



FYUGP
SYLLABUS FOR
UNDERGRADUATE COURSES OF
B.Sc. GEOLOGY
HONOURS/RESEARCH UNDER
N.E.P. 2020 UNDER
N.P. UNIVERSITY, MEDININAGAR

Implemented from
Academic Session 2022-2026

COURSE STRUCTURE FOR FYUGP 'HONOURS/ RESEARCH'

Table 1: Credit Framework for Four Year Undergraduate Programme (FYUGP) under State Universities of Jharkhand [Total Credits = 176]

Semester	Common Courses (29)									Introductory Courses (15)		Internship/ Project (4)	Minor** (32)		Research Courses (18)				Total Credit	
	Language and Communication Skills (Modern Indian Language including TRL) (6)	Language and Communication Skills (English) (6)	Environmental Studies (3)	Understanding India (2)	Health & Wellness, Yoga Education, Sports & Fitness (2)	Digital Education (3)	Mathematical & Computational Thinking and Analysis (2)	Value-Based Course/ Global Citizenship Education (2)	Community Engagement/ NCC/ NSS/ (3)	Introductory Courses [Natural Sc./ Humanities/ Social Sc./ Commerce] (9)	Introductory Course [Vocational Studies] (6)		Natural Sc./ Humanities/ Social Sc./ Commerce (18)	Vocational Studies (14)	Research Methodology Courses (6)	Research Proposal, Review of literature (4)	Research Internship/ Field Work (4)	Preparation of the Research Project Report (4)		
1	2	3	4	5	6	7	8			9	10	11	14	15	16	17	18	19	20	21
I	6			2	2					3	3		6							22
II		6					2	2		3	3		6							22
Exit Point: Undergraduate Certificate																				
III			3			3			3	3		4	6							22
IV													6+6	6	4					22
Exit Point: Undergraduate Diploma																				
V													6+6	6	4					22
VI													6+6	6	4					22
Exit Point: Bachelor's Degree																				
VII													6+6 (Adv. Topics)			6	4			22
VIII													6+6 (Adv. Topics)		2			4	4	22
Exit Point: Bachelor's Degree with Hons. /Research																				

*There will be four disciplinary areas: A-Natural Science, B-Humanities, C-Social Science, and D-Commerce; each having basket of courses. A student will have to select a 'Major' from any of the four disciplinary areas (out of A, B, C & D). The selection for admission will be primarily based on availability of seats in Major and marks imposed by the institution.

**A student has to select three subjects for 'Introductory Regular Courses' from a pool of subjects associated with the Major offered by the institution. One of the three subjects will continue as 'Minor' from semester IV onwards, based on the academic interest and performance of the student.

COURSES OF STUDY FOR FOUR YEAR UNDERGRADUATE PROGRAMME

Table 2: Course structure for Undergraduate Certificate Programme [May Exit after Sem.-II]

Semester	Common Courses			Introductory Courses		Major	Total Credits
Sem.-I	LCS (MIL/TRL) (6 Credits)	Understanding India (2 Credits)	Health & Wellness, Yoga Education, Sports & Fitness (2 Credits)	IRC-1 (3 Credits)	IVS-1A (3 Credits)	MJ-1 (6 Credits)	(22)
Sem.-II	LCS (English) (6 Credits)	Global Citizenship Education (2 Credits)	Mathematical & Computational Thinking (2 Credits)	IRC-2 (3 Credits)	IVS-1B (3 Credits)	MJ-2 (6 Credits)	(22)

Total = 44 Credits

(LCS: Language and Communication Skills; MIL: Modern Indian Languages; TRL: Tribal Regional Languages;
IRC: Introductory Regular Courses; IVS: Introductory Vocational Studies, MJ: Major)

SEMESTER WISE COURSES IN GEOLOGY FOR FYUGP

2022 onwards**Table 7: Semester wise Examination Structure in Discipline Courses:**

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Examination Structure			
	Code	Papers	Credits	Mid Semester Theory (F.M.)	End Semester Theory (F.M.)	End Semester Practical/ Viva (F.M.)
I	MJ-1	Earth System Science	6	15	60	25
II	MJ-2	Crystallography & Mineralogy	6	15	60	25
III	MJ-3	Structural Geology and Geomorphology	6	15	60	25
IV	MJ-4	Elements of Geochemistry and Igneous Petrology	6	15	60	25
	MJ-5	Sedimentary and Metamorphic Petrology	6	15	60	25
V	MJ-6	Stratigraphy	6	15	60	25
	MJ-7	Paleontology	6	15	60	25
VI	MJ-8	Economic and Engineering Geology	6	15	60	25
	MJ-9	Hydrogeology and Remote Sensing & GIS	6	15	60	25
VII	AMJ-1	Geological Mapping and Exploration Geology	6	15	60	25
	AMJ-2	Fuel Geology	6	15	60	25
	RC-1	Research Methodology	6	25	75	---
	RC-2	Research Proposal	4	25	75	---
VIII	AMJ-3	Earth and Climate	6	15	60	25
	AMJ-4	Introduction of Geophysics	6	15	60	25
	RC-3	Research Internship/Field Work	4	---	---	100
	RC-4	Research Report	4	---	---	100
	VSR	Vocational Studies (Associated with Research)	2	---	---	100
		Total Credit	98			

Table 7: Semester wise Course Code and Credit Points:

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Examination Structure			
	Code	Papers	Credits	Mid Semester Theory (F.M.)	End Semester Theory (F.M.)	End Semester Practical/ Viva (F.M.)
I/ II/ III	IRC	Introductory Regular Course (Disciplinary/Interdisciplinary Minor)	3	---	100	---
IV	MN-1	Minor paper 1 (Disciplinary/Interdisciplinary Minor)	6	15	60	25
V	MN-2	Minor paper 2 (Disciplinary/Interdisciplinary Minor)	6	15	60	25
VI	MN-3	Minor paper 3 (Disciplinary/Interdisciplinary Minor)	6	15	60	25
		Total Credit	21			

SEMESTER I

I. MAJOR PAPER – 1 (MJ 1):

(Credits: Theory-04, Practicals-02)

Marks: 15 (5 Attd. + 10 SIE: 1Hr) + 60 (ESE: 3Hrs) = 75

Pass Marks: Th (SIE + ESE) = 30

Instruction to Question Setter for

Semester Internal Examination (SIE 10+5=15 marks):

There will be **two** group of questions. **Question No.1 will be 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 any one to answer.

The Semester Internal Examination shall have two components. (a) One Semester Internal Assessment Test (SIA) of 10 Marks, (b) Class Attendance Score (CAS) of 5 marks. Conversion of Attendance into score may be as follows: (Attendance Upto 45%, 1mark; 45<Attd.<55, 2 marks; 55<Attd.<65, 3 marks; 65<Attd.<75, 4 marks; 75<Attd, 5 marks)

End Semester Examination (ESE 60 marks):

There will be **two** group of questions. **Group A is compulsory** which will contain three questions. **Question No.1 will be very short answer type** consisting of five questions of 1 mark each. **Question 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 answer.

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

EARTH SYSTEM SCIENCE

Theory: 60 Lectures

Learning Objectives

- To provide a fundamental understanding of the Earth in the solar system along with its origin, evolution, and different components; to understand the potential fields associated with earth; the evolution of life through geological time scale.

Course Learning Outcomes

After the completion of the course, the students will be able to:

- Acquire the fundamental understanding of the Earth and its components, thorough an understanding of materials and processes of the earth, and apply the knowledge of earth science to address societal issues.

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 age.

Unit 2:

Interior of Earth: Internal Structure of the early Earth's magnetic field: Convection in Earth's core and production of its magnetic field.

Unit 3:

Plate Tectonics: Concept of plate tectonics, sea-floor spreading 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.

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.

Soils: processes of formation, soil profile and soil types.

Unit 5:

Understanding the past from stratigraphic records, Stratigraphy: Introduction and scope; Geological Time Scale, Standard stratigraphic time scale Introduction to geochronological methods and their application in geological studies; Laws of superposition and faunal succession; Concepts of uniformitarianism.

Reference Books:

1. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.
2. Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.
3. Gross, M. G. (1977). Oceanography: A view of the Earth.
4. Krishnan, M. S. (1982). Geology of India and Burma, C.B.S. Publishers, Delhi.
5. Kumar, R. (1991). Fundamentals of Historical Geology and Stratigraphy of India. New Age International Publishers.
6. Wadia, DN (1919). Geology of India, Macmillan publishers.
7. Holmes, A. (1945). Principles of Physical Geology. Thomas Nelson and Sons Ltd., London Edinburgh Paris Melbourne, Toronto and New York.

GEOLOGY PRACTICAL- MJ 1 LAB

Marks : Pr (ESE: 3Hrs) =25

Pass Marks: Pr (ESE) = 10

***Instruction to Question Setter for
End Semester Examination (ESE):***

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

<i>Experiment</i>	<i>= 15 marks</i>
<i>Practical record notebook</i>	<i>= 05 marks</i>
<i>Viva-voce</i>	<i>= 05 marks</i>

PRACTICALS:**60 Lectures**

1. Study of major geomorphic features and their relationships with outcrops through physiographic models.
2. Detailed study of topographic sheets and preparation of physiographic description of an area
3. Study of soil profile of any specific area (Jharkhand)
4. Study of distribution of major lithostratigraphic units on the map of India
5. Study of distribution of major dams on the map of India and their impact on river systems
6. Study of major ocean currents of the World
7. Study of seismic profile of a specific area and its Interpretation.

Reference Books:

1. Laboratory Manual of Geology - A.K. Sen (Modern Book Agency Pvt. Ltd. Calcutta)
2. Singh, R.P. (1995) Structural Geology: A Practical Approach, Ganga Kaveri Publication House, Varanasi. 133p.
3. Bennison, G.M. (1990): An Introduction to Geological Structures and Maps, Fifth Edition, Edward Arnold. London. 5th edition, 67p.

SEMESTER II

I. MAJOR PAPER-2 (MJ 2):

(Credits: Theory-04, Practicals-02)

Marks: 15 (5 Attd. + 10 SIE: 1Hr) + 60 (ESE: 3Hrs) = 75

Pass Marks: Th (SIE + ESE) = 30

Instruction to Question Setter for

Semester Internal Examination (SIE 10+5=15 marks):

There will be **two** group of questions. **Question No.1** will be **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 any one to answer.

The Semester Internal Examination shall have two components. (a) One Semester Internal Assessment Test (SIA) of 10 Marks, (b) Class Attendance Score (CAS) of 5 marks. Conversion of Attendance into score may be as follows: (Attendance Upto 45%, 1mark; 45<Attd.<55, 2 marks; 55<Attd.<65, 3 marks; 65<Attd.<75, 4 marks; 75<Attd, 5 marks)

End Semester Examination (ESE 60 marks):

There will be **two** group of questions. **Group A is compulsory** which will contain three questions. **Question No.1** will be **very short answer type** consisting of five questions of 1 mark each. **Question 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 answer.

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

CRYSTALLOGRAPHY & MINERALOGY

Theory: 60 Lectures

Learning Objectives:

1. To provide fundamental understanding of crystal system, symmetry and its chemistry to understand the importance of minerals in our daily life; to provide comprehensive knowledge on the structure of silicates and different groups of minerals.

Course Learning Outcomes:

After the completion of the course, students will be able to:

1. Have a good understanding about the different symmetry elements, a comprehensive understanding on the importance and application of minerals/mineral groups, knowledge on the structure and composition, economic importance of minerals and building an overall knowledge in geology, knowledge on application and usage of minerals in industries.

Unit 1:

Crystallography: Elementary ideas about crystal morphology concerning internal structures, Crystal parameters and indices, Symmetry element, Crystal symmetry and Classification of crystals into six systems (Normal Class) and 32-point groups.

Unit 2:

Crystal symmetry and projections, Elements of crystal chemistry and aspects of crystal structures, Stereographic projections of symmetry elements and forms.

Unit 3:

Rock-forming minerals: Minerals-definition and Classification, physical and chemical properties, Composition of common rock-forming minerals, Silicate and non-silicate structures; C.C.P. and H.C.P. structures.

Unit 4:

Properties of light and optical microscopy, Nicol Prism: Construction and Principle, Nature of light and principles of optical mineralogy
Introduction to the petrological microscope and identification of common rock-forming minerals.

Unit 5:

Description of physical, chemical and optical properties of following mineral groups: Olivine, Pyroxene, Amphibole, Quartz, and Feldspar.

Reference Books:

1. 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.
2. Kerr, P. F. (1959). Optical Mineralogy. McGraw-Hill.
3. Verma, P. K. (2010). Optical Mineralogy (Four Colour). Ane Books Pvt Ltd.
4. Deer, W. A., Howie, R. A., & Zussman, J. (1992). An introduction to the rock-forming minerals (Vol. 696). London: Longman.
5. Read, H.H. (1988). Elements of Mineralogy. Surjeet Publication.

GEOLOGY PRACTICAL- MJ 2 LAB:

Marks : Pr (ESE: 3Hrs) =25

Pass Marks: Pr (ESE) = 10

Instruction to Question Setter for***End Semester Examination (ESE):***

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

<i>Experiment</i>	<i>= 15 marks</i>
<i>Practical record notebook</i>	<i>= 05 marks</i>
<i>Viva-voce</i>	<i>= 05 marks</i>

PRACTICALS:**60 Lectures**

1. Observation and documentation of the symmetry of crystals
2. 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.
3. Native Metals/non-metals, Sulfides, Oxides- Copper, Sulfur, Graphite, Pyrite, Corundum, Magnetite Hydroxides, Halides, Carbonates, Sulfates, Phosphates: Psilomelane, Fluorite, Calcite, Malachite, Gypsum, Apatite.
4. Study of some essential silicate minerals under an optical microscope and their characteristic properties

FIELDWORK:

1. Geological Mapping of one week's duration in a geologically complex area and Field Work Report based on it.

COURSES OF STUDY FOR **INTRODUCTORY/ MINOR ELECTIVE** FYUGP IN
“GEOLOGY”

SEMESTER I/ II/ III

INTRODUCTORY REGULAR COURSE

1 Paper

I. INTRODUCTORY REGULAR COURSE (IRC)

(Credits: Theory-03)

- All Four Introductory & Minor Papers of Geology to be studied by the Students of **Other than Geology Honours.**
- Students of **Geology Honours** must Refer Content from the **Syllabus of Opted Introductory & Minor Elective Subject.**

Marks: 100 (ESE: 3Hrs) = 100

Pass Marks: Th (ESE) = 40

Instruction to Question Setter for***End Semester Examination (ESE 100 marks):***

*There will be two group of questions. **Group A is compulsory** which will contain three questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 & 3 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of twenty marks each, out of which any four are to answer.*

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

INTRODUCTORY GEOLOGY**Theory: 45 Lectures****Course Objectives:**

1. To provide a fundamental understanding of Geology; Earth in the solar system along with its components and various processes, concepts of energy resources and engineering geology; basic understanding of minerals and rocks; the evolution of life through geological time scale.

Course Learning Outcomes:

After the completion of the course, the students will be able to:

1. Acquire the fundamental understanding of the Geology and its various branches; Earth and its components, thorough an understanding of materials (minerals, rocks and fossils), energy resources and processes of the earth, apply the knowledge of earth science to address societal issues.

Unit 1:

Introduction to Geology and its scope, Earth and Solar system; Origin, Size, Shape, Mass, Density. Introduction of various branches of Earth Sciences, Application of Geology in various fields.

Unit 2:

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: Dam/Reservoir, Tunnel, Bridges.

Unit 3:

Energy: Renewable and Non-renewable energy, use of alternate energy sources, growing energy needs.

Unit 4:

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, Igneous texture, forms and structure

Sedimentary: Weathering and Erosion, a process of formation, texture and Structure

Metamorphic: agents and types of metamorphism, Texture and Structure.

Unit 5:

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

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.
11. Schoch, R.M. (1989). Stratigraphy, Principles and Methods. Van Nostrand Reinhold
12. Prothero, D.R. (1998). Bringing fossils to life - An introduction to Palaeobiology, McGraw Hill.

FORMAT OF QUESTION PAPER FOR SEMESTER INTERNAL EXAMINATION

Question format for 15 Marks:

	Subject/ Code	
F.M. =15	Time=1Hr.	Exam Year
General Instructions:		
i. Group A carries very short answer type compulsory questions. ii. Answer 2 out of 3 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.	[5]
3.	[5]
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 subu.....		

Question format for 100 Marks:

	Subject/ Code	
F.M. = 100	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.		[10x1=10]
i.	
ii.	
iii.	
iv.	
v.	
vi.	
vii.	
viii.	
ix.	
x.	
2.	[5]
3.	[5]
Group B		
4.	[20]
5.	[20]
6.	[20]
7.	[20]
8.	[20]
9.	[20]
Note: There may be subdivisions in each question asked in Theory Examination.		