



FYUGP GEOLOGY HONOURS / RESEARCH SYLLABUS

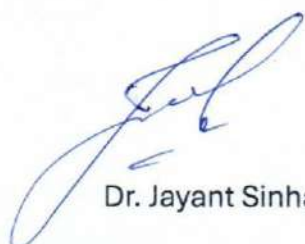
FOR B. Sc. IN GEOLOGY FOR SEMESTER I AND II,
SESSION 2022 – 2026

St. XAVIER'S COLLEGE, RANCHI

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FYUGP GEOLOGY HONOURS / RESEARCH SYLLABUS

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HIGHLIGHTS OF REGULATIONS OF FYUGP

PROGRAMME DURATION

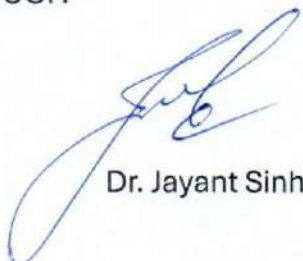
- The Full-time, Regular UG programme for a regular student shall be for a period of four years with multiple entry and multiple exit options.
- The session shall commence from **1st of July**.

ELIGIBILITY

- The selection for admission will be primarily based on availability of seats in the Major subject and marks imposed by the institution. Merit point for selection will be based on marks obtained in Major subject at Class 12 (or equivalent level) or the aggregate marks of Class 12 (or equivalent level) if Marks of the Major subject is not available. Reservation norms of The Government of Jharkhand must be followed as amended in times.

ADMISSION PROCEDURE

- The reservation policy of the Government of Jharkhand shall apply in admission and the benefit of the same shall be given to the candidates belonging to the State of Jharkhand only. The candidates of other states in the reserved category shall be treated as General category candidates. Other relaxations or reservations shall be applicable as per the prevailing guidelines of the University for FYUGP.




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ACADEMIC CALENDAR

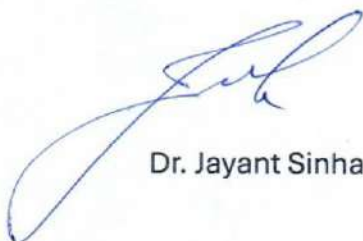
- Each year the University shall draw out a calendar of academic and associated activities, which shall be strictly adhered to. The same is non-negotiable. Further, the Department will make all reasonable endeavours to deliver the programmes of study and other educational services as mentioned in its Information Brochure and website. However, circumstances may change prompting the Department to reserve the right to change the content and delivery of courses, discontinue or combine courses and introduce or withdraw areas of specialization.

PROGRAMME OVERVIEW/ SCHEME OF THE PROGRAMME

- Undergraduate degree programmes of either 3 or 4-year duration, with multiple entries and exit points and re-entry options within this period, with appropriate certifications such as:
 - a Certificate after completing 1 year (2 semesters) of study in the chosen fields of study,
 - a Diploma after 2 years (4 semesters) of study,
 - a Bachelor after a 3-year (6 semesters) programme of study,
 - a Bachelor (with Hons. / Research) after a 4-year (8 semesters) programme of study

VALIDITY OF REGISTRATION

- Validity of a registration for FYUGP will be for maximum for Seven years from the date of registration.



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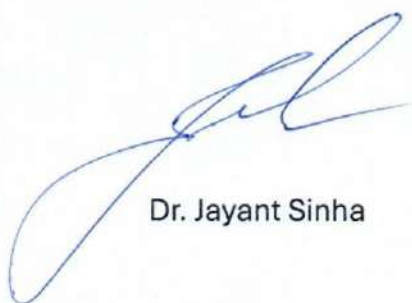
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CALCULATION OF MARKS FOR THE PURPOSE OF RESULT

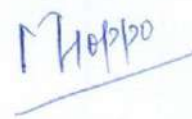

- Student's final marks and the result will be based on the marks obtained in Semester Internal Examination and End Semester Examination organized taken together.
- Passing in a subject will depend on the collective marks obtained in Semester internal and End Semester University Examination both. However, students must pass in Theory and Practical Examinations separately.

PROMOTION AND SPAN PERIOD

- i. The Requisite Marks obtained by a student in a particular subject will be the criteria for promotion to the next Semester.
- ii. No student will be detained in odd Semesters (I, III, V & VII).
- iii. To get promotion from Semester-II to Semester-III a student will be required to pass in at least 75% of Courses in an academic year (a student has to pass in minimum 9 papers out of the total 12 papers. However, it will be necessary to procure pass marks in each of the paper before completion of the course.
- iv. To get promotion from Semester-IV to Semester-V (taken together of Semester I, II, III & IV) a student has to pass in minimum 16 papers out of the total 22 papers.
- v. Eligibility to get entry in Semester VII is to secure a minimum of 7.5 CGPA up to semester VI along with other criteria imposed by the Institution.

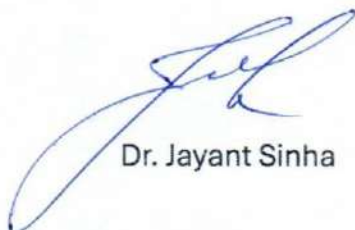


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PUBLICATION OF RESULT

- The result of the examination shall be notified by the Controller of Examinations of the University in different newspapers and also on University website.
- If a student is found indulged in any kind of malpractice/ unfair means during examination, the examination taken by the student for the semester will be cancelled. The candidate has to reappear in all the papers of the session with the students of next coming session and his one year will be detained. However, marks secured by the candidate in all previous semesters will remain unaffected.
- There shall be no Supplementary or Re-examination for any subject. Students who have failed in any subject in an even semester may appear in the subsequent even semester examination for clearing the backlog. Similarly, the students who have failed in any subject in an odd semester may appear in the subsequent odd semester examination for clearing the backlog.
- Regulation related with any concern not mentioned above shall be guided by the Regulations of the University for FYUGP.



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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)	Major* (54) + Adv. Major (24)	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 (1)	Mathematical & Computational Thinking and Analysis (2)	Value-Based Course (Global Citizenship Education) (2)	Community Engagement/ NCC/ NSS (3)	Introductory Course (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)	
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 must 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)

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Table 3: Course structure for Undergraduate Diploma Programme [May Exit after Sem.-IV]

Semester	Common Courses			Introductory Courses	Major	Minor	Internship/ Project	Vocational	Total Credits
Sem.-III	Environmental Studies (3 Credits)	Community Engagement/ NCC/ NSS (3 Credits)	Digital Education (3 Credits)	IRC-3 (3 Credits)	MJ-3 (6 Credits)		Internship/ Project (4 Credits)		(22)
Sem.-IV					MJ-4, MJ-5 (6+6=12 Credits)	MN-1 (6 Credits)		VS-1 (4 Credits)	(22)

Total = 88 Credits

(MN: Minor; VS: Vocational Studies)

Table 4: Course structure for Bachelor's Degree Programme [May Exit after Sem.-VI]

Semester	Major Courses	Minor Courses	Vocational	Total Credits
Sem.-V	MJ-6, MJ-7 (6+6 = 12 Credits)	MN-2 (6 Credits)	VS-2 (4 Credits)	(22)
Sem.-VI	MJ-8, MJ-9 (6+6= 12 Credits)	MN-3 (6 Credits)	VS-3 (4 Credits)	(22)

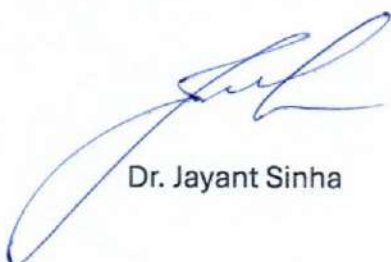
Total = 132 Credits


Table 5: Course structure for Bachelor's Degree with Hons./Research Programme

Semester	Advance Courses	Research Courses	Vocational	Total Credit
Sem.-VII	AMJ-1, AMJ-2	Research Methodology (6+6=12 Credits)	Research Proposal (6 Credits) (4 Credits)	(22)
Sem.-VIII	AMJ-3, AMJ-4 (6+6=12 Credits)	Research Int./Field Work (4 Credits)	Research Report (4 Credits) VSR (2 Credits)	(22)


Total = 176 Credits

(AMJ: Advance Major; VSR: Vocational Studies associated with Research)


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Table 6: Semester wise Course Code and Credit Points:

Semester	Common, Introductory, Major, Minor, Vocational & Internship Courses		Credits
	Code	Papers	
I	CC-1	Language and Communication Skills (Modern Indian language including TRL)	6
	CC-2	Understanding India	2
	CC-3	Health & Wellness, Yoga Education, Sports & Fitness	2
	IRC-1	Introductory Regular Course-1	3
	IVS-1A	Introductory Vocational Studies-1	3
	MJ-1	Major paper 1 (Disciplinary/Interdisciplinary Major)	6
II	CC-4	Language and Communication Skills (English)	6
	CC-5	Mathematical & Computation Thinking Analysis	2
	CC-6	Global Citizenship Education & Education for Sustainable Development	2
	IRC-2	Introductory Regular Course-2	3
	IVS-1B	Introductory Vocational Studies-2	3
	MJ-2	Major paper 2 (Disciplinary/Interdisciplinary Major)	6
III	CC-7	Environmental Studies	3
	CC-8	Digital Education (Elementary Computer Applications)	3
	CC-9	Community Engagement & Service (NSS/ NCC/ Adult Education)	3
	IRC-3	Introductory Regular Course-3	3
	IAP	Internship/Apprenticeship/ Project	4
	MJ-3	Major paper 3 (Disciplinary/Interdisciplinary Major)	6
IV	MJ-4	Major paper 4 (Disciplinary/Interdisciplinary Major)	6
	MJ-5	Major paper 5 (Disciplinary/Interdisciplinary Major)	6
	MN-1	Minor Paper 1 (Disciplinary/Interdisciplinary Minor)	6
	VS-1	Vocational Studies-1 (Minor)	4

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V	MJ-6	Major paper 6 (Disciplinary/Interdisciplinary Major)	6
	MJ-7	Major paper 7 (Disciplinary/Interdisciplinary Major)	6
	MN-2	Minor Paper 2 (Disciplinary/Interdisciplinary Minor)	6
	VS-2	Vocational Studies 2 (Minor)	4
VI	MJ-8	Major paper 8 (Disciplinary/Interdisciplinary Major)	6
	MJ-9	Major paper 9 (Disciplinary/Interdisciplinary Major)	6
	MN-3	Minor Paper 3 (Disciplinary/Interdisciplinary Minor)	6
	VS-3	Vocational Studies 3 (Minor)	4
VII	AMJ-1	Advance Major paper 1 (Disciplinary/Interdisciplinary Major)	6
	AMJ-2	Advance Major paper 2 (Disciplinary/Interdisciplinary Major)	6
	RC-1	Research Methodology	6
	RC-2	Research Proposal	4
VIII	AMJ-3	Advance Major paper 3 (Disciplinary/Interdisciplinary Major)	6
	AMJ-4	Advance Major paper 4 (Disciplinary/Interdisciplinary Major)	6
	RC-3	Research Internship/Field Work	4
	RC-4	Research Report	4
	VSR	Vocational Studies (Associated with Research)	2
Total Credit			176

Abbreviations:

CC Common Courses
 IRC Introductory Regular Courses
 IVS Introductory Vocational Studies
 IAP Internship/Apprenticeship/ Project
 VS Vocational Studies
 MJ Major Disciplinary/Interdisciplinary Courses
 MN Minor Disciplinary/Interdisciplinary Courses
 AMJ Advance Major Disciplinary/Interdisciplinary Courses
 RC Research Courses
 VSR Vocational Studies associated with Research


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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			

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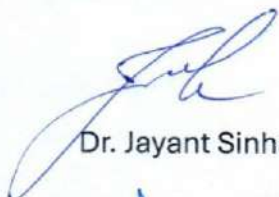
Table 7: Semester wise Course Code and Credit Points:

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			

AIMS OF BACHELOR'S DEGREE PROGRAMME IN GEOLOGY


Course Objectives:

1. The curriculum of B.Sc. (Hons) Geology is framed under the National Education Policy (N.E.P. 2022) to prepare its students for society.
2. Each program vividly elaborates its nature and promises the outcomes to be accomplished by studying the courses.
3. The Geology programs also state the attributes that it offers to inculcate at the graduation level. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice, and also skills for employability.
4. Being a fast, economically developing country with depleting natural resources, acute shortage of energy, natural disasters, and many environmental hazards.
5. Two-third of the Indian subcontinent lies in the seismic zones of moderate to severe intensity. Solution and management of many of these problems can be met by understanding the Earth more intensively and extensively, which could be achieved by pursuing a course in Geology.
6. It is an exciting course with both fundamental and applied utility.


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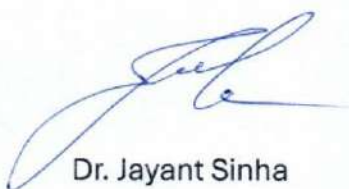

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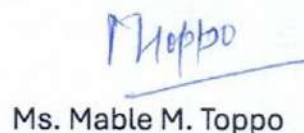
PROGRAM LEARNING OUTCOMES

Learning Outcomes:

1. To help students build up a progressive and successful career in Geology.
2. To enrich students' knowledge and train them in the pure and applied geological sciences.
3. To provide an updated education.
4. To impart more field-oriented knowledge.
5. To inculcate a sense of scientific responsibilities and social and environmental awareness.
6. To inculcate values and knowledge.
7. To make them well-being responsible citizen.
8. To encourage critical thinking with skills of employability.
9. To introduce the concepts of application and research in Geology.
10. Create a sense of preservation and conservation of natural resources.
11. To prepare students for sustainability and life-long learning.
12. To inculcate values and knowledge within students that will make them well-being responsible citizens and encourage critical thinking with the skill of employability.
13. In short, each program prepares students for sustainability and lifelong learning.



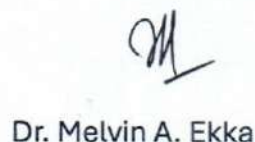
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SEMESTER I

I. **MAJOR COURSE –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%, 1 mark; 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.

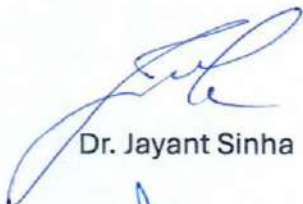
Note: There may be subdivisions in each question asked in Theory Examinations.

EARTH SYSTEM SCIENCE

Theory: 60 Lectures

Learning Objectives

1. 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.



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Learning Outcomes

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

1. 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.

Course Content:

The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.

Unit 1:

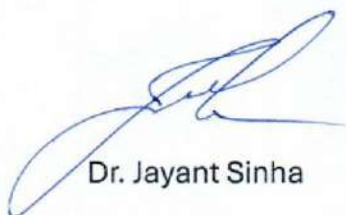
Earth as a planet: Holistic understanding of dynamic planet 'Earth' through Geology. Introduction to various branches of Earth Sciences. General characteristics and Origin of the Universe, Solar System, and its planets. The terrestrial and Jovian planets. Meteorites and Asteroids. Earth in the solar 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.




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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.

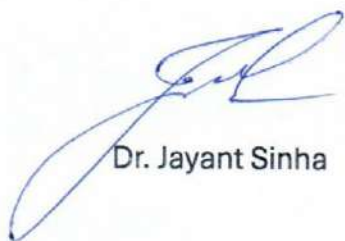
Soils: processes of formation, soil profile and soil types.

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.



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Dr. Somesh Sengupta



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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:

Experiment = 15 marks

Practical record notebook = 05 marks

Viva-voce = 05 marks

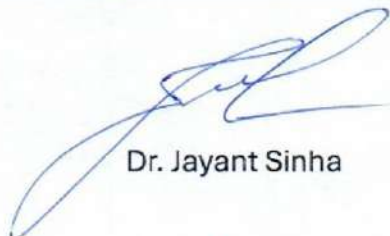
PRACTICALS:

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.



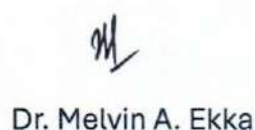
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COURSES OF STUDY FOR **INTRODUCTORY/ MINOR ELECTIVE** FYUGP IN
"GEOLOGY"

SEMESTER I

INTRODUCTORY REGULAR COURSE - 1

I. INTRODUCTORY REGULAR COURSE (IRC)

(Credits: Theory-02, Practicals-01)

- 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.


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Dr. Somesh Sengupta


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Dr. Melvin A. Ekka

Course 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.

Course Content:

Unit 1:

Holistic understanding of dynamic planet 'Earth' through Geology, 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:

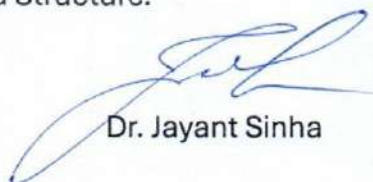
Energy: Renewable and Non-renewable energy, use of alternate energy sources, growing energy needs.

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.




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Ms. Mable M. Toppo



Dr. Somesh Sengupta



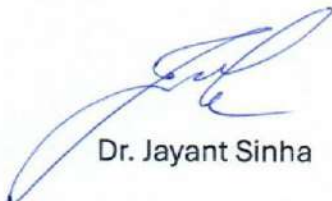
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Unit 5:

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.



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SEMESTER II

I. **MAJOR COURSE- 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.

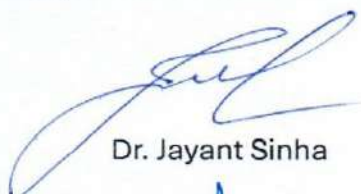
Note: There may be subdivisions in each question asked in Theory Examinations.

CRYSTALLOGRAPHY & MINERALOGY

Theory: 60 Lectures

Learning Objectives:

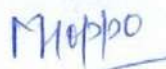
1. To provide fundamental understanding of crystal system, symmetry and its chemistry to understand the importance of minerals in our daily life; to provide comprehensive knowledge on the structure of silicates and different groups of minerals.



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Dr. Somesh Sengupta



Ms. Mable M. Toppo



Dr. Melvin A. Ekka

St. XAVIER'S COLLEGE, RANCHI
FYUGP GEOLOGY HONOURS / RESEARCH SYLLABUS

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.

Course Content:

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.

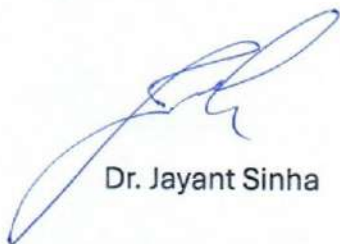
Unit 3:

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.




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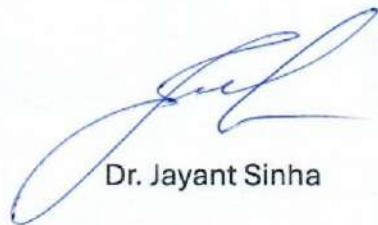
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Unit 5:


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.



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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:

Experiment = 15 marks

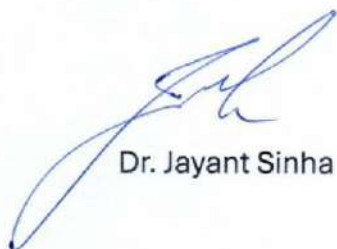
Practical record notebook = 05 marks

Viva-voce = 05 marks

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



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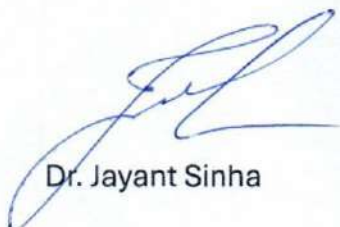
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FIELDWORK:

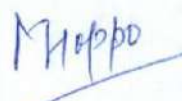
1. Geological Mapping of one week's duration in a geologically complex area and Field Work Report based on it.

Reference Books:

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



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Dr. Somesh Sengupta



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

SEMESTER II

INTRODUCTORY REGULAR COURSE - 2

II. INTRODUCTORY REGULAR COURSE (IRC)

(Credits: Theory-02, Practicals-01)

- 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.

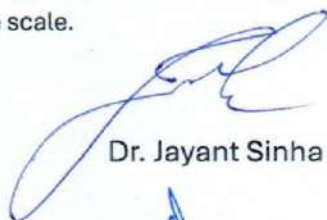
Note: There may be subdivisions in each question asked in Theory Examinations.

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.



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Course Outcomes:

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

2. 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.

Course Content:

Unit 1:

Holistic understanding of dynamic planet 'Earth' through Geology, 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:

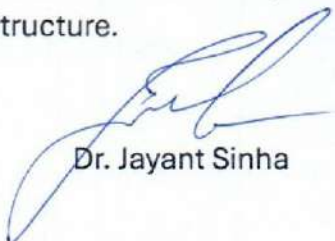
Energy: Renewable and Non-renewable energy, use of alternate energy sources, growing energy needs.

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.



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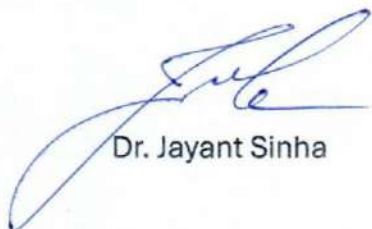
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Unit 5:

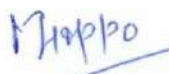
Fossils and their application: Definition, processes, modes of preservation and uses, application of fossils.

Reference Books;

13. Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.
14. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.
15. Lutgens, F., Tarbuck, E., and Tasa, D., (2009). The Atmosphere: An Introduction to Meteorology. Pearson Publisher
16. Johnson, R.B. and De Graf, J.V. (1988). Principles of Engineering Geology, John Wiley.
17. Goodman, R.E., 1993. Engineering Geology: Rock in Engineering constructions. John Wiley & Sons, N.Y.
18. Waltham, T., (2009). Foundations of Engineering Geology (3rd Edn.) Taylor & Francis.
19. Bateman, A.M. and Jensen, M.L. (1990). Economic Mineral Deposits. John Wiley.
20. Gokhale, K.V.G.K. and Rao, T.C. (1978). Ore deposits of India their distribution and processing, Tata McGraw Hill, New Delhi
21. Earth Materials- Introduction to Mineralogy and Petrology, Cornelis Klein and Anthony Philpotts, Cambridge University Press, 2013.
22. Understanding Earth (Sixth Edition), John Grotzinger and Thomas H. Jordan, 2010, W.H. Freeman and Company, New York.
23. Schoch, R.M. (1989). Stratigraphy, Principles and Methods. Van Nostrand Reinhold
24. Prothero, D.R. (1998). Bringing fossils to life - An introduction to Palaeobiology, McGraw Hill.



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