

DEPARTMENT OF GEOLOGY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. GEOLOGY

Semester - I

SESSION : 2021-22



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2021-22

M.Sc. geology programme renders insight on the Earth Systems Sciences and its relationship with other branches of science leading to development of basic observational skill to become prominent geoscientist. Students will develop their critical thinking skills, application to solve the geological problems using scientific methods. Training under this program will enhance the ability of the students to acquire, analyze and communicate their ideas, scientific data and interpretation to the users. The programme equips them for competing in different national level examinations.

Approved syllabus for M.Sc. Geology by the members of Board of Studies for the Sessions 2021-22 and 2022-23, the syllabus with the paper combinations is as under

Semester I:

Paper I : Geomorphology Course code:- MGL 101	Paper II : Structural Geology and Tectonics Course code:- MGL 102
Paper III: Mineralogy and Crystallography Course code:- MGL 103	Paper IV: Geochemistry, Instrumentation and Analytical Techniques Course code:- MGL 104
Practical: Lab Course I Course code:- MGLP01	Practical: Lab Course II Course code:- MGLP02

Semester II:

Paper I: Igneous Petrology Course code:- MGL 201	Paper II: Sedimentology Course code:- MGL 202
Paper III: Metamorphic Petrology Course code:- MGL 203	Paper IV: Palaeobiology and Stratigraphy Course code:- MGL 204
Practical: Lab Course I Course code:- MGLP03	Practical: Lab Course II Course code:- MGLP04
Field work/Report + viva - 100 Course code:- MGLP05	

Semester III:

Paper I: Environmental Geology Course code:- MGL 301	Paper II: Economic Geology Course code:- MGL 302
Paper III: Mineral Exploration Course code:- MGL 303	Paper IV: Hydrogeology Course code:- MGL 304
Practical: Lab Course I Course code:- MGLP06	Practical: Lab Course II Course code:- MGLP07

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M.Sc. Geology 2021-22

Semester IV:

Paper I: Photogeology and Remote Sensing Course code:- MGL 401	Paper II: Engineering Geology and Mineral Beneficiation Course code:- MGL 402
Paper III: Mineral Resource Development and Mining Geology Course code:- MGL 403	Paper IV: Energy Resources Course code:- MGL 404 OR Field Work/ Project work (In lieu of one theory paper)
Practical: Lab Course I Course code:- MGLP08	Practical: Lab Course I Course code:- MGLP09

* **Field Work/ Project work (In lieu of theory papers) –**

{Project oriented Dissertation - 50 marks +Viva on Dissertation - 50 marks} Total 100 Marks

The syllabus for M.Sc. Geology is hereby approved for the sessions 2021-22 and 2022 -23.

Program Specific Outcomes of M.Sc. Geology

The student graduating with the M.Sc. Geology will be able to

1. Acquire
 - (a) A fundamental/systematic or coherent understanding of the academic field of Geology, its different learning areas and applications in basic Geology like Mineralogy, Petrology, Stratigraphy, Palaeontology, Economic geology, Hydrogeology, etc. and its linkages with related interdisciplinary areas/subjects like Geography, Environmental sciences, Physics, Chemistry, Mathematics, Life sciences, Atmospheric sciences, Remote Sensing, Computer science, Information Technology;
 - (b) Procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Geology, including professionals engaged in research and development, teaching and Government/public service;
2. Demonstrate the ability to use skills in Geology and its related areas of technology for formulating and tackling geosciences-related problems and identifying and applying appropriate geological principles and methodologies to solve a wide range of problems associated with geosciences.
3. Recognize the importance of RS & GIS, mathematical modeling simulation and Computing and the role of approximation and mathematical approaches to describing the physical world.
4. Demonstrate relevant generic skills and global competencies such as
 - (a) Problem-solving skills that are required to solve different types of geosciences-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary area boundaries;
 - (b) Investigative skills, including skills of independent investigation of geosciences-related issues and problems;

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M.Sc. Geology 2021-22

- (c) Communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature;
- (d) Analytical skills involving paying attention to detail and ability to construct logical arguments using correct technical language related to Geology and ability to translate them with popular language when needed;
- (e) ICT skills;
- (f) Personal skills such as the ability to work both independently and in Teams
5. Demonstrate professional behavior such as
- (a) Being objective, unbiased and truthful in all aspects of work
- (b) Promoting safe learning and working environment.

Syllabus and Marking Scheme for First Semester

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I	Geomorphology	80	16	20	04	05
II	Structural Geology and Tectonics	80	16	20	04	05
III	Mineralogy and Crystallography	80	16	20	04	05
IV	Geochemistry, Instrumentation and Analytical Techniques	80	16	20	04	05
V	Lab Course I	100	33			04
IV	Lab Course II	100	33			04
	Total	520		80		28

04 Theory papers - **320**
04 Internal Assessments - **80**
02 Practical - **200**
Total Marks - **600**

Note: 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical/Project work.

GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.



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Course Outcome Paper I: Geomorphology

On completion of Course, the students will be able to

1. Describe the fundamental concepts of Geomorphology, Weathering, Soil processes and Karst Topography, Morphometric analysis.
2. Identify the landforms formed by the tectonic activities and the geological work done by a river and glacial processes.
3. Describe the coastal process along the shoreline on the surface of the earth and the geological work done by the wind.
4. Explain the volcanic processes acting on the surface of the earth and its resultant surface morphology; application of Geomorphology in various studies.

DETAILS OF SYLLABUS

FIRST SEMESTER

Course code:- MGL 101, Paper I: Geomorphology

Max. Marks 80

Min. Marks 16

Unit 1. (i) Concepts of Geomorphology, weathering processes, cycle of erosion.

(ii) Landforms in relation to climate, rock type, structure & tectonics.

(iii) Geomorphic regions of India. Rock weathering and soil formation.

(iv) Hypsography of the continents and ocean floor- Continental shelf, slope, rise and abyssal plains.

(v) Coastal landforms.

Unit 2. (i) Fluvial landforms: Erosional and depositional landforms formed due to fluvial action

(ii) Karst landforms. Erosional landforms formed due to the action of underground water

(iii) Karst landforms. Depositional landforms formed due to the action of underground water

(iv) Volcanoes- Their form & structure, Types, Volcanic products

(v) Volcanic landforms, volcanic belts of the world.

Unit 3. (i) Aeolian landforms: Erosional landforms formed due to the action of wind.

(ii) Aeolian landforms: Depositional landforms formed due to the action of wind.

(iii) Glacial landforms Erosional landforms formed due to glacial action

(iv) Glacial landforms: Depositional landforms formed due to glacial action

(v) Ice Age and its causes

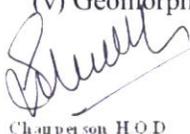
Unit 4. (i) Morphometric Analysis, slope analysis, stream ordering, Bifurcation ratio, stream frequency, drainage density.

(ii) Applied Geomorphology meaning and concept. Land use -land cover map.

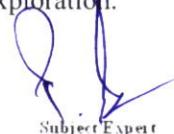
(iii) Geomorphology and hazard management.

(iv) Geomorphology and engineering works.

(v) Geomorphology and mineral exploration.


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FIRST SEMESTER

Paper I: Geomorphology

Books Recommended

Thornbury, W.D., 1986: Principles of Geomorphology. John Wiley.
 Singh, Savindra, 2007: Geomorphology. Prayag Pustak Bhavan, Allahabad.

Question Paper Format and Distribution of Marks for PG Semester Examination

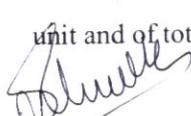
Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :
 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
 - Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

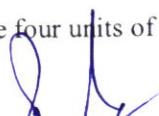
Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

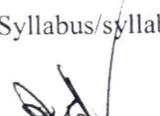
Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit. Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the Syllabus/syllabi.


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4. Internal Assessment Examination will be as follows :

- i. Internal Test in each paper (20 marks)
- ii. Seminar (Power point presentation) in any one of the paper (20 marks)
- iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
- iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.



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Course Outcome Paper II: Structural Geology and Tectonics

On completion of Course, the students will be able to

1. Predict the concept of stress forces acting in the earths and its resultant structural changes. The Geometry, Types and Mechanism of Faulting and Folding.
2. Explain the concept of strain and its effects on Geometry.
3. Illustrate the planar and linear fabrics in deformed rock.
4. Summarize the theory of plate tectonics and describe how the outer part of the earth broken into large fragments (plates) that are always in motion relative to each other.
5. Explain the evolution of continental and oceanic crust and tectonics of precambrian orogenic belts of India.
6. Identify and distinguish various geological structures on photographs, geological maps and in field.

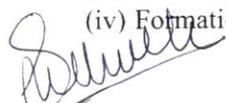
FIRST SEMESTER

Paper II: Structural Geology and Tectonics

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Mechanical principles of rocks and their controlling factors. Concept of stress and strain and theory of rock failure. Role of fluids in deformation processes.
(ii) Stress analysis: Compressive and shear stress, biaxial and triaxial stress, Mohr's circle and envelope. Two dimensional stress and strain analyses. Types of stress and strain ellipsoids, their properties and geological significance.
(iii) Folds, their description and classification. Causes and mechanics of folding and buckling.
(iv) Fold development and distribution of strains in folds.
- Unit 2.** (i) Fractures and joints, their nomenclature, classification, origin and significance.
(ii) Elements, terminology and classification of faults.
(iii) Causes and mechanics of faulting. Strike slip fault, normal fault, over thrust and nappe structure.
(iv) Unconformities, types and significance.
- Unit 3.** (i) Top and bottom criteria using primary and secondary structures.
(ii) Planar and linear fabrics in deformed rock, their origin and significance.
(iii) Field techniques of lithological and structural mapping.
(iv) Significance and limitations of π and β diagrams.
- Unit 4.** (i) Concept of plate tectonics and recent advances.
(ii) Dynamic evolution of continental and oceanic crust.
(iii) Tectonics of precambrian orogenic belts of India.
(iv) Formation of mountain roots and Anatomy of orogenic belts.


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Books Recommended

- Ramsay, J.G., 1967: Folding and Fracturing of Rocks. McGraw Hill.
 Hobbs, B.E., Means, W.D. and Williams, P.F., 1976: An Outline of Structural Geology, John Wiley.
 Davis, G.R., 1984: Structural Geology of Rocks and Region. John Wiley.
 Ramsay, J.G. and Huber, M.I., 1987: Modern Structural Geology, Vol. I and II Academic Press.
 Ghosh, S.K., 1995: Structural Geology Fundamentals of Modern Developments. Pergamon Press.
 Billings, M.P., Structural Geology
 Moores, E. and Twiss, R.J., 1995: Tectonics. Freeman.
 Valdiya, K.S., 1998: Dynamic Himalaya. Universities Press, Hyderabad.
 Summerfield, M.A., 2000: Geomorphology and Global Tectonics. Springer Verlag.

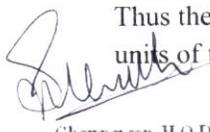
Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :
 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
 - Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

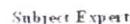
- Note :- 1. Question no. 1 and Question 2 will be compulsory.
 2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
 3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.
 Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.


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4. Internal Assessment Examination will be as follows :
- i. Internal Test in each paper (20 marks)
 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

Course Outcome Paper III: Mineralogy and Crystallography

At the end of the course, the students will be able to

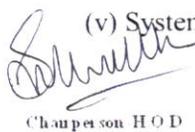
1. Identify the rock-forming minerals
2. Explain the optical mineralogical characteristics of various rock forming silicates.
3. Discuss the symmetry characteristics and forms of various crystal systems.
4. Describe the characteristics of Nesosilicates, Sorosilicates and Ring Silicates.
5. Explain the characteristics of Inosilicates, Phyllosilicates, and Tectosilicates.

FIRST SEMESTER
Paper- III Mineralogy and Crystallography

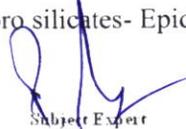
Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Minerals and their classification
(ii) Physical and optical properties of minerals
(iii) Refractometry and its determination. Uniaxial and Biaxial indicatrices.
(iv) Dispersion in minerals, optic orientation, optical anomalies.
(v) Optical accessories: Quartz wedge, Gypsum plate and Mica plate
- Unit 2.** (i) Determination of order of interference colour and pleochroic scheme of minerals
(ii) Optical characters of Uniaxial and Biaxial minerals
(iii) Morphology of crystals. Fundamental laws of crystal Zones and Zonal symbols.
(iv) Classification of crystals in 32 classes.
(v) Symmetry and forms of crystals of Isometric, Tetragonal, Hexagonal systems
- Unit 3.** (i) Symmetry and forms of crystals of orthorhombic , monoclinic and triclinic systems.
(ii) Crystal aggregates- Twinning. Irregularities and imperfection in crystals.
(iii) Classification of silicate structure
(iv) Systematic mineralogy (atomic structure, mineral chemistry and their P-T stability and mode of occurrence of Nesosilicates – Olivine, Garnet.
(v) Systematic mineralogy of Soro silicates- Epidote, Zircon, Topaz Staurolite and Sphe.


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M.Sc. Geology 2021-22

- Unit 4.** (i) Systematic mineralogy of Cyclosilicates – Cordierite, Tourmaline and Beryl.
(ii) Systematic mineralogy of Inosilicates – Pyroxene and Amphibole groups.
(iii) Systematic mineralogy of Phyllosilicates – Mica, Chlorite, Serpentine, Clay minerals, Kaolinite and Talc.
(iv) Systematic mineralogy of Tectosilicates- Silica, Felspar, Feldspathoids and Zeolite groups
(v) Gems and Semiprecious stones.

Books Recommended

Deer, W.A., Howie, R.A., and Zussman, J., 1996: The Rock Forming Minerals. Longman.
Klein and Hurlbut, Jr., C.S., 1993: Manual of Mineralogy. John Wiley.
Phillips, W.R. and Griffen, D.T., 1986: Optical Mineralogy. CBS Edition.
Perkins, D. 2002: Mineralogy. Prentice Hall.
Nesse, W.D., 2000: Introduction to Mineralogy. Oxford University Press.

Question Paper Format and Distribution of Marks for PG Semester Examination

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3. From each Unit, the questions will be asked as follows:
 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question **(Answer in 200-250 words) (04 Marks)**
 - Q.4 Long answer type questions **(Answer in 400-450 words) (12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			


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Note:

1. Question no. 1 and Question 2 will be compulsory.
 2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
 3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.
- Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
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 - i. Internal Test in each paper (20 marks)
 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - iii. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.


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Course Outcome Paper IV: Geochemistry, Instrumentation and Analytical Techniques

At the end of the course, the students will be able to

1. Describe the chemical composition characteristics of the Earth,
2. Discuss the geochemical classification of elements, Major, minor and trace and elements
3. Explain element partitioning in minerals and rocks.
4. Explain instrumentation and analytical techniques used in geochemical analysis.
5. Apply the laws of thermodynamics and nuclear chemistry in geochemical studies.
6. Interpret results of water analysis with the help of various diagrams

FIRST SEMESTER

Paper- IV : Geochemistry, Instrumentation and Analytical Techniques

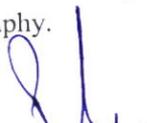
Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Origin and abundance of elements in solar system and in the earth and its constituents.
(ii) Special properties of transition and rare earth elements.
(iii) Geochemical classification of elements.
(iv) Principles of ionic substitution in minerals. Isomorphism, polymorphism and pseudomorphism
(v) Radiogenic isotopes, Stable isotopes: nature, abundance and fractionation
- Unit 2.** (i) Radioactive decay schemes of U-Pb, Sm-Nd, Rb-Sr, K-Ar and growth of daughter isotopes.
(ii) Radiometric dating of single minerals and whole rocks.
(iii) Laws of Thermodynamics: Concepts of free energy, fugacity and equilibrium constant.
(iv) Geochemistry of oceanic crust. Composition of continental crust.
(v) Geochemistry of island arcs.
- Unit 3.** (i) Element partitioning in minerals. Element partitioning in rocks.
(ii) Concept of simple distribution coefficients.
(iii) Element partitioning in mineral assemblages and its use in P-T Estimation
(iv) Elemental mobility in surface environment Mineral stability in Eh-pH diagram.
(v) Geochemical cycle. Bio geochemical cycle.
- Unit 4.** (i) X-ray Diffractometry, X-ray Fluorescence spectrometry
(ii) Scanning and Transmission, electron microprobe analysis.
(iii) Thermal ionization and gas source mass spectrometry.
(iv) Principles and application of AAS. Principles and application of cathodo-luminescence, thermoluminescence
(v) Sampling and sample preparations. Sample etching, staining and modal count techniques.
Techniques of photomicrography.


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2021-22

Books Recommended

Mason B. and Moore, C.B., 1991: Introduction to Geochemistry. Wiley Eastern.
 Krauskopf, K.B., 1967: Introduction to Geochemistry. McGraw Hill.
 Henderson, P. 1987: Inorganic Geochemistry. Pergamon Press.
 Faure, G., 1986: Principles of Isotope Geology. John Wiley.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

- Q.1 Very short answer type question
 (Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
 (Answer in one or two sentences) (02 Marks)
- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

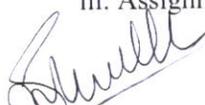
Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

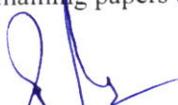
Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

4. Internal Assessment Examination will be as follows :

- i. Internal Test in each paper (20 marks)
- ii. Seminar (Power point presentation) in any one of the paper (20 marks)
- iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)


 Champion H.O.D.


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- iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

Course Outcome Lab Course - I

At the end of the course, the students will be able to

1. Identify various landforms.
2. Distinguish various types of drainage patterns
3. Do calculations of Morphometric analysis.
4. Demonstrate the skill of preparation of geological cross sections and interpretations of geological maps, Completion of outcrops.
5. Solve structural problems with the help of stereographic projections.
6. Identify structures present in natural rock specimens and models.

FIRST SEMESTER
PRACTICALS

LAB COURSE - I

1. Study of various models of landforms.
2. Morphometric analysis. Use of planimeter.
3. Study of various types of drainage patterns
4. Preparation and Interpretations of geological maps and sections.
5. Completion of outcrops.
6. Solution of structural problems with the help of stereographic projections.
7. Plotting and interpretation of petro fabric data and resultant diagrams.
8. Study of structures present in natural rock specimens and wooden models.
9. Use of diagonal scale, GPS, Clinometer compass and Brunton Compass .

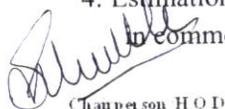
Course Outcome Lab Course - II

At the end of the course, the students will be able to

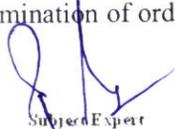
1. Identify rock forming minerals in hand specimen and thin section
2. Determine pleochroic scheme in minerals,
3. Estimate Anorthite content in plagioclase,
4. Determine order of interference colour in common minerals.
5. Interpret of results of water analysis with the help of various diagrams.

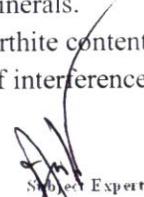
LAB COURSE - II

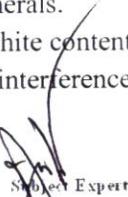
1. Megascopic and microscopic study of rock forming minerals.
2. Preparation of thin sections and polished section of minerals.
3. Determination of pleochroic scheme in minerals, Anorthite content in plagioclase.
4. Estimation of birefringence, determination of order of interference colors and sign of elongation in common minerals.


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5. Study of interference figure and determination of optic sign.
6. Interpretation of results of water analysis with the help of various diagrams.
7. Soil Analysis and its interpretation.
8. Study of crystal models of various crystal systems.
9. Numerical based on radioactive age dating.


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DEPARTMENT OF GEOLOGY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. GEOLOGY

Semester - II

SESSION : 2021-22



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2021 – 2022

Syllabus and Marking Scheme for Second Semester

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I	Igneous Petrology	80	16	20	04	05
II	Sedimentology	80	16	20	04	05
III	Metamorphic Petrology	80	16	20	04	05
IV	Palaeobiology and Stratigraphy	80	16	20	04	05
V	Lab Course I	100	33			04
IV	Lab Course II	100	33			04
	Field Work/Report + Viva	100				04
	Total	620		80		32

Field Work- Every student shall have to undergo geological field work for at least two weeks (14 days) in the Second Semester also. At the end of the Second Semester, each student shall have to submit field report covering all aspects of geological field work for evaluation. It is compulsory for each student to appear in a viva and she/he shall give a presentation on the field work done by him/her.

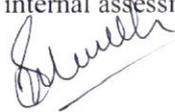
Marks allotted for field Report: 50

Marks allotted for Viva on field work: 50

Theory	-	320
Internal Assessment	-	80
Practical	-	200
Field work/Report + viva	-	100
Total Marks	-	700

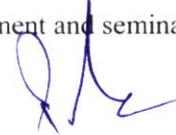
GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.


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M.Sc. Geology 2021 – 2022

Course Outcome Paper- I: Igneous Petrology

At the end of the course, the students will be able to

1. Explain principles concepts of petrology, petrography & petrogenesis.
2. Identify various forms, structures and textures of igneous rocks.
3. Classify the igneous rocks and describe their megascopic and microscopic characters.
4. Describe the evolution of magma
5. Summarize the generation of magma with reference to plate tectonics

SECOND SEMESTER

Course code: - MGL 201, Paper- I: Igneous Petrology

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Principles and general concept of petrology, petrography & petrogenesis.
(ii) Various forms, structures and textures of igneous rocks & their significance in petrogenesis.
(iii) Phase equilibria of unicomponent, Binary (mixed & eutectic) silicate systems.
(iv) Phase equilibria of Ternary (Albite-Anorthite-Diopside, and Forsterite- Diopside-Silica) Silicate systems
(v) Bowen's reaction series. Petrographic Province.
- Unit 2.** (i) Composition of primary magma; mantle mineralogy.
(ii) Factors affecting evolution of magma. Magmatic differentiation processes.
(iii) Partial melting of mantle – different models. Trace element behavior during partial melting.
(iv) Behavior of major and trace elements during fractional crystallization.
(v) Concurrent assimilation and fractional crystallization. Magma mixing.
- Unit 3.** (i) Criteria for classification of the igneous rocks. Factors of chemical composition & mineral composition. Tabular classification. CIPW and Niggli values. Petrogenetic study of the following rock types and their distribution in India:
(ii) Basalt and Ophiolite
(iii) Peridotite, Komatiite,
(iv) Granite, Anorthosite
(v) Kimberlite and Lamproite
- Unit 4.** (i) Rock suite and series. Generation of magma with reference to plate tectonics.
(ii) Petrogenetic study of Carbonatite, Lamprophyre, and their distribution in India.
(iii) Mid-ocean ridge volcanism and oceanic intra-plate volcanism
(iv) Magmatism associated with subduction related igneous activity- continental and island arc
(v) Magmatism in Large Igneous Plutons and continental alkaline magmatism.


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M.Sc. Geology 2021 – 2022

Books Recommended

- Turner, F.J., 1980: Metamorphic Petrology. McGraw Hill, New York.
 Yardley, B.W. 1989: An Introduction to Metamorphic Petrology. Longman. New York.
 Philpotts, A., 1992: Igneous and Metamorphic Petrology. Prentice Hall.
 Best, M.G., 1986: Igneous and Metamorphic Petrology, CBS Publishers.
 Bose, M.K., 1997: Igneous Petrology. World Press.
 Winter, J.D., 2001: Igneous and Metamorphic Petrology. Prentice Hall India Ltd.

Question Paper Format and Distribution of Marks for PG Semester Examination

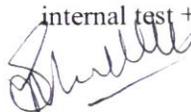
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Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
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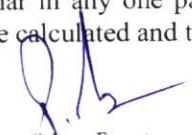
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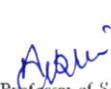

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M.Sc. Geology 2021 – 2022

Course Outcome Paper- II: Sedimentology

At the end of the course, the students will be able to

1. Evaluate the role of various sedimentary environments in the formation of sedimentary rocks.
2. Identify various forms, structures and textures of sedimentary rocks.
3. Classify the sedimentary rocks and describe their megascopic and microscopic characters.
4. Summarize Field and Laboratory techniques in Sedimentology
5. Explain application of trace element, rare earth element and isotope geochemistry to Sedimentological problems

SECOND SEMESTER
Paper- II : Sedimentology

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Earth Surface System: Liberation and flux of sediments.
(ii) Processes of transport and generation of sedimentary structures, control on the sedimentary rock record.
(iii) Sedimentary environments. Continental alluvial – fluvial, lacustrine, desert, aeolian and glacial sedimentary systems.
(iv) Shallow coastal clastics.
(v) Deep Sea Basins.
- Unit 2.** (i) Marine and continental evaporates. Shallow water carbonates.
(ii) Volcanoclastics – onland and marine.
(iii) Sedimentary facies.
(iv) Palaeocurrent and Basin Analysis.
(v) Evolution of Sedimentary Basins: Tectonics and Sedimentation.
- Unit 3.** (i) Clastic Petrofacies.
(ii) Palaeoclimate and Palaeoenvironment analysis.
(iii) Application of trace element, rare earth element and isotope geochemistry to sedimentological problems.
(iv) Top and Bottom Criteria.
(v) Heavy minerals in sedimentary rocks and their significance
- Unit 4.** (i) Field and Laboratory techniques in Sedimentology, recording of sedimentological structures.
(ii) Grain size analysis of sedimentary rocks: Graphic representation of data and calculation of statistical parameters
(iii) Preparation of thin section and staining.
(iv) Cathodoluminescence, use of Coulter counter.
(v) Diagenesis and fluid flow: Diagenesis of mud stone and carbonate rocks, changes in mineralogy, fabric and chemistry.

Chanpreet Singh H.O.D

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M.Sc. Geology 2021 – 2022

Course Outcome Paper- III: Metamorphic Petrology

At the end of the course, the students will be able to

1. Identify various forms, structures and textures of metamorphic rocks.
2. Classify the metamorphic rocks and describe their megascopic and microscopic characters.
3. Demonstrate the metamorphic mineral assemblages in ACF, AKF, and AFM, diagrams
4. Explain paired metamorphic belts with reference to Plate Tectonics
5. Describe facies of low pressures, medium to high pressure and very high pressure

SECOND SEMESTER

Paper- III: Metamorphic Petrology

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Metamorphism: Definition, Agents, Types of metamorphism
(ii) Structures of metamorphic rocks, metamorphic grades, Zones,
(iii) Textures of metamorphic rocks
(iv) Metamorphic Facies,
(v) Classification of metamorphic rocks,
- Unit 2.** (i) Regional and Thermal metamorphism of mafic, ultramafic rocks, pelitic sediments, and impure calcareous rocks.
(ii) Graphic representation of metamorphic mineral assemblages, ACF, AKF, and AFM, diagrams
(iii) Paired metamorphic Belts
(iv) Cycles of Paired metamorphic Belts.
(v) Study of important metamorphic rocks- Granulite, Charnockite, Eclogite, migmatites, Khondalite, Gondite
- Unit 3.** (i) Mineralogical phase rule of closed and open systems. A detailed description of each facies of low pressures, medium to high pressure and very high pressure with special reference to characteristic metamorphic zones and subfacies.
(ii) Facies of very high pressure with special reference to characteristic metamorphic zones and subfacies.
(iii) Nature of metamorphic reactions and Pressure-Temperature conditions of metamorphism. Isograd and isoreactiongrad,
(iv) Metasomatism and its types.
(v) Retrograde metamorphism
- Unit 4.** (i) Metamorphic differentiation.
(ii) Anatexis and origin of migmatites in the light of experimental studies.
(iii) Regional metamorphism and paired metamorphic belts with reference to Plate Tectonics.
(iv) Pressure – Temperature – Time paths. Ultra-high Temperature, ultra-high pressure metamorphism.
(v) Ocean floor metamorphism.

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SECOND SEMESTER

Paper- III: Metamorphic Petrology

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Question Paper Format and Distribution of Marks for PG Semester Examination

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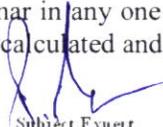
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1. Question no. 1 and Question 2 will be compulsory.
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 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

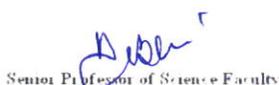

 Chairperson H.O.D


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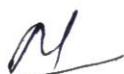
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Course Outcome Paper IV: Palaeobiology and Stratigraphy

At the end of the course, the students will be able to

1. Evaluate the principles of Stratigraphy and details of Geological Time scale
2. Identify Indian stratigraphic systems of Archean, Dharwar, Cuddapah, Kurnool, Vindhyan and Aravalli Supergroups
3. Describe the detailed insight into the Geological Time events of The Paleozoic, Gondwana, Triassic, Jurassic and Cretaceous and the Tertiary Group
4. Assess the detailed significance of the Siwalik, Pleistocene, Holocene, Himalayas, and Eocene systems.
5. Analyze the age and boundary problems of various ages.
6. Understand modern systematics, the evolution of Microfossils, Ammonoids, Trilobites and Brachiopods.
7. Explain the Micropaleontology basics 8. Identify and explain about various invertebrate fossils

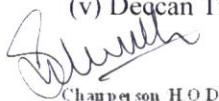
SECOND SEMESTER

Paper- IV: Palaeobiology & Stratigraphy

Max. Marks 80

Min. Marks 16

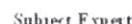
- Unit 1.** (i) Species concept, biometrics, molecular systematics, phylogeny.
(ii) Mechanisms of evolution – origin of life, origin of metazoan.
(iii) Major events in the history of Precambrian and Phanerozoic life.
(iv) Growth and allometry, theoretical and functional morphology and evolutionary trends in Brachiopoda and Echinoderms.
(v) Mollusks
- Unit 2.** (i) Growth and allometry, theoretical and functional morphology and evolutionary trends in Trilobites and Graptolites
(ii) Classification and significance of vertebrate palaeontology and micropalaeontology
(iii) Evolutionary history of man.
(iv) Evolutionary history of horse
(v) Significance of plant fossils.
- Unit 3.** (i) Controls on the development of stratigraphic records.
(ii) Lithostratigraphy and chronostratigraphy, stratigraphic correlation.
(iii) Biostratigraphy – controlling factors, zonation, time significance, quantitative stratigraphy, Magnetostratigraphy,
(iv) Cyclostratigraphy, event stratigraphy, pedostratigraphy, seismic stratigraphy and sequence stratigraphy.
(v) Geochronology . Geophysical and chemostratigraphic correlation.
- Unit 4.** (i) Completeness / incompleteness of stratigraphic records.
(ii) Preservation and net rates of accumulation in various basinal settings.
(iii) Study of Palaeogeography, palaeoclimate and igneous and mountain building activities in the Indian sub continent.
(iv) Detailed study of Chhattisgarh, Vindhyan and Cuddapah Basins
(v) Deccan Traps.


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DEPARTMENT OF GEOLOGY
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M.Sc. Geology 2021 – 2022

Books Recommended

- Clarkson, E.N.K., 1998: Invertebrate Palaeontology and Evolution. IV Ed. Blackwell.
 Jain, P.C., and Anantharaman, M.S., 1996: Palaeontology – Evolution and animal distribution. Vishal Publications.
 Prothero, D.R., 1998: Bringing fossils to life- An Introduction to Palaeobiology. McGrawHill.
 Stearn, C.W. and Carrol, R.L., 1989: Palaeontology- the record of life. John Wiley.
 Boggs Sam Jr., 1995: Principles of Sedimentology and Stratigraphy. Prentice Hall.
 Kumar, Ravindra, 1985 : Fundamentals of Historical Geology and Stratigraphy of India. Wiley Eastern Ltd.
 Naqvi, S.M. and Rogers, J.J.W, 1987: Precambrian Geology of India. Oxford University Press.

SECOND SEMESTER

Paper- IV: Palaeobiology & Stratigraphy

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

- | | | |
|-----|---|------------|
| Q.1 | Very short answer type question
(Answer in one or two sentences) | (02 Marks) |
| Q.2 | Very short answer type question
(Answer in one or two sentences) | (02 Marks) |
| Q.3 | Short answer type question (Answer in 200-250 words) | (04 Marks) |
| Q.4 | Long answer type questions (Answer in 400-450 words) | (12 Marks) |

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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Note: 1. Question no. 1 and Question 2 will be compulsory.

2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

4. Internal Assessment Examination will be as follows:

- i. Internal Test in each paper (20 marks)
- ii. Seminar (Power point presentation) in any one of the paper (20 marks)
- iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
- iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2021 – 2022
SECOND SEMESTER
PRACTICALS

Course Outcome Lab Course – I

At the end of the course, the students will be able to

1. Identify various forms, structures and textures of igneous, sedimentary and metamorphic rocks
2. Draw variation diagrams.
3. Construct ACF, AKF and AFM diagrams.

LAB COURSE – I

1. Megascopic and microscopic study of igneous litho types.
2. CIPW Norm manual calculation and calculation using software
3. Preparation of geochemical data of igneous and sedimentary rocks
4. Preparation of variation diagrams (TAS and MORB normalized diagrams)
5. Megascopic and microscopic study of metamorphic rocks of different facies.
6. Graphic construction of ACF, AKF and AFM diagrams.

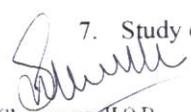
Course Outcome Lab Course – II

At the end of the course, the students will be able to

1. Identify primary, secondary and biogenic sedimentary structures in hand specimens, field photographs and outcrops.
2. Prepare rose diagram from palaeocurrent data .
3. Calculate statistical parameters related to Grain size analysis
4. Identify important fossils from Indian stratigraphic horizons.
5. Plot stratigraphic horizons in the outline map of India.

LAB COURSE – II

1. Study of primary, secondary and biogenic sedimentary structures in hand specimens, field photographs and wherever possible on the outcrops.
2. Exercises related to palaeocurrent data from different environments.
3. Grain size analysis and calculation of statistical parameters
4. Study of Important fossils from Indian stratigraphic horizons.
5. Exercises on stratigraphic classification and correlation.
6. Plotting of stratigraphic horizons in the outline map of India.
7. Study of rocks and its sequential arrangement according to geological age.


Chairperson HOD


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DEPARTMENT OF GEOLOGY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. GEOLOGY

Semester - III

SESSION : 2022-23



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Syllabus and Marking Scheme for Third Semester

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I	Environmental Geology	80	16	20	04	05
II	Economic Geology	80	16	20	04	05
III	Mineral Exploration	80	16	20	04	05
IV	Hydrogeology	80	16	20	04	05
V	Lab Course I	100	33			04
IV	Lab Course II	100	33			04
	Total	520		80		28

04 Theory papers	-	320
04 Internal Assessments	-	80
02 Practicals	-	200
Total Marks	-	600

Note: 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical/Project work.

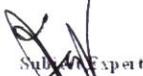
The syllabus for M.Sc. Geology is hereby approved for the sessions 2022-23.

GENERAL INSTRUCTIONS FOR STUDENTS

1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.


Chairperson H.O.D.


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DEPARTMENT OF GEOLOGY
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M.Sc. Geology 2022-23

Course Outcome Paper I: Environmental Geology

At the end of the course, the students will be able to

1. Assess the basics of Environmental Geology and Natural Disaster Management
2. Explain the concept of Natural Disaster Management
3. Analyze the risk and mitigation of hazards.
4. Assess the impact of human activities on soil, groundwater and other natural resources
5. Understand environmental policies of the Government for air and water pollution.
6. Identify the problems of environment in urban and rural areas

THIRD SEMESTER
Paper- I: Environmental Geology

Max. Marks 80

Min. Marks 16

- UNIT 1** (i) Definition, history and scope of Environmental Geology. Basic concepts of Environmental Geology.
(ii) Environment, Ecology, Ecosystems and habitat. Nature of its degradation. Interaction of man and natural systems.
(iii) Conservation principle, conservation of mineral and fuel resources, soil and water resources.
(iv) Transgression and Regression of sea. Climatic and sea level changes on different time scales. Air – sea interaction on different space and time scales
- UNIT 2** (i) Geological hazards- Lands slides, volcanic activity. Measures of mitigation
(ii) Earthquake. Measures of mitigation
(iii) Draught and desertification,
(iv) River flooding, erosion and sedimentation, Coastal erosion, cyclones and tsunamis. Measures of mitigation of these geological hazards
- UNIT 3** (i) Human modifications of nature in surface and subsurface by engineering constructions dams, reservoirs, bridges and buildings.
(ii) Changes in surface and subsurface by mining activities. Changes in surface and subsurface by mineral based industries.
(iii) Human settlement and contamination of atmosphere and soil.
(iv) Human settlement and contamination of surface water and groundwater by waste disposal and agro industries.
- UNIT 4** (i) Environmental policies of the Government for air and water pollution. Environmental laws.
(ii) Problems of environment in urban areas, causes and remedies.
(iii) Climate Change and global warming: Causes and Impact (ozone hole).Green house effect.
(iv) Environment impact assessment report and preparation of environment management plans.


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Books Recommended

- Valdiya, K.S., 1987: Environmental Geology-Indian Context. Tata McGraw Hill.
 Keller, E.A.,1978: Environmental Geology.Bell and Howell,USA.
 Patwardhan, A.M.,1999: The Dynamic Earth System. Prentice Hall.
 Subramaniyam, V.,2001: Textbook in Environmental Science.Narosa International.
 Bell,F.G.,1999: Geological HazardsRoutledge, London.
 Smith, K,1992:Environmental Hazards. Routledge, London.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :

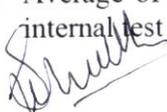
- Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
- Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
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- Q.4 Long answer type questions **(Answer in 400-450 words) (12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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- Note:** 1. Question no. 1 and Question 2 will be compulsory.
 2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
 3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

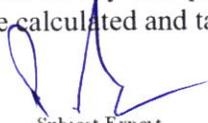
Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

4. Internal Assessment Examination will be as follows:
 - i. Internal Test in each paper (20 marks)
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 Chairperson HOD


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Course Outcome Paper II: Economic Geology

At the end of the course, the students will be able to

1. Explain mode of occurrence of ore bodies and ore textures
2. Describe ores of various affiliations
3. Define rank, grade and type of coal
4. Describe various ore deposits of India
5. Explain mode of occurrence and distribution of coal, petroleum and radioactive minerals in India

THIRD SEMESTER

Paper- II: Economic Geology

Max. Marks 80

Min. Marks 16

Unit 1. (i) Ore deposits and plate Tectonics.

- (ii) Mode of occurrence of ore bodies- morphology and relationship of host rocks.
- (iii) Textures, Paragenesis and zoning of ores and their significance.
- (iv) Concept of ore bearing fluids, their origin and migration. Wall rock alteration.
- (v) Fluid inclusions in ores- Principles, assumptions, limitations and applications.

Unit 2. (i) Ores of sedimentary affiliation in India- chemical and clastic sedimentation, stratiform and stratabound ore deposits (Mn, Fe, Non ferrous ores).

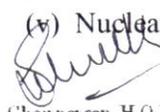
- (ii) Ores of metamorphic affiliations in India – metamorphism of ores, metamorphic ores.
- (iii) Ores related to weathering and weathered surfaces in India – laterite, bauxite, Ni/Au laterite.
- (iv) Petrological ore associations with Indian examples wherever feasible – orthomagmatic ores of mafic ultramafic association – diamonds in Kimberlite, REE in carbonatites.
- (v) Indian examples of Ti-V ores, chromite, Ni ores, Cyprus type Cu – Zn, ores of silicic igneous rocks and pegmatites, Greisens, skarns, porphyry associations in Indian context.

Unit 3. (i) Definition and origin of kerogen and coal. Rank, grade and type of coal. Indian and international classifications. Chemical characterization: proximate and ultimate analyses.

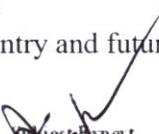
- (ii) Macroscopic ingredients and microscopic constituents, concept of maceral and microlithotypes.
- (iii) Preparation of coal for industrial purposes, coal carbonization (coke manufacture), coal gasification and coal hydrogenation.
- (iv) Detailed geology of some important coalfields in India.
- (v) Coal bed methane: a new energy resource. maturation of coal and generation of methane

Unit 4. (i) Composition of petroleum and its different fractions. Origin, nature and migration of oil and gas. Characteristics of reservoir rocks and trap (structural, stratigraphic and combination).

- (ii) Oil bearing basins of India and world. Geology of the productive oilfields of India.
- (iii) Atomic minerals as source of energy. Mode of occurrence and association of atomic minerals in nature.
- (iv) Atomic mineral deposits of India
- (v) Nuclear power stations of the country and future prospects.

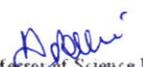

Chairperson H O D


Subject Expert


Subject Expert


Subject Expert


Subject Expert


Senior Professor of Science Faculty


Departmental member


Alumnus


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)

M.Sc. Geology 2022-23

THIRD SEMESTER

Paper- II: Economic Geology

Books Recommended

Chandra, D., Singh, R.M. and Singh, M.P., 2000: Textbook of Coal (Indian Context). Tara Book Agency, Varanasi.

Singh, M.P.(Ed.) 1998: Coal and Organic Petrology. Hindustan Publ. Corp., New Delhi.

Holson and Tiratsoo, E.N.,1985: Introduction to Petroleum Geology. Gulf. Publ. Houston, Texas.

Selley, R.C., 1998: Elements of Petroleum Geology. Academic Press.

Durrance, E.M., 1986: Radioactivity in Geology. Principles and Applications. Ellis Hoorwool.

Question Paper Format and Distribution of Marks for PG Semester Examination

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(Answer in one or two sentences) (02 Marks)
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- Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
- Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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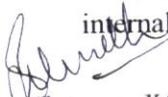
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Chauhan H O D


Subject Expert


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Subject Expert


Senior Professor of Science Faculty


Vikas
Departmental members


Alumnus

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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Course Outcome Paper III: Mineral Exploration

At the end of the course, the students will be able to

1. Describe Prospecting & Exploration
2. Describe tools and techniques of exploration such as mapping, sampling, drilling
3. Estimate grade and tonnage of ore
4. Explain principles of geophysical methods of prospecting
5. Interpret borehole log data

THIRD SEMESTER

Paper- III Mineral Exploration

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Prospecting & Exploration: Definition and characteristic features. Reconnaissance preliminary and detailed investigation, surface and subsurface methods.
(ii) Guides to ore search: global, regional and local guides, detailed study of regional physiographic, stratigraphic, lithological, mineralogical and structural guides. Persistence of ore in depth.
(iii) Drilling: Type of drills, Diamond drilling, Drilling records and logs, Duty of geologists during drilling.
(iv) Sampling: General principles, various methods and procedures, Average assays, weighting of samples, salting. Precautions.
(v) Calculating grade and tonnage of ore: Average grade, volume, specific gravity, tonnage factor, calculations from data obtained from bore holes, prospecting pits, trenches, ore blocks, geological maps and sections.
- Unit 2.** (i) Gravity Method of prospecting: Basic principles of gravimeter. Gravity field surveys. Various types of corrections applied to gravity data. Preparation of gravity anomaly maps and their interpretation in terms of shape, size and depth.
(ii) Magnetic method of prospecting: Magnetic properties. Magnetic anomaly. Magnetometer. Field survey and data reduction. Preparation of magnetic anomaly maps. Aeromagnetic surveys.
(iii) Seismic prospecting: Fundamentals of seismic wave propagation, Methods of seismic prospecting and interpretation of seismic data.
(iv) Basic principles of resistivity method. Resistivity survey. Application and interpretation of resistivity data. S. P. Method and interpretation of data obtained by S. P. Method.
(v) Radiometric prospecting and Borehole Logging. Radiometric survey. Application and interpretation of data.
- Unit 3.** (i) Borehole logging: Principles of various borehole-logging methods,
(ii) Interpretation of borehole log data.
(iii) Geochemical cycle, Forms of primary and secondary dispersion of elements.
(iv) Methods of lithogeochemical and pedogeochemical surveys.
(v) Methods of hydrogeochemical, atmogeochemical and biogeochemical surveys.
- Unit 4.** (i) Application of geomorphological principles in mineral exploration.
(ii) Application of photogeology in mineral exploration.
(iii) Application of remote sensing techniques in mineral exploration.
(iv) Case studies of exploration of non metallic mineral deposits.
(v) Case studies of exploration of metallic mineral deposits.

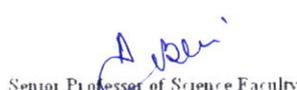

Chairperson H.O.D

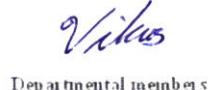

Subject Expert


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Books Recommended

Bagchi, T.C., Sengupta, D.K., Rao, S.V.L.N. (1979): Elements of Prospecting and Exploration, Kalyani Publ.
 Banerjee, P.K. and Ghosh, S. (1997): Elements of Prospecting for Non-fuel Mineral deposits, Allied Publ.
 Dobrin, M.B., 1976: Introduction to Geophysical Prospecting. McGraw Hill.
 Parasnis, D.S. 1975: Principles of Applied Geophysics. Chapman and Hall.
 Sharma, P.V., 1986: Geophysical Methods in Geology. Elsevier.

Question Paper Format and Distribution of Marks for PG Semester Examination

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(Answer in one or two sentences) (02 Marks)
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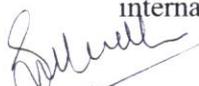
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Chairperson H O D


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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Course Outcome Paper IV: Hydrogeology

At the end of the course, the students will be able to

1. Explain the origin and occurrence, distribution and types of groundwater
2. Describe the hydrologic properties of rocks, Darcy law, pumping test and quality characteristics of groundwater
3. Understand about Groundwater Basins, Recharge and Management studies
4. Explain the water table fluctuation.
5. Analyze the problems related to porosity and specific yield and retention.
6. Execute the resistivity study in the field and assess the interpretation.

THIRD SEMESTER

Paper- IV Hydrogeology

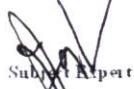
Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Hydrologic cycle. Ground water: Origin, types, importance, occurrence and movement.
(ii) Groundwater reservoirs and their classification, Classification of aquifers.
(iii) Darcy's law and its validity, Reynold Number,
(iv) Hydrologic properties of rocks: Porosity, permeability, specific yield, specific retention, transmissivity, storage coefficient.
(v) Renewable and non renewable groundwater resources.
- Unit 2.** (i) Ground water quality, various parameters for drinking purpose, for irrigation purpose and industrial use.
(ii) Estimation of ground water quality and methods of treatment for various uses.
(iii) Ground water quality map of India.
(iv) Water contaminants and pollutants: problem of arsenic and fluoride.
(v) Hydrographs, water table contour maps, hydrostratigraphic units, hydrogeology of arid zones and wet lands.
- Unit 3.** (i) Well Hydraulics: Confined, unconfined, steady, unsteady and radial flow.
(ii) Water level fluctuations: causative factors and their measurement.
(iii) Methods of pumping test and analysis of test data, evaluation of aquifer parameters.
(iv) Artificial recharge of ground water.
(v) Conjunctive use of ground water, problem of overexploitation, groundwater legislation.
- Unit 4.** (i) Water well technology: Well types, drilling methods, construction, design, development and maintenance of wells.
(ii) Water management in rural and urban areas.
(iii) Surface and subsurface geophysical and geological methods of ground water exploration.
(iv) Hydrogeological mapping using various techniques.
(v) Radio isotopes in hydrogeological studies.


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022-23

Books Recommended

Todd, D.K., 1980: Groundwater Hydrology. John Wiley.
 Davies, S.N. and Cherry, J.A., 1979: Ground Water. Prentice Hall.
 Fetter, C.W., 1990: Applied Hydrogeology. Merrill Publishing.
 Raghunath, H.M., 1982: Ground Water. Wiley Eastern.
 Karanth, K.R., 1987: Groundwater Assessment- Development and Management.
 Tata McGraw Hill.
 Subramaniyam, V., 2000: Water. Kingston Publ. London.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows:

- Q.1 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
- Q.2 Very short answer type question
(Answer in one or two sentences) **(02 Marks)**
- Q.3 Short answer type question **(Answer in 200-250 words)** **04 Marks)**
- Q.4 Long answer type questions **(Answer in 400-450 words)** **(12 Marks)**

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

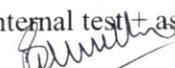
Note: 1. Question no. 1 and Question 2 will be compulsory.

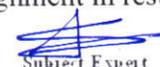
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

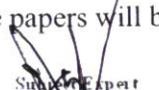
Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

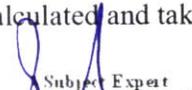
4. Internal Assessment Examination will be as follows:

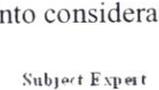
- i. Internal Test in each paper (20 marks)
- ii. Seminar (Power point presentation) in any one of the paper (20 marks)
- iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
- iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

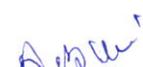

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Course Outcome Lab Course - I

At the end of the course, the students will be able to

1. Demarcate the seismic zones in outline map of India
2. Identify different ores in hand specimen and their associations.
3. Evaluate environmental impact assessment
4. Estimate ore reserves and coal reserves from given data.
5. Describe mineralogical and textural characteristics of common ore minerals under ore microscope.
6. Plot various ore deposits in the outline map of India.

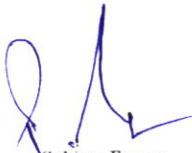
LAB COURSE - I

1. Study of seismic and flood- prone areas in India. Analyses for alkalinity, acidity, pH and electrical conductivity in water samples.
2. Megascopic study of structures and fabrics of different ores and their associations.
3. Presentation of chemical analyses data and plotting chemical classification diagrams.
4. Evaluation of environmental impact assessment of air pollution, ground water, landslides, deforestation, cultivation and building construction in specified areas.
5. Megascopic characterization of banded coals. Proximate analysis of coal.
6. Completion of outcrops in the given map and calculation of coal reserves.
7. Megascopic and microscopic study of cores and well cuttings.
8. Study of geological maps and sections of important oil fields of India and world.
9. Calculation of oil reserves.
10. Study of geological sections of Th-U bearing rocks of the country. Megascopic study of some uranium and thorium bearing minerals and rocks.
11. Mineralogical and textural studies of common ore minerals under ore microscope.
12. Plotting of ore deposits in the outline map of India.


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M.Sc. Geology 2022-23

Course Outcome Lab Course - II

1. Solve problems based on geophysical survey data.
2. Delineate hydrological boundaries on water table contour maps
3. Evaluate aquifer parameters using pumping test data.
4. Analyse Hydrographs.
5. Analyze quality of water using USGS and Piper's diagram

LAB COURSE - II

1. Study of problems based on gravimeter, magnetometer and seismographs.
2. Resistivity survey.
3. Calculation of grade and tonnage of ore: Average grade, volume, specific gravity, tonnage factor, calculations from data obtained from bore holes, prospecting pits, trenches, ore blocks, geological maps and sections.
4. Delineation of hydrological boundaries on water table contour maps
5. Evaluation of aquifer parameters using pumping tests.
6. Analysis of Hydrographs and estimation of infiltration capacity.
7. Chemical analysis of water. Study of quality of water using USGS and Piper's diagram
8. Onsite study of rain water harvesting structure and submission of its report.
9. Onsite study of drilling operation and submission of its report.


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DEPARTMENT OF GEOLOGY

COURSE CURRICULUM & MARKING SCHEME

M.Sc. GEOLOGY

Semester - IV

SESSION : 2022-23



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022– 2023

Syllabus and Marking Scheme for Fourth Semester

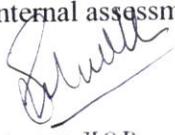
Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Credits
		Max	Min	Max.	Min.	
I	Photogeology and Remote Sensing	80	16	20	04	05
II	Engineering Geology and Mineral Beneficiation	80	16	20	04	05
III	Mineral Resource Development and Mining Geology	80	16	20	04	05
IV	Energy Resources	80	16	20	04	05
	Fieldwork/ Dissertation*	100				05
V	Lab Course I	50	17			02
IV	Lab Course II	50	17			02
	Total	440		60		24

*** Field Work/ Dissertation (In lieu of theory paper IV Energy Resources) –**
 {Project oriented Dissertation - 50 marks +Viva on Dissertation - 50 marks} Total 100 Marks
The syllabus for M.Sc. Geology is hereby approved for the session 2022-23.

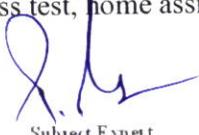
Note: 20 marks = 01 credit in Theory Papers and 25 Marks = 01 Credit in Practical2

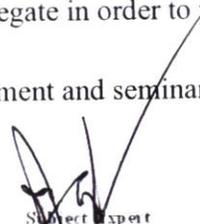
GENERAL INSTRUCTIONS FOR STUDENTS

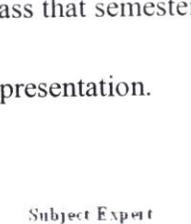
1. The candidate has to obtain minimum 20% marks in each theory paper and internal assessment separately.
2. The candidate has to secure minimum 36% marks as an aggregate in order to pass that semester examination.
3. The internal assessment shall include class test, home assignment and seminar presentation.


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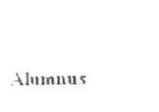

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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022– 2023

Course Outcome Paper I: Photogeology and Remote Sensing

At the end of the course, the students will be able to

1. Explain basic principles of photogeology and aerial photography
2. Understand basic concepts of electromagnetic radiation, its interaction with the earth's surface and atmosphere
3. Understand resolution properties to interpret, process and evaluate remotely sensed images
4. Explain about the GIS principles and applications
5. Apply basic analytical tool in GIS for the preparation of thematic maps
6. Identify the satellite data for various applications

FOURTH SEMESTER

Paper-I Photogeology and Remote Sensing

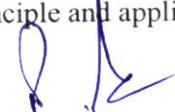
Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Types and geometry of aerial photograph, tilt and relief distortion.
(ii) Elements of photogrammetry, stereoscopy, stereovision, flight planning. Height and slope rectification of aerial photographs.
(iii) Recognition of photo-elements and terrain elements like tone, texture, pattern, shape, size.
(iv) Terrain elements like drainage pattern, density, type, landform characteristics, erosion behaviour of rocks and soil material, vegetation characteristics, land use and associations.
(v) Photo-interpretation of structural and landform elements, tectonic features, features of glacial, fluvial, coastal, aeolian and denudation landforms.
- Unit 2.** (i) Electromagnetic energy, electromagnetic spectrum, image characteristics.
(ii) Remote Sensing data products, geometric and radiometric corrections, thermal and microwave remote sensing. Digital Image Processing Space missions, Indian Remote Sensing Satellites.
(iii) Remote Sensing: data source, platforms and sensors. Acquisition of remote sensing data.
(iv) Remote Sensing techniques in Geosciences: Visual Interpretation of satellite images.
(v) Techniques of image interpretation using spectral, special and temporal information.
- Unit 3.** (i) Signature of the natural objects.
(ii) Interpretation of lithology: rock types, discrimination of igneous, sedimentary and metamorphic terrain.
(iii) Application of Remote Sensing techniques in site selection of dams, bridges, air strips, roads, tunnels, canals.
(iv) Studies in slope failure, rock failure and soil creep. Study of soils and relationship of rock types and geomorphology to various soil types, soil mapping and land use and land cover mapping.
(v) Forest types, their distribution and relationship of vegetation to rock types. Relationship between vegetation and geomorphic parameters.
- Unit 4.** (i). Geographic Information System: components, data presentation, vector and raster methods, input and output devices.
(ii) G.I.S. softwares and equipments.
(iii) Database design and structure. Data analysis and cartographic modeling.
(iv) Data representation and techniques of data integration. Digital Elevation Model.
(v) Global Positioning System, principle and applications.


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DEPARTMENT OF GEOLOGY
GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG (C.G.)
M.Sc. Geology 2022– 2023

Books Recommended

Miller, V.C., 1961: Photogeology. McGraw Hill.
 Sabbins, F.F., 1985: Remote Sensing- Principles and Applications. Freeman
 Drury, S.A., 1987: Image interpretation in Geology. Allen and Unwin.
 Lillesand, T.M. and Kieffer, R.W., 1987: Remote Sensing and Image Interpretation. John Wiley.
 Pandey, S.N., 1987: Principles and Applications of Photogeology. Wiley Eastern. New Delhi.
 Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag

Question Paper Format and Distribution of Marks for PG Semester Examination

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 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
 - Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

Note: 1. Question no. 1 and Question 2 will be compulsory.

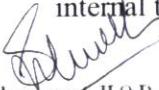
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.

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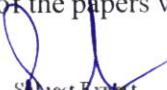
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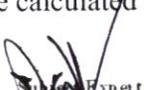
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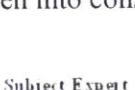
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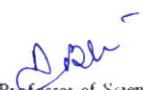

Chairperson H.O.D


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DEPARTMENT OF GEOLOGY
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M.Sc. Geology 2022– 2023

Course Outcome Paper II: Engineering Geology and Mineral Beneficiation

At the end of the course, the students will be able to

1. Explain role of engineering geology in civil construction and mining industry.
2. Describe various stages of engineering geological investigations for civil engineering projects.
3. Describe engineering properties of rocks and physical characters of building stones.
4. Analyze influence of geological conditions on various engineering structures.
5. Explain techniques of mineral beneficiation

FOURTH SEMESTER

Paper-II Engineering Geology and Mineral Beneficiation

Max. Marks 80

Min. Marks 16

- Unit 1.** (i) Role of engineering geology in civil construction and mining industry.
(ii) Various stages of engineering geological investigations for civil engineering projects.
(iii) Engineering properties of rocks: rock discontinuities. Physical characters of building stones.
(iv) Metal and concrete aggregates. Geological considerations for evaluation of dam and reservoir sites.
(v) Dam foundation rock problems. Geotechnical evaluation of tunnel alignments and transport routes.
- Unit 2.** (i) Method of tunneling: Classification of ground for tunneling purpose. Various types of support.
(ii) Mass movements with special emphasis on landslides and causes of hill slope instability. Seismicity and earthquakes, seismic zones of India.
(iii) Aseismic design of buildings.
(iv) Influence of geological conditions on foundation and design of buildings.
(v) Case history of engineering projects and geological causes for mishaps and failures of engineering structures.
- Unit 3.** (i) General principles, economic justification and scope of mineral dressing.
(ii) Properties of rocks and minerals as applied to mineral dressing.
(iii) Primary and secondary breaking, crushing and grinding, liberation by sizes, reduction.
(iv) Principles and methods of screening.
(v) Principles and methods of classification, classification as a means of concentration.
- Unit 4.** (i) Concentration methods, hand sorting, washing, jigging, tabling, heavy fluid.
(ii) Properties of rocks and minerals as applied to mineral dressing.
(iii) Magnetic and electrostatic methods of separation of minerals.
(iv) Flotation methods- Principles and techniques with examples.
(v) Concentration methods- with flow sheets of common types of mineral and ore dressing practices in India - Gold, copper, Lead-zinc, coal, beach sand, fluorite, iron, manganese, chromite and limestone


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DEPARTMENT OF GEOLOGY
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M.Sc. Geology 2022– 2023

Books Recommended

Krynine, D.H. and Judd, W.R. (1998): Principles of Engineering Geology, CBS Publishers
 Rider, M. H. (1986): Whittles Publishing, Caithness. The Geological Interpretation of Well Logs, (Rev. Ed.).
 Schultz, J.R. and Cleaves, A.B. (1951): Geology in Engineering, John Willey and Sons, New York.
 Singh, P. (1994): Engineering and General Geology, S.K. Kataria and Sons, Delhi.

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 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
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Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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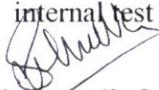
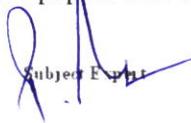
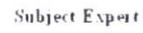
Note: 1. Question no. 1 and Question 2 will be compulsory.

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Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

4. Internal Assessment Examination will be as follows :

- i. Internal Test in each paper (20 marks)
- ii. Seminar (Power point presentation) in any one of the paper (20 marks)
- iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
- iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

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  Subject Expert
  Subject Expert

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  Departmental members
  Alumnus
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M.Sc. Geology 2022– 2023

Course Outcome Paper III: Mineral Resource Development and Mining Geology

At the end of the course, the students will be able to

1. Understand terms used in mining
2. Describe the methods of open cast and underground mining
3. Describe general concepts of RP (Reconnaissance Permit), PL (Prospecting License) and ML (Mining Lease)
4. Understand the components of mining plans
5. Explain united nation framework classification (UNFC classification) of mineral resource/reserve.

FOURTH SEMESTER

Paper-III Mineral Resource Development and Mining Geology

Max. Marks 80

Min. Marks 16

Unit 1. (i) Definition and scope of “mineral development”.

- (ii) General concepts of RP (Reconnaissance Permit), PL (Prospecting License) and ML (Mining Lease), MMDR-Mines & Minerals (Development & Regulation) Act, 1957 and amendments
- (iii) Procedure of obtaining prospecting license or mining lease in which the mineral vest in the government and other than government.
- (iv) Salient features of Mineral concession & Development Rule 1988 and amendments therein. Understanding of reconnaissance, prospecting and mining operations in context of a geologist in them.
- (v) Salient features of Mineral Concession Rules, 1960 and amendments therein. Chhattisgarh Minor Mineral Rules, 2015.

Unit 2. (i) Mining Plan, understanding the components of mining plans, understanding about its approval by appropriate authorities. Progressive and final mine closure plans.

- (ii) Mine planning for major and minor minerals, studies on geologists aspects therein.
- (iii) Study of measures indicated in MCDR about protection of environment.
- (iv) Guidelines under MCDR for united nation framework classification (UNFC classification) of mineral resource/reserve.
- (v) Understanding of economic axis, feasibility axis and geological axis of classification.

Unit 3. (i) Definition of mining terms: pitting, trenching, panning, adits, tunnels, and shafts.

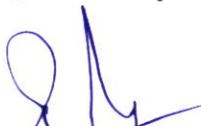
- (ii) Role of geologist in mining industry.
- (iii) Geological structures of ore deposits and choice of mining methods.
- (iv) Subsidence and rock bursts, mine supports Ventilation and drainage.
- (v) Strata control in different rocks and structures

Unit 4. (i) Open pit mining- geologic and geomorphic conditions.

- (ii) Different methods of opencast mining, advantages and limitations.
- (iii) Underground mining methods- gophering, shrinkage stoping, over hand, under hand methods.
- (iv) Underground mining methods- caving and slicing sublevel.
- (v) Coal mining methods, long wall, board and pillar.

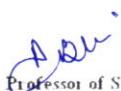

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Books Recommended

McKinstry, H.E., 1962: Mining Geology. II Ed. AsiaPublishing House.
 Arogyaswami, R.N.P., 1996: Courses in Mining Geology. IV Ed. Oxford IBH.
 Sinha, R.K. and Sharma, N.L. (1976): Mineral economics, Oxford and IBH Publ.

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination has been revised from the Session 2018-19. The revised format will be applicable for all the question papers of Semester I, II, III & IV. The following are the main points of the new format:

1. The question paper will be of **80 marks** (as before)
2. Questions will be asked Unit-wise in each question paper.
3. From each Unit, the questions will be asked as follows :
 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
 - Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

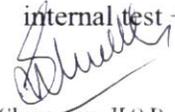
Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

Note:

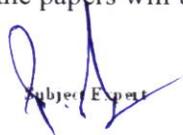
1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

Thus there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.

4. Internal Assessment Examination will be as follows:
 - i. Internal Test in each paper (20 marks)
 - ii. Seminar (Power point presentation) in any one of the paper (20 marks)
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar. (20 marks)
 - iv. Average of marks obtained in internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.


Chairperson H.O.D


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M.Sc. Geology 2022– 2023

FOURTH SEMESTER

Course Outcome Paper IV: Energy Resources

At the end of the course, the students will be able to

1. Understand salient features of different sources of energy,
2. describe main elements of technical systems designed for utilisation of renewable sources of energy,
3. Explain advantages and disadvantages of different sources of energy
4. Undertake simple analysis of energy potential of sources of energy,
5. Explain the impact of exploitation of various sources of energy
6. Evaluate status and challenges of current energy technologies and resources.

Paper-IV ENERGY RESOURCES

Max. Marks 80

Min. Marks 16

UNIT - 1

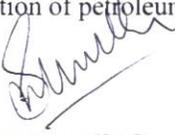
- (i) Definition of Energy, Difference between Energy, Power and Electricity.
- (ii) Classification of energy resources. Renewable and Non-Renewable Sources of Energy
- (iii) Social, Economic, Political and Environmental Dimension of Energy.
- (iv) Energy Scenario: Indian and global, Present and future energy demands, Energy crisis,
- (v) Pattern of energy consumption.

UNIT – 2

- (i) Coal: Theories of origin and formation, analysis, classification, washing and carbonization
- (ii) Geographical and geological distribution of Indian coal deposits
- (iii) Methods of prospecting and exploration of coal
- (iv) Major coal mines of India and the mining methods used in India.
- (v) Environmental impact of thermal power plants.

UNIT – 3

- (i)Petroleum: Theories of origin and formation, Generation, migration and accumulation of oil and gas.
- (ii)Concept of petroleum system. Reservoir rocks (clastic and non-clastic reservoir rocks, development and types of porosity in these rocks. Controls of permeability). Petroleum traps. Cap rocks (seals). Prospecting and exploration of petroleum


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- (iii) Oil bearing basins of India. Geology of the offshore and onshore productive oilfields of India.
(iv) Radioactive minerals – Mineralogical, geochemical survey techniques.
(v) Distribution of radioactive minerals in India.

UNIT-4

- (i) Sun as Source of Energy, Availability of Solar Energy, Nature of Solar Energy, Solar Energy & Environment. Trends in solar energy utilization.
(ii) Basic properties of wind energy. Applications of wind energy. Trends in wind energy utilisation.
(iii) Biomass: Generation and utilization, Properties of biomass, Agriculture Crop & Forestry residues used as fuels. Hydro power: Hydropower generation and distribution in India
(iv) Geothermal Energy. Recovery of Geothermal Energy, Sustainability of Geothermal Source. Trends in geothermal energy utilisation, scope in India
(v) Tidal and wave energy. Applications of tidal and wave energy. Trends in tidal energy utilisation

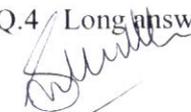
Books Recommended

Solar Energy Handbook: Kreith and Kreider (McGrawHill)
Energy & Environment – J.M. Fowler, (McGrawHill)
Energy for a sustainable world: Jose Goldenberg, Thomas Johansson, A.K.N.Reddy,
Renewable energy resources: Tiwari and Ghosal, Narosa publication.
Elements of Petroleum Geology. Selley, R. C. Academic Press, 1998
Coal and Organic Petrology. Singh, M. P. (Ed.) Hindustan Publ. Corp., New Delhi, 1998
Petroleum Formation and Occurrence. Tissot, B. P. and Welte, D. H. Springer Verlag, 1984
Textbook of Coal, (Indian context) Chandra, D. Singh R.M Singh M.P. Tara book agency
Varanasi. 2000

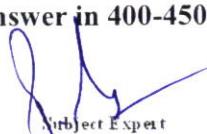
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Note:

1. Question no. 1 and Question 2 will be compulsory.
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3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
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Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks			

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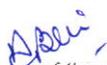

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FOURTH SEMESTER
PRACTICALS

Course Outcome Lab Course - I

At the end of the course, the students will be able to

1. Identify terrain elements present on aerial photographs and satellite imageries
2. Visually interpret satellite imageries.
3. Apply the knowledge of GIS software in geological studies
4. Apply the knowledge of Global Positioning System device in geological studies
5. Identify the satellite data for various geological applications

LAB COURSE – I

1. Study of aerial photographs using pocket and mirror stereoscope.
2. Study of terrain elements present on aerial photographs and satellite imageries
3. Visual interpretation of satellite imageries.
4. Study of Land use land cover map
5. Use of G.P.S.
6. Using “Google Earth Pro, QGIS and MapInfo” Practical exercises related to
 - Marking location
 - Making polygone
 - Making linear feature
 - Saving .kml and .kmz file
 - Creating print data
 - Importing image data
 - Georeferencing Toposheet or geological map
 - Digitisation point, line and polygon feature
 - Creating print data


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Course Outcome Lab Course – II

At the end of the course, the students will be able to

1. Classify common rocks with reference to their utility in engineering projects
2. Construct maps and models of important engineering structures such as dam sites and tunnels
3. Interpret geological maps for suitability of construction of engineering structures
4. Illustrate open cast and underground mining methods through diagrams and models
5. Solve the problems based on resistivity survey data
6. Explain about the distribution of various energy resources in India and their current status of utilization

LAB COURSE - II

1. Resistivity survey.
2. Study of properties of common rocks with reference to their utility in engineering projects.
3. Study of maps and models of important engineering structures such as dam sites and tunnels.
4. Interpretation of geological maps for landslide problems.
5. Diagrammatic representation of open cast and underground mining.
6. Exercises on mine sampling and determination of tenor, cut off grades
7. Demarcation of various coal fields, oil fields and radioactive mineral occurrences on outline map of India



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