

रक्षा, स्रॉतेजिक एवं भू-राजनीतिक अध्ययन विभाग
Department of Defence, Strategic & Geopolitical Studies



हेमवती नन्दन बहुगुणा गढ़वाल विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय)
श्रीनगर गढ़वाल 246174, उत्तराखण्ड

पत्रांक.....

दिनांक... 20.03.2022

To,
The Hon*ble Vice Chancellor
H.N.B. Garhwal University
Srinagar (Garhwal)

Through- Dean Earth Science

Sub - Regarding approval of B.O.S meeting's proceeding

R/ Sir,
The Meeting of B.O.S held on 30/03/2022 in the Department of Defence, Strategic and Geo Political Studies, Birla Campus, Srinagar (Garhwal) to discuss the Items regarding -

1. To conduct Ph.D admission interview..
2. Approval of syllabus under NEP 2020.
3. The candidate Rahul Kumar The BoS has unanimously recommended that futher 03 month wef 10-03-2022 be given to him for final submission of his doctoral dissertation.
4. Approval of Annual and Six monthly progress report of Research Scholar.

Enclosed please find the proceeding and recommendations of the B.O.S meeting for your kind approval and necessary action.

Thanking in anticipation.

Forwarded
for Dean Earth Science
30/3/2022

Kumar
30.03.2022
Head/Convener

Encl:-

1. Register regarding minutes of B.O.S
2. Sealed envelope of selected candidates for Ph.D Programme.
3. Attendance of Candidates and Research Scholar's.
4. Annual and Six Monthly Progress report of the research scholars.
5. Copy of the syllabus under NEP 2020.

To.

**The Hon'ble Vice Chancellor
H.N.B. Garhwal University
Srinagar (Garhwal)**

Through- Dean Earth Science

Sub.- Regarding approval of B.O.S meeting's proceeding

R/ Sir,

The Meeting of B.O.S held on 07/08/2020 in the Department of Defence, Strategic and Geo Political Studies, Birla Campus, Srinagar (Garhwal) to discuss the Items regarding –

1. To conduct Ph.D admission interview.
2. Approval of Research Topic and Research Supervisor .
3. Pre-Submission Presentation of Ph.D of Mr. Sohan Singh and Brig. Gyanodaya.
4. Approval of Progress report of Mr. Naresh Kumar .
5. Approval of Annual and Six Monthly Progress reports of Research Scholars.
6. Approval of modification in UG syllabus.
7. Approval of Extension and Re-registration of Research Scholars.

Enclosed please find the proceeding and recommendations of the B.O.S meeting for your kind approval and necessary action.

Thanking in anticipation.

Dean Earth Science

Head/Convener

Encl:-

1. Register regarding minutes of B.O.S
2. Sealed envelope of Selected candidates for Ph.D Programme.
3. Attendance of Candidates and Research Scholar's.
4. Annual and Six Monthly Progress report of the research scholars.
5. Copy of the modified syllabus.

To,

**The Hon'ble Vice Chancellor
H.N.B. Garhwal University
Srinagar (Garhwal)**

Through- Dean Earth Science

Sub.- Regarding approval of B.O.S meeting's proceeding

R/ Sir,

The Meeting of B.O.S held on 13/05/2017 in the Department of Defence & Strategic Studies, Birla Campus, Srinagar (Garhwal) to discuss the Items regarding –

1. To consider modifications of the existing PG and Pre-Ph.D curriculum of Research Methodology and to introduce a new self-studies paper for the P.G students.
2. To consider research extension of Mr. Vikas Sharma.
3. To consider the case of Dr. Rakesh Singh and Dr. Subodh Kumar for validation of their D.Phil degrees after evaluating their relevant papers.
4. To consider the request of B.O.S convener for authorizing him for change/modify the panel of examiners for P.G and U.G courses as and when required.
5. To consider the request of the B.O.S convener and head for authorizing him to prepare a list of examiners to conduct PG and UG examinations of the Department as and when required and forward it to the University for necessary action.

Enclosed please find the proceeding and recommendations of the BOS meeting for your kind approval and necessary action.

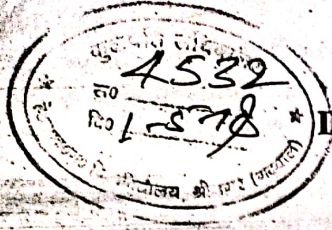
Thanking in anticipation.

Dean Earth Science

Head/Convener

Encl:-

1. Register regarding minutes of B.O.S
2. Attendance of Candidate



रक्षा एवं स्ट्रॉतेजिक अध्ययन विभाग
Department of Defence & Strategic Studies
स्कूल ऑफ अर्थसाइंस
School Of Earth Science



हेमवती नन्दन बहुगुणा गढ़वाल विश्वविद्यालय श्रीनगर (गढ़वाल), उत्तराखण्ड -246174
(केन्द्रीय विश्वविद्यालय)

Hemvati Nandan Bahuguna Garhwal University Srinagar (Garhwal), Uttarakhand -246174
(A Central University)

Ref.No:

Date

To,
The Hon'ble Vice Chancellor
H.N.B. Garhwal University
Srinagar (Garhwal)

Through- Dean Earth Science

Sub.- Regarding approval of B.O.S meeting's proceeding.

R/ Sir,

The Meeting of B.O.S held on 06/04/2018 in the Department of Defence & Strategic Studies, Birla Campus, Srinagar (Garhwal) to discuss the Items regarding -

1. To consider modifications of the existing C.B.C.S curriculum of U.G. Programme.
2. Approval of Examiners for various examinations conducted by the department.
3. To Consider the request of B.O.S. to the admission committee to give permission to non subject students also to appear in P.G. entrance examination of Defence & Strategic Studies.
4. To consider the request of B.O.S. convener for authorizing him to prepare a panel of Ten experts for selection / Promotion of the faculty.
5. To consider the request of B.O.S as on 04/10/2016 to allow B.Sc students of SRT campus to take admission in M.Sc.
6. To allow Mr. Vikas Sharma for Pre Submission of Ph D
7. To allow to submit the progress report of Research Scholars.
8. To give permission for revision of synopsis of Mr. Rahul Kumar.
9. To consider the request of B.O.S convener and head to authorizing him to prepare a list of examiners to conduct P.G. and U.G. examinations of the department as and when required and forwarded it to the university for necessary action.
10. To consider research extension of Brig. Gyanodaya Bajpai, Mr. Naresh Kumar, Col. Arundhan Sharma, Km Rachna Deodhi and Mr. Anil Kumar Meena.
11. To authorize B.O.S. Convener and head about change the name of external examiners for practical examinations if required.
12. The request letter of Dr. Devesh Singh, Assistant Professor, CCS P.G. College Dehradun to appoint research supervisor was discussed and was forwarded to the next B.O.S.
13. Discussed matter to take measures for the improvement of the standard of teaching and research.

Enclosed please find the proceeding and recommendations of the B.O.S meeting for your kind approval and necessary action.

Thanking in anticipation.

Dean Earth Science

School of Earth Science

Register regarding minutes of B.O.S
Dependancy of Central University

Head / Convener
Deptt. Of Defence & Strategic Studies,
H.N.B. Garhwal University
Garhwal (Uttarakhand)

To
Head of the Departments

Dear colleagues, kindly provide the following information totally based on the minutes of your BoS meetings. Example is also provided for your assistance in another file.

Please furnish the following information in the given formats. For information related to two points i.e. 1.1.2 and 1.2.1 please provide the BoS proceedings in PDF format (Please send the first page of the BoS proceedings along with the page in which concerned information is mentioned)

Please provide the information by 22 April, 2023.

Thank you for your cooperation

Name of Department: Geology

1.1.2

-	Information required	Date of change as per BoS minutes				
		July 2017- June 2018	July 2018- June 2019	July 2019- June 2020	July 2020-June 2021	July 2021- June 2022
1.1.2	1. Name of programme in which syllabus of any paper was changes or new paper was introduced between July 2017 to June 2022.					
Category of programme	U.G.	-	-	-	-	-
	P.G.	-	-	-	29 May, 2021 (Copy attached)	-
	M.Phil	-	-	-	-	-
	Ph.D	-	-	-	-	-
	Certificate or Diploma course	-	-	-	-	-
Please mention the exact date for each academic session (as per Bos minutes) in which program was modified						

1.2.1

Metric No.	Information required	Date of introduction of new course (paper) and its name(s) as per BoS minutes				
		July 2017- June 2018	July 2018- June 2019	July 2019- June 2020	July 2020- June 2021	July 2021-June 2022
1.2.1	1. Name of new courses(papers) in which were introduced between July 2017 to June 2022.					
Category of programme	U.G.	-	-	-	-	10 May, 2022 (Copy attached)
	P.G.	-	-	-	-	-
	M.Phil	-	-	-	-	-
	Ph.D	-	-	-	-	-
	Certificate or Diploma course	-	-	-	-	-
Please mention the exact date for each academic session (as per Bos minutes) in which program was modified						

1.3.2

Metric No.	Information required	Name of value-added course(s)** offered
1.2.1	1. Number of value-added courses for imparting transferable and life skills offered between July 2017 to June 2022.	Between July 2017 to June 2022
Category of programme	U.G.	-
	P.G.	-
	M.Phil	-
	Ph.D	-
	Certificate or Diploma course	-


****Value added courses:** *Example- courses related to personality development, soft and communication skills development, language courses, environmental awareness courses, courses related to ethics, courses related to community participation and social engagement.*

1.3.3

Metric No.	Information required	Appx. No. of students enrolled in the value-added courses offered under each program				
		July 2017- June 2018	July 2018- June 2019	July 2019- June 2020	July 2020- June 2021	July 2021- June 2022
1.3.3	1. No. of students enrolled between July 2017 to June 2022.					
Category of programme	U.G.	-	-	-	-	-
	P.G.	-	-	-	-	-
	M.Phil	-	-	-	-	-
	Ph.D	-	-	-	-	-
	Certificate or Diploma course	-	-	-	-	-

1.3.4

Metric No.	Information required	Appx. No. of students undertaking field project or research projects or internships under each program				
		July 2017- June 2018	July 2018- June 2019	July 2019- June 2020	July 2020- June 2021	July 2021-June 2022
1.3.4	1. No. of students enrolled between July 2017 to June 2022.					
Category of programme	U.G.	-	-	-	-	-
	P.G.	-	-	-	-	-
	M.Phil	-	-	-	-	-
	Ph.D	-	-	-	-	-
	Certificate or Diploma course	-	-	-	-	-


 Signature 7/4/23

Meeting of the Board of Studies in Geology is convened on 29th of May, 2021 on the virtual mode at 10:30 AM onwards. The following members participated in the meeting.

1. Prof. D.S. Bagri:	Chairman
2. Prof. R.S. Rana:	Member
3. Prof. H.C. Nainwal	Member
4. Prof. Y.P. Sundriyal	Member
5. Dr. D.P. Dobhal	Member (External Expert)
6. Dr. Pradeep Srivastava	Member (External Expert)
7. Dr. Deepak Bhatt	Member (Affiliated College)
8. Prof. S.C. Bhatt	Member
9. Prof. M.S. Negi	Member
10. Dr. M.S. Sati	Member

The Chairman, BoS in Geology welcomed all the members present in the meeting and the agenda items are taken up for discussions and approval thereafter.

Agenda item No. 1.

Confirmation of the minutes of the last meeting of BoS held on 18th of September, 2020 on google meet.

Resolution: .

Minutes of BoS held on 18th of September, 2020 are confirmed.

Agenda item No. 2.

Modification in the syllabus in M.Sc. is proposed in the 4th semester wherein the dissertation is there for the fulfilment of the award of M.Sc. degree. However, for the last couple of years there is tremendous workload on the faculty of teaching and research and moreover, the application of software for detecting plagiarism in the manuscript further complicating the scene. In view of this, it is proposed that dissertation be replaced with a new paper namely "Himalayan Geology" in the 4th semester of M.Sc. The syllabus for the proposed paper of Himalayan Geology covers all the relevant aspects of the contemporary themes in geology.

Syllabus:

**DEPARTMENT OF GEOLOGY
SCHOOL OF EARTH SCIENCES
HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY (A CENTRAL UNIVERSITY)
M.Sc. Geology Course (4 – Semesters)**

2022-2024 onwards

Candidates, who have passed the three years B.Sc. examination with Geology as one of the major subjects or earned a prescribed number of credits for a undergraduate degree through the examinations conducted by a University/Autonomous Institution or possess such qualifications recognized by the HNB Garhwal University as an equivalent to undergraduate degree will be considered eligible for admission in 04 semesters M. Sc. course in Geology.

The M.Sc. course in Geology shall be imparted to the students for two academic sessions consisting of four semesters. The odd semesters (1 and 3) will run from July to November and even semesters (2 and 4) December to April. Candidates will be examined and evaluated at the end of each semester in the different courses of theory and practical as per the credits given against each course. A semester shall normally be extended over a period of 15 weeks i.e. 90 days and each week shall have 30 hours of instructions including laboratory/fieldwork as applicable. The core courses will be compulsory for all the students admitted to M.Sc. Geology. There will be 18 core, 06 elective and 01 self-study, courses covering major branches of subject including practical and two sessions of field training of 2 to 3 weeks duration. These are mandatory for all the students. The field training and the viva-voce examinations will be conducted by at least two internal examiners during 2nd and 4th semesters, 60% marks are allotted for lab work / report / thesis evaluation and 40% for viva-voce / sessional / seminar presentation. The semester break can be utilized for the Geological Field Training.

In order to qualify for the 4 Semester Master Degree, a student must acquire 72 credits including a minimum of 18 credits in electives and one qualifying self-study course of minimum 03 credits.

The details of courses, semester schedule, credits, and maximum marks for each course are given below.

M.Sc. Geology Course (4-Semester)-2022-2024

Semester 1

Course No.	Core Courses	Credit	Marks
SOES/GEOL/C-001	General Geology and Geomorphology	3	60+40
SOES/GEOL/C-002	Structural Geology	3	60+40
SOES/GEOL/C-003	Mineralogy	3	60+40
SOES/GEOL/C-004	General and Invertebrate Palaeontology	3	60+40
SOES/GEOL/C-005	Precambrian Stratigraphy	3	60+40
SOES/GEOL/C-006	Practical- (For Course No. 001 to 005)	3	60+40
	Total	18	600

Semester-2

Course No.	Core Courses	Credit	Marks
SOES/GEOL/C-007	Crystallography	3	60+40
SOES/GEOL/C-008	Geotectonics	3	60+40
SOES/GEOL/C-009	Micropalaeontology, Vertebrate Palaeontology and Palaeobotany	3	60+40
SOES/GEOL/C-010	Phanerozoic Stratigraphy	3	60+40
SOES/GEOL/C-011	Geological field training tour	3	60+40
SOES/GEOL/C-012	Practical- (For Course No. 007 to 010)	3	60+40
	Total	18	600

Semester-3

Course No.	Core Courses/ Elective	Credit	Marks
SOES/GEOL/C-013	Igneous Petrology & Geochemistry	3	60+40
SOES/GEOL/C-014	Engineering Geology	3	60+40
SOES/GEOL/C-015	Practical- (For Course No C-013, 014)	3	60+40
SOES/GEOL/E-001	Sedimentary and Metamorphic Petrology	3	60+40
SOES/GEOL/E-002	Mineral exploration and Mining	3	60+40
SOES/GEOL/E-003	Practical- (For Course No E-001, 002)	3	60+40
SOES/GEOL/S-001	a. Petroleum Geology, b. Remote Sensing, c. Environmental Geology, d. Geoinformatics	3	100
	Total (excluding self-study course)	18	600

Semester-4

Course No.	Core Courses/ Elective	Credit	Marks
SOES/GEOL/C-016	Geohydrology	3	60+40
SOES/GEOL/C-017	Ore genesis and Indian mineral deposits	3	60+40
SOES/GEOL/C-018	Practical- (for Course C- 016 to C-017 & E-004)	3	60+40
SOES/GEOL/E-004	Elective Course: Any one of the following a. Glaciology, b. Sedimentology c. Advance Micro- palaeontology, d. Quaternary Geology, e. Palaeoseismology	3	60+40
SOES/GEOL/E-005	Geological Field Training tour	3	60+40
SOES/GEOL/E-006	Dissertation/ Himalayan Geology	3	60+40
	Total	18	600
	Grand Total (excluding selfstudy course)	72	2400 MM

SOES/GEOL/E-006: Himalayan Geology

Unit-I: Introduction and Geographical Framework of the Himalaya; Geomorphology of the Himalaya: Mountains, Glaciers, Rivers, Lakes, Thermal Springs/Geysers; Elementary idea of Glaciation in the Himalayas.

Unit-II: Geodynamic Evolution of the Himalaya; Tectonics and stratigraphy of Outer, Lesser, Higher & Tethys Himalaya; Indus Suture Zone. Palaeotectonism and Neotectonism in Himalaya; Palaeogeography and closure of the Tethys Sea.

Unit-III: Lithological subdivisions and Petrology of the Himalayan terrain; Himalayan granites and their geochronology. Elementary idea of metamorphism in the Himalayan context; Brief account of the metallogeny and mineral deposits of Himalaya.

Unit-IV: Geo-environmental aspects of Himalaya; Types of natural and manmade hazards: Causes and mitigations; A case studies of floods of Kanauldiagad 1978; Kedarnath tragedy of 2013 and Rishiganga floods of 2021. Conservation and management of land and water resources with a special reference to the Uttarakhand Himalaya.

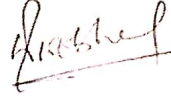
Books Recommended

1. Chakrabarti, BK, 2016. Geology of the Himalayan Belt: Deformation, Metamorphism, Stratigraphy, Elsevier Science.
2. Biyani, AK 2006. Dimensions of Himalayan Geology, SSPH Delhi
3. Gansser, A., 1959. Geology of the Himalayas.
4. Holmes Arthur, 1945. Principles of Physical Geology
5. Krishnan, M.S., 1982. Geology of India and Burma, 6th Edition. CBS Publ.
6. Rupke, and Sharma, A.K. Geology and sedimentation of the Kumaon Lesser Himalayas.
7. Saklani, P.S., 1992. Geology of the Lesser Himalayas. Today & Tomorrow Publ.
8. Sinha, A.K. Global tectonics and metallogeny of the Himalayas.
9. Treloar PJ and Searle MP, 2019. Himalayan Tectonics: A Modern Synthesis. Geological Society of London Special Publications.
10. Valdiya, K.S. and Jaishri Sanwal, 2017. Neotectonism in the Indian sub-continent, Elsevier
11. Valdiya, K.S., 1980. Geology of the Kumaon Himalayas. WIHG Publ.
12. Valdiya, K.S., 1998. Dynamic Himalaya, Universities Press, India Ltd.
13. Valdiya, K.S., 2004, Geology, environment and society, Universities Press, India Ltd.
14. Valdiya, K.S., 2016. The making of India: Geodynamic evolution, Springer
15. Wadia, D., 1973. Geology of India. McGraw Hill Book co.

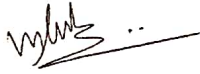
Resolution: The BoS approved the modification in syllabus in M.Sc. 4th Semester. Now, there is an option for students in place of the Elective Paper Project/Dissertation (SOES/GEOL/E-006). Those the students who score 7.5 CGPA or above in the first semester of M.Sc. will be eligible for opting for Dissertation and others will be allotted a paper named as “Himalayan Geology” in place of it.

pradeep

(Dr. Pradeep Srivastava)



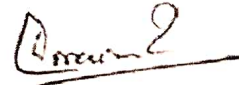
(Dr. D.P. Dobhal)



(Dr. M.S. Sati)



(Dr. Deepak Bhatt)

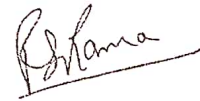


(Prof. H.C. Nainwal)



(Prof. Y.P. Sundriyal)

(Prof. S.C. Bhatt)



(Prof. R.S. Rana)



(Prof. M.S. Negi)



(Prof. D.S. Bagri)

Meeting of the Board of Studies in Geology is convened on 10th of May 2022 on the blended mode at 10:30 AM onwards. The following members participated in the meeting.

1. Prof. D.S. Bagri:	Chairman
2. Prof. Sandeep Singh	Member (External Expert)
3. Dr. Navin Juyal	Member (External Expert)
4. Prof. R.C. Ramola	Member
5. Prof. R.S. Rana	Member
6. Prof. H.C. Nainwal	Member
7. Prof. Y.P. Sundriyal	Member

The Chairman, BoS in Geology welcomed all the members present in the meeting and the agenda items are taken up for discussions and approval thereafter.

Agenda No. 1.

Confirmation of the minutes of the last meeting of BoS held on 5th of April 2022 on virtual mode.

Resolution:

Minutes of BoS held 5th of April 2022 are confirmed.

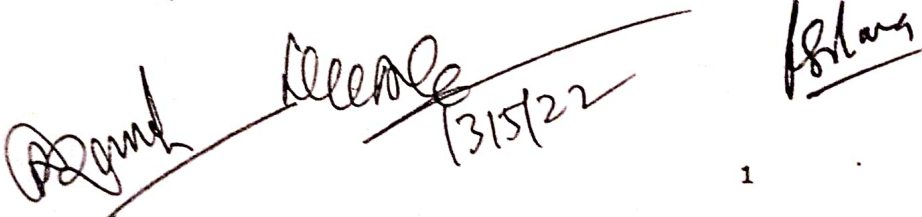
Agenda item No. 2.

To consider the grant of approval or otherwise to the Pre-Submission presentations of his Ph.D. work by Mr. Sandeep Kumar, a research scholar at WIHG.

Resolution: The BoS took a note of above and approved the Pre-Ph.D. submission presentation of Mr. Sandeep Kumar. However, the suggestions and recommendations given by the members of BoS to the research scholar in reference to his research works will be incorporated by him into his thesis.

Agenda No. 3.

To consider grant of approval or otherwise to the progress reports of Miss Prerna Gahlaut, for the time periods mentioned below:

The block contains handwritten signatures and dates. On the left, there is a signature that appears to be 'Sandeep' with a date '13/5/22' written below it. To the right, there is another signature that appears to be 'Prerna'.

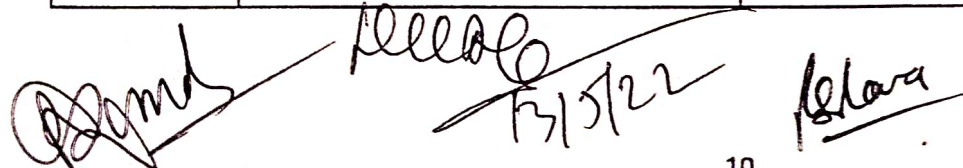
Agenda No. 5.

To consider grant of approval or otherwise to the newly drafted syllabus for B.Sc. Geology in view of the implementation of New Education Policy.

Resolution: The committee approved the newly drafted syllabus for B.Sc. Geology in view of the implementations of New Education Policy

NATIONAL EDUCATION POLICY 2022-26 THREE YEARS DEGREE/FOUR YEARS (RESEARCH) Syllabus for B.Sc. Geology

SEMESTER	Major Subject	COURSE NAME	Credit	Marks
I	Core Subject-1 (CS-1)	Physical and Structural Geology	4	70+30
	Core subject-1 Practical	Physical and Structural Geology Lab	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30
	Core subject-2 Practical	Any other subject	2	70+30
	Additional /Interdisciplinary/multidisciplinary	Elementary knowledge of Earth Part I, with practical	2+2	70+30
	Skill course-1	Geomorphology	2	70+30
	Extracurricular courses/CC	I-Understanding and connecting with the Environment	2	70+30
	Total		20	700
II	Core Subject-1 (CS-2)	Crystallography and Mineralogy	4	70+30
	Core subject-1 Practical	Crystallography and Mineralogy	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30
	Core Subject-2 Practical	Any other subject	2	70+30
	Additional /Interdisciplinary/multidisciplinary	Elementary knowledge of Earth Part II, with practical	2+2	70+30
	Skill course-2	Geological Field training	2	70+30
	Life skills and personality development/cc	Life skills and personality development/cc	2	70+30

Handwritten signatures and dates: A large signature on the left, a signature with the date '17/5/22' in the center, and a signature on the right.

	Total		20	700
III	Core Subject-1 (CS-1)	Petrology	4	70+30
	Core subject-1 Practical	Petrology	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30
	Core Subject-2 Practical	Any other subject	2	70+30
	Additional /Interdisciplinary/multidisciplinary	Elementary knowledge of Earth Part III, with practical	2+2	70+30
	Skill course-3	Photogeology and Remote Sensing	2	70+30
	IKS -I	Indian Knowledge System-I	2	70+30
	Total		20	700
IV	Core Subject-1 (CS-1)	Palaeontology and Stratigraphy	4	70+30
	Core subject-1 Practical	Palaeontology and Stratigraphy	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30
	Core Subject-2 Practical	Any other subject	2	70+30
	Additional /Interdisciplinary/multidisciplinary	Elementary knowledge of Earth Part III, with practical	2+2	70+30
	Skill course-4	Geological Field training	2	70+30
	ISK-2	Indian Knowledge System-I	2	70+30
	Total		20	700
V	Core Subject-1 (CS-1)	Economic Geology	4	70+30
	Core subject-1 Practical	Economic Geology	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30
	Core Subject-2 Practical	Any other subject	2	70+30
	Vocational Course/field visit/Entrepreneurship skills	Geochemistry	4	70+30
	Extracurricular courses/Compulsory/course	Culture, traditions and moral values	2	70+30
	Languages-I	Indian, Modern, Regional language-1	2	70+30
	Total		20	700
VI	Core Subject-1 (CS-1)	Engineering Geology	4	70+30
	Core subject-1 Practical	Engineering Geology	2	70+30
	Core Subject-2 (CS-2)	Any other subject	4	70+30





	Core Subject-2 Practical	Any other subject	2	70+30
	Vocational Course/field visit/Entrepreneurship skills	Geological field training	4	70+30
	Communication Skills Based on: either CS-1 or CS-2	Communication Skills Course (Based on developing soft skills)	2	70+30
	Languages-II	Indian, Modern, Regional language-II	2	70+30
	Total		20	700
VII with Research	Core Subject-1 (CS-1)	Geohydrology	3	70+30
	Core Subject-2 (CS-1)	Structures and Tectonics	3	70+30
	Practical Core-1 and 2	Geohydrology/ Structures & Tectonics	2	70+30
	Research Methodology	Research Methodology of Geology	6	70+30
	Elective paper	Vertebrate & Micropalaeontology with practical	3+1	70+30
	Research writing Ethics	Research writing and Research Ethics	2	70+30
	Total		20	600
VIII	Core Subject-1 (CS-1)	Mineral Exploration and Mining	3	70+30
	Core Subject-2 (CS-1)	Igneous and Metamorphic Petrology	3	70+30
	Practical Core-1 and 2	CS-1 and CS-2	2	70+30
	Research presentation Skill	Research presentation Skills (Oral and Poster)	2	70+30
	Elective paper	Natural Hazards	3+1	70+30
	Dissertation	Project oriented and field based	6	70+30
	Total		20	600
	Grand Total			5400

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B.Sc. Program with Geology

Core papers Geology (Credit: 06 each)

- SOES/GEOL/UG/C C-001: Physical & Structural Geology(04 credits)+Labs(2 credits)
SOES/GEOL/UG/C C-002: Crystallography & Mineralogy(04 credits)+Labs(2 credits)
SOES/GEOL/UG/C C-003: Petrology (04 credits) + Labs (2 credits)
SOES/GEOL/UG/C C-004: Palaeontology & Stratigraphy (04 credits)+Labs (2credits)
SOES/GEOL/UG/C C-005: Economic Geology (04 credits)+Labs (2credits)
SOES/GEOL/UG/C-006: Engineering Geology (04 credits)+Labs (2 credits)
SOES/GEOL/UG/C C-007: Geohydrology (04 credits)+Labs (2 credits)
SOES/GEOL/UG/C C-008: Structures & Tectonics (04 credits)+Labs (2credits)
SOES/GEOL/UG/C C-009: Mineral Exploration and Mining (04 credits)+Labs (2 credits)
SOES/GEOL/UG/C C-010: Igneous & Metamorphic Petrology (04 credits)+Labs (2 credits)

Discipline-Specific Elective papers (Credit: 06 each) (DSE 1, DSE 2):

- SOES/GEOL/UG/DSE-001: Vertebrate & Micropalaeontology with practical (03 credits) + Labs (1 credits)
SOES/GEOL/UG/DSE-002: Natural Hazards (03 credits) + Labs (1 credit)

Skill Enhancement Course (Credit: 02 each) (SEC1-4)

- SOES/GEOL/UG/SEC-001: Geomorphology
SOES/GEOL/UG/SEC-002: Geological Field training
SOES/GEOL/UG/SEC-003: Photogeology and Remote Sensing
SOES/GEOL/UG/SEC-004: Geological Field training

Additional /Interdisciplinary/multidisciplinary (2 Theory+2 Lab. credits) (AD)

- SOES/GEOL/UG/AD-001: Elementary knowledge of Earth Sciences Part I, 2 Th+2 Lab. credits
SOES/GEOL/UG/AD-002: Elementary knowledge of Earth Sciences Part II, 2 Th+2 Lab. credits
SOES/GEOL/UG/AD-003: Elementary knowledge of Earth Sciences Part III, 2 Th+2 Lab. credits
SOES/GEOL/UG/AD-004: Elementary knowledge of Earth Sciences Part IV, 2 Th+2 Lab. credits

Vocational Course/field visit/Entrepreneurship skills (4 Credit)

- SOES/GEOL/UG/VC-001 Geochemistry
SOES/GEOL/UG/VC-002 Geological field training



SOES/GEOL/UG/CORE COURSE-001
PHYSICAL AND STRUCTURAL GEOLOGY
(04 CREDITS) (70+30)

Unit-I: Introduction to Geology and its scope, Earth and Solar System: origin, shape, size, mass, density and its atmosphere.

Unit-II: A brief account of various theories regarding the origin and age of the earth; brief idea of interior of the earth and its composition.

Unit-III: Weathering and Erosion: factors, types and their effects.

Unit-IV: Earthquakes: nature of seismic waves and their intensity; causes of earthquakes; Volcanoes: types, products, causes and distribution.

Unit-V: Introduction to Structural Geology; contours, topographic and geological maps
Elementary idea of dip and strike; true and apparent dip, outcrops and effects of different structures on outcrop.

Unit-VI: Folds: nomenclature and their types.

Unit-VII: Faults: terminology and classifications with emphasis on Normal and Reverse faults.

Unit-VIII: Definition, types and importance of joints and unconformities.

PRACTICALS/LAB
(02 CREDITS) (70+30)

Physical Geology: (20)

Study of topographic maps, Identification of geomorphic features/ models.

Structural Geology: (20)

Learning use of Clinometers/Brunton compass; Exercises on structural problems; Preparation of cross-section profiles.

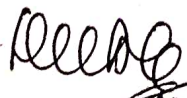
Practical records: (15)

Viva Voce: (15)

Books Recommended:

1. Arthur Holmes, 1992. Principles of Physical Geology. Chapman and Hall, London.
2. Miller, 1949. An Introduction to Physical Geology. East West Press Ltd.
3. Spencer, E.V., 1962. Basic concepts of Physical Geology. Oxford & IBH.
4. Mahapatra, G.B., 1994. A text book of Physical geology. CBS Publishers.
5. Billings, M.P., 1972. Structural Geology. Prentice Hall.
6. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley
7. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.
8. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.
9. Structural Geology (Haakon Fossen, 2010).
10. Structural Geology (Twiss and Moores, 2007)
11. Structural Geology of Rocks and Regions (Davis and Reynolds, 1996).
12. Structural Geology (Ghosh, 1993).




3/5/22



ADDITIONAL/INTERDISCIPLINARY SUBJECT/MULTIDISCIPLINARY

SOES/GEOL/UG/AD-001

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART I (PHYSICAL AND STRUCTURAL GEOLOGY: THEORY)

(02 CREDITS) (70+30)

Unit-I: Introduction to Geology and its scope, Earth and solar system: origin, shape, size, mass, density and its atmosphere.

Unit-II: A brief account of various theories regarding the origin and age of the earth; brief idea of interior of earth and its composition.

Unit-III: Weathering and Erosion: factors, types and their effects.

Unit-IV: Earthquakes: nature of seismic waves and their intensity; causes of earthquakes; Volcanoes: types, products, causes and distribution.

Unit-V: Introduction to Structural Geology; contours, topographic and geological maps. Elementary idea of dip and strike; true and apparent dip, outcrops and effects of different structures on outcrop.

Unit-VI: Folds: nomenclature and their types.

Unit-VII: Faults: terminology and classifications with emphasis on Normal and Reverse faults.

Unit-VIII: Definition, types and importance of joints and unconformities.

PRACTICALS/LAB

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART I

(02 CREDITS) (70+30)

Physical Geology: (25)

Study of topographic maps; Identification of geomorphic features/ models.

Structural Geology: (25)

Learning use of Clinometers/Brunton compass; Exercises on structural problems; Preparation of cross-section profiles.

Practical records: (15)

Viva Voce: (15)

SKILL/MULTIDISCIPLINARY

SOES/GEOL/UG/SEC-001

GEOMORPHOLOGY

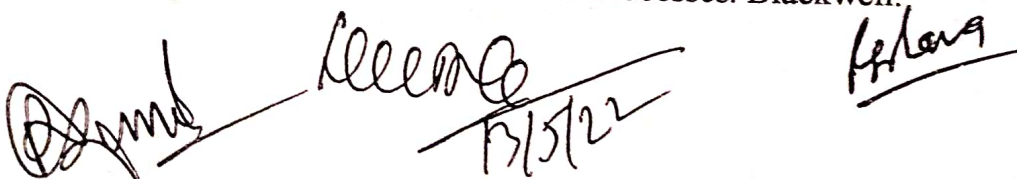
(02 CREDITS) (70+30)

Unit-I: Basic Principles of Geomorphology, Geomorphological Cycles, Weathering and Erosion; Geomorphic mapping: tools and techniques.

Unit-II: Epigenic and Exogenic processes: degradation and aggradation. Hypogenic and Endogenic processes; Diastrophism and Volcanism, Extraterrestrial Processes; Geological Work of Wind, Glacier, River, Underground Water and Ocean.

Books Recommended:

1. Allen, P., 1997. Earth Surface Processes. Blackwell.

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2. Bloom, A.L., 1998. Geomorphology: A systematic analysis of Landforms (3rd Edition). Pearson Edu. Inc.
3. Keary, P. and Vine, F.J., 1997. Global Tectonics. Blackwell and crustal evolution. Butterworth-Heinemann.
4. Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology. Orient Longman Ltd.
5. Moores, E and Twiss. R.J., 1995. Tectonics. Freeman.
6. Patwardhan, A. M., 1999. The Dynamic Earth System. Prentice Hall.
7. Summerfield, M.A., 2000. Geomorphology and Global tectonic. Springer Verlag.
8. Valdia, K.S., 1988. Dynamic Himalaya. Universities Press, Hyderabad.
9. WD Thornbury, 2002. Principles of Geomorphology. CBS Publ. New Delhi.

Semester II

SOES/GEOL/UG/CORE COURSE-002 CRYSTALLOGRAPHY AND MINERALOGY (04 CREDITS) (70+30)

Unit-I: Crystal: Definition and external morphology.

Unit-II: Interfacial angles and their measurements, Parameters in crystals, Weiss and Miller system of notations. .

Unit-III: Symmetry elements and forms of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Unit-IV: Introduction to Mineralogy, Definition and characters of mineral.

Unit-V: Physical properties and Chemical composition of minerals, diagnostic properties of the following minerals: Quartz, Orthoclase, Microcline, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine and Calcite.

Unit-VI: Ordinary and polarized lights; Polarizing microscope and its parts with functioning. Important optical properties observed under polarized lights and crossed nicols.

Unit-VII: Optical properties of following rock forming minerals: Quartz, Orthoclase, Microcline, Olivine, Garnet, Augite, Hypersthene, Hornblende, Biotite, Calcite and Zircon.

PRACTICALS/LAB

(02 CREDITS) (70+30)

Crystallography: (25)

Study of symmetry elements of a normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Mineralogy: (25)

Study of physical properties of minerals mentioned in theory course. Use of polarizing microscope; Study of optical properties of common rock-forming minerals mentioned in theory course.

Practical records: (10)

Viva Voce: (10)

Books Recommended:

1. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy.
2. Flint, Y., 1975. Essential of crystallography, Mir Publishers.

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3. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
4. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
5. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
6. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
7. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
8. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.
9. Crystallography and Crystal Chemistry by F.D. Bloss (Crystallography)
10. Introduction to Mineralogy by William D Nesse (Crystallography, Optical Mineralogy & Mineralogy)
11. Optical Crystallography by E. E. Wahlstrom (Optical Mineralogy)
12. Minerals: Their Constitution and Origin by H-R Wenk & A. Bulakh (Mineralogy)
13. An Introduction to Mineral Sciences by A. Putnis (Mineralogy mainly, but excellent concepts in Optical mineralogy & crystallography)
14. Earth Materials: Introduction to Mineralogy and Petrology by C. Klein & A. Philpotts (Crystallography & Mineralogy)

ADDITIONAL/INTERDISCIPLINARY SUBJECT/MULTIDISCIPLINARY

SOES/GEOL/UG/AD-002

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART II (CRYSTALLOGRAPHY AND MINERALOGY: THEORY)

(02 CREDITS) (70+30)

Unit-I: Crystal: Definition and external morphology.

Unit-II: Interfacial angles and their measurements, Parameters in crystals, Weiss and Miller system of notations.

Unit-III: Symmetry elements and forms of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Unit-IV: Introduction to Mineralogy, Definition and characters of mineral.

Unit-V: Physical properties and Chemical composition of minerals, diagnostic properties of the following minerals: Quartz, Orthoclase, Microcline, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine and Calcite.

Unit-VI: Ordinary and polarized lights; Polarizing microscope and its parts with functioning. Important optical properties observed under polarized lights and crossed nicols.

Unit-VII: Optical properties of following rock forming minerals: Quartz, Orthoclase, Microcline, Olivine, Garnet, Augite, Hypersthene, Hornblende, Biotite, Calcite and Zircon.

PRACTICALS/LAB

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART II

(02 CREDITS) (70+30)

Crystallography: (25)

Study of symmetry elements of a normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Mineralogy: (25)

Study of physical properties of minerals mentioned in theory course. Use of polarizing microscope;

Study of optical properties of common rock-forming minerals mentioned in theory course.

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Practical records: (10)

Viva Voce: (10)

Books Recommended:

15. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy.
16. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
17. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
18. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
19. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
20. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
21. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
22. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.

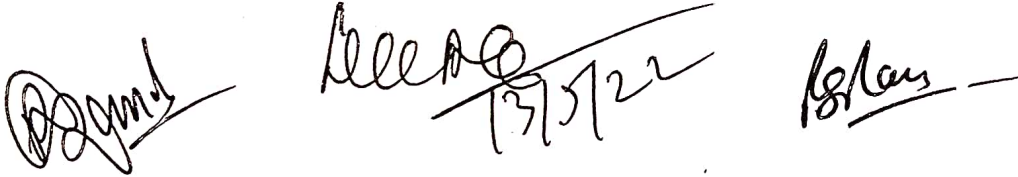
SKILL/MULTIDISCIPLINARY

SOES/GEOL/UG/SEC-002

GEOLOGICAL FIELD TRAINING

(02 CREDITS) (70+30)

Students will be required to carry out Geological field training in an important geological terrain to study the elementary aspects of field geology for one week and to submit a report thereon.

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SOES/GEOL/UG/ CORE COURSE -003

PETROLOGY

(04 CREDITS) (70+30)

Igneous Petrology

Unit-I: Magma: definition, composition, types and origin; Forms and textures of Igneous Rocks.

Unit-II: Reaction principle; Differentiation and Assimilation.

Crystallization of unicomponent and bicomponent magma, mixed crystals.

Unit-III: Mineralogical classification of Igneous Rocks.

Unit-IV: Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro.

Sedimentary Petrology

Unit-V: Fundamentals of Sedimentary processes and their products; Sedimentary Rocks; Formation, Classification, textures and structures.

Unit-VI: Petrographic details of Sedimentary Rocks given below:

Conglomerate, Breccia, Sandstone, Greywacke, Shale, Limestone and Dolomite.

Metamorphic Petrology

Unit- VII: Process and products of metamorphism; Metamorphism: Factors and types, metamorphic zones and metamorphic facies ; Textures and structures.

Unit-VIII: Petrographic details of following Metamorphic Rocks:- Slate, Phyllite, Schists, Gneisses, Quartzite, Marble.

PRACTICALS/LAB

(02 CREDITS) (70+30)

Igneous Petrology: (20)

Identification of igneous rocks both in hand specimen and thin sections listed in theory paper.

Sedimentary and Metamorphic Petrology: (30)

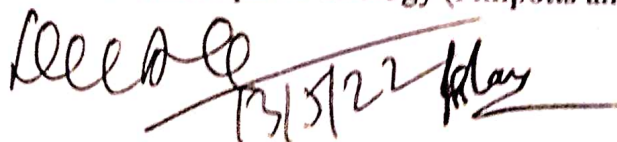

Identification of sedimentary and metamorphic both in hand specimen and thin sections-listed in theory paper

Practical records: (10)

Viva Voce: (10)

Books Recommended:

1. Turner, F.J. & Verhoogen, J., 1960, Igneous & Metamorphic petrology. McGraw Hill Co.
2. Tyrell, G. W., 1989. Principles of Petrology. Methuren and Co (Students ed.).
3. Ehlers, WG, and Blatt, H., 1987. Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers
4. Moorhouse, WW., 1969. The study of rocks in thin sections. Harper and sons.
5. Friedman & Sanders, 1978. Principles of Sedimentology. John Wiley and sons.
6. Pettijohn, F.J., 1975. Sedimentary rocks, Harper & Bros. 3rd Ed.
7. Prasad, C., 1980. A text book of sedimentology.
8. Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.
9. Mason, R., 1978. Petrology of Metamorphic Rocks. CBS Publ.
10. Winkler, H.G.C., 1967. Petrogenesis of Metamorphic Rocks. Narosa Publ.
11. Introduction to Igneous and Metamorphic Petrology (Philpotts and Ague)



12. Basalts and their phase diagrams (S. A. Morse)
13. Evolution of the Igneous Rocks (Cox, Bell and Pankhurst)
14. Igneous Petrogenesis - A global Tectonic approach - M. Wilson
15. Metamorphic phase equilibria and pressure-temperature-time paths by Spear, F. S.; 1995; Monograph Mineralogical Society of America, pp. 799.
16. An Introduction to Metamorphic Petrology by Bruce Yardley & Clare Warren; 2021; 2nd Edition, Cambridge University Press.
17. Petrogenesis of Metamorphic Rocks by Kurt Bucher & Martin Frey; 2002; 7th Edition; Springer-Verlag Berlin Heidelberg.
18. Principles of Metamorphic Petrology by R.H. Vernon & G.L. Clarke; 2008; Cambridge University Press.

ADDITIONAL/INTERDISCIPLINARY SUBJECT/MULTIDISCIPLINARY

SOES/GEOL/UG/AD-003

**ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART III
(PETROLOGY: THEORY)**

(02 CREDITS) (70+30)

Igneous Petrology

Unit-I: Magma: definition, composition, types and origin; Forms and textures of Igneous Rocks.

Unit-II: Reaction principle; Differentiation and Assimilation, Crystallization of unicomponent and bicomponent magma; mixed crystals.

Unit-III: Mineralogical classification of Igneous Rocks.

Unit-IV: Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro.

Sedimentary Petrology

Unit-V: Fundamentals of Sedimentary processes and their products; Sedimentary Rocks; Formation, Classification, textures and structures.

Unit-VI: Petrographic details of Sedimentary Rocks given below:

Conglomerate, Breccia, Sandstone, Greywacke, Shale, Limestone and Dolomite .

Metamorphic Petrology

Unit- VII: Process and products of metamorphism; Metamorphism: Factors and types, metamorphic zones and metamorphic facies ; Textures and structures.

Unit-VIII: Petrographic details of following Metamorphic Rocks:- Slate, Phyllite, Schists, Gneisses, Quartzite, Marble.

PRACTICALS/LAB

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART III

(02 CREDITS) (70+30)

Igneous Petrology: (20)

Identification of igneous rocks (listed in theory paper) both in hand specimen and thin sections.

Sedimentary and Metamorphic Petrology: (30)

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Identification of sedimentary and metamorphic rocks (listed in theory paper) both in hand specimen and thin sections.

Practical records: (10)

Viva Voce: (10)

SKILL/MULTIDISCIPLINARY

SOES/GEOL/UG/SEC-003

PHOTO GEOLOGY AND REMOTE SENSING

(02 CREDITS) (70+30)

Unit- I: Elementary idea of photogeology: electro-magnetic spectrum, types & of aerial photographs; factors affecting aerial photography; types of camera, film and filters; factors affecting scale.

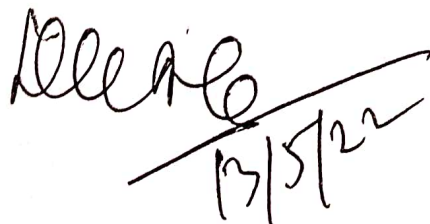
Unit-II: Fundamentals of remote sensing; remote sensing systems and sensors; signatures of rocks, minerals and soils; Application of remote sensing in geosciences and geomorphological studies.

Unit-III: Types of Indian and Foreign Remote Sensing Satellites, Digital image processing and their classification.

Unit-IV: Introduction to Geographic Information System (GIS); components of GIS; product generation, tools for map analysis; integration of GIS with remote sensing.

Books Recommended:

1. Bhatta, B., 2008. Remote Sensing and GIS. Oxford, New Delhi.
2. Gupta, R.P., 1990. Remote Sensing Geology. Springer Verlag.
3. Lilleasand, T.M. and Kiffer, R.W., 1987. Remote Sensing and Image Interpretation. John Wiley.
4. Pandey, S.N., 1987. Principles and Application of Photogeology. Wiley Eastern, New Delhi.
5. Sabbins, F.F., 1985. Remote Sensing – Principles and Applications. Freeman.
6. Sigal, B.S. and Gillespie, A.R., 1980. Remote Sensing in Geology. John Wiley.
7. Rampal K.K. 1999. Hand book of aerial photography and interpretation. Concept publication.



**SOES/GEOL/UG/CORE COURSE-004:
PALAEOLOGY AND STRATIGRAPHY
(04 CREDITS) (70+30)**

Unit I: Palaeontology, definition, subdivision and scope, its relationship with other subdisciplines of geology.

Unit II: Origin of life and a brief idea of organic evolution; Fossils: definition, conditions for fossilization, mode of preservation and significance of fossils; binomial nomenclature in taxonomy.

Unit III: Morphology and geological distribution of Brachiopods, Pelecypods, Cephalopods, Gastropods, Trilobite, Echinoidea.

Unit IV: Evolution of Horse and its intercontinental migration, Human evolution; morphology, distribution and significance of Gondwana flora in India.

Unit V: Stratigraphy: definition, Principles, subdivision, scope and its relationship with other subdisciplines of geology.

Unit VI: Geological Time Scale; Stratigraphic classifications; Physical and structural subdivisions of India and their characteristics.

Unit VII: Precambrian and its subdivisions: Dharwar, Delhi, Cuddapah and Vindhyan supergroups; Brief idea of Palaeozoic successions of Salt range, Spiti and Kashmir; Triassic of Spiti, Kutch and Rajasthan; Cretaceous of Tiruchirapalli.

Unit VIII: Study of Gondwana supergroup and Deccan Traps; Palaeogene-Neogene sequences of Northwest Himalaya, Assam and Rajasthan.

**PRACTICALS/LAB
(02 CREDITS) (70+30)**

Paleontology: (25)

Morphological characters, systematic position and age of fossil genera pertaining to Brachiopods, Pelecypods, Cephalopods, Trilobite and Echinoidea.

Stratigraphy: (25)

Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

Practical records: (10)

Viva Voce: (10)

Books Recommended:

1. Wadia, D., 1973. Geology of India. Mc Graw Hill Book co.
2. Krishnan, M.S., 1982. Geology of India and Burma, 6th Edition. CBS Publ.
3. Ravindra Kumar, 1985. Fundamentals of Historical Geology & Stratigraphy of India. Wiley Eastern.
4. Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
5. Swinerton, H.H., 1961. Outlines of Paleontology. Edward Arnold Publishers
6. Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution. Vishal Publ.
7. Lehmann, U., 1983. Fossil Invertebrate. Cambridge Univ. Press.

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8. Rastogi, 1988. Organic evolution. Kcdrnath and Ramnath Publ.
9. Principles of Paleontology, 3rd ed., Michael Foote and Arnold I. Miller, W. H. Freeman
10. Principles of Paleontology, 2nd ed., David M. Raup and Steven M. Stanley, CBS Publishers & Distributors
11. Invertebrate Palaeontology And Evolution, E.N.K. Clarkson, Wiley India Pvt Ltd
12. Paleobiology II, edited by Derek E.G. Briggs & Peter R. Crowther, Blackwell Science
13. Bringing fossils to life, by Donald R. Prothero, 3rd edition, Columbia University Press New York
14. Vertebrate Palaeontology, 4th Edition, Michael J. Benton, Wiley-Blackwell
15. Introduction to Marine Micropaleontology by B.U. Haq and A. Boersma
16. Microfossils by Howard A. Armstrong and Martin D. Brasier
17. Introduction to Microfossils by Daniel J. Jones
18. Principles of Sedimentology and Stratigraphy By Sam Boggs Jr.; Pearson; Latest edition
19. Cycles and events in stratigraphy", by Einsele G., Ricken W., and Seilacher A., Springer
20. Sedimentology and Stratigraphy 2009, by Gary Nichols. – 2nd ed, Wiley-Blackwell
21. Geological Time Scale 2012. ED. Gradstein, F, Ogg, JG, Schmitz, MD, Ogg, GM.
22. of India (Vol. 1 & 2) Editors/Authors: Ramakrishnan M & Vaidyanadhan R, Geol. Soc. Ind.
23. "Principles of sequence stratigraphy", by Catuneanu, Octavian, Elsevier

ADDITIONAL/INTERDISCIPLINARY SUBJECT/MULTIDISCIPLINARY

SOES/GEOL/UG/AD-004

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART IV

(PALAEOLOGY AND STRATIGRAPHY: THEORY)

(02 CREDITS) (70+30)

Unit I: Palaeontology, definition, subdivision and scope, its relationship with other subdisciplines of geology.

Unit II: Origin of life and a brief idea of organic evolution; Fossils: definition, conditions for fossilization, mode of preservation and significance of fossils; binomial nomenclature in taxonomy.

Unit III: Morphology and geological distribution of Brachiopods, Pelecypods, Cephalopods, Gastropods, Trilobite, Echinoidea.

Unit IV: Evolution of Horse and its intercontinental migration, Human evolution; morphology, distribution and significance of Gondwana flora in India.

Unit V: Stratigraphy: definition, Principles, subdivision, scope and its relationship with other subdisciplines of geology.

Unit VI: Geological Time Scale; Stratigraphic classifications; Physical and structural subdivisions of India and their characteristics.

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Unit VII: Precambrian and its subdivisions: Dharwar, Delhi, Cuddapha and Vindhyan supergroups; Brief idea of Palaeozoic successions of Salt range, Spiti and Kashmir; Triassic of Spiti, Kutch and Rajasthan; Cretaceous of Tiruchirapalli.
Unit VIII: Study of Gondwana supergroup and Deccan Traps; Palaeogene-Neogene sequences of Northwest Himalaya, Assam and Rajasthan.

PRACTICALS/LAB

ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART IV
(02 CREDITS) (70+30)

Paleontology: (25)

Morphological characters, systematic position and age of fossil genera pertaining to Brachiopods, Pelecypods, Cephalopods, Trilobite and Echinoidea.

Stratigraphy: (25)

Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

Practical records: (10)

Viva Voce: (10)

SKILL/MULTIDISCIPLINARY

SOES/GEOL/UG/SEC-004

GEOLOGICAL FIELD TRAINING

(02 CREDITS) (70+30)

Students will be required to carry out Geological field training in an important geological terrain to study the different aspects of field geology for a week and submit a report thereon.

Semester –V

SOES/GEOL/UG/CORE COURSE-005

ECONOMIC GEOLOGY

(04 CREDITS) (70+30)

Unit-I: Ore: Definition, Classification and Scope. Ore and gangue minerals, Tenor of ores; Metallic and non-metallic minerals; Strategic, Critical and essential minerals.

Unit-II: Ore processes: Magmatic, Contact Metasomatic, Hydrothermal, Sedimentation, Residual and Mechanical Concentration, Oxidation and Secondary Sulphide Enrichment, Metasomatism.

Unit-III: Study of important metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesite, mica, asbestos).

Unit-IV: Origin, mode of occurrences and distribution of coal and petroleum in India.

PRACTICALS/LAB

(02 CREDITS) (70+30)

Economic Geology: (50)

Study of ore and economic minerals in hand specimen;

Refers

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...maps showing the distribution of important metallic and non-metallic deposits and important coal and oil fields of India.

Practical records: (10)

Viva Voce: (10)

Books Recommended:

1. Brown, C. and Dey, A.K. 1955. Indian Mineral Wealth. Oxford Univ.
2. Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
3. Jense, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
4. Krishnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
5. Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
6. Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributors.
7. Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.
8. Karanth, K. R., 1989. Hydrogeology. Tata McGraw Hill Publ.
9. Raghunath, H. M., 1990. Groundwater. Wiley Eastern Ltd.
10. Subramaniam, V., 2000. Water-Kingston Publ. London.

VOCATIONAL COURSE/FIELD VISIT/ENTREPRENEURSHIP SKILLS

SOES/GEOL/UG/VC-001

GEOCHEMISTRY

(04 CREDITS) (70+30)

Unit-I: Introduction to geochemistry: basics of crystal chemistry, chemical bonds, coordination number; Colloids in geological systems and geological evidences of earlier colloids; Periodic Table.

Unit-II: Cosmic abundances of elements; Composition of planets and meteorites; Geochemical evolution of the earth and geochemical cycles.

Unit-III: Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, sedimentary and metamorphic rocks.

Unit-IV: Elements of geochemical thermodynamics; Isomorphism and polymorphism; Isotope geochemistry.

Books Recommended:

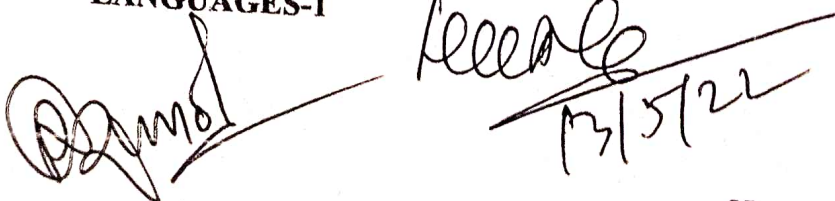
1. Hoefs, J., 1980. Stable Isotope Geochemistry. Springer-Verlag.
2. Klein, C. and Hurlbut, C.S., 1993. Manual of Mineralogy. John Wiley and Sons, New York.
3. Krauskopf, K.B., 1967. Introduction to Geochemistry. McGraw Hill.
4. Mason, B. and Moore, C.B., 1991. Introduction to Geochemistry. Wiley Eastern.
5. Rollinson, H.R., 1993. Using geochemical data: Evaluation, Presentation, and Interpretation. Longman. 1. 2. 3. 4. 5.

EXTRACURRICULAR COURSE/ COMPULSORY COURSE

CULTURE, TRADITIONS AND MORAL VALUES

(02 CREDITS) (70+30)

LANGUAGES-1

The bottom of the page contains several handwritten signatures and dates. On the left, there is a signature that appears to be 'D. S. M.' followed by a horizontal line. In the center, there is a signature that looks like 'K. S. S.' with a horizontal line underneath it, and the date '13/5/22' written below the signature. On the right, there is another signature that looks like 'P. S. S.' with a horizontal line underneath it.

INDIAN, MODERN, REGIONAL LANGUAGE-I
(02 CREDITS) (70+30)

SEMESTER VI

SOES/GEOL/UG/CORE COURSE-006

ENGINEERING GEOLOGY

(04 CREDITS) (70+30)

Unit-I: Engineering properties of rocks.

Unit-II: Soil and Soil groups of India.

Unit-III: Dams: types and their geological and environmental considerations; Geological and geotechnical investigations of reservoirs.

Unit-IV: Tunnels: geology, structure, leakage and seepage problems with prevailing groundwater conditions.

Unit-V: Landslides: causes, classification and preventative measures.

PRACTICALS/LAB

(02 CREDITS) (70+30)

Engineering properties and identification of building stones. Study of soil profiles. (25)

Surveying by Plane Table/Theodolite; Preparation of engineering geological maps/cross-sections of project sites. (25)

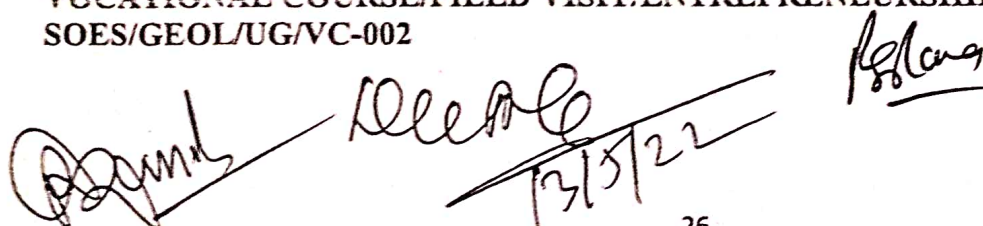
Practical records: (10)

Viva Voce: (10)

Books Recommended:

1. Valdiya, K.S., 1987. Environmental Geology – Indian Context. Tata McGraw Hill.
2. Rajendran S., 2007. Mineral Exploration: Recent Strategies.
3. Dobrin, M.B. & Savit, CH., 1988. Introduction to Geophysical Prospecting, McGraw-Hill.
4. Arogyaswamy, R.N.P., 1973. Courses in Mining Geology. Oxford and IBH Publ.
5. Parasins, D.S., 1997. Principles of applied geophysics. Chapman Hall.
6. Krynine D.P. and Judd W.R., 1957. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
7. Kesavulu, N.C., 2009. A text book of engineering geology. Macmillan P publishing India Ltd.
8. Crozier. M.J., 1989. Landslides: causes, consequences and environment. Academic Press.
9. Readman, J.H., 1979. Techniques in Mineral exploration. Applied Science Publishres.
10. Bell, F.G., 1983. Fundamentals of Enginccring Geology. Butterworth and Co.
11. Introduction to Rock Mechanics" by R. E. Goodman
12. "Geology for Engineers" by F. G. H. Blyth and M. H. de Freitas
13. "Soil Mechanics and Foundations" by Muni Budhu

VOCATIONAL COURSE/FIELD VISIT/ENTREPRENEURSHIP SKILLS
SOES/GEOL/UG/VC-002

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**GEOLOGICAL FIELD TRAINING
(04 CREDITS) (70+30)**

Students will be required to carry out Geological field training in an important geological terrain in the Himalaya and peninsular India to study the different aspects of field geology for a week and to submit a report thereon.

**EXTRACURRICULAR COURSE/ COMPULSORY COURSE
CULTURE, TRADITIONS AND MORAL VALUES
(02 CREDITS) (70+30)**

**LANGUAGES-II
INDIAN, MODERN, REGIONAL LANGUAGE-II
(02 CREDITS) (70+30)**

SEMESTER VII (WITH RESEARCH)

SOES/GEOL/UG/CORE COURSE-007

**GEOHYDROLOGY
(3 CREDITS)(70+30)**

Unit-1: Origin, occurrence and distribution of groundwater, hydrological cycle, hydrological properties of rocks, water table fluctuations.

Unit-2: Theories of groundwater flow, Darcy's law and its application, determination of permeability, types of the wells: unconfined, confined.

Unit-3: Groundwater quality, physical and chemical properties of water, problems of arsenic and fluorides, groundwater contaminations.

Unit-4: Geophysical methods of groundwater exploration with special emphasis on electrical (resistivity) method. Elementary idea of well logging.

Unit-5: Groundwater problems and management, artificial recharge, groundwater provinces of India.

**PRACTICALS/LAB
(1 CREDIT) (70+30)**

Delineation of hydrological boundaries on the water table, contour maps and estimation of permeability. (10 Marks)

Analysis of hydrographs and estimation of infiltration capacity. (10 Marks)

Chemical analysis of water in evaluation of aquifer parameters. (10 Marks)


Step drawdown tests, electric resistivity sounding for delineation of fresh and saline aquifers. (10 Marks)

Study of geophysical well logs. Estimation of TDS using resistivity and SP logs. (10 Marks)

Practical records: (10)

Viva Voce: (10)




13/5/22



Books Recommended:

1. Bouver, H. (1978): Groundwater Hydrology, McGraw Hill.
2. Fetter, C.W. (1990): Applied Hydrogeology, CBS Pub. New Delhi.
3. Todd, D.K. (1988): Ground Water Hydrology, John Wiley & Sons, New York.
4. Davies, S.N. and De-West, R.J.N. (1966): Hydrology, John Wiley & Sons, New York.
5. Raghunath, H M (1983): Ground Water, Wiley Eastern Ltd. Calcutta.

SOES/GEOL/UG/CORE COURSE-008 STRUCTURES AND TECTONICS (3 CREDITS) (70+30)

Unit-I: Definition and scope of structural geology: behavior of rocks under elastic, plastic and viscous deformations, Theory of stress and strain, kinematic analysis, Mohr's Circles, strain and stress ellipsoids. Techniques of strain measurements.

Unit-II: Classifications and mechanics of folds, boudins, cleavage, lineation and foliations.

Unit-III: Geometry and mechanics of fault/thrust, joints, unconformities.

Unit-IV: Concept of Plate Tectonics with geological and geophysical evidences, mechanism and present status; tectonic history of India and origin of the Himalaya.

Unit-V: Major tectonic features of the oceanic and continental crust.

Unit-VI: Palaeo-magnetism, Seafloor spreading, Island arcs, Oceanic islands and Volcanic arcs.

Books Recommended:

1. Davies, A.Z.: Structural Geology.
2. Ghosh, S. K.: Structural Geology, Fundamental and Modern Concepts, Pergamon Press.
3. Ramsay J. G. (1967): Folding and fracturing of Rocks, McGraw Hill Pub.
4. Ramsay J.G. & Huber M. I. (1983): The Techniques of Modern Structural Geology-I, Strain Analysis, Academic Press.
4. Ramsay J.G. & Huber M. I., (1987): The Techniques of Modern Structural Geology-II, Strain Analysis, Academic Press.
5. Hobbs, B.E., Means, W.D. & Williams, P.F. (1976): An outlines of Structural Geology, John Wiley and Sons publ.
6. Turner, F.J. & Weiss, L.E. (1963): Structural analysis of Metamorphic Tectonites, McGraw Hill publ.
7. Condie Kent, C. (1989): Plate Tectonics and Crustal Evolution.
8. W. J. Kious & Robert I.T.: This dynamic of Earth: the Story of Plate Tectonics USGS publ.
9. Moores, E. & Twiss, R.J., 1995: Tectonics. Freeman publ.
10. Keary, P. & Vine, F.J. 1990: Global Tectonics. Blackwell scientific publ.
11. Storetvedt, K.N. 1997: Our Evolving Planet. Earth History in new perspective.
12. Valdiya, K.S. 1998: Dynamics Himalaya. Univ. Press.

PRACTICALS/LAB

(1 CREDIT) (70+30)

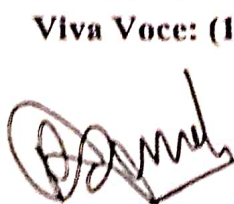
Unit-I: Preparation and interpretation of geological maps and sections. (20)

Unit-II: Structural problems concerning economic mineral deposits. (20)

Unit-III: Stereographic presentation of structural data. (10)

Practical records: (10)

Viva Voce: (10)







RESEARCH METHODOLOGY: RESEARCH METHODOLOGY OF GEOLOGY
(6 CREDITS)(70+30)

ELECTIVE PAPER

SOES/GEOL/UG/DSE-001

VERTEBRATE AND MICROPALAEONTOLOGY
(3 CREDITS)(70+30)

Unit-I: Vertebrate life through ages and landmarks in their evolution, evolutionary trends of man, horse and elephant.

Unit-II: History of micropalaeontology, Collection, and preparation of microfossils and their significances.

Unit-III: Palynology: Morphology and significances of pollen and spores,

Unit-IV: Micro-paleontology: Morphology, Palaeoecology, Palaeoenvironment and geological distribution of Foraminifera, Conodonts, Ostracodes, Radiolarian, Dinoflagellates and diatoms.

Books recommended

1. Carroll, Stearn, C.W. & Carroll, R.L. (1989): Palaeontology-the record of life, John Willey.
2. D.K., Sinha (2005): Micropaleontology application in Stratigraphy & palaeoceanography.
3. Romer, A.S. 1966. Vertebrate Paleontology, Chicago Univ. Press.
4. Armstrong, H. & Brasier M. (2005): Micro fossils. Black Well pub.
5. Haq B.U. & Boersma, A. (1998): Introduction to marine Micro-paleontology. Elsevier Pub.
6. Jenking D.G. (1993): Applied micropaleontology, Kluwer acad. Publ.

PRACTICALS/LAB

(1 CREDIT) (70+30)

1. Study of important Microfossils and their importance (25)
2. Study of Vertebrate fossils (25)

Practical records: (10)

Viva Voce: (10)

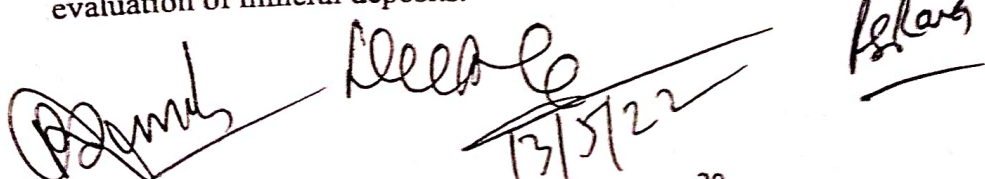
SEMESTER VIII (WITH RESEARCH)

SOES/GEOL/UG/CORE COURSE-009
MINERAL EXPLORATION AND MINING
(3 CREDITS)(70+30)

Unit-1: Exploration and Exploitation Techniques: Geophysical and Geochemical and Geobotanical Explorations, Geological mapping at different scales.

Unit-2: Drilling and Logging: Core and non-core drilling, borehole logs, planning of bore holes and their location on the ground, Core-logging.

Unit-3: Principles of mineral exploration, Prospecting and Exploration- conceptualization, methodology and stages, Sampling, subsurface sampling including pitting, trenching, assaying and evaluation of mineral deposits.

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Unit-4: Mining methods: Alluvial mining, Opencast mining, underground mining, Coal mining methods and mining hazards.

Unit-5: Principles of reserve estimation, density and bulk density; Factors affecting the reliability of reserve estimation, Reserve estimation based on geometrical models (square, rectangular, triangular and polygon blocks), Regular and irregular grid patterns, statistics and error estimation.

Books recommended

1. P.K. Banerjee and S. Ghosh (1997): Elements of prospecting for non-fuel mineral deposits.
2. Bagchi, T.C., Sengupta, D.K. & Rao, S.L.V.N. (1979): Elements of Prospecting and Exploration.
3. Sinha, R.K. & Sharma, N.L. (1976): Mineral Economics.
4. Arogyaswami, R.N.P. (1996): Courses in Mining Geology

PRACTICALS/LAB

(1 CREDIT) (70+30)

- I. Preparation of mineral maps of India. (10)
- II. Graphical representation of production, export and import of important minerals. (10)
- III. Calculation of grade and ore reserves. (20)
- IV. Interpretation of remote sensing data for mineral exploration. (10)

Practical records: (10)

Viva Voce: (10)

SOES/GEOL/UG/CORE COURSE-010

IGNEOUS AND METAMORPHIC PETROLOGY

(3 CREDITS) (70+30)

Unit-I: Magma generation in the mantle, their nature and evolution; Magmatic crystallization: differentiation, Bowen's reaction principle, crystallisation of bi-component magma and tri-component magma (An-Al-Di system and An-Di-Fo, system).

Unit-II: Gibbs phase rule – definition of phase, component and degree of freedom, application of Phase rule in the crystallization of bi-component and tri-component magma.

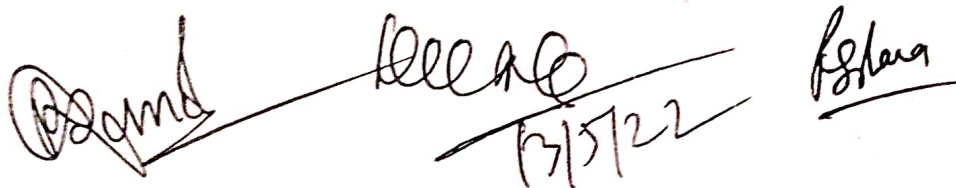
Unit-III: Texture and structures, Classification of igneous rocks (IUGS only), granites, granitoid rocks and ophiolites.

Unit-IV: Petrogenesis and petrography of the following rocks:- Aplite, Anorthosite, Andesite, Basalt, Basanite, Carbonatite, Charnockite, Diorite, Dunite, Dacite, Dolerite, Foidolite, Gabbro, Granite, Granodiorite, Kimberlite, Komatiite, Lamprophyre, Monzonite, Pegmatite, Phonolite, Peridotite, Syenite, Trachyte, Tonalite.

Unit-V: Metamorphic process, agent, grade and type of metamorphism, metamorphic zones, texture and fabrics, Mineralogical Phase rule of open and closed systems; Law of Thermodynamics and Gibbs Equation

Unit-VI: Concept and classification of Metamorphic Facies with emphasis on the following: Zeolite, Prehnite-Pumpellyite, Greenschist, Blueschist, Amphibolite, Granulite, Eclogite

Unit-VII: Petrogenesis and petrography of the following rocks- Amphibolite - Blueschist, Eclogite, Basalt, Gabbro, Gneisses - Gossan - Granulite, Greenschist, Hornfels, Marble, Migmatite, Mylonite, Pelite, Phyllite, Psammite, Quartzite, Schist, Serpentinite, Skarn, Slate.

The image shows three handwritten signatures in black ink. The first signature on the left is 'D. S. S.', the middle one is 'S. S. S.', and the right one is 'S. S. S.'. Below the middle signature is a date stamp '13/5/22'.

Books recommended

1. Gupta, A.K. (1998): Igneous Rocks Allied Publishers Ltd., New Delhi.
2. Jackson: Textbook of lithology.
3. Winter, J.D. (2001): An Introduction to Igneous and Metamorphic Petrology
4. McBirney, A.R. (1984): Igneous Petrology, Freeman Cooper & Co. California.
5. Phillips A.: Introduction to igneous and metamorphic petrology, Prentice Hall Pub.
6. Turner, F.J. & Verhoogen, J.: Igneous & Metamorphic petrology CBS Publications.
7. Bose, M.K. (1997): Igneous Petrology, World Press, Kolkatta.
8. Best, Myron G. (2002): Igneous and Metamorphic Petrology, C B S Publishers, New Delhi.
9. Blatt, Harvey; Tracy, Robert J.; Owens, Brent (2005), Petrology: igneous, sedimentary, and metamorphic (New York: W. H. Freeman).

PRACTICALS/LAB (1 CREDIT) (70+30)

- I. Study of Igneous and Metamorphic rocks in thin sections with emphasis on texture, structure, and mineral composition. (20)
 - II. Study of Igneous and Metamorphic rocks in hand specimen. (20)
 - III. Graphic construction of ACF, AKF and AFM diagrams. (10)
- Practical records: (10)
Viva Voce: (10)

RESEARCH PRESENTATION SKILLS (ORAL AND POSTER) (2 CREDITS) (70+30)

ELECTIVE PAPER SOES/GEOL/UG/DSE-002 NATURAL HAZARDS (3 CREDITS) (70+30)

Unit-I: Natural hazards and disasters: changing perspectives; Human dimensions of disasters: vulnerability, risk perception and behavioural change; Predicting catastrophe and mitigating hazards

Unit-II: Earthquakes and their causes; Ground Motion and Failures; Tsunami: Generation and Movement; Seismic and Tsunami Hazard Assessment,

Unit-III: Volcanic Hazards: Types of eruptions and related hazards, Tectonic environment

Unit-IV: Landslide and their causes; Types of downslope movement and associated hazard; Land Subsidence and resulting calamities, Landslide hazard zonation.

Unit-V: Floods and Human Impacts, Flood Frequency, Recurrences, Causes and Mitigative Measures.

Unit-VI: Storms: Tropical Cyclone, Hurricane, Tornado; Storm damages and safeguards.

Unit-VII: Drought and Wildfires: causes and secondary effects; mitigative methods.

Unit-VIII: Global warming, records of paleo-temperatures in the ice cores of glaciers, Increase of CO₂ in the atmosphere and resulting hazards.

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Books recommended

1. Barrett, E.C. & Curtis, L. F.: Introduction to Environmental Remote Sensing.
2. Valdiya, K.S. (1987): Environmental Geology- Indian Context, Tata McGraw Hill.
3. Keller, E.A. (1978): Environmental Geology Bell and Howell, USA.
4. Bryant, E. (1985): Natural Hazards, Cambridge University Press.
5. Patwardhan, A.M. (1999): The Dynamic Earth System, Prentice Hall.
6. Subramaniam, V. (2001): Textbook in Environmental Science, Narosa International.
7. Bell, F.G. (1999): Geological Hazards, Routledge London.
8. Smith, K. (1992): Environmental Hazards, Routledge London.
9. Bull, William B., 2009. Tectonically active landscapes. Willey-Blackwell publication.
10. Burbank, D. W. and Anderson, Robert, S. 2001. Tectonic Geomorphology. Blackwell Science Publication.
11. Monroe, J. S., Wicander, R., and Hazlett, R. (2007). Physical Geology: Exploring the Earth. Sixth Edition. Page 690
12. Strahler, A. Introduction to Physical Geology. Pub. John Wiley & Sons, Inc. page 632.
13. Hyndman, D., and Hyndman, D. (2011). Natural Hazards and Disasters. Third Edition. Pages 571.
14. Keller, F. D. (2012). Introduction to Environmental Geology. Printice Hall. Page 801.

PRACTICALS/LAB

(1 CREDIT) (70+30)

Dos and Do not's at individual/community levels before, during, and after a natural hazard/disaster.

Study of physiographic models related to various natural hazards.

DISSERTATION

(6 CREDITS)(70+30)

Supplementary agenda no. 1

The Chairman BoS received a mail from Sameeksha Kaushik on 9th May 2022 regarding approval to the candidature of Dr. Naresh Rana as her Co- supervisor for Ph.D. work. In the meeting of the BoS on 10th May 2022 it was resolved that a new NOC should be sought from Dr. Rana as there was discrepancy in the earlier ones. Moreover, the BoS, in principle, agreed to approve the candidature of Dr. Naresh Rana as Co- supervisor to Sameeksha Kaushik after an updated NOC from the University of Delhi is received. Meanwhile, on 11th May 2022, the Chairman, BoS received the desired document from Department of Geology, the University of Delhi. So, the BoS approves the candidature of Dr. Naresh Rana as Co-supervisor to Sameeksha Kaushik for her Ph.D. work.

I, Prof. R.S. Rana do not agree with the resolution
1. 10/00/00 supplementary agenda No.1.