FYUGP

GEOLOGY HONOURS/ RESEARCH
&
ASSOCIATED CORE COURSE
&
ELECTIVE COURSE
&
MDC (MULTIDISCIPLINARY COURSE)

FOR UNDER GRADUATE COURSES UNDER

BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY, DHANBAD

Implemented from
Academic Session 2025-2029

Table 1 A : Credit Framework for the first three years of FYUGP:

Academic Level		Level of Courses		MJ; Discipline Specific Courses – Core or Major (60)	AC; Associated core courses from discipline/ Interdisciplinary/ vocational (8)		ELC; Elective courses may be opted from four paths [Follow table 4, 5 & 6] (16)	MDC; Multidisciplinary Courses (From a pool of Courses) (9)	AEC; Ability Enhancement Courses (Modern Indian Language and English) (8)	SEC; Skill Enhancement Courses (9)	VAC; Value Added Courses (6)	IKS; (i) Indian Knowledge System (2) & (ii) Social awareness (2)	RC; Research Courses (12)	AMJ; Advanced Courses instead of Research (12)	Total Credits	IAP; Internship/Apprenticeship/ Project/ Vocational course/ Dissertation (4)
	1	2		3 (80)	4 (32)			5	6	7	8	9	10	11	12	13
Level 4.5		Level 100-199: Foundation or Introductory courses	I	4	4	-	-	3	2	3	2	-	-	-	20	4
			II	4	-	4	-	3	2	3	2	-	-	-	20	
			Exit Point: Undergraduate Certificate provided with Summer Internship/ Project/ Vocational course/ Dissertation (4 credits)													
Level 5		Level 200-299: Intermediate-level courses	III		4		-	3	2	-	-	-	-	-	20	
			IV	4+4+4	4		-		2	-	-	-	-	-	20	
			Exit Point: Undergraduate Diploma provided with Summer Internship/ Project/ Vocational course/ Dissertation (4 credits)													
Level 5.5		Level 300-399: Higher-level courses	V	4+4+4+4	4		-	-	-	-	-	-	-	-	20	
			VI	4+4+4+4	4		-	-	-	-	-	-	-	-	20	
			Exit Point: Bachelor's Degree with Summer Internship/ Project/ Vocational course/ Dissertation (4 credits)												120	+4

Table 1 B: Credit Framework for various pathways in the fourth year of FYUGP:

Academic Level	Level of Courses		MJ; Discipline Specific Courses – Core or Major (20)	AC; Associated core courses from discipline/ Interdisciplinary/ vocational (8)	ELC; Elective courses opted in Semester III from four paths of Table 4, 5 & 6 (8)	MDC; Multidisciplinary Courses (From a pool of Courses) (0)	AEC; Ability Enhancement Courses (Modern Indian Language and English) (0)	SEC; Skill Enhancement Courses (0)	VAC; Value Added Courses (0)	IKS; (i) Indian Knowledge System (0) & (ii) Social awareness (0)	RC; Research Courses (12)	AMJ; Advanced Courses in place of Research (12)	Total Credits	IAP; Internship/Apprenticeship/ Project/ Vocational course/ Dissertation (4)
	1	2	3 (80)		4(32)	5	6	7	8	9	10	11	12	13
					Honours with Research									
Level 6	Level 400-499: Advanced courses	VI I	4+4+4	-	4	-	-	-	-	-	4	-	20	---
		VI II	4+4	-	4	-	-	-	-	-	8	-	20	
		Exit Point: Bachelor's Degree with Hons. with Research											OR	
OR		Honours												
Level 6	Level 400-499: Advanced courses	VI I	4+4+4	-	4	-	-	-	-	-	-	4	20	---
		VI II	4+4	-	4	-	-	-	-	-	-	4+4	20	
		Exit Point: Bachelor's Degree with Hons.												

SEMESTER WISE COURSES OF STUDY FOR FOUR YEAR UNDERGRADUATE PROGRAMME

2025 onwards

Table 2: Semester-wise Course Code and Credit Points for Single Major during the First Three Years of FYUGP

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Credits	
	Code	Papers	Paper	Semester
I	AEC-I	Language and Communication Skills (MIL-I; Modern Indian language Hindi/ English)	2	20
	VAC-I	Value Added Course- I	2	
	IKS-I	Indian Knowledge System-I/Social Awareness Activities	2	
	SEC-I	Skill Enhancement Course- I	3	
	MDC-I	Multi-disciplinary Course- I	3	
	AC-I	Associated core courses from discipline/ Interdisciplinary/ vocational	4	
	MJ-I	Major paper I (Disciplinary/ Interdisciplinary Major)	4	
II	AEC-2	Language and Communication Skills (MIL-I; Modern Indian language English/ Hindi)	2	20
	VAC-2	Value Added Course-2	2	
	1KS-2	Social Awareness Activities/ Indian Knowledge System-I	2	
	SEC-2	Skill Enhancement Course-2	3	
	MDC-2	Multi-disciplinary Course-2	3	
	AC-2	Associated core courses from discipline/ Interdisciplinary/ vocational	4	
	MJ-2	Major paper 2 (Disciplinary/ Interdisciplinary Major)	4	
III	AEC-3	Language and Communication Skills (MIL-2; MIL including TRL)	2	20
	SEC-3	Skill Enhancement Course-3	3	
	MDC-3	Multi-disciplinary Course-3	3	
	ELC-I	Elective courses from discipline/ Interdisciplinary/ vocational	4	
	MJ-3	Major paper 3 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-4	Major paper 4 (Disciplinary/ Interdisciplinary Major)	4	
IV	AEC-4	Language and Communication Skills (MIL-2; MIL including TRL)	2	20
	VAC-3	Value Added Course-3	2	
	ELC-2	Elective ELC from discipline/ Interdisciplinary/ vocational	4	
	MJ-5	Major paper 5 (Disciplinary/ Interdisciplinary Major having IKS)	4	
	MJ-6	Major paper 6 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-7	Major paper 7 (Disciplinary/ Interdisciplinary Major)	4	
V	ELC-3	Elective courses from discipline/ Interdisciplinary/ vocational	4	20
	MJ-8	Major paper 8 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-9	Major paper 9 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-IO	Major paper 10 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-I I	Major paper 10 (Disciplinary/ Interdisciplinary Major)	4	
VI	ELC-4	Elective courses from discipline/ Interdisciplinary/ vocational	4	20
	MJ-12	Major paper 12 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-13	Major paper 13 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-14	Major paper 14 (Disciplinary/ Interdisciplinary Major)	4	
	MJ-15	Major paper 15 (Disciplinary/ Interdisciplinary Major)	4	
Total Credits, excluding one Internship (IAP) of 4 credits			120	120

Table 3A: Semester-wise Course Code and Credit Points for Single Major during the Fourth Year of FYUGP for Bachelor's Degree (Honours with Research)

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Credits	
	Code	Papers	Paper	Semester
VIIA	ELC-5	Elective courses from Discipline/Interdisciplinary/vocational	4	20
	MJ-16	Major paper 16 (Disciplinary/Interdisciplinary Major)	4	
	MJ-17	Major paper 17 (Disciplinary/Interdisciplinary Major)	4	
	MJ-18	Major Paper 18 (Disciplinary/Interdisciplinary Major)	4	
	RC-1	Research proposal – Planning & Techniques (Disciplinary/Interdisciplinary Major)	4	
VIIIA	ELC-6	Elective courses from Discipline/Interdisciplinary/vocational	4	20
	MJ-19	Major paper 19 (Disciplinary/Interdisciplinary Major)	4	
	MJ-20	Major Paper 20 (Disciplinary/Interdisciplinary Major)	4	
	RC-2	Research Internship/Field Work/Project/Dissertation/Thesis	8	
Total Credits, excluding one internship (IAP) of 4 Credits			160	160

Table 3B: Semester-wise Course Code and Credit Points for Single Major during the Fourth Year of FYUGP for Bachelor's Degree (Honours)

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Credits	
	Code	Papers	Paper	Semester
VIIB	ELC-5	Elective courses from Discipline/Interdisciplinary/vocational	4	20
	MJ-16	Major paper 16 (Disciplinary/Interdisciplinary Major)	4	
	MJ-17	Major paper 17 (Disciplinary/Interdisciplinary Major)	4	
	MJ-18	Major Paper 18 (Disciplinary/Interdisciplinary Major)	4	
	MJ-19	Major Paper 19 (Disciplinary/Interdisciplinary Major)	4	
VIIIB	ELC-6	Elective courses from Discipline/Interdisciplinary/vocational	4	20
	MJ-20	Major paper 20 (Disciplinary/Interdisciplinary Major)	4	
	AMJ-1	Advanced Minor Paper-1 (Disciplinary/Interdisciplinary Major)	4	
	AMJ-2 AMJ-3	Advanced Minor Paper-2 (Disciplinary/Interdisciplinary Major) Advanced Minor Paper-3 (Disciplinary/Interdisciplinary Major)	4	
Total Credits excluding one internship (IAP) of 4 Credits			160	160

Abbreviations:

AEC	Ability Enhancement Courses
SEC	Skill Enhancement Courses
IAP	Internship/Apprenticeship/ Project
IKS	Indian Knowledge System
MDC	Multidisciplinary Courses
ELC	Elective Courses
MJ	Major Disciplinary/interdisciplinary Courses
AC	Associated core courses from discipline/ Interdisciplinary/ vocational
AMJ	Advanced Major Disciplinary/interdisciplinary Courses
RC	Research Courses
JOC	Skill based Job Oriented course

AEC (Ability enhancements courses)- 2 Credits

- *Full marks – 50, Pass Marks – 20*
- *In AEC the students of all faculties will have to select either Hindi or English in Semester -1 and those students who have opted Hindi will have to select English as AEC in Semester -2 and vice versa. For 3rd and 4th semester student can opt Sanskrit, Urdu, Bengali, English, Hindi or TRL.*
- *In 4th semester there will be AEC-3 will include Language and Communication Skill in Hindi and English.*
- *No internal examination will be conducted.*

VAC (Value added Courses)- 2 Credits

- *Full marks – 50, Pass Marks – 20*
- *For 1st semester – "Understanding India"*
- *For 4th Semester – "Environmental Studies"*
- *No internal examination will be conducted.*

SEC (Skill Enhancement Courses) – 3 Credits

- *Full Marks – 75, Pass Marks – 30*
- *Digital Education or Mathematical & Computational Thinking Analysis is selected as SEC. Student will have to select or opt either of the two subjects for semester – I, II and III in no case both subjects will be allowed to opt.*
- *No internal examination will be conducted.*

MDC (Multidisciplinary Courses) – 3 credits

- *Full Marks – 75, Pass Marks – 30*
- *A student will study three different subjects in the multidisciplinary courses during first three semesters.*
- *No internal examination will be conducted.*

Indian Knowledge System(IKS) & Awarness Module

*The **National Education Policy 2020 (NEP 2020)** integrates the **Indian Knowledge System (IKS)** into education at all levels. A **2-credit IKS course** introduces students to India's cultural, scientific, and philosophical heritage.*

*A **2-credit Awareness Module** covers social ethics and common rules, balancing broad and in-depth topics. **Part 1 (10 hours)** includes road safety, diversity, cleanliness, financial management, and basic first aid. **Part 2 (20 hours)** focuses on a single topic like civic education, drug abuse, gender norms, or sustainable development.*

Universities are encouraged to experiment and revise course content, with credits awarded through alternative activities like quizzes, workshops, group presentations, and community projects.

***UGC mandates** that at least **5% of UG programme credits** be dedicated to IKS, with 50% integrated into the student's major. The **FYUGP curriculum** includes **9 credits for IKS**, comprising a **2-credit common course, a 3-credit multidisciplinary course, and 4 credits** of IKS content within a major paper.*

Common Course

- *Full marks – 50, Pass Marks – 20*
- *For 1st semester (IKS-1)– "Indian Knowledge System-I/Social Awareness Activities"*
- *For 2nd Semester (IKS-2) – "Social Awareness Activities/Indian Knowledge System-I"*
- *No internal examination will be conducted.*

Major Paper having IKS

- *Full marks – 100, Internal-15 (10 Written+5 Class Performance and Attendance), End Semester Examination Theory-60, Practical-25*
  Pass Marks Theory– 30(6 Internal+24 End Semester Examination),
  Pass Marks Practical-10.
- *In the 4th Semester, Major Paper 5.*
- *There will be no internal examination for the practical paper.*

AC (Associated Core Courses) – 4 credits

- *Full Marks Theory (Internal+End Semester)– (15+60), Pass Marks –ELC-2; Full Marks Practical-25, Pass Marks-10.*
- *A student will study two different subjects in the Associated Core courses during the first and second semesters.*
- *There will be no internal examination for the practical paper.*

ELC (Elective Courses) – 4 credits

- *Full Marks Theory (Internal+End Semester)– (15+60), Pass Marks –30; Full Marks Practical-25, Pass Marks-10.*
- *A student will study two different subjects in the Elective courses from the third to the eighth semesters.*
- *There will be no internal examination for the practical paper.*

Table 4: Suggested list of Associated Core (AC) for SCIENCE Discipline

S.N.	Major (MJ)	Associated Core (AC)
1	Botany	Chemistry
		Zoology
2	Zoology	Chemistry
		Botany
3	Chemistry	**Physics** /Botany
		Mathematics/Zoology
4	**Physics**	Mathematics/Statistics
		Chemistry
5	Mathematics	Chemistry/Computer Science
		Physics/ Statistics/Economics
6	Statistics	Mathematics
		Computer Science/**Physics**
7	Geology	Chemistry /**Physics/Math**
		Geography

SEMESTER WISE COURSES OF STUDY FOR FOUR YEAR UNDERGRADUATE PROGRAMME **2025 onwards**

Table 5: Semester-wise Course Code and Credit Points and Marks distribution of Associated core courses

S.N.	Semester	Paper	Credits	Full Marks		Pass Marks	
				Theory (Internal+ End Sem)	Practical End Sem.	Theory (Internal+ End Sem	Practical
1.	I/II	AC-1/AC-2	3+1	15+60	25	30	10

- *No internal or mid-semester examination will be conducted for practical papers.*

Table 6: Semester wise Course Code and Credit Points and Marks distribution of Elective courses

S.N.	Semester	Paper	Credits	Full Marks		Pass Marks	
				Theory (Internal+ End Sem)	Practical End Sem.	Theory (Internal+ End Sem	Practical
1.	III/IV	ELC-1/ELC-2	3+1	15+60	25	30	10
2.	V/VI	ELC-3/ELC-4	3+1	15+60	25	30	10
3.	VII/VIII	ELC-5/ELC-6	3+1	15+60	25	30	10

- *No internal or mid semester examination will be conducted for practical papers.*

SEMESTER WISE COURSES IN GEOLOGY FOR FYUGP **2025 onwards**

Table 7: Semester wise Papers and Examination Structure for Geology Major with Bachelor's Degree (Honours) :

Year	Semester	Geology Major		Examination Structure				Pass Marks		
		Code	Papers	Credits	Internal (Mid Semester) Theory (F.M.)	End Semester Theory (F.M.)	End Semester Practical (F.M.)	Internal Theory (Mid Sem.)	End Sem. Theory	End sem. Practical
1st	I	MJ-1: Theory	Earth System Science	3	15 (10+5)*	60	-	6	24	-
		MJ-1: Practical	Practical	1	-	-	25	-	-	10
	II	MJ-2: Theory	Crystallography & Mineralogy	3	15 (10+5)*	60	-	6	24	-
		MJ-2: Practical	Practical	1	-	-	25	-	-	10
EXIT POINT: UNDERGRADUATE CERTIFICATE										
2nd	III	MJ-3: Theory	Structural Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-3: Practical	Practical	1	-	-	25	-	-	10
		MJ-4: Theory	Elements Of Geochemistry	3	15 (10+5)*	60	-	6	24	-
		MJ-4: Practical	Practical	1	-	-	25	-	-	10
	IV	MJ-5: Theory	Indian Knowledge System in Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-5: Practical	Practical	1	-	-	25	-	-	10
		MJ-6: Theory	Igneous Petrology	3	15 (10+5)*	60	-	6	24	-
		MJ-6: Practical	Practical	1	-	-	25	-	-	10
		MJ-7: Theory	Sedimentary Petrology	3	15 (10+5)*	60	-	6	24	-
		MJ-7: Practical	Practical	1	-	-	25	-	-	10
EXIT POINT: UNDERGRADUATE DIPLOMA										
3rd	V	MJ-8: Theory	Metamorphic Petrology	3	15 (10+5)*	60	-	6	24	-

		MJ-8: Practical	Practical	1	-	-	25	-	-	10
		MJ-9: Theory	Stratigraphic Principles & Indian Stratigraphy	3	15 (10+5)*	60	-	6	24	-
		MJ-9: Practical	Practical	1	-	-	25	-	-	10
		MJ-10: Theory	Paleontology	3	15 (10+5)*	60	-	6	24	-
		MJ-10: Practical	Practical	1	-	-	25	-	-	10
		MJ-11: Theory	Economic Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-11: Practical	Practical	1	-	-	25	-	-	10
	VI	MJ-12: Theory	Geomorphology	3	15 (10+5)*	60	-	6	24	-
		MJ-12: Practical	Practical	1	-	-	25	-	-	10
		MJ-13: Theory	Hydro Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-13: Practical	Practical	1	-	-	25	-	-	10
		MJ-14: Theory	Engineering Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-14: Practical	Practical	1	-	-	25	-	-	10
		MJ-15: Theory	Remote Sensing & GIS	3	15 (10+5)*	60	-	6	24	-
		MJ-15: Practical	Practical	1	-	-	25	-	-	10
EXIT POINT: BACHELOR'S DEGREE										
4th	VII	MJ-16: Theory	Ore Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-16: Practical	Practical	1	-	-	-	-	-	10
		MJ-17: Theory	Exploration Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-17: Practical	Practical	1	-	-	-	-	-	10
		MJ-18: Theory	Environmental Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-18: Practical	Practical	1	-	-	-	-	-	10

		MJ-19: Theory	Soil Geoscience	3	15 (10+5)*	60	-	6	24	-
		MJ-19: Practical	Practical	1	-	-	-	-	-	10
	VIII	MJ-20: Theory	Fuel Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-20: Practical	Practical	1	-	-	-	-	-	10
		AMJ-1: Theory	Earth & Climatology	3	15 (10+5)*	60	-	6	24	-
		AMJ-1: Practical	Practical	1	-	-	-	-	-	10
		AMJ-2: Theory	Urban Geology	3	15 (10+5)*	60	-	6	24	-
		AMJ-2: Practical	Practical	1	-	-	-	-	-	10
		AMJ-3: Theory	Sedimentology	3	15 (10+5)*	60	-	6	24	-
		AMJ-3: Practical	Practical	1	-	-	-	-	-	10
EXIT POINT: BACHELOR'S DEGREE (HONOURS)										

- ** For internal examination written examination will be of 10 marks and class performance and attendance of 5 marks.*
- *No internal or mid semester examination will be conducted for practical papers.*

Table 8: Fourth Year Papers and Examination Structure for Geology Major with Bachelor's Degree (Honours with Research):

Year	Semester	Geology Major		Examination Structure				Pass Marks		
		Code	Papers	Credits	Internal (Mid Semester) Theory (F.M.)	End Semester Theory (F.M.)	End Semester Practical (F.M.)	Internal Theory (Mid Sem.)	End Sem. Theory	End sem. Practical
		MJ-16: Theory	Ore Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-16: Practical	Practical	1	-	-	-	-	-	10
		MJ-17: Theory	Exploration Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-17: Practical	Practical	1	-	-	-	-	-	10
		MJ-18: Theory	Environmental Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-18: Practical	Practical	1	-	-	-	-	-	10
		RC-1	Research Proposal-Planning & Techniques (Disciplinary/ Interdisciplinary Major)	4	25	75	-	10	30	-
		MJ-19: Theory	Soil Geoscience	3	15 (10+5)*	60	-	6	24	-
		MJ-19: Practical	Practical	1	-	-	-	-	-	10
		MJ-20: Theory	Fuel Geology	3	15 (10+5)*	60	-	6	24	-
		MJ-20: Practical	Practical	1	-	-	-	-	-	10
		RC-2	Dissertation Thesis	8	-	200	-	-	80	-
EXIT POINT: BACHELOR'S DEGREE (HONOURS with RESEARCH)										

- ** For internal examination written examination will be of 10 marks and class performance and attendance of 5 marks.*
- *No internal or mid semester examination will be conducted for practical papers.*

Table 9: Semester wise Papers and Examination Structure for Associated Core Course in Geology

Semester	Code	Minor Papers	Credits	Full Marks		Pass Marks	
				Theory (Internal+ End Sem)	Practical End Sem.	Theory (Internal+ End Sem	Practical End Sem
I/II	AC Theory	Introductory Geology	3	15(10+5) +60	-	30	
	AC Practical	Practical	1	-	25	-	10

Table 10: Semester wise Papers and Examination Structure for Elective Course in Geology

Semester	Code	Minor Papers	Credits	Full Marks		Pass Marks	
				Theory (Internal+ End Sem)	Practical End Sem.	Theory (Internal+ End Sem	Practical End Sem
III/IV	ELC -1 Theory	Essentials of Geology, Rocks & Minerals	3	15(10+5) +60	-	30	-
	ELC -1 Practical	Practical	1	-	25	-	10
V/VI	ELC -2 Theory	Earth Resources	3	15(10+5) +60	-	30	-
	ELC -2 Practical	Practical	1	-	25	-	10
VII/VIII	ELC -3 Theory	Fossils & their applications	3	15(10+5)+60	-	30	-
	ELC -3 Practical	Practical	1	-	25	-	10

General Instructions

1. *Semester Internal Theory Examination will be of **1 hour** duration.*
2. *There shall be only one Practical Examination of 3 hours duration in **each semester for each paper separately.***
3. *One external and one internal examiner will conduct the Practical Examinations.*
4. *There will be **Only One Semester Internal Examination** in Major, Minor, and Research Courses, which will be organized at the college/institution level.*
5. *Out of 100 Marks, the Semester Internal Theory Examination (each of 1 hour) in the Practical subjects will be of 15 marks and in non-practical subjects will be of 25 marks.*
6. *15 Marks in Theory Examination of Practical subjects may include 10 Marks questions from the Written Examination/ Assignment/ Project/ Tutorial, wherever applicable, and 5 marks will be awarded on the attendance/overall class performance in the semester.*
7. *25 Marks in Theory Examination of Non-Practical subjects may include 20 Marks questions from Written Examination/ Assignment/ Project/ Tutorial wherever applicable, and 5 marks will be awarded on the attendance/ overall class performance in the semester.*
8. *To convert attendance into marks, a suggestive range is provided here. However, institutions may develop their range:*
   [Attendance Upto 45%, I mark; 45<Attd. <55, 2 marks; 55<Attd. <65, 3 marks; 65<Attd. <75, 4 marks; 75<Attd, 5 marks].

MAJOR PAPERS

SEMESTER I

GEOLOGY MJ 1 THEORY: EARTH SYSTEM SCIENCE

Credits: 03 Lectures: 45

Marks: 75 (End Semester Examination=60, Semester Internal Examination= 10 (Theory), Class Performance & Attendance =05) **Pass Marks (Internal + End Semester) = 30**

Instructions to Question Setter for

Semester Internal Examination (SIE 10 marks):

*There will be **two** groups of questions. Question No.1 will be a **very short answer type in Group A,** consisting of five questions of 1 mark each. **Group B will contain descriptive type** two questions of five marks each, out of which one to be answered.*

End Semester Examination (ESE 60 marks):

*There will be **two** groups of questions. **Group A is compulsory,** which will contain three questions. **Question No.1 will be a very short answer type** consisting of five questions of 1 mark each. **Questions No.2 & 3 will be short-answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to be answered.*

***Note:** There may be subdivisions in each question asked in Theory Examinations*

COURSE OBJECTIVE

This course aims in helping the students:

- To introduce fundamental aspects of Earth and Planetary system and its related changes with time.
- Knowledge on Hydrosphere and Atmosphere, Soil, Understanding the past from stratigraphic records

COURSE LEARNING OUTCOMES

After successfully completing this course, the students will be able to understand:

- understanding the interconnectedness of Earth's various components (atmosphere, hydrosphere, geosphere, and biosphere) and how they interact to influence global change
- The course will investigate how geologic materials and processes influence mineral occurrence, stability, and composition, & different tectonic plate movement.

SKILLS TO BE LEARNED

- Problem-solving skills and creativity thinking
- The ability to recognize and understand complex patterns systems

COURSE CONTENT

Unit 1: Earth as a planet

Holistic understanding of dynamic planet 'Earth' through Geology. Introduction to various branches of Earth Sciences. General characteristics and origin of the Universe, Solar System and its planets. The terrestrial and jovian planets. Meteorites and Asteroids,
Earth in the solar system - origin, size, shape, mass, density, rotational and revolution parameters and its age. Age of the earth **(9-lectures)**

Unit 2: Interior of Earth

Internal Structure of the earth, Primary discontinuity & secondary discontinuity, composition of different layers, Earth's magnetic field: Convection in Earth's core and production of its magnetic field. **(9-lectures)**

Unit 3: Plate Tectonics

Concept of plate tectonics & types of boundaries, sea-floor spreading, Isostacy, and continental drift Geodynamic elements of Earth- Mid Oceanic Ridges, trenches, transform faults and island arcs Origin of oceans, continents, mountains and rift valleys, Earthquake and earthquake belts, Volcanoes- types, products and their distribution. **(9-lectures)**

Unit 4: Hydrosphere and Atmosphere

Introduction to hydrosphere and atmosphere; Oceanic current system and effect of Coriolis force; Wave erosion and beach processes; Atmospheric circulation; Earth's heat budget.

(9-lectures)

Unit 5: Soil

Soils- processes of formation, soil profile and soil types. **(4-lectures)**

Unit 6: Understanding the past from stratigraphic records

Stratigraphy: introduction and scope; Standard stratigraphic time scale Introduction to geo-chronological methods and their application in geological studies; Laws of superposition and faunal succession; Concepts of uniformitarianism. Stratigraphic correlation & its types.

(5-lectures)

Reference Books:

- *Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.*
- *Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment.* Cambridge University Press.
- *Gross, M. G. (1977). Oceanography: A view of the earth.*

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MJ 1:Practical

Credit: 01 Lectures: 30(15X2)

Instructions to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3 hours duration. Evaluation of the Practical Examination will be as per the following guidelines:

Experiment	*= 15 marks*
Practical record notebook	*= 05 marks*
Viva-voce	*= 05 marks*

Practicals:

- Study of major geomorphic features and their relationships with outcrops through physiographic models.
- Detailed study of topographic sheets and preparation of physiographic description of an area
- Study of soil profile of any specific area
- Study of distribution of major lithostratigraphic units on the map of India
- Study of distribution of major dams on map of India and their impact on river systems
- Study of major ocean currents of the World
- Study of seismic profile of a specific area and its interpretation

Reference Books:

- *Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.*
- *Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.*
- *Gross, M. G. (1977). Oceanography: A view of the earth.*

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SEMESTER II

GEOLOGY-MJ 2 THEORY: CRYSTALLOGRAPHY & MINERALOGY

Credits: 03 Lectures: 45

Marks: 75 (End Semester Examination=60, Semester Internal Examination= 10 (Theory), Class Performance & Attendance =05) **Pass Marks (Internal + End Semester) = 30**

Instructions to Question Setter for

Semester Internal Examination (SIE 10 marks):

*There will be **two** groups of questions. Question No.1 will be a **very short answer type in Group A**, consisting of five questions of 1 mark each. **Group B will contain descriptive type** two questions of five marks each, out of which one to be answered.*

End Semester Examination (ESE 60 marks):

*There will be **two** groups of questions. **Group A is compulsory,** which will contain three questions. **Question No.1 will be a very short answer type** consisting of five questions of 1 mark each. **Questions No.2 & 3 will be short-answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to be answered.*

***Note:** There may be subdivisions in each question asked in Theory Examinations*

COURSE OBJECTIVE

This course aims in helping the students:

- Learn the basics of crystallography and its application to optical mineralogy;
- Optical mineralogy part will help the student to understand microscopic techniques applicable to mineralogical and petrographic studies.

COURSE LEARNING OUTCOME

After successfully completing this course, the students will be able to understand:

- The aim of this course is to study the major mineral groups, their occurrences, physical, chemical and crystallographic properties and their possible uses in industry.
- The course is divided into different modules as given in the course content and covers the structure of minerals, characters of minerals and mineral chemistry.

SKILLS TO BE LEARNED

- Problem-solving skills and creativity thinking
- The ability to recognize and understand complex patterns systems
- Mineral identification

COURSE CONTENT

Unit 1: Crystallography

Elementary ideas about crystal morphology in relation to internal structures Crystal parameters and indices, different symmetry elements, Crystal symmetry and classification of crystals into six systems and 32 point groups, Hermann-Mauguin symbol & its interpretation, Isometric system, Tetragonal system with example of different mineral crystallized. **(9-lectures)**

Unit 2: Crystal symmetry and projections

Elements of crystal chemistry and aspects of crystal structures, Stereographic projections of symmetry elements and forms, Miller indices, Bravis indices, Mathematical problem on crystallography, Hexagonal, Orthorhombic, Monoclinic & triclinic system with example of different mineral crystallized. **(9-lectures)**

Unit 3: Rock forming minerals

Minerals - definition and classification, physical and chemical properties Composition of common rock-forming minerals, Silicate and non-silicate structures; BCC, CCP and HCP structures, Classification of silicate structures. **(9-lectures)**

Unit 4: Properties of light and optical microscopy

Nature of light and principles of optical mineralogy, Isotropic & Anisotropic, Birefringence, Interference color, Extinction & its types, Uniaxial & Biaxial Indicatrix, O-ray, E-ray, Nicol Prism, Twinning & its types. **(9-lectures)**

Unit 5: petrological microscope

Introduction to the petrological microscope and identification of common rock-forming & ore-forming minerals through transmitted & reflected light. **(9-lectures)**

Reference Books:

- *Klein, C., Dutrow, B., Dwight, J., & Klein, C. (2007). The 23rd Edition of the Manual of Mineral Science (after James D. Dana). J. Wiley & Sons.*
- *Kerr, P. F. (1959). Optical Mineralogy. McGraw-Hill.*
- *Verma, P. K. (2010). Optical Mineralogy (Four Colour). Ane Books Pvt Ltd.*
- *Deer, W. A., Howie, R. A., & Zussman, J. (1992). An introduction to the rock-forming minerals (Vol. 696). London: Longman.*

GEOLOGY-MJ 2: PRACTICAL

Credit: 01 Lectures: 30(15X2)

Instructions to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3 hours duration. Evaluation of the Practical Examination will be as per the following guidelines:

Experiment	*= 15 marks*
Practical record notebook	*= 05 marks*
Viva-voce	*= 05 marks*

Practicals:

- Observation and documentation on symmetry of crystals.
- Study of physical properties of minerals in hand specimen: Silicates: Olivine, Garnet, Andalusite, Sillimanite, Kyanite, Staurolite, Beryl, Tourmaline, Augite, Actinolite, Tremolite, Hornblende, Serpentine, Talc, Muscovite, Biotite, Phlogopite, Quartz, Orthoclase, Plagioclase, Microcline, Nepheline, Sodalite, Zeolite, Quartz varieties: Chert, Flint, Chalcedony, Agate, Jasper, Amethyst, Rose quartz, Smoky quartz, Rock crystal.
- Native Metals/non-metals, Sulfides, Oxides- Chalcopyrite, Graphite, Pyrite, Corundum, Galena, Hematite, Magnetite Hydroxides, Halides, Carbonates, Sulfates, Phosphates: Psilomelane, Pyrolusite, Fluorite, Calcite, Azurite, Malachite, Gypsum, Apatite.
- Study of some key silicate minerals under optical microscope and their characteristic properties. Rock-forming Minerals & Ore minerals

Reference Books:

- *Klein, C., Dutrow, B., Dwight, J., & Klein, C. (2007). The 23rd Edition of the Manual of Mineral Science (after James D. Dana). J. Wiley & Sons.*
- *Kerr, P. F. (1959). Optical Mineralogy. McGraw-Hill.*
- *Verma, P. K. (2010). Optical Mineralogy (Four Colour). Ane Books Pvt Ltd.*
- *Deer, W. A., Howie, R. A., & Zussman, J. (1992). An introduction to the rock-forming minerals (Vol. 696). London: Longman.*

ASSOCIATED CORE COURSE

ASSOCIATED CORE COURSE IN GEOLOGY

SEMESTER I/SEMESTER II

GEOLOGY-AC-1 THEORY: INTRODUCTORY GEOLOGY

Credits: 03 Lectures: 45

Marks: 75 (End Semester Examination=60, Semester Internal Examination= 10 (Theory), Class Performance & Attendance =05) Pass Marks (Internal + End Semester) = 30

Instructions to Question Setter for

Semester Internal Examination (SIE 10 marks):

*There will be **two** groups of questions. Question No.1 will be a **very short answer type in Group A,** consisting of five questions of 1 mark each. **Group B will contain descriptive type** two questions of five marks each, out of which one to be answered.*

End Semester Examination (ESE 60 marks):

*There will be **two** groups of questions. **Group A is compulsory,** which will contain three questions. **Question No.1 will be a very short answer type** consisting of five questions of 1 mark each. **Questions No.2 & 3 will be short-answer type** of 5 marks. **Group B will contain descriptive type** five questions of fifteen marks each, out of which any three are to be answered.*

***Note:** There may be subdivisions in each question asked in Theory Examinations.*

Course Objective:

The primary objective of the course is:

- To provide student the fundamental ideas about igneous rocks.
- The students will get to know the different types of sedimentary, metamorphic rocks and fundamentals of sedimentary and metamorphic petrology.
- The students will able to understand the texture, structures and process of their formation.

Learning outcomes

After successfully completing this course, the students will be able to understand:

- This course helps the students to understand how to use structures and appreciate the dynamic nature of the Earth's lithosphere.
- The students will learn the skills of identifying different structures.

Skills to be Learned

- Know basic terminologies and concepts in structural geology
- Get familiar with clinometers and measure dip and strike;
- Significance of folds and faults
- Evaluate the geological significance of joints and unconformity;
- Can understand the difference between various types of sedimentary rocks
- Know the Process and control of physico-chemical and compositional control on metamorphism of rocks.

COURSE CONTENT

Unit 1: **(10-Lectures)**

Holistic understanding of dynamic planet 'Earth" through Geology, Introduction of various branches of Earth Sciences, Application of Geology in various fields.

Unit 2: **(10-Lectures)**

Earth in Solar System: Origin, the internal constitution of the Earth: core, mantle, crust. Atmosphere and Hydrosphere, Physiographic division of India, Earthquake and volcano, Major engineering projects of India:

Type of Dam/Reservoir, Tunnel, Bridges.

Unit 3: **(05-Lectures)**

Energy: Renewable and Non-renewable energy, use of alternate energy sources, growing energy needs. **Unit 4:** **(10-Lectures)**

Mineral: Definition, Classification and physical properties, distribution of important economic minerals

of India.

Rocks: definition and types, and basics of formation

Igneous: Magma, their types, origin and composition,

Sedimentary: Weathering and Erosion, a process of formation

Metamorphic: agents and types of metamorphism

Unit 5: **(10-Lectures)**

Fossils and their application: Definition, processes, modes of preservation and uses, application of

Fossils, Gondwana fossils and their types.

Reference Books:

- *1. Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge*
- *University Press.*
- *2. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.*
- *3. Lutgens, F., Tarbuck, E., and Tasa, D., (2009). The Atmosphere: An Introduction to Meteorology. Pearson*
- *Publisher*
- *4. Johnson, R.B. and De Graf, J.V. (1988). Principles of Engineering Geology, John Wiley.*
- *5. Goodman, R.E., 1993. Engineering Geology: Rock in Engineering constructions. John Wiley & Sons, N.Y.*
- *6. Waltham, T., (2009). Foundations of Engineering Geology (3rd Edn.) Taylor & Francis.*
- *7. Bateman, A.M. and Jensen, M.L. (1990). Economic Mineral Deposits. John Wiley.*
- *8. Gokhale, K.V.G.K. and Rao, T.C. (1978). Ore deposits of India their distribution and processing, Tata McGraw*
- *Hill, New Delhi*
- *9. Earth Materials- Introduction to Mineralogy and Petrology, Cornelis Klein and Anthony Philpotts, Cambridge*
- *University Press, 2013.*
- *10. Understanding Earth (Sixth Edition), John Grotzinger and Thomas H. Jordan, 2010, W.H. Freeman and Company,*
- *New York.*

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GEOLOGY AC-1: Practical

Credit: 01 Lectures: 30(15X2)

Instructions to Question Setter for

End Semester Examination (ESE):

There will be one Practical Examination of 3 hours duration. Evaluation of the Practical Examination will be as per the following guidelines:

Experiment	*= 15 marks*
Practical record notebook	*= 05 marks*
Viva-voce	*= 05 marks*

Practical

1. Distribution of Seismic zone in India
2. Locate the major engineering projects in India: Dam/Reservoir, Tunnel, Bridges.
3. Physiographic division of India
4. Distribution of renewable and non-renewable energy sources of India
5. Megascopic study of Igneous, Sedimentary and Metamorphic rocks.
6. Distribution of important economic minerals in India with special reference to Jharkhand.
7. Megascopic study of Invertebrate fossils.
8. Megascopic study of Plant fossils.

Reference Books

1. Sen, A.K.: Laboratory Manual of Geology (Modern Book Agency Pvt. Ltd. Calcutta).
2. Sinha, R.K. and Sharma, N.L. (1993): An introduction to Mineral Economics, Wiley Eastern.
3. Mahadevan, T.M. (2002): Geology of Bihar and Jharkhand, GSI, Bangalore.
4. Krishnan, M.S. (1982): Geology of India and Burma, CBS publication and distributors, Delhi.

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MDC (Multidisciplinary Course): GEOLOGY

SEMESTER I/SEMESTER II/SEMESTER III

MDC-1/2/3: GEOLOGY

(Credits: Theory-03 Lectures-45)

Marks: 75 (End Semester Examination=75, *No* Semester **Internal Examination** **Pass Marks: = 30**

Instructions to Question Setter for

End Semester Examination (ESE 75 marks):
There will be ***two*** *groups of questions.* ***Group A is compulsory,*** *which will contain three questions.* ***Question No.1 will be a very short answer type*** *consisting of five questions of 1 mark each.* ***Questions No. 2 & 3 will be short answer type*** *of 5 marks.* ***Group B will contain descriptive type*** *six questions of fifteen marks each, out of which any four are to be answered.*

COURSE CONTENT:

Unit-I:

Introduction to geology and its scope, Earth and solar system: origin, size, shape, mass, density and its atmosphere. A brief account of various theories regarding the origin and age of the earth; Brief idea of interior of earth and its composition. Earthquakes: types, origin, nature of seismic waves, their intensity and magnitude scale; Volcanoes: types, products and causes of volcanism, Plate Tectonics & its types with example

Unit-II:

Introduction to Structural Geology, Elementary idea of bed, dip and strike, Fold, Fault, joints, unconformity: its types & recognition in the field. Principle of stratigraphy, Stratigraphy of Gondwana, Vindhyan & Cuddapah supergroup & its type area; Geological Time Scale, definition of Fossils and Mode of preservation condition of fossilization and significance of fossils.

Unit-III:

Introduction to Mineralogy, Definition and characters of mineral. Common physical properties of minerals- Talc, Gypsum, Calcite, Fluorite, Apatite, Orthoclase, Quartz, Topaz, Corundum, Diamond, Muscovite, Biotite, Hypersthene, Olivine, Hornblende. Optical properties of minerals.

Unit-IV:

Magma: definition, composition, types and origin; Forms of igneous rocks; textures, structure & classification of igneous rocks. Classification, textures and structures of sedimentary rocks, Definition of metamorphism; Type of metamorphism. Factors, zones, grade & facies of metamorphism, textures and structures of metamorphic rocks.

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Unit-V:

Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor, cutoff grade; Origin, mode of occurrence & distribution of Metallic and non-metallic ore minerals in India- Iron, Copper, Aluminium, Gold, Lead, Zinc, Chromite & Manganese. Coal: origin, types & distribution, Petroleum: origin, occurrence & distribution.

Reference Books:

- *Earth Materials- Introduction to Mineralogy and Petrology, Cornelis Klein and Anthony Philpotts, Cambridge University Press, 2013.*
- *Understanding Earth (Sixth Edition), John Grotzinger and Thomas H. Jordan, 2010, W.H. Freeman and company, New York.*
- *Davis, G. R. (1984) Structural Geology of Rocks and Region. John Wiley Billings, M. P. (1987) Structural Geology, 4th edition, Prentice-Hall.*
- *Park, R. G. (2004) Foundations of Structural Geology. Chapman & Hall.*
- *Mason, B. (1986) Principles of Geochemistry. 3rd Edition, Wiley New York.*
- *Rollinson, H. (2007) Using geochemical data – evaluation, presentation and interpretation. 2nd Edition. Publisher Longman Scientific & Technical.*
- *Energy and the Environment by Fowler, J.M 1984. McGraw-Hill*
- *Global Energy Perspectives by Nebojsa Nakicenovic 1998, Cambridge University Press.*
- *Energy Resources and Systems: Fundamentals and Non-Renewable Resources by Tushar K. Ghosh and M. A. Prelas. 2009, Springer*
- *Introduction to Wind Energy Systems: Hermann-Josef Wagner and Jyotirmay Mathur. 2009, Springer.*
- *Renewable Energy Conversion, Transmission and Storage. Bent Sorensen, 2007, Springer.*

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FORMAT OF QUESTION PAPER FOR SEMESTER INTERNAL EXAMINATIONS

Question format for **10 Marks:**

Subject/ Code

F.M. =10 Time=1Hr. Exam Year

General Instructions:

i. **Group A** carries very short answer type compulsory questions.
ii. **Answer 1 out of 2** subjective/ descriptive questions given in **Group B.**
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [1×5 = 5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....

Group B

2. ..... [5]
3. ..... [5]

Note: There may be subdivisions in each question asked in Theory Examination.

FORMAT OF QUESTION PAPER FOR END-SEMESTER UNIVERSITY EXAMINATIONS

Question format for **50 Marks:**

Subject/ Code

F.M. =50 Time=2Hrs. Exam Year

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B.**
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....

Group B

2. ..... [15]
3. ..... [15]
4. ..... [15]
5. ..... [15]
6. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

Question format for **60 Marks:**

Subject/ Code

F.M. =60 Time=3Hrs. Exam Year

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B.**
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....
2. ..... [5]
3. ..... [5]

Group B

4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.

Question format for 75 Marks:

Subject/ Code

F.M. = 75 **Time=3Hrs.** **Exam Year**

General Instructions:

i. **Group A** carries very short answer type **compulsory** questions.
ii. **Answer 4 out of 6** subjective/ descriptive questions given in **Group B.**
iii. Answer in your own words as far as practicable.
iv. Answer all sub parts of a question at one place.
v. Numbers in right indicate full marks of the question.

Group A

1. [5x1=5]
   i. .....
   ii. .....
   iii. .....
   iv. .....
   v. .....
2. ..... [5]
3. ..... [5]

Group B

4. ..... [15]
5. ..... [15]
6. ..... [15]
7. ..... [15]
8. ..... [15]
9. ..... [15]

Note: There may be subdivisions in each question asked in Theory Examination.