KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

ಸ್ವಾತಂತ್ರ್ಯದ ಅಮೃತ ಮಹೋತ್ಸವ

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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/JS/MGJ(Gen)/2024-25/436 Date: 11 NOV 2024

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿಯನುಸಾರ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕೋತ್ತರ ಪದವಿಗಳಿಗೆ / ಸ್ನಾತಕೋತ್ತರ ಡಿಪ್ಲೋಮಾಗಳಿಗೆ ಪಠ್ಯಕ್ರಮವನ್ನು ಪ್ರಕಟಣೆ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 2 ರಿಂದ 9, ದಿ: 08.11.2024.

2. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ: 11.11.2024.

ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿಯನುಸಾರ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಎಲ್ಲ ಸ್ನಾತಕೋತ್ತರ ಪದವಿಗಳಾದ M.A./ M.Sc / M.Com / MBA / M.Ed 1 ರಿಂದ 4ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ ಮತ್ತು 1 & 2ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳ ಸ್ನಾತಕೋತ್ತರ ಡಿಪ್ಲೋಮಾಗಳಿಗೆ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆಯೊಂದಿಗೆ ಈ ಕೆಳಗಿನಂತೆ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳಲಾಗಿದೆ. ಕಾರಣ, ಸಂಬಂಧಪಟ್ಟ ಎಲ್ಲ ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗಗಳ ಅಧ್ಯಕ್ಷರು / ಸಂಯೋಜಕರು / ಆಡಳಿತಾಧಿಕಾರಿಗಳು / ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳು / ಶಿಕ್ಷಕರು ಸದರಿ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅನುಸರಿಸುವುದು ಮತ್ತು ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದನ್ನು ಸಂಬಂಧಪಟ್ಟ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸೂಚಿಸುವುದು.

Arts Faculty

Sl.No	Programmes	Sl.No	Programmes
1	Kannada	8	MVA in Applied Art
2	English	9	French
3	Folklore	10	Urdu
4	Linguistics	11	Persian
5	Hindi	12	Sanskrit
6	Marathi	13	MPA Music
7	MVA in Painting		

Faculty of Science & Technology

Sl.No	Programmes	Sl.No	Programmes
1	Geography	10	M.Sc (CS)
2	Chemistry	11	MCA
3	Statistics	12	Marine Biology
4	Applied Geology	13	Criminology & Forensic Science
5	Biochemistry	14	Mathematics
6	Biotechnology	15	Psychology
7	Microbiology	16	Applied Genetics
8	Zoology	17	Physics
9	Botany	18	Anthropology

Faculty of Social Science

Sl.No	Programmes	Sl.No	Programmes
1	Political Science	8	Journalism m & Mass Commn.
2	Public Administration	9	M.Lib. Information Science
3	History & Archaeology	10	Philosophy
4	A.I.History & Epigraphy	11	Yoga Studies
5	Economics	12	MTTM
6	Sociology	13	Women's Studies
7	MSW		

Management Faculty

Sl.No	Programmes	Sl.No	Programmes
1	MBA	2	MBA (Evening)

Faculty of Commerce

Sl.No	Programmes	Sl.No	Programmes
1	M.Com	2	M.Com (CS)

Faculty of Education

Sl.No	Programmes	Sl.No	Programmes
1	M.Ed	2	M.P.Ed

OEC subject for PG

Sl.No	Programmes	Sl.No	Programmes
1	Russian	5	Veman Peetha
2	Kanaka Studies	6	Ambedkar Studies
3	Jainology	7	Chatrapati Shahu Maharaj Studies
4	Babu Jagajivan Ram	8	Vivekanand Studies

PG Diploma

Sl.No	Programmes	Sl.No	Programmes
1	PG Diploma in Chatrapati Shahu Maharaj Studies	2	P.G. Diploma in Women's Studies
3	P.G. Diploma in Entrepreneurial Finance		

ಕುಲಸಚಿವರು.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,

1. ಕ.ವಿ.ವಿ. ಸ್ನಾತಕೋತ್ತರ ಅಧ್ಯಕ್ಷರುಗಳಿಗೆ / ಸಂಯೋಜಕರುಗಳಿಗೆ / ಆಡಳಿತಾಧಿಕಾರಿಗಳಿಗೆ / ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ
2. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ/ ಸಿಸ್ಟಮ್ ಅನಾಲೆಸಿಸ್ಟ್ / ಸಂಬಂಧಿಸಿದ ಪದವಿಗಳ ವಿಭಾಗಗಳು, ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
6. ನಿರ್ದೇಶಕರು, ಐ.ಟಿ. ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ ಇವರಿಗೆ ಕ.ವಿ.ವಿ. ಅಂರ್ತಜಾಲದಲ್ಲಿ ಪ್ರಕಟಿಸುವುದು.

KARNATAK UNIVERSITY DHARWAD

FACULTY OF SCIENCE AND TECHNOLOGY

M.Sc. TWO YEARS PG PROGRAMME

DEPARTMENT OF STUDIES IN APPLIED GEOLOGY

Programme Structure and Syllabus

As Per NEP-2020

With Effect from 2024-25

GENERAL INSTRUCTIONS

I. CREDIT, WORKLOAD AND SYLLABUS EQUIVALENCE:

1. One credit is equal to 1 hour theory teaching per week.
2. One credit is equal to 2 hour practical teaching per week.
3. One credit is equal to 15 hours theory syllabus per semester (1 Unit is equal to 15 Hours)
4. One credit is equal to 30 hours practical syllabus per semester (1 credit practical is equal to 2 hours/ week)

A. Workload for theory subjects:

1. There shall be 16 hrs/week workload for Assistant Professor
2. There shall be 14 hrs/week workload for Associate Professor/ Professor/Senior Professor.
3. There shall be 2hrs/week workload relaxation for Guiding Ph.D. students

B. Workload for practical subjects:

1. There shall be 20 hrs/week workload for Assistant Professor
2. There shall be 18 hrs/week workload for Associate Professor/ Professor/Senior Professor.
3. There shall be 2hrs/week workload relaxation for Guiding Ph.D. students

C. Workload for practical batches:

1. A batch of 10-12 students shall have 1 teacher

D. Workload for Project:

1. Students for projects / internship shall be preferably guided by permanent faculty for atleast10 students by sharing equally among the permanent faculty. If remained excess shall be allotted to other teacher's on roll on temporary basis.
2. If there are no permanent faculty, the students shall be distributed among the temporary teachers on roll.
3. There shall be maximum of 4 hrs/week workload for guiding the students for project work irrespective of number of students.

II. ALLOTMENT OF SPECIALIZATION:

While allotting specialization in 3rd and 4th semester, minimum of 10 students shall have to select the specialization.

III. **ATTENDANCE:** 75% attendance is mandatory for every course (paper). No marks are reserved for attendance. If the candidates fail to fulfill 75% attendance in any one of the course (paper) in the given semester, such candidate is not eligible to appear for examination in all the papers and candidate has to get the readmission for such semester. However, up to 20% attendance may be condoned with the supportive documents for a student who represents University /State / National level sports, cultural and other events. Monthly attendance shall be displayed on notice board.

IV. CREDIT AND MARKS EQUIVALENCE:

1. Generally, 20% weightage for Formative assessment and 80% weightage for Summative assessment.
2. Up to 2 credits equal to 50 marks (10 marks Formative assessment and 40 marks summative assessment).
3. 3-4 credits equal to 100 marks (20 marks Formative assessment and 80 marks summative assessment).
4. 5-6 credits equal to 150 marks (30 marks Formative assessment and 120 marks summative assessment).
5. Example for 100 marks out of which 20 marks for Formative assessment i.e., Formative Assessment shall be in two internal assessments i.e.: 10 marks I.A. for 8^{th} week and 10 marks for 14^{th}week of every semester.

V. Conduct of Examination:

1. Formative assessment examination shall be conducted for 1hr. There shall not be any provision for improvement. A special Formative assessment examination shall be conducted for a student who represents University /State / National level sports, cultural and other events if a schedule is overlapping.
2. 80 marks summative theory examination shall be conducted for 3 hrs and 40 marks for 1.5 hrs.
3. 80/ 40 marks Formative / Summative Practical examination shall be conducted for 4 hrs.
4. There shall be a single examiner for both even and odd semesters' Formative Practical examination.
5. There shall be a single examiner for odd semester Summative Practical examination and two examiners for even semester Summative Practical examination; one from internal and other shall be external examiner.

VI. Assessment:

1. **Theory papers:** There shall be a single valuation for odd semester theory papers preferably internal examiner and double valuation for even semesters; one from internal and other shall be external examiner.
2. **Project/Internship assessment**

A) **For100 marks Project/Internship assessment (Wherever applicable):**

i. **Formative Assessment**: Project/Internship assessment carrying 20 marks out of 100 marks Candidate has to submit two Progress Reports; each carries 10 Marks. i.e. 10 x 2= 20 marks.

ii. **Summative Assessment**: Project/Internship assessment carrying 80 marks out of 100 marks

a. Project Report : 35

b. Presentation : 25

c. Viva-voce : 20

B) **For150 marks Project/Internship assessment (Wherever applicable):**

i. **Formative Assessment**: Project/Internship assessment carrying 30 marks out of 150 marks Candidate has to submit two Progress Reports; each carries 15 Marks. i.e. 15 x 2= 30 marks.

ii. **Summative Assessment:** Project/Internship assessment carrying 120 marks out of 150 marks

a. Project Report : 60

b. Presentation : 35

c. Viva-voce : 25

VII. Passing criteria:

1. There shall be no minimum passing marks for Formative assessment.

2. Candidate has to score minimum 40% in summative examination and fulfill 40% of the maximum marks including Formative assessment marks. For example: for 80 marks summative examination, candidate has to score minimum of 32 marks (40%) and should score cumulatively 40 marks including formative assessment in every course.

VIII. DECLARATION OF RESULT:

1. Candidate has to score 40% as above in all the courses to pass the semester end examination to declare pass.
2. **Percentage and Grading:** Result shall be declared in terms of SGPA and at the end of four semesters as CGPA. The calculation of CGPA is as under
3. If P is the percentage of marks secured (IA + semester end score) by the candidate in a course which is rounded off to the nearest integer, the grade point (GP) earned by the candidate in that course will be given as below.

Percentage (%)	Grade(GP)	Percentage (%)	Grade(GP)
40	4.0	71-75	7.5
41-45	4.5	76-80	8.0
46-50	5.0	81-85	8.5
51-55	5.5	86-90	9.0
56-60	6.0	91-95	9.5
61-65	6.5	96-100	10.0
66-70	7.0		

Grade point of less than 4 shall be considered as fail in the course, hence, GP=0 and for the absent candidate also GP=0

4. A student's level of competence shall be categorized by grade point (GP), Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of the programme.
5. **Semester Grade Point Average (SGPA):** The SGPA is a ratio of sum of the number of Credit Grade Points scored from all the courses (subject) of given semester to the total credits of such semester in which the candidate studied. (Credit Grade Points of each course = Credits x GP).
6. **Cumulative Grade Point Average (CGPA):** It is calculated as below for 4 semester programme.

   CGPA=($Credit_1$ x $SGPA_1$) + ($Credit_2$ x $SGPA_2$) +($Credit_3$ x $SGPA_3$) + ($Credit_4$ x $SGPA_4$) / Total credits of programme (sum of credits of 4 semesters).
7. After studying and passing, all the credits prescribed for the programme the degree shall be awarded with CGPA score after rounding off to second decimal and class distinguishing as second class, first class, and distinction along with grade letter as under:

CGPA of the programme(Degree)	Class obtained	Grade Letter
9.5 to 10.00	Outstanding	A^{++}
7.00 to 9.49	Distinction	A^{+}
6.00 to 6.99	First Class	A
5.50 to 5.99	Second class	B^{+}
5.00 to 5.49		B
4.00 to 4.99	Pass	C
Less than 4.0	Fail/ Reappear	D

8. Each semester Grade Card shall have marks and SGPA and final Grade Card shall have semester wise marks obtained in all semesters, CGPA and % of cumulative marks obtained from all semesters.
9. There shall be Revaluation / Challenge valuations provisions as per the prevailing rules and regulations.
10. Marks obtained from the OEC shall not be considered for award of CASH PRIZE / RANK / GOLD MEDAL.

IX. MAXIMUM DURATION FOR COMPLETION OF THE PROGRAMME:

A candidate admitted to any P.G. Programme shall complete it within a period, which is double the duration of the programme from the date of admission.

X. ANY OTHER TERMS AND CONDITIONS:

Apart from the above, the prevailing rules and regulation are valid for any other matters which are not addressed in this regard.

Karnatak University, Dharwad
Programme structure: Effective from **2024-25**

M.Sc. APPLIED GEOLOGY COURSE SEMESTER SCHEME ORDINACES AND REGULATIONS GOVERNING THE EXAMINATION IN M.Sc. APPLIED GEOLOGY

P R E A M B L E

1) Admission for M.Sc. Applied Geology Course in offered to only those who have studies geology as one of the subjects at B.Sc. Degree level.
2) M.Sc. Applied Geology is of two semester course (4 Semesters).
3) First semester will 4 core theory papers and 3 practicals. Second and Third semester will have 3 core theory papers and 1 elective paper and 3 practicals. Fourth semester will have 3 theory papers, 3 practicals and project work.
4) Each Theory Paper will carry 20 internal marks and 80 marks for the University Examination. Each practical will carry 10 internal marks and 40 marks for the University Exam.
5) The students are required to undergo training in the Geological mapping during 2nd Semester for a period of 10-15 days.
6) During the 4th Semester, students will be taken to Geological study tour for about 10 to 15 days to the places of Geological interest.
7) The candidates remaining absent for the Geological mapping / study tour / on valid grounds may be permitted to appear for the University Examination only on the condition that such absentees undergo Geological mapping/study tour / programmes as assigned by the Chairman of the Department during the dates suggested by the Chairman. The examination results of such candidates will be announced only after the compliance with this provision.
8) The students are required to maintain practical laboratory records for all the semesters and get them duly certified by the concerned teachers and the Chairman of the Department and submit at the time of practical examination.
9) The Internal Assessment shall be based on the written test / practical for each course.
10) The total intake of students is 25 (twenty five only)

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Theory Question Paper pattern for Semester Examinations of 2024-25 onwards

M.Sc._____Semester Examination

Subject _____

Paper Title _____

Time: 3 hours Max. Marks: 80

I. Answer any **EIGHT** questions in about **50** words each. **[8 x 2=16]**

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

II. Answer any **TWO** of the following questions in about **300** words each. **[2 x 8=16]**

11.
12.
13.

III. Answer any **TWO** of the following questions in about **300** words each. **[2 x 8=16]**

14.
15.
16

IV. Answer any **TWO** of the following questions in about **300** words each. **[2 x 8=16]**

17.
18.
19.

V. Answer any **TWO** of the following questions in about **300** words each. **[2 x 8=16]**

20.
21.
22.

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KARNATAK UNIVERSITY DHARWAD

M.SC. in **Applied Geology**
Effective from 2024-25

Sem	Type of Course	Theory/ Practical	Course code	Course Title	Instruction hour / week	Total hours /sem	Duration of Exam.	Marks			Credits
								Formative	Summative	Total	
I	DSC-0	Theory	A1GEG001T	Stratigraphy & Paleontology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A1GEG002T	Mineralogy	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A1GEG003T	Geodynamics & Structural Geology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A1GEG004T	Gemstones & Industrial Minerals	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Practical	A1GEG005P	Paleontology & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A1GEG006P	Mineralogy & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A1GEG007P	Structural Geology & Viva	12	180 hrs	04 hrs	10	40	50	02
Total								**110**	**440**	**550**	**22**

Sem	Subject Code	Type of course	Course code	Course Title	Instruction hour / week	Total hours /sem	Duration of Exam.	Marks			Credits
								Formative	Summative	Total	
II	DSC-0	Theory	A2GEG001T	Petrology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A2GEG002T	Mining Geology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A2GEG003T	Ore Geology, Indian Mineral Deposits & Energy Resources	04	60 hrs	03 hrs	20	80	100	04
	OEC-2	Theory	A2GEG004T	Earth Science - I	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Practical	A2GEG005P	Petrology & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A2GEG006P	Ore Geology & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A2GEG007P	Ore Reserve Estimation & Viva	12	180 hrs	04 hrs	10	40	50	02
Total								**110**	**440**	**550**	**22**

Sem.	Type of course	Theory / practical	Course code	Course Title	Instruction hour / week	Total hours /sem	Duration of Exam.	Marks			Credits
								Formative	Summative	Total	
III	DSC-0	Theory	A3GEG001T	Geochemistry	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A3GEG002T	Hydrogeology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A3GEG003T	Mineral Economics & Engineering Geology	04	60 hrs	03 hrs	20	80	100	04
	OEC-2	Theory	A3GEG004T	Earth Science II	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Practical	A3GEG005P	Geochemistry & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A3GEG006P	Hydrogeology & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A3GEG007P	Geostatistics and Computer Applications & Viva	12	180 hrs	04 hrs	10	40	50	02
Total								**110**	**440**	**550**	**22**

Sem.	Type of course	Theory / practical	Course code	Course Title	Instruction hour / week	Total hours /sem	Duration of Exam.	Marks			Credits
								Formative	Summative	Total	
IV	DSC-0	Theory	A4GEG001T	Mineral Beneficiation & Environmental Geology	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A4GEG002T	Geochemical Exploration & Geophysical Exploration	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Theory	A4GEG003T	Photogeology & Remote Sensing	04	60 hrs	03 hrs	20	80	100	04
	DSC-0	Project	A4GEG004P	Project Work	04	60 hrs	03 hrs	25	125	150	06
	DSC-0	Practical	A4GEG005P	Mineral Beneficiation & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A4GEG006P	Exploration Geophysics & Viva	12	180 hrs	04 hrs	10	40	50	02
	DSC-0	Practical	A4GEG007P	Photogeology and Remote Sensing & Viva	12	180 hrs	04 hrs	10	40	50	02
Total								**115**	**485**	**600**	**24**
Grand Total including I to IV Semesters								**445**	**1805**	**2250**	**90**

- Dissertation Vive-Voce (20 marks), Geological Field Mapping Report (15 Marks) and Geological Study Tour Report (15 marks)

F I R S T S E M E S T E R

A1GEG001T: STRATIGRAPHY AND PALAEONTOLOGY

UNIT I

History and Development of Stratigraphy, Concept of Lithofacies and Biofacies. Stratigraphic classification & nomenclature: litho-, chemo-, bio-, seismo-magneto and chrono-stratigraphy. Correlation of strata based on lithostratigraphy, biostratigraphy, geochronological. Walther's Law. Concepts of magneto stratigraphy, chemo stratigraphy, event stratigraphy and sequence stratigraphy. Standard stratigraphic scale. Physiographic features and Tectonic features of India.

UNIT II

Classification, structure and tectonics of cratons of India – Dharwar Craton, Bastar Craton, Singbhum Craton, Bundelkhand Craton and Aravalli Craton. Stratigraphy, sedimentation, tectonics and evolution of the following Proterozoic basins of India: Vindhyan, Cuddapah, Papaghni sub- basin, Pranhita-Godavari Basin, Kaladgi and Bhima. Gondwana Supergroup – Introduction, Characteristics, Stratigraphy and Structure, Classification and Age, Life in Gondwana. Stratigraphy and classification of Trichinopoly and fossil assemblage, Cretaceous/Tertiary Boundary. Deccan Volcanic Province – Introduction, Regional Stratigraphy, Sub provinces, Inter-Trappean beds and infratrappeans beds, Distribution and its age. Siwalik – Stratigraphy and Sedimentation, Distribution and Fauna of Siwalik. Stratigraphy and tectonics of Himalaya.

UNIT III

Scope of Palaeontology and Organic evolution, Techniques in Palaeontology - collection, identification and illustration – binomial nomenclature, Mega fossils, Microfossils, Nanofossils, Ichnofossils. Principles of classification, concept of species, naming of species and classification into higher categories. Origin and evolution of life, mechanism of evolution.

Lamarck’s theory of inheritance, Darwin’s theory of natural selection, theory of mutation. Applications of Fossils in the study of palaeoecology, paleobiogeography and paleoclimate. Mass extinction and its causes.

UNIT IV

Classification, morphology, evolutionary trends, paleoecology and stratigraphic distribution of the following groups – Brachiopods, Pelecypods, Cephalopods, Gastropods,

Trilobites, Echinodermata, Corals, Graptolites, Plant Fossils. Palaeobotany - Plants through

geological ages-Precambrian Algae and Stromatolites. Morphology, General classification of spores and pollens. Introduction to Microfossils and Micropaleontology; Classification and Applications of Microfossils and micropaleontology; Separation of various Microfossils: Morphology, stratigraphic significance and applications of Foraminifera, Ostracoda, Conodont. Introduction to Vertebrates-palaeontology. Evolution, classification and geological significance of Fishes and Human.

BOOKS RECCOMMENDED:

1. Ramakrishna, M. & Vaidyanadhan, R. (2010): Geology of India, v. I and II, Geol. Soc. Ind.
2. K.S. Valdiya (2016) The Making of India, Geodynamic Evolution, Second Edition, Springer International Publishing Switzerland.
3. Ram S. Sharma (2009). Cratons and Fold Belts of India. Springer Heidelberg Dordrecht London New York

4. Geology of India and Burma (6 edition) – M.S Krishnan. (2006), CBS Publishers & Distributors.
5. Naqvi, S.M. and Rogers, J.J.W. (1987): Precambrian Geology of India, Oxford Univ. Press.
6. Fundamentals of historical geology and stratigraphy of India- Ravindra Kumar. (1985). Wiley Eastern.
7. Doyle, P. and Bennett, M.R., (1996). Unlocking the Stratigraphic Record, John Willey.
8. Weller, J. M. (1960): Stratigraphic Principles and Practice, Harper and Brothers.
9. Pascoe, E.H., (1968). A Manual of the Geology of India & Burma (Vols.IN), Govt. of India Press, Delhi.
10. Pomerol, C., 1982. The Cenozoic Era - Tertiary and Quaternary. Ellis Harwood Ltd., Halsted Press.
11. Schoch, R.M., 1989. Stratigraphy: Principles and Methods, Van Nostrand Reinhold, New York.
12. Clarkson, E.N.K., 1998, Invertebrate Palaeontology and Evolution, IV edition, publ., Blackwel.
13. Stearn, C.W. & Carroll R.L. 1989, Palaeontology-the Record of Life, Publ. John Wiley.
14. Smith, A.B, 1994, Systematics and The Fossils Record-Documenting Evolutionary Patterns., publ, Blackwell.
15. Principles of palaeontology (3rd edition)-Michael Foote& Arnold I. Miller. 2006. W.H. Freeman.
16. Principles of palaeontology (2nd edition) – Roop and Stanley. 1978. W. H. Freeman.
17. Prothero, D.R. 1998. Bringing fossils to life - An introduction to Palaeobiology, McGraw Hill.
18. Kathal, P.K., Nigam, R. & Talib, A., (2017) Micropaleontology, and its applications. Scientific publishers, New Delhi, Jodhpur.
19. Saraswati, P. K. & Srinivasan, M. S. (2016): Micropaleontology, Principles & Applications, Springer.
20. Murray, John, (2006): Ecology & Application of Benthic Foraminifera, Cambridge University Press.
21. Micropaleontology – Bilal Ulla Haq. 1998. Elsevier

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A1GEG002T: MINEROLOGY

UNIT –I

Mineralogy: Mineral, condition for minerals formation, scope of mineralogy, occurrence and association, Physical and optical properties of minerals and petrological microscope.
Group of minerals: native elements; Gold, Silver, Copper and platinum. Sulphides; stibnite group, Oxides; Carbonates (Calcite and aragonite), Silicates; Mica, feldspar and Feldspathoids, Pyroxene, Amphibolites, Garnet and Olivine. **15 Hours**

UNIT –II

Crystal structure in general, Silicate structure; Occurrence of silicates in the earth's crust, Classification of silicates and uses. Isomorphism, Polymorphism and Psedomorphism. **15 Hours**

UNIT –III

Optics; Nature of light, Simple Harmonic Motion (SHM), Wave motion and Wave theory, isotropic, anisotropic (Uniaxial and biaxial) substances, refraction, reflection, Refractive Index (RI), critical angle, birefringence, Double refraction, pleochroism, extinction and types of extinction. **15 Hours**

UNIT –IV

Crystallography; Crystal Structure, Unit Cell, Lattice, Bravais Lattice, Crystallographic Axes, terms of crystallography (shape, edge and solid angle), Crystal System, Rotoinversion Symmetry and classification of six crystal system.32 symmetry classes of crystal. Hermann Mauguan and Shoenflies symbols. Crystal formation and irregularities; Internal; Crystal Defects, Impurities, Line Defects, Dislocation. External; Surface Imperfections, Imperfections in Solids, Twinning, Polycrystalline Structure. **15 Hours**

BOOKS RECOMMENDED:

1. Introduction to Rock forming Minerals Vol. 1 to 4: Deer, Howie & Zussman, Longmans, 1966.
2. Dan's manual of Mineralogy: Hurlbut, C.S. Hohn Wiley 1959. 3. Mineralogy of Students: Belady Mill Oliver & Boyd, 1972.
4. Optical Crystallography: Earnst E. Wahlstrom, John Wiley & Sons.
5. Elements of Optical Mineralogy: Winchel & Winchel, Wiley Eastern 1968.
6. Optical Mineralogy, Roger, S.R.F. & Kerr. P.G. Mc. Graw Hill 1960.
7. Elementary Crystallography: Burger. M.
8. Essentials of Crystallography: Flint Peace Publi. 9. Elements of X-ray Crystallography: Azaroff.
10. A text book of Mineralogy: E.S. Dana.
11. Elements of crystallography by Phillipsy

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A1GEG003T: GEODYNAMICS AND STRUCTURAL GEOLOGY

UNIT I

Introduction, Continental drifts theories. Earth and its shape. Major layers of the earth, characterstics of crust, mantle and core. Various methods to infer the earth's internal structure. Types of discontinuities. Physiographic features of Continental and Oceanic crusts. Plate tectonics: Concept of plate tectonics and major plates, Evidences of continental drift theory, Types of plate boundaries, Seafloor spreading and its hypothesis, Evidence for Seafloor Spreading, Mid-oceanic ridges, World Distribution of Mid-Oceanic Ridges.

UNIT II

Development of Island arcs, Wadati–Benioff zone, Island arcs, Ring of fire, Island Arc Magmatism. Oceanic trenches, Deepest Oceanic trenches of the world and Geological Distribution, Controlling factors of trench depth. Continental margins: active and passive continental margins, continental shelf, Continental slope, Continental rise, submarine canyons, abyssal fans, abyssal plains, turbidity currents. Hot spots: Development of Hotspot, Major concepts of mantle plumes, evidences for mantle plumes, characteristics of hotspots and mantle plumes, shape and size of mantle plumes, origin and evolution of mantle plumes, Trail of a hotspot, prominent hotspots. Mountain ranges of the world, Orogeny, anatomy of Orogenic belt, Types of Mountains, Orogenic belts of India. Global tectonics in relation to plate tectonics, continental drift theory, Evidences for Continental Drift, primary plates and secondary plates, India's role in continental drift, Continent-Continent Collision.

UNIT III

Introduction: Objectives of structural studies, Role of kinds of rocks, Role of deformative forces, Classification of structures, Tectonites, Mechanical properties of rocks, Varieties of deformative forces. Concept of stress and strain, Stress-strain diagram, Factors controlling the behavior of rock. Stages of deformation. Strain analysis of naturally deformed rocks, Types of strain, Stress-strain ellipsoids and their geological significance. Folds: Geometric Classification of folds, nomenclature of fold, Classification of fold, Basic forms of fold. Genetic classification/Mechanics of folding, primary folds, secondary folds, recognition of folds. Foliations and lineation, Types of foliation, Types of lineation.

UNIT IV

Shear Zones: Nature of Shear Zones and their Geometry and Mechanics Geometry and Mechanics, General Characteristics of Shear Zones, Analyzing shear zones, Shear sense indicators, Large scale thrusts and their significance in tectonics, thrust shear zones. Classification of unconformities, Formations of unconformity, types of unconformities. Faults: Parts of the Fault, Types of Faults, classification and their recognition in the field, Role of fluids in faulting, Fault Mechanics. Joints: Formation of Joints, Types of Joints, Mechanics of joints and classification of Joints. Advantages and Disadvantages of Joints.

BOOKS RECOMMENDED

1. Ramsay, J.G. & Huber, M.I. 1983. The Techniques of modern structural geology. V.1. Strain Analysis.
2. Ramsay, J.G. & Huber, M.I. 1987. The Techniques of modern structural geology. V.2. Folds and Fractures.

3. Park, R.G. Foundations of structural geology.
4. Turner, F.J. & Weiss, L.E. 1963. Structural analysis of metamophic tectonites.

5. Price, N.J. & Cosgrove, J.W. 1990. Analysis of Geological structures. Cambridge University Press.
6. Davis, G.H. 1984. Structural Geology of Rocks and Regions.
7. Ghosh, S.K. 1993. Structural Geology: Fundamentals and modern developments.
8. Suppe, J. 1985 Principles of structural geology. Printice-Hall.
9. Principles of Physical Geology : A Holmes, Nelson, London 1965
10. Basic concents of physical Geology : E.W. Spencer, Oxford & I.B. 1971.
11. Physical Geology: Strahler Wiley & Sons. 1974.
12. Dynamic Earth : H. Leep, Mc Graw Hill 1973
13. Changing Earth : B. Meers Rein hold N.Y. 1973.
14. The Dynamic Earth System: A.M. Patvardhan, Prentice Hall of India Pvt. Ltd.,1999
15. Plate Tectonics & Crustal Evolution: K.C.Condie , Pergamon Press, 1986.
16. Palaeomagnetism & Plate tectonics : M.M.Mc. Elhimony, Cambridge Univ. Press.
17. Understanding Earth by Traak Press, Raymond Seiver Treeman & Co.,
18. Tectonics by E.M.Moores, R.J. Twiss, Freeman & Co.,
19. Theory of structural Geology by N.W.Gokhale, CBS Publishers and Distributors Pvt ltd., New Delhi

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A1GEG004T: GEMSTONES & INDUSTRIAL MINERALS

UNIT-I **15 Hours**

Introduction to Gemstones, Role of Geologist in Gemology, Precious and Semi-Precious Gemstones. Gem Industry in India, Physical and optical properties of Gemstones, Qualities of Gemstones. Classifications of Gemstones. Internal Features of natural gemstones. Measuring units of Gems. Instruments used for testing gemstones. A detail Study of the following gems - Diamond, Topaz, Ruby, Sapphire, Emerald, and Aquamarine.

UNIT-II **15 Hours**

Study of the following gems Tourmaline, Chrysoberyl, Laurite, Turquoise and Quartz varieties of gemstones, Organic Gems - Pearl, Coral, and Amber. Gemstones in Zodiacal and Astrological. Synthetic and Enhancement of Gemstones, Distributions of Gemstones in India.

UNIT-III **15 Hours**

Introduction to Industrial Minerals. Classification of Industrial Minerals Properties, characters of different Minerals or materials used in following industries with respects to their specifications and preparations of Ceramic, Abrasives, Chemical, Refractory, Fertilizers Industries.

UNIT-IV **15 Hours**

Properties, Characters of different Minerals or materials used in following industries with respects to their specifications and preparations of Paints, Glass, Cement industries and Building Materials. Role of minerals National economy and development of Indigenous production.

BOOKS RECOMMENDED:

1. The geology of ore deposits – John, M. Guilbert and Chartes, F. Park. Jr. W.H. Freeman and Co., New York 1986.
2. Interpretation of ore textures – Bastin E.S.
3. Economic Mineral Deposits – Bastin A.H.
4. Ore Microscopy – Cameron E.N.
5. Ore Deposits – Park Jr. C.G.
6. Geology of Mineral Deposits Smirnor U.J.
7. The Ore Minerals and their intergrowths – Raibor
8. India's Mineral resources – Krishna Swamy S.
9. Metallic and Industrial Minerals Lamey Carl. A.
10. Introduction to India's Economic Minerals – Sharma N.L. and Ram K.S.
11. A treatise an Industrial Minerals of India – Sinha R.L.
12. Non-Fuel Mineral Deposits of India – Mukarjee 1999 – Allied publications.
13. Minerals in world affairs – lovering
14. Minerals in worlds and Industry – Vorkii
15. Mineral Economics – Sinha R.K. and Sharma N.L. Oxford I.B.H. Publications Co.,
16. Concerning Mineral Sesouran – Allen
17. An introduction to Mineral Economics by K.K. Chatterjee New Age International Ltd., 2004
18. Granite Industry: Emerging Trends and Developments by N.C. Ghose, A.N. Trivedy and S.N. Virhave 2000.
19. Gemstones -Smith H
20. Gems and Gem Materials -Kvans E.H and Slawson S.B
21. Gemstones -Smith H
22. Gems -Webster R
23. Gems and Gem Industry in India - R.V, Karanth
24. Gemstones -Enchanting Gifts of Nature -R.V. Karanth
25. Healing Power of Gems and stones - V. Rajsushla

26. All about Gemmology, Chips of brilliance –Goodwill Publishing House.

PRACTICAL S

A1GEG005P: PALAENTOLOGY AND VIVA

Identification, Diagnosis and Geological distribution of the following groups: Brachiopoda, Pelecypod, Gastropod, Cephalopoda, Trilobite, Corals, Plant fossils. Illustration and identification of important taxa of microfossils.

A1GEG006P: MINEROLOGY AND VIVA

Study of minerals belonging to major groups and their identification with aid of megascopic characters and optical properties.Identification of crystals and crystal systems. Calculation of axial ratios of minerals of tetragonal, orthorhombic and monoclinic systems by stereographic methods.

A1GEG007P: STRUCTURAL GEOLOGY AND VIVA

Interpretation of geological maps and drawing sections. Study of Geological maps. Exercise on structural maps preparation of cross section profile from geological map such as horizontal inclined strata with or without intrusion, inclined strata with and without fault. Tracing of outcrops, construction of geological cross sections. Solving dip and strike problems. Interpretation of underground structure from borehole data.

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SECOND S E M E S T E R

A2GEG001T: PETROLOGY

UNIT I

Introduction, Types of Igneous rocks, Textures and Structures of Igneous rocks, Forms of Igneous Rocks. The Origin and evolution of magma, Types of Magmas, Site source for Magma Generation, Bowen's reaction series, Modes of melting, Magma on the basis of silica%, Partial melting, Evolution of magmas, Migration, Cooling of magmas. Petrography and composition of Magmatic rocks, Magma Crystallization and Melting Sequence, Igneous rocks composition, Intrusive and Extrusive Igneous Rocks, Common Rock-Forming Minerals of Igneous rocks, General classification of igneous rocks, Classification based on Fabric, Classification based on Field Relations, Classification based on Mineralogical and Modal compositions (IUGS), Classification based on whole rock chemical composition.

A brief study of the following groups of rocks:

1. Calc- alkali volcanic rock body
2. Calc-alkali plutonic rock body
3. Basaltic and Ultramafic rock bodies
4. Alkali rock bodies **15 Hours**

UNIT II

A general study of the composition of magma, Exsolution, Phase of Magma, Composition, Volatile constituents, Equilibrium vapour pressure, Viscosity of Magma. Physical and Chemical Properties of Magma, Generation/Genesis of Magma, Decompression Melting, Transfer of Heat, Flux Melting. Magma diversification, Mechanisms of Magma Diversification, Partial melting, Segregation, Filter pressing, Crystal fractionation, Liquid immiscibility, Magma mixing, Assimilation. Stokes' Law. Crystal-liquid-vapor equilibrium in magmatic system, Congruent and Incongruent melting, Phase Equilibrium, Crystallization Behavior of Melts, Gibbs Phase Rule, One & two Component systems, Ternary systems, Crystallization Behavior of Melts. **15 Hours**

UNIT III

Introduction to metamorphic petrology, Metamorphism, Types of Protolith, Metamorphic systems. Agents of Metamorphism - Temperature, Load Pressure (P_{load}), Fluid Pressure (P_{fluid}), Deviatoric stress, Chemically active fluids. Types of Metamorphism - Thermal/Contact Metamorphism, Regional Metamorphism, Burial Metamorphism, Dynamic/Cataclastic Metamorphism, Shock/Impact Metamorphism. Structures and texture of metamorphic rocks. Petrography and compositional aspects of metamorphic rock bodies. Metamorphic grade. Concept of facies. Metamorphic Facies & their mineral assemblages. Role of temperature and pressure in metamorphism. General metamorphic rock bodies: schists, gneisses, amphibolites, granulites and eclogites. **15 Hours**

UNIT IV

Introduction to sedimentary petrology, Origin of sediments, types of sediments and formation of sedimentary rocks. Weathering: Types of Weathering - Mechanical Weathering, Chemical Weathering, and Biological Weathering. Sediment transportation and deposition. Lithification and Diagenesis, compaction, cementation, chemical alteration and recrystallization, Factors control the Diagenesis, Major Diagenesis processes, and Major effects of Diagenesis. Structures and textures (clastic and non-clastic) of sedimentary rocks.

A general study of the following sedimentary rocks. Sandstone, limestone and argillaceous rocks. Important sedimentary basins of India. **15 Hours**

BOOKS RECOMMENDED:

1. Igneous and Metamorphic Petrology, Turner & Verhoogen, Mc Graw Hill.
2. Principles of Petrology: G.W. Tyrell, Asia Publ. House.
3. Metamorphic Petrology: H.G.F. Winkler.
4. Igneous & Metamorphic rocks: Antony.
5. Interpretation of Igneous rocks: K.G. Cox & Others.
6. Metamorphic Petrology: Bhaskar Rao.
7. Metamorphic Petrology: Miyashiro
8. Sedimentary Petrology: Petti John CBS Publ.
9. Principles of Sedimentation: Twenhofel.
10. Procedures of Sedimentary Petrology: R.E. Carver.
11. Introduction to Sedimentology: S.M. Sena Gupta, Oxford IBH.
12. Principles of Sedimentary Basin Analysis: Miall, A.D. Springer Verlag, 2000
13. Analysis of Sedimentary Successions: Bhattacharya, A & Chakraborti, C. Oxford IBH 2000.
14.
15. Sedimentary Rocks: Pettijohn, F.J. Harper & Row 1975.
16. Principles of Sedimentary Basin Analysis: G.M. Freeman & Others, John Wiley 1978.
17. Methods of Sedimentary Petrology: Garmon Muller, Hafner Public.
18. Igneous and Metamorphic petrology: MYRON.G. BEST, Brigham young University.
19. Origin of sedimentary rocks. Blatt, Middleton & Murray (1980) Printice Hall Inc.
20. Sedimentary Structures. J.D. Collins and D.B. Thompson (1982) George Allen & Unwin, London.
21. Sedimentary Petrology. M.E. Tucker (1981) John Willey & Sons inc, New York.
22. Petrography: William Turner & Martin Frey, CBS Public

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A2GEG002T: MINING GEOLOGY

UNIT: I

Introduction to mining, history of mining in brief, prospecting, exploration, Delineation. Mine technologies: Artificial Intelligence, Automation, GPS technologies, GIS system work force tracking, Drones, Special data visualization, How technology attacked the mining industry. Increased Productivity, Higher throughput, Maintenance optimization, and improved safety, fewer operating costs, Minimized Environmental harm.

Mining Methods:

I. Alluvial Mining: Pam and Bateau, Rocker, Long tom, Slicing (Ground Slicing), Derrick & cable way, Drift mining, Dredging.

II Open Cast Mining or Quarrying: 1. Trucks / Dumpers, Direct Haulage Aerial Ropeway

2. Loading by machines – using: Dragline, Power shovels, Serapes, Land dredges, Over burden bridge , Bucket wheel excavators , Conveyers (flight / belt), Spreaders, Glory hole**,** Kaolin Mining

III Underground Mining Methods:

Open Stopes: Gophering, breast stoping, open underhand stoping, open over hand stoping, underground glory hole, pillar and chambers, sub level method.

Supported stopes: Timbered stopes, Flat backed stopes, domed stopes, Rilled stopes, Vertical face stopes, Under hand stopes

Filled Stopes, Shrinkage stopes, Mitchell slicing, Caving Methods: Top Slicing, Sub level caving, Block covering

15 Hours

UNIT: II

Shaft sinking and Development of Mines; shapes, location, items needed service to be provided, basic operations, Reaching up to the rock head, Sinking through the rock.

Mine Development: Prospecting (Mineral Deposit), Exploration (Ore body), Development (Prospect), Exploitation (Mine), and Reclamation

Mine Sampling: Sampling equipment, sampling internals record of sample, breaking the sample, reduction of sample, assay of sample, calculating average width and value of the vein, High assay values, future prospects sampling heaps of tailings, salting of mines, Examination and valuation of Mines, Estimations of tonnage, calculation the average value and methods of sampling

Guides to one search: Mineralogical guides, stratigraphic guides, lithologic guides and structural guides. Ringed targets, Intersecting loci, Regional guides, Geochemical guides, Ground water as a guide, Geobotanical and Biochemical guides.

15 Hours

UNIT: III

Geological parameters for mine planning and designing, **Drilling** : Types of Drilling and methods used in mining: Percussive Drilling,, Drilling with rods, Manual Drilling, Linings a drill hole, Power Drilling with rods, Rotary Drilling. Diamond Drilling, Rope Drilling or cable Drilling, Auger Drilling

Drilling bits: Single tube core barrel, Double tube core barrel, Wire line Drilling, Types and Specification of Drilling Methods in various geological formations

15 Hours

UNIT: IV

Coal Mining Methods : Introduction, History of Coal Mining, feasibility of coal mining, pen pit

mining, Long wall mining , Board and Pillar method, Long wall mining, Long wall advancing,

Long wall retreating, Short wall method, Miscellaneous Methods, Hydraulic mining of Coal, Mine ventilation, Blasting, Health, Safety and Environment.

Surface mining, Slice mining, Horizon mining, Mountain top removal mining, Room and pillar mining, Strip mining, Underground mining. **15 Hours**

Books Recommended:

1. Elements of mining Geology C.J.Young Mc Graw Hill
2. Courses in Mining Geology by Arogyaswami Oxfords and IBH
3. Mining Geology by W.C Peter
4. Mining Geology by Mc Kinstry
5. Mining geology by C.S Fox
6. Exploration and mining Geology by W.C .Peter
7. Elements of Mining by Lewis
8. Mining of Mineral deposits by Shevyekov
9. Introduction of Mining by Stoces
10. An Introduction to mineral economics K.K. Chetterjee
11. Mineral economics by Sinha R.K and Sharma N.L, Oxford and IBH

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A2GEG003T: ORE GEOLOGY, INDIAN MINERAL DEPOSITS AND ENERGY RESOURCES

UNIT I

History and scope of ore geology, resources and reserves. Processes of formation of ore deposits. Magmatic ore deposits, residual and mechanical concentration, oxidation and supergene enrichment, hydrothermal ore deposits general characteristics and genesis of hydrothermal ore deposits - Porphyry deposits, skarn and carbonate-replacement deposits; epithermal deposits; volcanic-hosted massive sulfide deposits; Orogenic gold deposits; carlin-type deposits; iron oxide-copper-gold (IOCG) deposits; Mississippi Valley-type (MVT) deposits; SEDEX deposits.

15 Hours

UNIT II

Ore deposits formed by weathering – Nickel laterite deposits, Deposits related to clastic sedimentation process, placer deposits – Witwatersrand gold and U deposits. Chemical sedimentation: phosphate deposits, evaporates, manganese nodules. Ore deposits related to metamorphism. Relationship between crustal evolution, plate tectonics and metallogeny, Metallogenic provinces and epoch in India. **!5 Hours**

UNIT III

Indian Mineral Deposits: Mineralogy, Occurrence and Distribution of the following mineral deposits; Metallic – Gold, Silver, Iron, Manganese, Copper, Lead, Zinc, Aluminium Chromium, Tin, Non-Metallic-Asbestos, Barite, Graphite, Mica, Clay, Sillimanite group of minerals. **15 Hours**

UNIT IV

Definition and origin of coal, coal forming sedimentary environments. Process of coalification, classification of coal based on grade and rank. Important coal deposits of India. Petroleum-composition, uses, theories of origin, types of migration and entrapment of hydrocarbons and types of hydrocarbons. Characters of source and reservoir rocks. Different types of traps (Structural, Diapiric, hydrodynamic and combination traps). Important oil fields of India.

Petroliferous basins of India. Radioactive Mineral, Composition, type, radioactive metals: Thorium, Uranium, Titanium; Distribution of Radioactive minerals. **15 Hours**

Books Recommended:

1. Ridley, John. (2013). Ore deposit geology. Cambridge University Press.
2. The Geology of Ore Deposits – Gilbert and Park. 2007, Waveland Press.
3. Barnes, H.L., 1979. Geochemistry of Hydrothermal Ore Deposits, John Wiley.
4. Mookerjee, A, 2000. Ore Genesis - A Holistic Approach. Allied Publisher.
5. Economic mineral deposit- Mead Le Roy Jensen & Alan Mara Bateman. 1981. Wiley.
6. India's Mineral resources – Krishnaswami S. 1979. Oxford & IBH
7. Mineral Resources of Karnataka – B.P Radha Krishna. 1996. Geological Society of India.
8. Introduction to ore forming processes-Laurence Robb.2005. Blackwell Science. ltd.
9. Ore Geology and Industrials Minerals: An Introduction- A.M. Evans. 1993. John Wiley & Sons.
10. Chandra, D., Singh, R.M., Singh M.P., (2000): Text book of coal (Indian context), Tara Book Agency, Varanasi.
11. Scott, A.C., (1987): Coal and coal bearing strata: Recent Advances, Blackwell Scientifics Publications.

A2GEG004T: EARTH SCIENCE - I (ELECTIVE)

UNIT-I

The Solar System and Origin of the Earth. Four subsystems of the Earth: Lithosphere, Biosphere, Atmosphere & Hydrosphere. Materials of Lithosphere. Importance of Earth science.

15 Hours

UNIT-II

Rock cycle, igneous rocks, Sedimentary rocks and Metamorphic rocks. Resources from rocks and minerals.

15 Hours

UNIT-III

Weathering: Definition, Mechanical and Chemical weathering and, Factors affecting weathering. Soil: Horizon, formations, classification and erosion. Mass Wasting: Definition and Types.

15 Hours

UNIT-IV

Hydrologic cycle, Running Water: Work of streams, stream valleys and floods. Drainage basins and pattern. Groundwater: Distribution and movement of groundwater, Hot springs, Geysers.

15 Hours

REFERENCES

1. Principles of Physical Geology: A Holmes, Nelson, London 1965
2. Basic concents of physical Geology: E.W. Spencer, Oxford & I.B. 1971
3. Physical Geology: Strahler Wiley & Sons. 1974
4. Dynamic Earth: H Leep Mc. Graw Hill 1973
5. Changing Earth: B. Meers Rein hold N.Y. 1973
6. The Dynamic Earth System : A.M. Patvardhan, Prentice Hall of India Pvt. Ltd., 1999
7. Plate Tectonics & Crustal Evolution : K.C. Condie, Pergamon Press, 1986
8. Palaeomagnetism & Plate tectonics : M.M.Mc. Elhimony, Cambridge Univ. Press
9. Understanding Earth by Traak Press, Raymond Seiver Treeman & Co.,
10. Tectonics by E.M. Moores, R.J. Twiss, Freeman & Co.,

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PRACTICALS

A2GEG005P: PETROLOGY AND VIVA

Classification, identification and petrographic study of the following groups/families based on megascopic, microscopic and structural studies of Igneous rocks: Granites, granodiorites, gabbros-ultramafics, lamprophyres, andesites, dacites, rhyolites and volcanic glasses etc. Sedimentary rocks- megascopic and microscopic identification of common sedimentary rocks: sandstones, greywackes, siltstones, shales, limestone, dolomite, conglomerate, Heavy mineral analysis. Study of clastic and non-clastic rocks in hand specimen. Microscopic examination of important rock types. Metamorphic rocks – megascopic and microscopic identification of schists, amphibolites, geneisses, granulites, eclogites and hornfelses.

A2GEG006P: ORE GEOLOGY AND VIVA

Identification of mega and microscopic ore minerals based on physical and optical properties. Study of typical structures and textures and their genetic significance.

A2GEG007P: ORE RESERVE ESTIMATION AND VIVA

Estimation and calculation of ore reserves. Regular and irregular samples, Underground mine samples. Ore deposits with over burden. Hidden ore bodies, use of trigonometric functions in estimation of ore reserve. Preparation of cross section of underground mine data and calculation of ore reserves. Preparation of contour maps to represent depth to ore body and concentration specific metals.

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T H I R D S E M E S T E R

THEORY

A3GEG001T: GEOCHEMISTRY

UNIT I

Geochemical classification of elements: Lithophile, Siderophile, Chalcophile and Atmophile elements with examples. Structure of the earth: composition of crust, Mantle and core. Lattice energy of crystals: Ions, Atoms and Energy, Lattice energy estimated using Born – Haber Cycle. Gibb's Free Energy: Thermodynamic system, Thermodynamic potential, State function, STP and Rule of thumb and Derivation of Gibbs free energy. Oxygen Fugacity: Definitions, concepts and geology. Godich's stability series.

15 hrs.

UNIT II

Physico-chemical factors in sedimentation: Ionic potential, Redox potential and Hydrogen ion concentration. Colloids and Colloidal processes: Colloidal stability system, Classification of colloids. Metamorphism as geochemical processes.

15 hrs.

UNIT III

Thermodynamics of magmatic crystallization, Introduction of magma: Composition of the magma, Partial melting geochemical implications of partial melting, Effect of composition on physical properties of magmas, Fractional melting, Fractional Crystallization, assimilation and magma mixing. Introduction to Meteorites, origin and their composition and classification and mineral constituents of meteorites.

15 hrs.

UNIT IV

Mineralogy of metamorphic rocks and stability of minerals. Thermodynamics of metamorphism, Metamorphic phase rule: Illustration of phase rule, metamorphic phases and phase diagrams. Principal types of phase diagrams (ACF, AKF and AFM Diagrams) Geochemical cycle, the Earth as a physico chemical system, Crust as a separate system.

15 hrs.

Books Recommended:

1. Principles of Geochemistry B. Mason John Wiley & Sons.
2. Principles of Geochemistry B. Mason John Wiley & Sons.
3. Handbook of Geochemistry Vol I K.H. Wodephol
4. Principles of Agrochemical Prospecting Ginsberg & Sokol.
5. Geochemistry in Mineral Exploration M.S. Balasundarm
6. Geobotany and Biogeochemistry in Mineral Exploration. A.R. Brooks Harper & Row, 1972
7. Inorganic Geochemistry P.K. Anderson.
8. Geochemistry in Mineral Exploration A.W. Rose, H.E. Howkers and J.A. Webb Academic Press. 1979.

A3GEG002T: HYDROGEOLOGY

UNIT-I

Definition of hydrology, hydrogeology and groundwater hydrology. Worldwide water resources. Origin and different types of water. Hydrological cycle: Definition and different components. Precipitation– types of precipitation and hydrograph. Factor controlling evaporation, evapotranspiration, surface runoff and infiltration. Influent and effluent situations. Water budgeting and water balance studies. Subsurface distribution of water: Zone of Aeration and Zone of Saturation. Hydrogeology of Arid and Wetlands. **15 Hours**

UNIT-II

Hydrogeological properties of rocks: porosity, permeability, specific yield, specific retention, specific absorption, Transmissivity, storativity, hydraulic conductivity specific capacity, void ratio, specific storage, hydraulic diffusivity, hydraulic resistively, leakage coefficient, leakage factor, drainage factor, storativity ratio. Factor influencing porosity and permeability. Classification of rock with respect to its Hydrogeological characters and yield. Darcy's Law and its applicability; flow through saturated and unsaturated porous formations. Water table fluctuations: Groundwater flow, equation of continuity and, laminar and turbulent flow. Springs: Definition, origin and types of springs. **15 Hours**

UNIT-III

Definitions of aquifer, aquiclude, aquitard and aquifuge. Types of aquifers: unconfined, confined and perched. Pumping Tests: Definition, purpose and different methods. Estimation of Storativity (S) and Transmissivity (T). Water Quality Studies: Physical and chemical characters, criteria for different use, role of rocks and minerals in water quality; Organic and inorganic pollutants in water and wastewater; Case Studies. Well technology: Classification of wells – vertical and horizontal, well design, completion and development. Deterioration and maintenance of well. **15 Hours**

UNIT-IV

Groundwater Exploration: Definitions and methods with special reference to Electrical resistivity method. Radioisotopes in Hydrogeological studies. Artificial recharge of groundwater: Criteria, Feasibility, Pre-study and Different methods. Rain water harvesting: Definition, Requirement and Methods of rainwater harvesting. Groundwater Provinces of India. Sea water intrusion in coastal aquifers. Concept of basin management. National Water policy with special emphasis on management of groundwater resources. Different groundwater legislations in the State and other parts of the Country. **15 Hours**

BOOKS RECCOMMMENDED

Davis, S. N. and De Weist, R. J. M. (1966). Hydrogeology. John Wiley and Sons Inc., New York.
Domenico P.A. and F.W. Schwartz, Physical and chemical hydrogeology. John Wiley 1997.
Fetter, C. W., Applied Hydrogeology, New York, Macmillan, 2001.
Hiscock, K, Hydrogeology: Principles and Practice, Wiley-Blackwell, 2005
Karanth, K. R., Groundwater Assessment, Development and Management, Tata McGraw Hill
Raghunath H, M. (2007). Groundwater. 3rd Ed. New Age International Publishers, New
D. K. Todd and L. W. Mays, "Groundwater Hydrology," 3rd Edition, John Wiley & Sons, Inc., New York, 2005.

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REFERENCES

Davis, S. N. and De Weist, R. J. M. (1966). Hydrogeology. John Wiley and Sons Inc., New York.
Domenico P.A. and F.W. Schwartz, Physical and chemical hydrogeology. John Wiley 1997.
Fetter, C. W., Applied Hydrogeology, New York, Macmillan, 2001.
Hiscock, K, Hydrogeology: Principles and Practice, Wiley-Blackwell, 2005
Karanth, K. R., Groundwater Assessment, Development and Management, Tata McGraw Hill
Raghunath H, M. (2007). Groundwater. 3rd Ed. New Age International Publishers, New
D. K. Todd and L. W. Mays, "Groundwater Hydrology," 3rd Edition, John Wiley & Sons, Inc., New York, 2005.
D. K. Todd and L. W. Mays, "Groundwater Hydrology," 3rd Edition, John Wiley & Sons, Inc., New York, 2005.
Hiscock, K, Hydrogeology: Principles and Practice, Wiley-Blackwell, 2005

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A3GEG003T: Mineral economics And Engineering Geology

Unit I

Introduction of Mineral economics. Metallic minerals and Non-Metallic minerals, Applications of minerals, Environmental Effects of Extracting and Using Mineral Resources, Conservation of Mineral Resources. Role of India in the world market of the following minerals: Iron, Manganese, Barytes, Asbestos, Lead and zinc, Copper, Mica their application, resource, production, stocks, consumption, substitutes, foreign trade, future outlook, mode of occurrence and Geological distribution in India **15 Hours**

Unit II

Coal: Classification of coal, consumption, world review, foreign trade, future outlook. Petroleum: Distribution of Petroleum in India, India's Oil & Gas Production, Oil & Gas Reserves of India, World oil & gas production, Uses of Natural Gas and Petroleum, Importance of Natural Gas and Petroleum. Atomic Minerals. Strategic, Critical and essential minerals: Definition, India's most Strategic Minerals, India's most Critical Minerals, Production and Reserves, Importance of strategic and critical minerals, Worldwide distribution, global challenges. Listing of various minerals of India into the above categories Exclusive economic zones of India (EEZ) and their strategic importance in the production of marine minerals, National mineral policy of India and Mineral Legislation.

15 Hours

Unit III

Introduction and Basics of Engineering Geology, Engineering properties of rocks and soils. Engineering Classification of Rocks. Dams and Reservoirs – Parts and types/classification, Geological investigations, and problems. Tunnels – Parts and types/Classification, Geological investigations, and problems. Bridges – Parts and types/classifications, Geological investigations, and problems. **15 Hours**

Unit IV

Shoreline Engineering- Shoreline processes and Protection Measures. Concrete aggregates - properties, sources, Cement-Aggregate reactions, Effects of Sulfides, Sulphates, Organic substances, and Sea Water in concrete. Earthquakes and Seismicity, Seismic Zones of India, Earthquake resistant structures. Groundwater problems related to foundation work, mining, canals, and tunnels. Landslides- Causes of landslides, types/classification of landslides, Precautionary measures, and mitigations landslides. **15 Hours**

BOOKS RECOMMENDED:

1. Introduction to India's Economic Minerals-Sharma and Ram K S
2. A treatise an Industrial Mineral of India – Sinha R.L
3. Non-fuel Mineral deposits of India – Mukarjee 1999-Alled publications.
4. Minerals in world affairs – Lovering
5. Minerals in worlds and Industry – Vorkii
6. Mineral Economics – Sinha R.K. and Sharma N.L. Oxford I.B.H. Publication co.,
7. Concerning Mineral Sesouran – Allen
8. An introduction to Mineral Economics by K.K. Chatterjee New Age International Ltd., 2004.
9. Granite Industry ; Emerging Trends and Developments by N.C. Ghose, A.V Trivedy and S.N. Virhave 2000.Principles of Engineering Geology and Geotectonics – Krymimine.
10. Principles of Engineering Geology and Geotectonics – D.P Krynine and W.R. Judd
11. Geology in Engineering – Sschulz and Cleaves, John Wiley and Sons.
12. Eng. Geology – Fox, C.S. Teelmical Press, London.
13. Applications of Geology to engineering practice (Berkly vol.)
14. Engineering Geology – Roice H & Watson, Jhon Wiley & Sons.
15. Geology in Engineering – Legget. F.R. Me grow Hill Co.,
16. Elements of engineering Geology – Raichey E.E. Pitman 1964
17. Engineering Geology & Hydrology – Danisev 18. Foundation Engineering – Peak, Hanson & Thom burn.
18. Rock Mechanics – Fair Hurst, C. Pergmen Press.
19. Dam Geology – Walters. R.c. Butterworth & Co., Ltd., London.
20. Geology for Engineers – Blyth, F.c. H. Edward Armod Ltd.,
21. Engineering Geology – Parbin Singh, CBS Publication

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A3GEG004T: EARTH SCIENCE – II (ELECTIVE)

UNIT I

Definition, origin, classification, distribution and geological significance of Glaciers and Deserts. River System: Classification and mode of formation. Earthquakes: Interior of Earth, Earthquake waves, focus, epicenters, intensity and magnitude of Earthquakes. Forecast and Prediction of Earthquakes. Tsunamis. Volcanoes: Definition, Types of volcanoes and Distribution.

UNIT II

Major layers of the earth. Plate Tectonics: Concept of plate tectonics and major plates, Evidences of continental drift theory, Types of plate boundaries, Seafloor spreading, Mid-oceanic ridges, Orogeny and Hotspots.

UNIT III

Introduction and principles of Paleontology. Fossils, its significance and their preservation. Geologic Time Scale: Divisions of timescale, Evolution of Earth's atmosphere, most important periods in the earth history. Introduction to vertebrate and invertebrate paleontology.

UNIT IV

Oceans: waves, tides and currents, Ocean's layered structure, coastal geomorphology, resources of oceans. Composition of sea water. Renewable and non-renewable resources. Natural hazards: Landslides, floods etc.

Books Recommended:

1. Principles of Physical Geology : A Holmes, Nelson, London 1965
2. Basic concents of Physical Geology : E.W. Spencer, Oxford & I.B. 1971
3. Physical Geology : Strahler Wiley & Sons 1974
4. Dynamic Earth : H Leep, Mc Graw Hill 1973
5. Changing Earth : B. Meers Rein hold N.Y. 1973
6. The Dynamic Earth System : A.M. Patvardhan, Prentice Hall of India Pvt. Ltd., 1999
7. Plate Tectonics & Crustal Evolution : K.C. Condie, Pergamon Press 1986
8. Palaeomagnetism & plate tectonics : M.M. Mc Elhimony, Cambridge Univ., press.
9. Understanding Earth by Traak Press, Raymond Seiver Treeman & Co.,
10. Tectonics by E.M. Moores, R.J Twiss, Freeman & Co.,
11. http://nside.org/glaciers/questions/what.html
12. http://www.uwsp.edu/geo/faculty/lemke/geol370/lecture_notes/09_glacial_erosion_landforms.html
13. http://www.uwm.edu/whale/GlaciersWhatAre.html
14. http://geography.about.com/od/geographyintern/a/glaciers.htm
15. http://www.cliffsnotes.com/study_guide/Types-of-Glaciers.topicArticleId-9605,articleId-9518.html
16. http://www.angelfire.com/alt/bfeldman_geology115/Geology-pg3.htm
17. http://www.physicalgeography.net/fundamentals/104f.html
18. Principles of Geomorphology. W.D. Thornbury (1969) Wiley Eastern Ltd. New Delhi.
19. Indian Geomorphology. H.S. Sharma (1990) Concept Pub. Co., New Delhi
20. Physical Geology. Carlson, Diane H., David McGeary and Charles C. Plummer. New York City, McGraw-Hill Higher Education, 2001.

PRACTICALS

A3GEG005P: GEOCHEMISTRY AND VIVA

Analysis of Iron, Manganese and copper ores. Analysis of Limestone and Dolomites, Demonstration of working principles of AAS (Atomic Absorption Spectrophotometer), Flame Photometer, pH meter, Conductivity meter and other related analytical Instruments.

A3GEG006P: HYDROGEOLOGY AND VIVA

1. Morphometric analysis of basin
2. Problems on Rainfall Data
3. Preparation and interpretation of Hydrogeological maps
4. Interpretation of water quality data through calculations and graphical plots
5. Numerical Problems on aquifer properties

A3GEG007P: GEOSTATISTICS AND COMPUTER APPLICATION IN GEOLOGY AND VIVA

GEOSTATISTICS

1. Frequency distribution table and graphical representation of data
2. Measures of Central Tendency
3. Measures of Dispersion
4. Correlation studies – simple and bivariate

5. Regression Analysis

6. Principal Components Analysis (PCA)
7. Hierarchical Cluster Analysis

COMPUTER APPLICATION

1. Executing of HYCHEM Programme- Analysis of hydro geochemical data
2. Executing of GW_CHART-Plotting on Piper's diagram
3. Executing of PLOCHEM – Plotting on Piper;s Stiff diagrams
4. Executing of GWW (Ground Water for Windows) software
5. Calculation of Saturation Indices (SI) of mineral species using WATEQ4F programme
6. Analysis of electrical resistivity data using RESIST software
7. Analysis of electrical resistivity data sing IGIS VES software
8. Analysis of electrical resistivity data using IPI2 WIN software
9. Principal Component analysis using PCA software
10. Preparation of Rose Diagram using ROZETA software – for plotting structural data related to joints and faults.
11. Executing Aqua Chem software – Plotting Durov, Pie, Piper, Radial, Schoeller, Stiff Diagram

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F OURTH S E M E S T E R

A4GEG001T: MINERAL BENEFICIATION AND ENVIRONMENTAL GEOLOGY

UNIT – I

Principle and scope of Mineral Beneficiation. Properties of ores and minerals applied to Mineral Beneficiation. Sampling: Definition, purpose and types of sampling. Size reduction – Based on laws of Comminuition. Crushers and Grinders: Principle, Mechanism and Types. Sizing and Screening: Principles, Mechanism and Types. Principles of Concentration Processes: Gravity concentration, Jigging, Tabling, comparison of jigging and tabling. Liberation: Definition and importance. **15 Hours**

UNIT - II

Magnetic separators and electric separators. Flotation: Principles, Types and functions of Reagents. Dense Medium Separation: Principles, media preparation, Classification of DMS, types of dense medium separators and their Operation. Flow sheets of metallic ores: Gold, Copper, Lead and Zinc. Flow sheets of non-metallic ores: Barite and Coal. **15 Hours**

UNIT-III

Definition of Environmental Geology, Scope and objectives of environmental Geology Ecosystem, concepts of ecosystem: Energy transformation, Food chain, Stratification of biotic communities. Atmosphere: Major layers, Global temperature, Greenhouse effect, Greenhouse gases and their characters, Ozone depletion, CFC's emission, Sources of Air pollution, Overview of the global warming problems. Landslides: Definition, Types, Roles of different agents, recognizing areas prone to slope instability, ways to reduce incidence and severity of landslides. Floods: Definition, Types, Occurrence of floods, Anticipating and controlling of floods. Water Pollution: Definition, point and non-point sources of pollution. Pollution sources: Heavy metal pollution, Pesticide pollution, trace metals in waste water, DO, BOD, COD, Problems of Arsenic, Fluoride and Nitrate in groundwater. Steps for restoration of groundwater.

15 Hours

UNIT – IV

Earth quakes: Definition, magnitude and intensity of earthquakes, Forecasting of earthquake: Animal Sense, Science of forecasting palaeoquakes, Protecting from earthquakes: building construction, personal preparation, Official forecasts and public response, Earthquake hazards and Tsunamis. Volcanoes: Definition, Occurrence of volcanoes, Types of volcanoes, Forecasting eruption, volcanic hazards and benefits. Mining and Environment: Problems and issues as a result of mining industry, Geomorphological changes, Geohydrological changes, Biological changes, Cultural changes, Climatologically changes, Effect air quality, Noise pollution and vibrations and steps to mitigate the problems. **15 Hours**

BOOKS FOR REFERENCE:

A.M.Gaudin: Principles of Mineral Dressing
B.A.Wills: Mineral Processing Technology
S.K.Jain: Ore Processing
E.J.Pryor: Mineral Processing
A.F.Taggart: Text Book of Ore Dressing
A.F.Taggart: Hand Book of Mineral Dressing
Kelly & Spottiswood: Introduction to Mineral Processing

Robert.H.Richards, Charles Lock & R.Schumann : A Text Book of Ore Dressing

S.P.Mehrotra & P.Sarkar : Mineral Processing – Recent advances and future trends
R.P.King: Flotation
S.Venkatachalam & Degaleeson : Laboratory Experiments in Mineral Processing
A.K.Matis : Flotation Science and Engineering
Environmental Geology, C.W. Montgomery
Environmental Geology, Keller Bell and Howell, USA 1978
Environmental Geology, Indian Context K.S. Valdiya Tata MacGraw Hill 1987
Geological Hazards, Bell, F.G. Routledge, London, 1999
Natrual Hazarrds, Bryant E., Cambridge University, Press 1985
Text Book in Environmental Science V. Subramanian, Sarosa International 2001.
Environment Impact of Mining Down and Stokes.

A4GEG002T: GEOPHYSICAL EXPLORATION & GEOCHEMICAL EXPLORATION

UNIT-I

Introduction, Basic principles, Classification, Modes, and General field procedures of Geophysical Exploration. Introduction and classification of Electrical method, Electrical Resistivity Method basic principles, Measurement and Instruments used in Electrical Resistivity Method. Electrode configurations /arrays and types. Field procedures - VES & Profiling. Analysis and interpretation of Electrical Resistivity Data. Application of Electrical Resistivity Method of exploration. Introduction to Seismic Method exploration, fundamental principles of wave propagation. General principles and field procedures of reflection and refraction surveys. Shooting patterns seismic Method. Instruments used in seismic surveys. Application of Seismic Method of exploration. Basics of Well logging, Classification, and applications. **15 Hours**

UNIT-II

Magnetic Method of Exploration - Fundamental principles and Earth's Magnetism. Magnetic properties of Rocks and Minerals. Instruments-Types, working principles of Schmidt, Fluxgate, Proton precision and alkali vapour magnetometers. Field procedure, Magnetic Data reductions, Removal of regional effects, Interpretations of the data, Application of Magnetic method of exploration. Basics of Gravity Method of Exploration, Variation of Gravity over the surface of the earth. Instruments – types, working principles -Torsion Balance, Eotovos Torson Balance. Principles of gravimeter – Static type and Astatic type (Thyssen, La Coste-Romberg and Worden gravimeters). Field procedure, Various corrections applied to gravity data**,** Interpretation of the gravity data. Application of Gravity Method of exploration. Radioactivity methods - principle, instruments used, Interpretation of the data. **15 Hours**

UNIT-III

Introduction to Geochemical Exploration. History and present status of Geochemical Exploration. Geochemical cycle, Principles of Geochemical exploration. Geochemical environment, Geochemical Dispersion, Geochemical Mobility of elements, Factors controlling mobility, Hypogene Mobility and Supergene Mobility of elements. Association of Elements. Patterns of Geochemical distribution, and Geochemical anomalies. Primary dispersions and classifications, Syngenetic Patterns, Epigenetic Pattern. **15 Hours**

UNIT-IV

Secondary dispersion and classification, Syngenetic Patterns, Epigenetic Pattern. Anomalies in Residual overburden, Transported overburden, Natural water, and Drainage Sediment. Biogeochemical anomalies. Geochemical Soil surveys. Geochemical drainage survey. Biogeochemical Survey. Geobotanical indicators in mineral, Groundwater exploration and rock types. **15 Hours**

BOOKS RECOMMENDED:

1. Introduction to geophysical prospecting - Milton B Dobrin
2. Exploration geophysics – Jakaosku J
3. Outlines of geophysical prospecting-A manual for geologists–M B Ramachandra Rao
4. Geophysical Methods in Geology – P V Sharama
5. Exploration Geophysics for geologist and Engineers – Bhimasanakaran and Gaur
6. Principles of Applied Geophysics – D S Paransis
7. Introduction to Geophysics – C H Howel
8. Fundamentals of Geophysics - William Lowrie
9. Applied Geophysics – W. M. Telford
10. Geochemistry in Mineral exploration – Awkes H & Wobb J.S. Harper and Row New York.
11. Principles of Geochemical prospecting Ginzburg I.I. Pergaman Press. N.Y. London.
12. Geochemistry of rare and dispersed chemical elements in Society – Vimogroudev
13. Biochemical Methods of prospecting – Malyuga D.P. 5.
14. Geochemistry of epigenesis – Faibidge
15. Principles of Mining Geology – Arogyswamy
16. Geochemistry of epigenesist – Farbidge

A4GEG003T: PHOTO GEOLOGY, REMOTE SENSING AND GIS

UNIT –I

Photogeology; Definition, scope advantages and limitations of photogeology.Basic concepts of aerial photography; optical axis, vertical axis, pointing angle, Principal and Fiducial point, Flight line, overlap and sidelaps. Errors of Aerial photo; tilt, tip, drift and crab. Scale of photographs and its significance. Types of aerial photographs;On the basis of camera axis (vertical, low oblique and high oblique), scale of photographs, angle of coverage, films used in the camera (black and white, colour, infrared, color infrared (FCC)), lens system, multiband spectra (MSS), thermal infrared, Radar imagery and spectra zonal. Geometrical classifications of vertical and oblique photographs. Instruments for interpretation: Viewing instruments; lens and mirror stereoscopes. Measuring instruments; stereometer, parallax bar. Plotting instruments; sketch master and stereosketch.

UNIT –II

Criteria for photo interpretation: photographic tone, photographic texture and scale, shape and size of the objects, drainage pattern. Interpretation of Geological structures: factors which affect the photographic appearance of a rock**,** lineaments**,** faults, folds, dip slopes, unconformities, dikes and sills, domal structures. Interpretation of rocks and types of landforms: Igneous rocks- intrusive and extrusive igneous rocks. Sedimentary rocks- conglomerates, shales, sandstones, gravels, limestone. Metamorphic rocks- Gneisses, schist's.

REMOTE SENSING

UNIT –III

Remote sensing: Definition, scope, history and development of remote sensing. Remote sensing satellites, evolution of Indian remote sensing satellites, Electromagnetic spectrum and its parts. Spectral reflectance properties of common earth surface features: vegetation, soil, water and rock.

Radiation laws (Thermal emission laws): kirchchoff's law, plank's law, wein's law and Stefan-Boltzmann's law. Atmospheric effects and scattering. Sensing sensors: active and passive. Multi

band cameras, multi band video cameras, optomechanical scanners, modular multispectral scanners, land sat multispectral scanners, thermal mapper, Linear imaging self-Scanning sensors (LISS).

UNIT –IV

Earth Stations: Main reflector, servo system, feed, Low noise amplifier (LNA), down converter, tracking receiver, data demodulator, bit synchronizer. Principles and applications of Geographic Information System. Processing of remote sensed data: (A) Geometric correction: Earth rotation correction, line-length correction, detector offsets, band to band offsets, altitude variation, velocity change. (B) Radiometric correction and Atmospheric effects. Principles of microwave remote sensing and Digital Image processing technique. Application of remote sensing: spectral signature of rocks, significance of drainage analysis. Applications for lithologic discrimination: igneous, sedimentary and metamorphic rocks. Criteria for structural mapping: attitude of beds, folds, linear features, unconformities. Classification of land use and land cover systems and classification for use with remote sensor data.

Books recommended

1. Photogeology, Milder, V.C. Mc. Graw Hill
2. Manual of photogrammetry M.M. Thomposn
3. Remote Sensing Principles and application. A.N. Patel and Surendra Singh.
4. Manual of Remote Sensing Robert G. Reevers.
5. Remote Sensing Principles and applications Sabbins, F.F. Free man1985
6. Image interpretation in Geology, Drury, S.A. Allen and Unwin 1987.
7. Photogrammetry Moffit F.H. and Mikhail. E.M. Harper and row 1980.
8. Aerial photography and image interpretation for Resource Management. Paine, D.P.Jhn Wiley, 1981.
9. Remote Sensing Geology, Gupta, M.R.P. Springer, Verlag, 1990.
10. Principles and Applications of Photogeology. Pandely, S.N. Wiley Eastern, New Delhi 1987.
11. Aerial Photographs in Geological Interpretation and Mapping Ray, R.G. Usgs Prof. papers.
12. Geographic Information Systems, Author – Pratap, Rana, Year 2006 Geographic Information Systems an Spatial Analysis in Veterinary Science, Author- Durr, P. & A Gatrell Year 2004.
13. Geoinformatics for Environmental Management, Authour Reddy, M. Anji, Year 2004, Rs. 895/-
14. GIS Application for water waste and Stromwater systems, Author – Shamsi, U.M. Year 2005.
15. GPS Principles and Applications, Author-Ganesh.A. & R. Narayankumar, Year 2006.
16. Remote Sensing and Geographical Information System :An introduction : Author-Reddy, M Anji Year 2000.
17. The Science of Earth, Authour Bonney T.G. Year 2004
18. Sensors and Environmental Applications of Remote Sensing, Author- Askne, Jan Year 2005
19. The Social Implication of Geographic Information Systems, Author Pickels, John Year 2006.
20. Textbook of Remote Sensing and Geographic Information Systems 3rd edn. Author- reddy,

M Anji year 2006
21. Trends in geographical Remote Sensing / Ramaswamy S M Year 1996

22. Remote Sensing and Urban analysis ; Edited by Jean Paul Donny, Mike J Barsley & Paul Alongley. Pub: Taylo and Frances: ISBN: 0748408606
23. Introduction of Environmental Remote Sensing 4th ed. Eric Chales Barrelt and Leonard F Curtis.
24. Waste land mapping in India, Goutam N.C. and L. R.a. Narayan, pink publishing house.
25. Geo-interpretation Model for Land- cover / Land-use classification Jiancheng, Z.C.L. and H.Lin, 1999.
26. Suggested land use/land cover classification system for Indian sing remote sensing technique: Gautam N.C. and Narayan L.R.A. Pink publishing house, Mathura.
27. Remote Sensing and Urban Analysis: Edited by Tem-Paul Donnay Taylor and Frances
28. Introduction of Environmental remote sensing Eric Charles Barelt Rontledge 4 edn.
29. Remote Sensing in hydrology and water management by Schultz.
30. Hydrological application of GIS by Gurnell.
31. Remote sensing in hydrology & water management by Schultz.
32. Introduction to remote sensing - Jams B Campbell. 3rd ed.
33. Remote sensing and Urban analysis / edited by Jean – Paul Donny Michael J. Barnsley Paul A Logley. London
34. Remote sensing for sustainable forest management/Steven E. Franklin, Boca Raton
35. Fundamentals of Remote Sensing and air photo > interpretation / Thomas Eugene Avery
36. Remote sensing for soil survey/L.P. White
37. Manual of aerial photography/Ron Graham, Roger E Read
38. Remote sensing and Geographical information system Author Chandra A.M. Year 2006
39. Introduction Digital Image Processing A Remote Sensing Perspective Author Jensen Prentice Hal Publication
40. Remote Sensing in Water Resources Author Ramaswamy S.M. Rawat Publishers

41. Remote Sensing of the Environment: An Earth Resources Perspective (2rd Edition) Author by John R Jense Publishers Prontice Hall $ 113.33
42. Introduction to Remote Sensing, 3 Edition Author-james B Campbell Year 2002
43. Remote Sensing and Urban Analysis GISDATA, Author J.P. Donnay, Mike Barnsley and Paul Longle Publishers John Wiley $119.95 44.

44. Physical Principles of Remote Sensing (Topics in Remote Sensing), Author W.G.Rees
45. Urban Remote Sensing, Author-Qihao Weng and Dale A Quattrochi year 2006
46. Manual of Remote Sensing, Remote Sensing for Natural Resource Management and Environmental Monitorian (Manual of Remote Sensing-3d edition), Author - Susan Ustin

47. Introduction to Remote Sensing 2nd edition Year 2007 author Arthur P. Cracknell and Ladson Hayes

48. Handbook of Aerial Photography and Interpretation year Jun 1999, Author K.K. Rampal

49. Acrial Photography (Teachers Gudie) Jan 2002, Author Laurel Tilbury and Mike Corbishley

50. Digital Photogrammetry: A Practical Course, Author Wilfried Linder year Mar 8. 2006

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A4GEG004P: PROJECT/DISSERTATION

Geological Field Work, Geological Study Tour and Project Work & Viva

PRACTICALS

A4GEG005P: MINERAL PROCESSING PRACTICAL

1. Size Reduction: Jaw crushers; Roll crushers, Ball mill and Rod mills.
2. Angle of nip and ratio between size of feed and size of product.
3. Ball and Rod mills: Size analysis of ground material & their graphical representation.
4. Study of settling rate of solids with reference to Stoke's law and Rittinger's law.
5. Froth flotation experiments using Denver flotation.
6. Calculation of ratio of concentration and recovery percentages

A4GEG006P: EXPLORATION GEOPYSICS AND VIVA

1. Practical training to the students on various geophysical instruments and techniques, field setup and collection of geophysical data.
2. Electrical resistivity technique – determination of resistivity and thickness of subsurface layers (VES) – Preparation of geoelectrical cross sections and their interpretation.
3. Computation of thickness / depth of beds and velocity of seismic waves by refraction and reflection methods for single- and two-layer horizontal discontinuity.
4. Computation of magnetic intensity due to buried magnetic ore bodies. Case study of magnetic anomalies.
5. Computation of gravity anomaly, gravity gradient and gravity curvature due to buried ore body. Case study of gravity anomalies.

A4GEG007P: PHOTOGEOLOGY AND REMOTE SENSING

Experiments used in Photogeology and remote sensing. Stereoscopic study of aerial photographs. Interpretation of aerial photographs, (Geomorphological, structural and lithological). Study of satellite Imageries and their visual Interpretation (Geomorphological, structural and lithological).

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