ramdohr, 1970: Ore minerals and their intergrowth, Elsevier
3. R.L. Stanton, 1972: Ore petrology, McGraw-Hill Book Company, New York.
4. Lindgre, W: Ore deposits Stratabound Stratiform ore deposits, McGraw hill scientific company

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER II – GEO.402: MINERAL EXPLORATION AND ORE BENEFICIATION

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Renewable resources
2. Mineralogical guides to locate resources
3. Objectives of mineral exploration.
4. Describe types of drills
5. Methods of sampling
6. Magnetic method of mineral exploration
7. Ore controls and guides
8. Physical and chemical controls of ore fluids.

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Write an essay on conservation of minerals
Or
b) Explain the role of structural guides to locate the mineral resources
10. a) Briefly explain the Geobotanical methods of surface and sub surface explorations on different scales.
Or
b) Give a detailed an account of various types of drilling
11. a) Write a detailed note on seismic methods of mineral exploration
Or
b) Write an essay on calculations of statistical method
12. a) Write an essay on metallogenic epochs and provinces with special reference to India.
Or
b) Briefly explain the Ore beneficiation processes

GENERIC ELECTIVE: GEO.403a

MINING GEOLOGY

Course Objectives

1. To make students conversant with prevailing Mineral policies and acts
2. To understand different approaches of mineral exploration using different methods
3. To develop the capability to identify ore minerals and also design process flow charts in mineral processing.

UNIT- I

Mines and Minerals (Regulations and development) - Act ,1957 – National Mineral Policy - Mining Lease –Prospecting license – Renewal – Royalty and dead rent – Mineral concession rules (1960) – Certification of approval.

UNIT - II

Drilling: Percussion Drills, Rotary Drills, Miscellaneous Drilling methods, Drill Sampling, Accuracy of Sole Hole Sampling, Bore Hole Problems, Bore Hole Logging, Preservation and Sampling cares

UNIT – III

Mining methods: Classification of mining methods, Alluvial mining, Open cast mining or quarrying, Underground mining – Coal mining methods: Longwall advancing, Longwall retreating, Horizon mining, Strip mining and Miscellaneous mining.

UNIT - IV

Geochemical Prospecting: Metallic Mineral Deposits, Geochemical Field Techniques, Techniques used in Geobotanical Survey, Geochemical methods for Petroleum and Natural Gases Exploration – Ore Dressing: Crushing, Grinding, Sizing, Concentration; Washing and Scrubbing, Giggling, Tabling, Magnetic Separation, Electrostatic Separation – Flow Sheets: Chromite Gold, Copper and Lead and Zinc.

Course Outcomes

1. Confirm mining rules and regulations
2. Able to determine suitable mining methods
3. Analyse different ores and ore beneficiation processes.

Textbooks/Reference Books:

1. Abbas & Abbasi - Renewable Energy Resources & their Implication. (Prentice Hall India)
2. Arogyaswamy, R.N.P. (1994): Course in Mining Geology. Oxford IBH– New Delhi.
3. Gupta, H.K., and Rastogi, B.K. (1976). Elements of Mining Technology Dhanbad publishers, Dhanbad.
4. Mckinstry, H.E. (1980). Mining Geology, Prentice Hall, N.Y.
5. R.W. Marjoribanks (1997). Geological methods in Mineral Exploration and Mining, Chapman & Hall, London.

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CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.403a: MINING GEOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Definition of mining.
 2. Mining lease and regulations.
 3. Rotary Drills
 4. Bore hole logging.
 5. Alluvial mining.
 6. Longwall Advancing.
 7. Washing and Scrubbing
 8. Magnetic Separation.
- .

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. (a) Write an essay on Mineral Concession Rules, 1960.
Or
(b) Briefly explain the National Mineral Policy in India.
 10. (a) Write an essay on various types of drilling methods.
Or
(b) Explain briefly about Drill sampling, Preservation and Sample cares
 11. (a) Explain in detail the Open cast mining methods
Or
(b) Write an essay on Coal mining methods
 12. (a) Discuss about the various types of Geochemical prospecting methods
Or
(b) Give an account on Ore dressing processes
- .

GENERIC ELECTIVE: GEO. 403b

DIGITAL IMAGE PROCESSING

Course Objectives

1. To introduce the concepts of image processing and basic analytical methods to be used in image processing
2. To familiarize students with image enhancement and restoration techniques
3. To develop the capability to use GPS and DGPS instruments and technology

UNIT – I

Digital Number/pixel value - Image Rectification - Types of errors (Geometric, Radiometric and Atmospheric errors) – Corrections (Geometric, Radiometric and Atmospheric) – Image resampling – Resampling techniques - Computation of radiance and reflectance

UNIT – II

Image Registration - Image Enhancements, Spatial Enhancement, Radiometric Enhancement, Spectral Enhancement, Principal Component Analysis – Image Classifications: Digital Supervised classification, Unsupervised classification - Reclassification Processing and Feature Extraction – Data merging.

UNIT – III

Basic concepts of Global Navigational Satellite Systems (GNSSs) – Principle of GPS – Components of GPS - Source of GPS Errors and biases, Advantages and disadvantages of GPS surveying – GPS positioning types – Absolute positioning- Applications of GPS

UNIT – IV

Differential positioning – DGPS Measuring Techniques (Static, Rapid Static, Kinematic, Real Time Kinematic), Application of DGPS.

Course Outcomes

1. Analyze images in the frequency domain using various transforms.
2. Evaluate the techniques for image enhancement and image restoration.
3. Use GPS and DGPS techniques to various projects

Textbooks/Reference books:

1. Bernhardsen, T., 2002: Geographic Information Systems – An introduction. Wiley India.
2. Bonham, G. F and Carter. Geographic Information system for Geoscientists - Modelling with GIS, Elsevier.
3. Chandra, A.M. and Ghosh, S.K. 2007: Remote Sensing and Geographical Information Systems. Narosa Publishing House.
4. Estors, J.E. and Senger, L.W., 1974: RemoteSensing. Hamilton Publishing Company.
5. George Joseph: Fundamentals of Remote Sensing. Universities Press, Hyderabad.

6. Gupta, R. P. 2003: RemoteSensing Geology. Springer.
7. Heywood, I., Cornelius, S. and Carver, S. 2011: An Introduction to Geographical Information Systems, Pearson Prentice Hall, London.
8. Lillesand, T.M. and Keifer, R.W., 1979: Remotesensing and Image interpretation. John Wiley and Sons.
9. Lo C. P. and Yeung, A. K. W. 2002: Concepts and Techniques of Geographic Information Systems. Prentice Hall.
10. Panda, B. C. 2005: Remote Sensing – Principles and Applications. Viva Books Private Limited, New Delhi.
11. Pandey, S.N. 2001: Principles and Applications of Photogeology. New Age International (P) Limited Publishers, New Delhi.
12. Reddy, A.M., 2006: Textbook of Remote Sensing and Geographical Information Systems. B S Publications.
13. Rees W.G., 2001: Physical principles of Remote Sensing. Cambridge University Press.
14. Sabins, F.F., 1985: Remote Sensing–Principles and Applications. Freeman.
15. Seigal, B.S. and Gillespie, A.R., 1980: Remotesensing in Geology, John Wiley & Sons, 1980.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
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CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.403b: DIGITAL IMAGE PROCESSING

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Atmospheric errors
2. Reflectance
3. Spatial Enhancement
4. Supervised classification
5. Principle of GPS
6. Absolute positioning
7. Source of GPS errors
8. DGPS kinematic measuring

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. (a) Explain the process of Image Rectification
Or
(b) Describe the image resampling techniques
10. (a) Give in detail the image enhancement techniques
Or
(b) Describe in detail the various image classifications
11. (a) Explain Basic concepts of Global Navigational Satellite Systems
Or
(b) Explain the components of GPS and its applications
12. (a) Describe the DGPS measuring techniques
Or
(b) Write an essay on applications of DGPS

GENERIC ELECTIVE: GEO. 403c

WATER RESOURCES MANAGEMENT

Course Objectives

1. To introduce the fundamentals of groundwater flow
2. To learn the hydraulics of various types of wells
3. To develop the skills to conduct groundwater investigations
4. To understand the impacts of seawater intrusion

UNIT- I:

Hydrologic cycle; Hydrological properties of rocks - Types of Aquifers: Unconfined, Confined, Semi Confined & Perched-Groundwater movements: Sub surface movement, Base flow, Effluent flow and influent flow - Darcy's law, Reynold's number, Laminar flow and turbulence flow.

UNIT - II

Pumping test: Objectives, layout of the test and measurements - Pumping Tests Methods, Estimation of T & S by Theis, Jacob and Theis Recovery, Methods, Specific Capacity Method by Slither's Method

UNIT - III

Water level fluctuation: Water Table fluctuations and causative factors; Water table and Piezometric surface and its fluctuations - Water Table Contour maps - Well types, drilling methods

UNIT - IV

Surface investigation of groundwater - Subsurface investigation of groundwater - Artificial recharge of groundwater: Concept and methods - Saline water intrusion in aquifers: Saline water intrusion, Ghyben – Herzberg relation between fresh and saline water, Prevention and control of salt water intrusion in the coastal aquifers.

Course Outcomes

1. Explain the distribution of groundwater
2. Estimate the yield of the wells
3. Assess the quantity and quality of groundwater

Textbooks/Reference Books:

1. Groundwater Hydrology by Todd, D.K. John Wiley & Sons. New York.
2. Hydrogeology by Karanth, K.R., Tata McGraw Hill Publ Co New Delhi.
3. Ground water assessment, Development and Management by Karanth K.R. Tata, McGraw Hill Publ. Co. New Delhi.
4. Keller, E.A., 1978. Environmental Geology. Bell and Howell, USA.
5. Subramanian, V., 2001. Textbook in environmental Science, Narosa Publication, New Delhi.
6. Hydrogeology by Davis, S.N. and Dewiest, R.J.M. John Wiley & Son New York.
7. Ground Water by Raghunath, H. M. Wiley Eastern Ltd. New Delhi.
8. Groundwater Resources evaluation by Walton, W.C. McGraw Hill Publ. Co. New Delhi.
9. Groundwater Hydrology by Bouwer, H., McGraw Hill Book Co. New Delhi.
10. Davies, S.N. and De Wiest, D.R., (1966), Hydrogeology-John Wiley & sons, Inc, New York, 463p.
11. Fetter, C.W., (1990), Applied Hydrogeology-McGraw Hill, Publisher, New Delhi.
12. Freeze, R.A. and John, A., (1979), Groundwater, Cherry, Prentice Hall, Inc, 604p.
13. Handa, O.P (1984). Groundwater Drilling, Oxford & I.B.H. Publishing Co.
14. Hiscock, K., (2005), Hydrogeology, Principles and Practice, Blackwell Publishing, 389p.
15. Kazmann, (1973), Modern Hydrology, Harper and sons Publishers, New Delhi.
16. Manning, J.C., (2007). Applied Principles of Hydrology, CBS Publishers and Distributors, New Delhi.
17. Reddy and Rami, J.P., (2008). A Textbook of Hydrology, University Science Press, Bangalore.
18. Schwartz, F.W and Zhang, H., (2003). Fundamentals of groundwater, John Wiley & sons, Inc, New York, 583p.
19. Shaw, E.M., (1994). Hydrology in Practice, 3rd edition, Chapman and Hall, London, 569p.
20. Tolman, C. (1972). Groundwater, McGraw Hill Book Company.
21. Walton, W.C. (1970). Groundwater Resource Evaluation, McGraw Hill Book Company.

CO – PO Mapping:

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CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER III – GEO.403c: WATER RESOURCES MANAGEMENT

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Confined and unconfined aquifers
2. Effluent and Influent flows
3. Methods of pumping tests
4. Yield of a well
5. Differentiate water levels and water table
6. Factors influencing the water level fluctuation
7. Why saline water intrusion occurs
8. List the types of rainwater harvesting structures

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Discuss the hydrological properties of rocks
OR
b) How many types of aquifers are present and their characteristics?
10. a) Explain the procedure of Theis recovery test
OR
b) Explain the procedure of specific capacity method by Slither's method
11. a) What is a Peizometric head? Discuss the factors affecting the Peizometric head
OR
b) What are the types of wells and Discuss different drilling methods
12. a) Discuss various surface investigation methods for groundwater
OR
b) Write the prevention and control methods of salt water intrusion in coastal aquifers.

PRACTICAL I – GEO.404P:

HYDROGEOLOGY AND ENGINEERING GEOLOGY MINERAL EXPLORATION AND ORE BENEFICIATION MINING GEOLOGY

HYDROGEOLOGY AND ENGINEERING GEOLOGY SYLLABUS:

Course Objectives:

1. To provide the basics of hydrological properties of rock, aquifers, source of groundwater pollution and artificial recharge structures
2. To analyze the quality of water
3. To design the groundwater movement
4. To conduct groundwater investigations, to insist on the management of groundwater and methods of groundwater recharge
5. Role of geologist in engineering projects geological consideration for the selection of sites for major engineering projects.

Syllabus:

1. Simple numerical problems related to: determination of permeability, Groundwater flow, Well hydraulics etc.
2. Preparation and interpretation of water level contour maps and depth to water level maps.
3. Study, preparation and analysis of hydrographs for differing groundwater conditions
4. Water potential zones of India (map study).
5. Graphical representation of chemical quality data and water classification (C-S and Trilinear diagrams).
6. Topomap study on topographic environment for ideal site and route selection for (i) Dams (ii) Reservoirs (iii) Canal alignment (iv) Check dams (v) Flood water storage, (vi) Ghat roads
7. Preparation of Merits, demerits & remedial measures based up on geological cross sections of project sites
8. Identification of building stones and rock metal and study for physical and engineering properties.

Course Outcomes

1. Apply the knowledge of geological formations and the hydrological properties of rocks
2. Analyze the suitability of water for domestic, irrigation and industrial purposes
Conduct geological and geophysical investigations and give recommendations for drilling of borewells.
3. Explain causes of pollution of groundwater give remedial measures to the society.
4. Use modern methods and appropriate techniques to carrying out geophysical studies and artificial recharge methods
5. Students will get critical knowledge on evaluation of geological condition at the major engineering project sites.

MINERAL EXPLORATION AND ORE BENEFICIATION SYLLABUS:

Course Objectives:

1. Knowledge on energy resources and guides to locate ore bodies.
2. To enhance knowledge on methods of sampling and open cast mining and underground mining methods.
3. Awareness on National Mineral Policy
4. To impart knowledge on mineral processing principles and techniques.
5. Role of geologist in engineering projects geological consideration for the selection of sites for major engineering projects.

Syllabus:

1. Preparation of Geological cross section based on Borehole data;
2. Laying down of stripping boundary on geological cross sections;
3. Calculation of geological and mineable ore reserves, mineable waste, and grade.
4. Interpretation of remote sensing data for mineral exploration.
5. Preparation of mineral maps of India,
6. Graphical representation of production, export and import of important minerals.

Course Outcomes

1. The purpose of mineral exploration is the discovery and acquisition of new mineral deposit amenable to economic extractive operations now or in future.
2. There is uncertainty on the supply side of the market because mineral exploration is risky and the results of investment in exploratory activity are difficult.
3. Exploration Results, Mineral Resources and Mineral Reserves for Oil Shales,. Oil Sands, and other energy minerals extracted by mining methods.
4. Mineral exploration is conducted to search for commercially viable concentrations of ores and minerals for mining purposes. A highly accurate

MINING GEOLOGY SYLLABUS:

Course Objectives:

1. Development and conservation of minerals. Encourage value addition of minerals through promotion of mineral based industries. Strengthen mineral administration. Enforcement of mineral laws and rules.
2. Geology is the first step in mining and involves identifying prospective mineral deposits that might become mines. Geology also helps mine managers know where to develop once the mine is up and running.
3. In mining geology, ore deposits resemble shale in that they are typically continuous resources across broad areas that vary in richness.
4. The students will gain knowledge about various mineral groups. Course Outcomes. CO1. Identify face, form, Axis, symmetry and laws of crystallography.

Syllabus:

1. Identification of anomaly
2. Concept of weighted average in anomaly detection

3. Geological cross-section
4. Models of reserve estimation
5. Study of existing mine plans and sketches

Course Outcomes

1. Our efforts towards this goal span the mining lifecycle: we utilize geological tools to address technical and socio-technical problems in mineral exploration,
2. They help us to develop new technologies and are used in our everyday lives. Our use of rocks and minerals includes as building material, cosmetics, cars, roads, and appliances.
3. In order maintain a healthy lifestyle and strengthen the body, humans need to consume minerals daily.
4. Geological exploration is fundamental to the discovery of a mineral deposit and establishing its viability from an exploitation perspective. Present-day geological studies involve the use of satellites and aerial photographs, as well as geophysical and geochemical techniques.

MULTIDISCIPLINARY COURSE: GEO. 405

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

Course Objectives

1. To impart knowledge on concept of environmental impact assessment
2. To prepare the database for planning and management of EIA
3. To develop the skills to prepare mitigation measures
4. To understand the Various Acts related to Environment audit

UNIT - I

Concept and Scope of EIA – Elements and methodologies of EIA – Classification of environmental parameters – Public participation in environmental decision making process – Planning and management of EIA – Criteria for the selection of EIA methodology

UNIT- II

Procurement of relevant soil quality data, impact prediction, assessment of impacts significance, Identification and incorporation of mitigation measures

UNIT- III

Procurement of relevant Air, Wild life and other Ecosystem quality data, impact prediction, assessment of impacts significance, Identification and incorporation of mitigation measures

UNIT - IV

Need of Environmental audit – Importance of environmental legislation – Classification of environmental audit – Audit data and report - The Air Act – The Environmental Protection Act – The water Act – Wild life Act - Case studies.

Course Outcomes

1. Explain and evaluate the EIAM report
2. Estimate the cost benefit ratio of a project
3. Assess the risks and impacts of a project
4. Identify suitable EIA methodology

Textbooks/Reference Books:

1. H.S. Bhatia, 2003: A Text Book of Environmental Pollution and Control - Galgotia Publications (P) Ltd, New Delhi.
2. Larry, W. Canter, 1977: Environmental Impact Assessment - McGraw-Hill publications.
3. Anjaneyulu, Y. and Manickam, V, 2017: Environmental Impact Assessment Methodologies – B.S. Publication.
4. Balakrishna Moorthy, 2008: Environmental Management, 2nd Edn – PHI Publications.
5. B.B. Hosetti, and A. Kumar, 1998: Environmental Impact Assessment and Management - Daya Publishing house.

CO – PO Mapping:

POs → COs↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	M							
CO2	M	L	M	M	M							
CO3	M	L	M	M	M							
CO4	H	L	H	H	H							

H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER IV – GEO.405: ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks *4 X 5 = 20 M*

1. Elements of Environmental Impact Assessment and management
2. Concept of EIAM
3. Significance of Soil data in EIAM studies
4. Assessment of impact on soils
5. Significance of Air quality data in EIAM studies
6. Mitigation measures of impact on ecosystem
7. Environmental audit data
8. Air Act

SECTION – B

Answer ALL questions. All questions Carry equal Marks *4 x 15 = 60 M*

9. a) Classification of environmental parameters in EIA studies
OR
b) Explain the role of public participation in environmental decision making process
10. a) Write the procedure for the Identification and incorporation of mitigation measures in case of Soil quality
OR
b) Write the procedure for impact prediction and assessment of impact's significance done in case of water quality
11. a) Write the procedure for impact prediction and assessment of impact's significance done in case of Air quality
OR
b) Write the procedure for impact prediction and assessment of impact's significance done in case of Ecosystems
12. a) Discuss the classification of environmental audit in detail
OR
b) Write a note on Water act and Environmental protection act

PRACTICAL II – GEO.406P: GEOLOGICAL FIELD SURVEY AND TRAINING PROGRAMME

Course Objectives:

1. Geology is the one of the most interesting subject about mother earth which can be best studied on field.
2. Geological Survey is the nation's largest water, earth, and biological science and civilian mapping agency.
3. It collects, monitors, analyzes, and provides scientific understanding of natural resource conditions, issues, and problems.
4. The **geological** map of the region given to us was thoroughly studied so that we could get an idea of the important rock

Syllabus:

1. To carryout yield test of a bore well in the field.
2. Collection of water level data of various wells in the field.
3. Visit to a dam or a bridge or any other major engineering structures to understand the geological conditions in and around the engineering structures.
4. Visit to open cast or underground ore forming rock mining areas to understand the mining operations.
5. Preparation of field report (draft) incorporating the above said geological characteristics in the field.

Course Outcomes:

1. Traditional **field geological surveys** include searching for geological outcrops, surveying various geological phenomena.
2. A geological survey is the systematic investigation of the geology beneath a given piece of ground for the purpose of creating a geological map or model.
3. The management of **geological** data has been one of the important **research fields** in engineering **geology**, geotechnical engineering, and Geographic Information
4. Program outcomes examine what a program or process is to do, achieve, or accomplish for its own improvement and/or in support of institutional or divisional goals: generally numbers, needs, or satisfaction driven. They can address quality, quantity, fiscal sustainability, facilities and infrastructure, or growth.

OPEN ELECTIVE: GEO.407a

FUEL GEOLOGY

Course Objectives

1. To impart knowledge about the origin, composition and accumulation of petroleum; reservoir rock types and reservoir traps.
2. To know geology of oil bearing basins of India, position of oil and gas in India and future prospects and economic scenario.
3. To educate about the coal characteristics, geographical distribution of coal and detailed geology of coal fields of India.
4. To enlighten about the occurrence and association of atomic minerals, methods of prospecting and Nuclear power stations country and future prospects.

UNIT- I:

Petroleum: Composition – nature - origin: inorganic and organic theories - migration (primary and secondary) and accumulation of oil and gas - Geographic locations - petroleum reservoir rocks - Reservoir rock types, Geological age of reservoir rocks - Reservoir traps - Classification of traps, anticlinal theory - Structural traps caused by folding, faulting and fracturing.

UNIT- II:

Primary stratigraphic traps - Fluid traps, Salt domes, Salt plugs, Cap rocks and association traps: Origin, reservoir conditions - Oil bearing basins of India - Geology of the productive oil fields of India - Position of oil and natural gas in India - Future prospects and economic scenario.

UNIT- III:

Coal: Definition, origin, sedimentology of coal bearing strata - Rank, grade and type of coal - Chemical characterization: Proximate and ultimate analysis - Coal forming epochs in the geologic past - Geological and geographical distribution of coal in India - Detailed geology for important coal fields in India.

UNIT- IV:

Atomic minerals: Mode of occurrence and association of atomic minerals in nature - Atomic minerals as source of energy - Methods of prospecting and productive geological horizons in India - Nuclear power stations of country and future prospects - Atomic fuels and environment.

Course Outcomes

1. The course offers a detailed study about natural fuels like coal and petroleum their formation and distribution especially in sedimentary basins.
2. Students shall benefit to have basic ideas about formations, nomenclature in constitution of coal working detail of distribution of coals and coal industry in India, Sufficient idea of formation and entrapment of oil and gas.
3. Get elaborate knowledge about occurrence of atomic minerals in nature, methods of prospecting, atomic fuels and environment.

Textbooks/Reference Books:

1. Taylor, G.H., Teichmueller, M., Davis, A., Diesel, C.F.K. and others, 1998: Organic Petrology, Berlin – Stuttgart.
2. Selley, R.C., 1985: Elements of Petroleum Geology, Academic Press
3. Chandra, D., Singh, R.M and Singh, M.P: Textbook of Coal
4. Singh, M.P: Coal and Organic Petrology
5. Stach, E, Mackowsky, M.T.H, Taylor, H.H and others, 1982: Stach's Textbook of Coal Petrology
6. Durrance, E.M., 1986: Radioactivity in Geology: Principles and Applications, Ellis Horwood Ltd.
7. Scott, A.C., (1987): Coal and Coal-bearing strata: Recent Advances. The geological Society of London, Publication no. 32, Blackwell scientific Publications.

8. Holson, G.D. and Tiratso, E.N., (1985): Introduction to Petroleum Geology. Gulf Publishing, Houston, Texas.
9. North, F.K., (1985): Petroleum Geology. Allen Unwin.
10. Dahlkamp, F.J., (1993): Uranium Ore Deposits. Springer Verlag.
11. VBoyle, R.W., (1982): Geochemical prospecting for Thorium and Uranium deposits, Elsevier

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H: High; M: Medium; L: Low

MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER V – GEO.407a: FUEL GEOLOGY

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Origin of Petroleum
2. Geographic locations of Petroleum
3. Origin of cap rocks
4. Salt domes
5. Hydrocarbon evaluation
6. Coal petrology
7. Radioactive minerals
8. Occurrence of atomic minerals

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) Write an essay on surface and subsurface occurrence of petroleum and gas
(OR)
b) Describe the migration and accumulation of oil and gas
10. a) Describe various types of stratigraphic traps with neat sketch
(OR)
b) Enumerate the geology of the oil fields in India
11. a) Write an essay on preparation of coal for industrial propose
(OR)
b) Discuss about Indian coal reserves and production of coal in India
12. a) Write a detailed note on Atomic fuels and environment
(OR)
b) Give an account of productive geological horizons of atomic minerals of India

OPEN ELECTIVE: GEO.407b

NATURAL HAZARDS AND DISASTER MANAGEMENT

Course Objectives

1. To understand the origin and types of disasters
2. To Compare hazards, disasters and associated natural phenomena and their interrelationships, causes and their effects
3. To build skill to respond to disasters

UNIT - I

Natural Hazard - definition - Earth's processes: catastrophic geological hazards: study of floods, Landslides, Earthquakes, Volcanism and avalanches – with a view to assess the magnitude of the problem, prediction and perception of the hazards - Laws and regulations towards hazard management.

UNIT - II

Earthquakes: Definition - seismic waves, intensity and magnitude, Richter scales, Seismograph, seismogram, seismicity in Indian region, mitigation measures and management, Preparation of seismic hazard map – **Tsunamis:** Causes, General

characteristics, Predictability, effects, Possible Risk Reduction Measures – **Volcanoes:** Definition, types, mitigation measures and management - **Avalanche:** Definition, types, mitigation - **Flood:** Definition, causes, vulnerable zones in India, Mitigation measures and management

UNIT - III

Coastal Hazards: Introduction, Coastal Processes, Coastal erosion, mitigation measures and management - **Landslides:** Types, Causes and mechanism, Vulnerable zones in India, mitigation measures and management – **Cyclone:** Definition, Causes, Vulnerable zones in India, mitigation measures and management - **Soil erosion:** Soil formation, Soil classification, Factors influencing Soil erosion, Hazards of Soil erosion – **Drought:** Types, Mitigation Measures.

UNIT - IV

Pre-planning for a Disaster: Internal Actions, External Actions – Eliminating, minimizing and shifting risks – Developing an Action plan – Developing the written plan – Effective Communication – Selecting the right people – Training for Success – Media control - Shareholder factor – **After a Disaster;** Minimizing the Damage – Governmental reactions – Disaster Preparedness Assessments.

Course Outcomes

1. Identify the natural and environmental disasters, its causes and apply preventive measures.
2. Adopt the laws and regulations towards hazard management
3. Able to prepare controls of mitigating toward natural disasters.

Textbooks/Reference Books:

1. K. S. Valdiya, 2013: Environmental Geology, McGraw Hill Education (India)
2. D. Collins Larry, R. and Schneid Thomas, D., 2000: Disaster Management and Preparedness, Taylor and Francis.
3. Goel, S.L. and Kumar Ram, 2000: Disaster Management, Deep and Deep Publications.
4. Living with Risk: A global review of disaster reduction initiatives, 2004 Vision, United Nations.
5. Parasuraman, S., 2004: India Disasters Report: Towards a Policy Initiatives, Oxford University Press.

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MODEL QUESTION PAPER

(Revised Syllabus w.e.f. 2021-2022 for Campus Students)

M.Sc. DEGREE EXAMINATION - 2022

FOURTH SEMESTER

SUBJECT: GEOLOGY

PAPER V - GEO.407b: NATURAL HAZARDS AND DISASTER MANAGEMNET

Time: 3 hrs

Max. Marks: 80

SECTION – A

Answer any FOUR of the following questions. All questions carry equal marks

4 X 5 = 20 M

1. Earthquake Magnitude and Intensity
2. Define Avalanche. Explain the causes of Avalanche.
3. Tsunami
4. Seismic waves and Richter Scale
5. Coastal processes
6. Define Flood and explain its causes
7. Pre-planning for a Disaster
8. Media control in an emergency and Disaster preparedness plan

SECTION – B

Answer ALL questions. All questions Carry equal Marks

4 x 15 = 60 M

9. a) List out and Briefly describe different geological hazards
OR
b) Discuss the Governing Laws and Regulations towards Hazard Management
10. a) Define Earthquake. Explain its causes, mitigation measures and management
OR
b) Define Volcano and explain mitigation measures and management in Volcanic Regions.
11. a) Define Avalanche. Explain its types and mitigation measurements to control the disaster.
OR
b) Discuss causes of Coastal erosion and its mitigation measures and management
12. a) Explain the Pre-planning measures for a disaster management
OR
b) Discuss in detail how to minimize the damage after a disaster.