UNIVERSITY DEPARTMENT OF GEOLOGY NILAMBER-PITAMBER UNIVERSITY MEDININAGAR, PALAMU – 822101 JHARKHAND, INDIA

C.B.C.S. Curriculum for M.Sc. GEOLOGY PROGRAMME Subject Code- GEOL For Post Graduate Courses Under Nilamber-Pitamber Unniversity

स्त्र्यविद्यालय

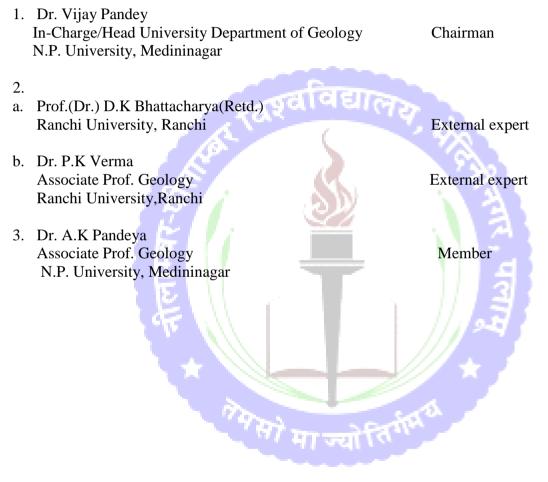
NILAMBER-PITAMBER UNIVERSITY MEDININAGAR, PALAMU-822102 JHARKHAND, INDIA

^{लेभ}सो मा ज्योरि



UNIVERSITY DEPARTMENT OF GEOLOGY N.P UNIVERSITY, MEDININAGAR, PALAMU- 822102 (JHARKHAND)

UNIVERSITY DEPARTMENT OF GEOLOGY N.P UNIVERSITY, MEDININAGAR BOARD OF STUDIES FOR M.Sc. GEOLOGY



In-Charge/Head University Department of Geology Nilamber-Pitamber University Medininagar

Contents

S.No	Descriptions	Page No.
1	Members of Board of Studies	2
2	Contents	3
3	COURSE STUCTURE FOR M.Sc. Geology PROGRAMME	4-5
4	Semester Wise Examination Structure for Mid Sem & End Sem Examinations	6
5	Marks Weightage and Scheme of Examination	7
	SEMESTER-I	
6	FOUNDATION COURSE [FCGEOL-101]	8-9
7	CORE COURSE [CC-1]	10-11
8	CORE COURSE [CC-2]	12-13
9	CORE COURSE [CC-3P]	14
	SEMESTER-II	
10	ELECTIVE COURSE [(SE) EC-1A]	15
11	ELECTIVE COURSE [(SE) EC-1B]	16
12	ELECTIVE COURSE [(SE) EC-1C]	17-18
13	ELECTIVE COURSE [(SE) EC-1D]	19-20
14	ELECTIVE COURSE [(SE) EC-1E]	21-22
15	CORE COURSE [CC-4]	23-24
16	CORE COURSE [CC-5]	25-26
17	CORE COURSE PRACTICAL [CC-6(P)]	27
	SEMESTER-III	
18	CORE COURSE [CC-7]	28-29
19	CORE COURSE [CC-8]	30-31
20	ELECTIVE [EC-2A]	32-33
21	ELECTIVE [EC-2B]	34
22	ELECTIVE [EC-2C]	35-36
23	ELECTIVE [EC-2D]	37-38
24	ELECTIVE [EC-2E]	39-40
	ELECTIVE [EC(P)-3A]	
	ELECTIVE [EC(P)-3B]	
25	ELECTIVE [EC(P)-3C]	41-42
	ELECTIVE [EC(P)-3D]	
	ELECTIVE [EC(P)-3E]	
	SEMESTER-IV	
26	CORE COURSE [CC-9]	43-44
27	ELECTIVE [EC-4A]	45-46
28	ELECTIVE [EC-4B]	47-48
29	ELECTIVE [EC-4C]	49-50
30	ELECTIVE [EC-4D]	51-52
31	ELECTIVE [EC-4E]	53-54
32	ELECTIVE [EC(P)-5A]	55
33	ELECTIVE [EC(P)-5B]	56
34	ELECTIVE [EC(P)-5C]	57
35	ELECTIVE [EC(P)-5D]	58
36	ELECTIVE [EC(P)-5E]	59
37	Project [CC10 Project]	60

3

Semester wise Distribution of Courses

M.Sc. (CBCS) Programme in Geology with Practical Table-I: Course Structure for M.Sc. Programme in Geology

Semester	Courses	Paper	Course Code	Credit	Hrs/Week
	Foundation Course	FC	FCGEOI-101	5	5(L)+1(T)
	Core Course	CC1	CCGEOL-101	5	5(L)+1(T)
Ist	Core Course	CC2	CCGEOL-102	5	5(L)+1(T)
	Practicals on Core Course	ССЗ-Р	CCGEOL-103 P	5	10
	Ability Enhancement Course	EC1	ECGEOL-201	5	5(L)+1(T)
	Core Course	CC4	CCGEOL-204	5	5(L)+1(T)
IInd	Core Course	CC5	CCGEOL-205	5	5(L)+1(T)
	Practicals on Core Course	CC6-P	CCGEOL-206 P	5	10
	Core Course	CC7	CCGEOL-307	5	5(L)+1(T)
	Core Course	CC8	CCGEOL-308	5	5(L)+1(T)
IIIrd	Elective (GE/DC)	EC2	ECGEOL- 302	5	5(L)+1(T)
	Practicals on Elective (GE/DC)	EC3-P	ECGEOL-303 P	5	10
	Core Course	CC9	CCGEOL- 409	5	5(L)+1(T)
	Elective (GE/DC)	EC4	ECGEOL- 404	5	5(L)+1(T)
IVth	Practicals on Elective (GE/DC)	EC5-P	ECGEOL-405 P	5	10
	Project/Dissertion	CC10	CCGEOL-410	5	10

P.G. GEOLOGY Table-II: GEOLOGY, M.Sc. Semester-I

1.15

Paper	Paper Code	Course Name	
FC	Compulsory, FCGEOL-	G <mark>eo</mark> tectonic and	
	101	Str <mark>u</mark> ctural Geology	
CC-1	Core Course - CCGEOL-	Stratigraphy and	
	101	Paleobiology	
CC-2	Core Course-CCGEOL-	Crystallography and	
	102	Descriptive	
57		Mineralogy	
CC-3 (P)	Core Course (P) -	Practical	
	CCGEOL-103P	///	

GEOLOGY, M.Sc. Semester-II

Paper	Paper Code	Course Name	
AE-EC-1	Select one Elective course fr Groups	from the following Electiv	
	ECGEOL-201, Group-A	Fossil Fuel Geology	
	ECGEOL-201, Group-B	Sedimentary	
	ECGEOL-201, Group-C	Hydrology	
	ECGEOL-201, Group-D	Ore Geology	
	ECGEOL-201, Group-E	Environment Geology	
CC-4	Core Course - CCGEOL- 204	Geochemistry and Igneous Petrology	
CC-5	Core Course - CCGEOL- 205	Sedimentary and Metamorphic Petrology	
CC-6 (P)	Core Course - CCGEOL- 206 P	Practical	

Paper	Paper Code	Course Name		
CC-7	Core Course -	Geomorphology and		
	CCGEOL307	Remote Sensing in Geology		
CC-8	Core Course - CCGEOL308	Economic Geology		
GE/ DC Course, EC-2				
	Select one Elective GE/ DC course from the following			
	Groups:			
	ECGEOL-302, Group-A	Fossil Fuel Geology		
	ECGEOL-302, Group-B	Sedimentary		
	ECGEOL-302, Group-C	Hydrology		
	ECGEOL-302, Group-D	Ore Geology		
	ECGEOL-302, Group-E	Environmental		
		Geology		
EC-3 (P)	ECGEOL-303-P	Practical		

GEOLOGY, M.Sc. Semester-IV

Paper	Paper Code	Course Name				
CC-9	Core Course - CCGEOL-	Hydrology,				
1.10	409	Engineering Geology,				
128		Environment				
		G <mark>eo</mark> logy, Mining				
		Geology				
Elective GE/ DC,EC- 4						
	Select one Elective GE/ DC	Select one Elective GE/ DC course from the following				
	Groups:	Groups:				
	ECGEOL-404, Group-A	Fossil Fuel Geology				
47	ECGEOL-404, Group-B	Sedimentary				
	ECGEOL-404, Group-C	Hydrology				
	ECGEOL-404, Group-D	Ore Geology				
	ECGEOL-404, Group-E	Environmental				
		Geology				
EC-5 (P)	ECGEOL 405-P	Practical				
EC-3(1)						

DISTRIBUTION OF CREDITS FOR POSTGRADUATE M.Sc. PROGRAMME

Table: III Semester wise distribution of 80 credits for subjects with practical

Semester	CC	FC and AE	GE/ DC/ EC	Project	Total Credits
Semester I 15 (05			20
Semester II	Semester II 15 05				20
Semester III 10			10		20
Semester IV 05		10	05	20	
	45	10	20	05	80

Table: IV Semester wise Examination Structure for Mid Sem & End Sem Examination:

Sem						amination Structure	
	Courses	Course Code	Credit	Name of paper	Mid Semester Evaluation(F.M.)	End Semester Evaluation(F.M.)	End Semester practical/ /Field work / Viva (F.M.)
Ι	Foundation Course	FCGEOL101	5	Geotectonics and Structural Geology	30	70	
	Core Course	CCGEOL101	5	Stratigraphy and Palaeobiology	30	70	
	Core Course	CCGEOL102	5	Crystallography and Descriptive Mineralogy	30	70	
	Practicals on Core	CCGEOL103(P)	5	Practical			70+30
II	Ability Enhancement Course	ECGEOL201	5	Group A, B, C, D and E Select one Elective Course Group	30	70	
	Core Course	CCGEOL204	5	Geochemistry and Igneous Petrology	30	70	
	Core Course	CCGEOL205	5	Sedimentary and Metamorphic Petrology	30	70	
	Practicals on Core	CCGEOL206(P)	5	Practical based on CCGEOL-204 & CCGEOL- 205	(X)		70+30
III	Core Course	CCGEOL307	5	Geomorphology and Remote Sensing in Geology	30	70	
	Core Course	CCGEOL308	5	Economic Geology	30	70	
	Elective GE/ DC Course	ECGEOL302	5	Group A, B, C, D and E Select one Elective Course Group	30	-70	
	Practical on Elective GE/ DC Course	ECGEOL303(P)	5	Practical	// ••	7	70+30
IV	Core Course	CCGEOL409	5	Hydrology, Engineering Geology, Environment Geology, Mining Geology	30	70	
	Elective GE/ DC Course	ECGEOL404	5	A. Fossil Fuel Geology B. Sedimentology C. Hydrogeology D. Ore Geology E. Environmental Geology	30	70	
	Practical on Elective GE/ DC Course	ECGEOL405(P)	5	A. Fossil Fuel Geology B. Sedimentology C. Hydrogeology D. Ore Geology E. Environmental Geology			70+30
	Core Course	CCGEOL410	5	Project Work/Dissertation			70+30

N.P UNIVERSITY

SEMESTER I

4 Papers

Total 100 x 4 = 400 Marks

Theory: 60 Hours; Tutorial: 15 Hours

PAPER –I FOUNDATION COURSE

[FCGEOL101]: (Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GEOTECTONICS AND STRUCTURAL GEOLOGY

Unit 1:

Study of seismic waves – structure and composition of the earth – Radioactivity – Basic concept of palaeomagnetism Major tectonic features of the earth-shield areas, mobile belts, rift valleys, mid oceanic ridges, continental shelves and slopes, submarine canyons.

Unit 2:

Plate Tectonics: concept, geological and tectonic environment of Plate boundaries, Sea Floor Spreading, Island arcs, Hydrothermal vents; Orogeny and orogenic cycles – Epeirogeny and evolution of plateaus. Structural and tectonic features of India. Tectonic framework of India; Structure and Origin of the Himalaya. Quaternary tectonics

Unit 3:

Mechanical principles of rock deformation; Concept of stress, strain and the resulting ellipsoids; Factors controlling behavior of rock material. Folds, Recognition, mechanics and causes of folding – Recognition of top and bottom of beds; Faults, recognition criteria and mechanics of faulting; Joints- Quantitative and qualitative classification of joints; Unconformities – types, recognition, significant distinction from faults and their use in dating structural events.

Unit 4:

Cleavage, Schistosity and Lineation – their description, origin and relation to major structures. Petrofabric analysis – Field and laboratory techniques – petrofabric diagrams land their interpretation. Classification and characteristics of Tectonites, Diapirs and related structural features.

Unit 5:

Toposheets:-definition, scale, reading various components of a toposheet. Geological map -definition, various components of a geological map including scale, legend, structures etc. Geological Field work instruments, Use of clinometer compass, Brunton compass, strike and dip measurements; Sampling and oriented sample and its significance; Geological mapping of igneous, sedimentary and metamorphic terrains. GPS and its applications in Geology.

Suggested Books:

- □ Condie, Kent. C. (1982): Plate Tectonics and Crustal Evolution, Pergamon Press Inc.
- □ Gass I.G. (1982): Understanding the Earth. Artemis Press (Pvt) Ltd. U.K.
- □ Ghosh, S.K. (1993): Structural Geology: Fundamental and Modern Development. Pergamon Press.
- □ Hobbs, B.E., Means, W.D. and Williams, P.F. (1976): An outline of Structural Geology, John Wiley and Sons, New York
- Naqvi, S.M.(2005)Geology and Evolution of the Indian Plate (From Hadean to Holocene 4Ga to 4 Ka) GSI, Bangalore
- □ Ramsay, J.G. (1967): Folding and fracturing of rocks, McGraw Hill.
- □ Windley B. (1973): The Evolving continents, John Wiley and Sons, New York.
- □ N.J. Price and J.W. Cosgrove (1990) Analysis of Geological Structures, Cambridge University Press
- □ Ragan, Donal M.: Structural Geology, Cambridge University Press
- □ Whitten, E. H. Timothy (1966) Structural geology of folded rocks. Chicago: Rand McNally,
- George H. Davis (2011) Structural Geology of Rocks and Regions, John Wiley and Sons
- □ Fossen H (2010) Structural Geology, Cambridge University Press

मितिस्ति सिंहितिस्ति सिंहित्य सि

SEMESTER I

PAPER –II CORE COURSE [CCGEOL101]: (Cre

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

STRATIGRAPHY AND PALAEOBIOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Principles of Statigraphy; Concept of Lithofacies and Biofacies; Stratigraphic Correlation; Concepts of Magnetostratigraphy and Sequence stratigraphy. Precambrian Stratigraphy of Dharwar and Singhbhum-Chotanagpurcraton; Proterozoic stratigraphy -tectonic framework, geological history and evolution of Vindhyan Super Group, Cuddapahs and their equivalents;

Unit 2

Palaeozoic stratigraphy: Palaeozoic formations of India with special reference to type localities, history of sedimentation, fossil content; Concept, classification, lithology, life and age of Gondwana supergroup ; Mesozoic formations of India with special reference to type localities, history of sedimentation, fossil content; Tertiary formations of NortheasternIndia, Siwalik Group; Stratigraphic boundary problems – Pre Cambrian-Cambrian (P/C),Permian-Triassic(P/Tr) and Cretaceous –Tertiary (K/T)boundaries.

Unit 3

Study of Ichno fossils; Taphonomy and preservation. Morphology, classification, biostratigraphy and evolutionary trends of Trilobites, Brachiopods, Bivalves, Cephalopoda, Gastropods and Echinoids.

Unit 4

Vertebrate and its classification. Evolutionary trends in Equidae, Proboscidae and Man; Siwalik mammals and their causes of extinction;

Unit 5

Micropalaeontology; Foraminifera, diamorphism, morphology and biostratigraphy; Gondwana flora and their significance, Palynology, types of Gondwana palynomorphs and its importance; Microfossils and their significance in oil exploration

P.G. GEOLOGY Suggested Books:

- □ A.Sahni, (1996), Cretaceous Stratigraphy and Palaeoenvironments. GSI, Bangalore
- D Boggs, S. (2001): Principles of Sedimentology and Stratigraphy, Prentice Hall.
- Danbar, C.O. and Rodgers, J. (1957): Principles of Stratigraphy, John Viley and Sons.
- Doyle, P. and Bennett. M.R. (1996): Unlocking the Stratigraphic Record, John Viley and Sons.
- □ Krishnan, M.S. (1982): Geology of India and Burma, C.B.S. Publ. and Distributors, Delhi.
- □ M. Ramakrishnan & R. Vaidyanadhan (2008)Geology of India (Vol. 1& 2) GSI, Bangalore
- □ T.M.Mahadevan (2002),Gology of Bihar and Jharkhand. GSI, Bangalore
- □ Naqvi, S.M. and Rogers, J.J.W. (1987): Precambrian Geology of India, Oxford University Press.
- Naqvi, S.M.(2005)Geology and Evolution of the Indian Plate (From Hadean to Holocene 4Ga to 4 Ka) GSI, Bangalore
- □ Pascoe, E.H. (1968): A Manual of the Geology of India and Burma (Vols.I-IV), Govt. of India Press, Delhi.
- Demorol, C. (1982): The Cenozoic Era? Tertiary and Quaternary, Ellis Harwood Ltd., Halsted Press.
- □ Schoch, Robert, M. (1989): Stratigraphy: Principles and Methods, Van Nostrand Reinhold, New York.
- Deardman, R.S., Cheethan, A.M. and Rowell, A.J. (1988): Fossil Invertebrates, Blackwell.
- □ Clarksons, E.N.K. (1998): Invertebrate Paleontology and Evolution, Allen and Unwin, London.
- □ Horowitz, A.S. and Potter, E.D. (1971): Introductory Petrography of Fossils, Springer Verlag.
- □ Mayr, E. (1971): Population, Species and Evolution, Harvard.
- Prothero, D.R. (2004): Bringing Fossil to Life An Introduction to Paleontology (2nd Ed.), McGraw Hill.
- □ Raup, D.M. and Stanley, S.M. (1985): Principles of Paleontology, CBS Publ.
- □ Romer A.S.(1959)The Vertebrate Story, Univ. of Chicago Press
- □ Smith, A.B.(1994): Systematics and Fossil Record Documenting Evolutionary Patterns, Blackwell.
- □ Strean, C.W. and Carroll, R.L. (1989): Paleontology the record of life, John Wiley
- □ Shrock R.R.(1953)Principles of Invertebrate Paleontology, Mc Graw Hill Book Co.
- □ Alfred Traverse (1988): Paleopalynology, Unwin Hyman, USA.
- Arnold (2002): Quaternary Environmental Micropaleontology (Ed. Simon K. Haslett), Oxford University Press, New York.
- □ Bignot, G., Grahm and Trottman (1985): Elements of Micropaleontogy, London.



लेखसो मा ज्योतिर्भाष

SEMESTER I

PAPER –III CORE COURSE [CCGEOL102]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

CRYSTALLOGRAPHY AND DESCRIPTIVE MINERALOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit 1

External symmetry of crystals: Symmetry Elements, methods of projectio, Hermaun Muguin notation. Internal symmetry of crystals: Derivation of 230 space groups, diffraction of crystals by X-rays, Braggs' law.

Unit 2

Principles of optical mineralogy: polarized light, behaviour of isotropic and anisotropic minerals in polarized light, refractive index, pleochroism, double refraction, birefringence, sign of elongation, interference figures, 2V, dispersion in minerals. Optic sign determination of Uniaxial and Biaxial minerals.

Unit 3

Principles of crystal chemistry; Chemical bonds, ionic radii, Coordination principle, Radius ratio; Principles of ionic substitution in minerals; Isomorphism, Exsolution ,Polymorphism, Pseudomorphism; Introduction to XRF,XRD and Electron Probe Microanalysis

Unit 4

Structural classification of silicate minerals; Description of chemistry, optical and physical properties, and paragenesis of the following mineral groups: Olivine group, Garnet Group, Epidote group, Pyroxene group, Amphibole group

Unit 5

Description of chemistry, optical and physical properties and paragenesis of the following mineral groups: Mica group, Chlorite group and clay minerals, Quartz group, Feldspar group, Feldspathoids and Zeolites.

Suggested Books

- Dexter Perkins, 2003 Mineralogy, Pearson Education Private ltd.
- □ Carmelo Giacovazzo, 2002 Fundamentals of crystallography, Oxford University Press
- □ Boris Konstantinovich Vaĭnshteĭn, 1994 Modern Crystallography: Fundamentals of crystals, symmetry and methods of structural crystallography, Springer
- □ William D. Nesse, 2009 Introduction to Mineralogy, Oxford University Press
- □ Dana, E.S. 1955 Text Book of mineralogy, Wiley
- □ Wade, F.A. and Mattox, R.E 1960 Elements of crystallography and Mineralogy, Harmer and brods.
- □ Philips, P.C. 1971 An introduction to Crystallography, John Wiley
- □ Winchell, A.N. 1968 Elements of optical Mineralogy, parts, I & II Wiley Eastern
- Berry, L.G. and Mason B, Dietrich. 1983 Mineralogy- Concept, Descriptions Determinations, Freeman
- □ Burerger, M.J. 1956 Elementary Crystallography, Wiley
- □ Heinrich, E.W. 1965 Microscopic identification of Minerals McGraw Hill
- □ Naidu, P.R.J. C.S. 1971 Johansen's optical mineralogy, Allied
- □ Haribury, C.S. 1971 Dana's Manual of Mineralogy, Wiley.
- Deer, W.A. Howie, R.A. & Zussman, J 1992 Rock forming Mineralogy Vols. 1 to 5, Longmans.
- □ Hammond, C. 1990. Introduction to Crystallography. Oxford: Oxford University Press.
- □ Klein, C. 2002. Manual of Mineral Science. 22nd edition. New York: John Wiley and Sons.



SEMESTER I

PAPER IV CORE COURSE PRACTICAL [CCGEOL103(P)]: (Credits: Practical-05)

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Marks

Pass Marks =45

Instruction to Question Setter:

End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

PRACTICAL

Practical: 60Hours

- Completion of outcrops in given maps;
- Structural problems by Stereographic Net;
- Plotting of Geological Sections;
- Mineral formulae, calculation of important rock forming mineral groups;
- Microscopic identification of important rock forming minerals;
- Determination of Optic Sign of Uniaxial and Biaxial Minerals;
- Determination of pleochroic scheme;
- Determination of An content in Plagioclase felspars;
- Study of rocks in hand specimens from known Indian stratigraphic horizons and type localities;
- Megascopic study of Invertebrate fossils;
- Study of Molar tooth of important vertebrate fossils;
- Study of morphological characters of selected microfossils;
- Megascopic study of Plant Fossils;
- Study of morphological characters of selected palynomorphs

M.Sc. Semester II Ability Enhancement Course Code ECGEOL201 Select One elective from the following Elective Groups: Group A: Fossil Fuel geology Group B: Sedimentology Group C: Hydrogeology Group D: Ore Geology Group E: Environmental Geology

Total 100 x 4 = 400 Marks

PAPER V ELECTIVE COURSE CODE [ECGEOL201A]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components; a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP A. FOSSIL FUEL GEOLOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit 1

Definition and origin of coal, sedimentology of coal bearing strata; Mode of occurrence and structures of coal; Coal forming epochs in the geological past;

Unit2

Physical and chemical characterization of coal; Proximate and Ultimate analysis of coal; Rank, grade and types of coal; Types of coking and non-coking coals; Classification of Coal

Unit 3

Macroscopic and microscopic examination of coal, Concepts of Macerals and Microlithotypes, Origin and classification of macerals, Concept of coal rank; Application of Coal Petrology

Unit 4

Basics of Coal Bed Methane, coal as it sreservoir- its exploration and production; Application of microscopic methods for C.B.M. prospecting; Gas Hydrates, Shale gas.

Unit 5

Microscopic techniques for evaluation of rank, Palaeoenvironmental study and characterization of coal for carbonization, gasification and hydrogenation processes.

Suggested Books

- □ Chandra, D., Singh, R.M. Singh, M.P. (2000): Textbook of Coal (Indian context), Tara Book Agency, Varanasi.
- □ Scott, A.C. (1987): Coal and Coal-bearing strata: Recent Advances, Blackwell Scientific Publications.
- □ Singh, M.P. (1998): Coal and organic Petrology, Hindustan Publishing Corporation, New Delhi.
- □ ,G.H., Teichmuller, M., Davis, A., Diessel, C.F.K., Littke, R. and Robert P. (1998): Organic Petrology, Gebruder Borntraeger, Stuttgart.
- □ Thomas, Larry (2002): Coal Geology, John Wiley and Sons Ltd., England.
- □ Van Krevelen Stach;, E., Mackowsky, M-Th., Taylor, G.H., Chandra, D., Teichumullelr, M. and Teichmuller R. (1982): Stach Textbook of Coal Petrology, Gebruder Borntraeger, Stuttgart.

Taylor, D. W. (1993): Coal : Typology-Physics-Chemistry-Constitution), Elsevier Science, Netherlands

SEMESTER II

PAPER V ELECTIVE COURSE CODE [ECGEOL201B]:

(Credits: Theory-04, Tutorial-01)

Theory: 60 Hours; Tutorial:15 Hours

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

ब्रावद्याल

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP B. SEDIMENTOLOGY

Unit-1

Sedimentary textures - shape, size, fabric and surface textures, methods of textural analysis, textural parameters and their significance. Framework, matrix and cement of terrigenous sediments.

Unit 2

Sedimentary structures: classification, genesis and significance Primary structures, palaeocurrent analysis. Biogenic and chemical sedimentary structures; . Use of structures and textures in basin studies

Unit 3

Origin of sediments and sedimentary rocks, Lithification and diagenesis.

Unit-4

Petrogesis of sandstones, Graywacke and graywacke problem; plate - tectonics and sandstones composition;

Argillaceous rocks, their classification and genesis.

Unit-5

Carbonates: Minerlogy, chemistry, texture and classification of Limestones; Diagenesis of Limestone in various diagenetic realms, change in mineralogy, fabric, chemistry and petrophysical characteristics; Study of evaporites such as gypsum, anhydrite and halite

Suggested Books:

- □ Blatt, H., Middleton, G.V. and Murray, R.C. (1980): Origin of Sedimentary Rocks, Prentice-Hall Inc.
- □ Collins, J.D., and Thompson, D.B. (1982): Sedimentary Structures, George Allen and Unwin, London.
- Lindholm, R.C. (1987) A Practical Approach to Sedimentology, Allen and Unwin, London.
- □ Pettijohn;, F.J. (1975): Sedimentary Rocks (3rd Ed.), Harper and Row Publ., New Delhi.
- □ Reading, H.G. (1997): Sedimentary Environments and facies, Blackwell Scientific Publication.
- □ Reineck, H.E. and Singh, I.B. (1973): Depositional Sedimentary Environments, Springer-Verlag.
- □ Selley, R. C. (2000) Applied Sedimentology, Academic Press.
- □ Tucker, M.E. (1981): Sedimentary Petrology: An Introduction, Wiley and Sons, New York.
- □ Tucker, M.E. (1990): Carbonate Sedimentolgy, Blackwell Scientific Publicatio

SEMESTER II

PAPER V ELECTIVE COURSE CODE [ECGEOL201C]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

बवावद्याल

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP C. HYDROGEOLOGY

Unit 1

Hydrologic Cycle, Distribution of water in Earth crust, Groundwater in hydrologic cycle; Ground water, origin, types, importance; Aquifer, their types and characteristics; Hydrologic properties of aquifer materials: porosity; permeability; specific yield; specific retention, hydraulic conductivity, transmissivity, storage coefficient;

Unit 2

Forces and laws of groundwater movement; Darcy law and its application in hydrogeology; Confined, unconfined, steady, unsteady and radial flows of groundwater; Methods of pumping test and evaluation of aquifer parameters. Springs: types, origin and movement of water; Water Table map and its significance;

Unit 3

Hydrographic analyses, Water budget studies; Water resource inventory of the basin; Consumptive and conjunctive use of surface and groundwater; Causative factors for Water Table fluctuation. Wells: types, drilling methods, construction, design and development of wells;

Unit4

Physical and Chemical characteristics of groundwater. Interpretation of chemical analysis. Relationship of quality to use. Ground water pollution; Sources of surface and subsurface pollution; Control of ground water pollution

Unit 5

Chemical characteristics of groundwater in relation to various uses – domestic, industrial and irrigation; Water contaminants and pollutants, natural (geogenic) and anthropogenic contaminants; Saline water intrusion in coastal and other aquifers and its prevention; Groundwater contamination and problems of



Theory: 60 Hours; Tutorial:15 Hours

arsenic and fluoride in Indian subcontinent with special reference to Jharkhand .

Suggested Books

- □ C.F. Tolman (1937): Groundwater, McGraw Hill , New York and London.
- D.K. Todd (1995): Groundwater Hydrology, John Wiley and Sons.
- □ F.G. Driscoll (1988): Groundwater and Wells, UOP, Johnson Div.St.Paul. Min. USA.
- □ H.M. Raghunath (1990): Groundwater, Wiley Eastern Ltd.,
- □ H.S. Nagabhushaniah (2001): Groundwater in Hydrosphere (Groundwater hydrology), CBS Publ..
- □ K. R. Karanth (1989): Hydrogeology, Tata McGraw Hill Publ..
- □ S.N. Davies and R.J.N. De Wiest (1966): Hydrogeology, John Wiley and Sons, New York.
- □ Patra, H. P., Adhikari, Shyamal Kumar, Kunar, Subrata(2016)Groundwater Prospecting and Management, Springer
- □ Jakeman, A.J., Barreteau, O., Hunt, R.J., Rinaudo, J.-D., Ross, A. (2016) Integrated Groundwater Management:Concepts, Approaches and Challenges, Springer
- □ Ramanathan, A., Johnston, S., Mukherjee, A., Nath, B. (Eds.)2015, Safe and Sustainable Use of Arsenic-Contaminated Aquifers in the Gangetic Plain
- □ A Multidisciplinary Approach; Springer
- C.W. Fetter Jr. (2016) Applied Hydrogeology (4th Edition) 4th EditionPearson Education Ltd.
- □ Kevin M. Hiscock(2009)Hydrogeology: Principles and Practic, Wiley-Blackwell
- □ Singhal, B.B.S. Gupta R.P.(2010)Applied Hydrogeology of Fractured Rocks, Springer





SEMESTER II

PAPER V ELECTIVE COURSE CODE [ECGEOL201D]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP D. ORE GEOLOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit-1

Ore deposits and ore minerals. Classification of ore deposits. Magmatic processes of mineralization. Porphyry, skarn and hydrothermal mineralization.

Unit-2

Structure and texture of ores, Paragenesis, Controls of ore localisation. Spatial and temporal distribution of ore deposits.

Unit-3

Plate tectonics and ore genesis. Ore bearing fluids, movement of ore bearing fluids, Fluid inclusion studies of ores, Geothermometry.

Unit-4

Mineralization associated with ultramafic, mafic and acidic rocks, Wall rock alteration, Magma related mineralization through geological time.

Unit-5

Mineralization associated with sedimentary rocks, submarine volcanism, Weathering and metamorphic processes. Stratiform and stratabound ores.

Suggested Books

- □ Edwards, R. and Atkinson, K. (1986) Ore Deposit Geology. Chapman and Hall, London.
- □ Craig, J.M. and Vaughan, D.J. (1981) Ore Petrography and Mineralogy. John Wiley.
- D Evans, A.M. (2012) Ore Geology and Industrial Minerals. Third Edition (Reprint), Blackwell
- □ Sawkins, F.J. (1984) Metal Deposits in relation to Plate Tectonics. Springer Verlag.
- □ Stanton, R.L. (1972) Ore Petrology. McGraw Hill.
- □ Torling, D.H. (1981) Economic Geology and Geotectonics. Blackwell Sci. Publ.
- □ Barnes, H.L (1979) Geochemistry of Hydrothermal Ore Deposits. John Wiley.
- □ Klemm, D.D. and Schneider, H.J. (1977) Time and Strata Bound Ore Deposits. Springer Verlag.
- □ Guilbert, J.M. and Park, Jr. C.F. (1986) The Geology of Ore Deposits. Freeman.
- □ Mookherjee, A. (2000) Ore genesis -a Holistic Approach. Allied Publishers.
- □ Wolf, K.H. (1981) Hand book of Strata Bound and Stratiform Ore Deposits. Elsevier.
- □ Jensen, M.L. and Bateman, A.M. (1981) Economic Mineral Deposits. John Wiley and Sons, New York.
- □ McKinstry, H.E. (1972) Mining Geology. Prentice-Hall Inc.
- Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH Publishing Co., New Delhi. Thomas, L.J. (1978)An Introduction to Mining. Methuen, Brisbane.
- □ Clark, G.B. (1967) Elements of Mining. Asia Publishing House.
- □ Sinha, R.K. & Sharma, N.L. (1993) An Introduction to Mineral Economics, Wiley Eastern
- □ Chaterjee, K.K. (1993) An Introduction to Mineral Economics, Wiley Eastern.

CASTAL CONTRACTOR



SEMESTER II

PAPER V ELECTIVE COURSE CODE [ECGEOL201E]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP E. ENVIRONMENTAL GEOLOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit 1

Basics of Environment; Type of Environment; Man and Environment; Components of environmental geology, Concepts and principles of Environmental Geology; Time scales of global changes in the ecosystem and climate;

Unit 2

Atmosphere, structure and composition of atmosphere; Global warming. Greenhouse effect.; CO₂ increase and global warming in the present and past atmospheres;

भाज्या

Unit 3

Environmental Pollution: Sources of Air Pollution, emission of major industrial air pollutants, effects of air pollution on atmospheric processes, oxides of carbon as pollutants, greenhouse effect, global warming, chlorofluro carbons (CFC's), depletion of ozone layer, effects of ozone depletion, smog, acid rain;

Unit 4

Components of Hydrosphere; Water cycle; solubility of gases in water, Acidification of Ocean; Impact of oceanic and atmospheric circulation on climate and rain fall. Fluctuation of water table due to anthropogenic and geogenic causes.

Unit 5

Water Pollution: Types of water pollution, groundwater pollution and its effects, sources of water pollution; organic and inorganic contamination of groundwater and its remedial measures.

Suggested Books:

- □ Abhijit Dutta.Environmental Issues and Challenges
- D B. K. Sharma Environmental Pollution
- □ Bell, F.G. (1999): Geological Hazards, Routledge, London.
- □ Bryant, E. (1985): Natural Hazards, Cambridge Univ. Press.
- □ Keller, E.A. (1978) Environmental Geology
- □ Rekha Ghosh and D. S. Chatterjee :Environmental Geology
- D Valdiya, K.S. (1987) Environmental Geology- Indian Context
- Derived Patwarrdhan, A.M. (1999) The Dynamic Earth System
- □ Smith, K.(1992) Environmental Hazards
- □ Subramaniam, V.(2001) Textbook of Environmental Hazards
- □ Strahler and Strahler: Environmental Geology

.....



SEMESTER II

PAPER VI CORE COURSE [CCGEOL204]: (Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GEOCHEMISTRY AND IGNEOUS PETROLOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit I

Origin and abundance of elements in the Solar System and in the Earth, cosmic abundance of elements; Geochemical classification of Elements; Radiogenic Isotopes; Radioactive decay scheme of U-Pb, Sm-Nd, Rb-Sr, K-Ar and growth of daughter isotopes; Radiometric dating; Stable Isotopes: nature, abundance and fractionation;

Unit 2

Laws of Thermodynamics and its application in Petrology; Age of the Earth. Geochemistry and principles of evolution of hydrosphere, biosphere and atmosphere. Geochemical cycle and principles of geochemical prospecting.

Unit3:

Nature and evolution of magma; Plate tectonics and generation of magmas; Plume magmatism and hot spots; Large igneous provinces and mafic dyke swarms; Partial melting, batch and fractional melting; Crystal fractionation and Contamination; IUGS classification of the igneous rocks and CIPW norm

Unit 4:

Phase equilibrium - binary systems (Ab-An, Ab-Or, Di-An, Fo-Si) and their relations to magma genesis and crystallization in the light of modern experimental works; Ternary systems (Di-Ab-An, Di-Fo-Si, Di-Fo-An, Fo-An-Si) and their relations to magma genesis and crystallization

Unit-5:

Petrogenetic significance of igneous textures; Petrology and petrogenesis of major igneous rock types with Indian examples of ultramafic, komatiite, basalt, anorthosite, granite, alkaline rocks, ophiolite, carbonatite, lamprophyre.

Suggested Books:

- □ Krauskopf, K.B. (1967): Introduction to Geochemistry, McGraw Hill.
- □ Mason, B. and Moore, C.B. (1991): Introduction to Geochemistry, Wiley Eastern.
- □ Rollinson, H.R. (1993): Using geochemical data: Evaluation, Presentation, Interpretation. Longman U.K.
- □ Bose, M.K. (1997): Igneous Petrology, World Press, Kolkata.
- □ Best, Myron G. (2002): Igneous and Metamorphic Petrology, Blackwell Science.
- □ Cox, K.G., Bell, J.D. and Pankhurst, R.J. (1993): The Interpretation of Igneous Rocks, Champman and Hall, London.
- □ Faure, G. (2001): Origin of Igneous Rocks, Springer.
- □ Hall, A. (1997): Igneous Petrology, Longman.
- □ LeMaitre R.W. (2002): Igneous Rocks: A Classification and Glossary of Terms, Cambridge University Press.
- D McBirney (1994): Igneous Petrology, CBS Publ., Delhi
- D Phillpotts, A.R. (1994): Principles of Igneous and Metamorphic Petrology, Prentice Hall of India.
- □ Sood, M.K. (1982): Modern Igneous Petrology, Wiley-Interscience Publ., New York.
- Srivastava, Rajesh K. and Chandra, R., (1995): Magmatism in Relation to Diverse Tectonic Settings, A.A. Balkema, Rotterdam.
- □ Wilson, M. (1993): Igneous Petrogenesis, Chapman and Hall, London.
- □ Winter, J.D. (2001): An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, New Jersey.
- □ Hoefs, J. (1980): Stable Isotope Geochemistry, Springer-Verlag.
- □ Krauskopf, K.B. (1967): Introduction to Geochemistry, McGraw Hill.
- □ Mason, B. and Moore, C.B. (1991): Introduction to Geochemistry, Wiley Eastern.
- □ Rollinson, H.R. (1993): Using geochemical data: Evaluation, Presentation, Interpretation. Longman U.K.



SEMESTER II

PAPER VII CORE COURSE [CCGEOL205]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

SEDIMENTARY AND METAMORPHIC PETROLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit1

Surface processes and rock weathering; Processes of transport and generation of sedimentary rocks; Sedimentary Texture: Textural elements of clastic and non-clastic rocks, Sructures: important erosional, depositional and post depositional sedimentary structures and their significance; Provenance: Source of sediments, compositional maturity; Significance of light and heavy minerals in provenance study.

Unit 2

Sedimentary environment and facies. Facies modeling for marine, non-marine and mixed sediments. Tectonics and sedimentation. Classification and definition of sedimentary basins. Sedimentary basins of India. Cyclic sediments. Seismic and sequence stratigraphy. Purpose and scope of basin analysis. Stratum contours and isopach maps.

Unit3

Concept of Zones and Grades; Metamorphic facies and facies series ;Fabric in metamorphism; Classification of Metamorphic Rocks; Minerlogical Phase Rule; A detailed description of each of low pressure, medium to high pressure and very high pressure with special reference to mineralogical assemblages Meatmorphic Differentiation; ACF, AKF and AFM diagrams in metamorphic petrology .

Unit 4

Regional metamorphism and Ocean Floor Metamorphism; Regional and thermal metamorphism of pelitic rocks. Regional and thermal metamorphism of basic and ultrabasic rocks; Regional and thermal metamorphism of impure, silicious carbonate rocks; Metamorphism of Granitoides, Charnockites and Migmatites.

Unit 5

Metamorphism in space and time: Plate tectonics and metamorphic processes; Paired metamorphic belts, Archaean and Proterozoic terrains; polymetamorphis

Suggested Books

- D Blatt, H., Middleton, G.V. and Murray, R.C. (1980): Origin of Sedimentary Rocks, Prentice-Hall Inc.
- □ Collins, J.D., and Thompson, D.B. (1982): Sedimentary Structures, George Allen and Unwin, London.
- □ Lindholm, R.C. (1987) A Practical Approach to Sedimentology, Allen and Unwin, London.
- □ Miall, A.D. (2000): Principles of Basin Analysis, Springer-Verlag.
- □ Pettijohn;, F.J. (1975): Sedimentary Rocks (3rd Ed.), Harper and Row Publ., New Delhi.
- □ Reading, H.G. (1997): Sedimentary Environments and facies, Blackwell Scientific Publication.
- □ Reineck, H.E. and Singh, I.B. (1973): Depositional Sedimentary Environments, Springer-Verlag.
- □ Selley, R. C. (2000) Applied Sedimentology, Academic Press.
- □ Tucker, M.E. (1981): Sedimentary Petrology: An Introduction, Wiley and Sons, New York.
- □ Bucher, K. and Martin, F. (2002): Petrogenesis of Metamorphic Rocks (7th Rev. Ed.), Springer–Verlag,.
- □ Philpotts, A.R. (1994): Principles of Igneous and Metamorphic Petrology, Prentice Hall.
- □ Spry, A. (1976): Metamorphic Textures, Pergamon Press.
- □ Winter, J.D. (2005): An introduction to Igneous and Metamorphic Petrology, Prentice Hall.
- □ Yardley, B.W.D., Mackenzie, W.S. and Guilford, C. (1995): Atlas of Metamorphic Rocks and their textures, Longman Scientific and Technical, England.
- □ Yardlley, BW(1989)An introduction to Metamorphic Petrology, Longman,NY
- □ Best, M.G.(2004) Igneous and Metamorphic Petrology, cbs Publ.
- □ Winkler H.G.F.(1979) Petrogenesis of Metamorphic Rocks, Springer Verlag
- □ Turner E.J.(1980)Metamorphic Petrology, McGraw Hill,NY



SEMESTER II

PAPER VIII CORE COURSE PRACTICAL [CCGEOL206(P)]:(Credits: Practical-05)

Marks: 60 (Practical examination+ Viva voce) and 40 (field work report) =100 Marks Pass Marks =45

Instruction to Question Setter:

End Semester Practical Examination (ESE Pr- 6 hours):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 60 marks for practical and 40 marks for field work report and viva voce.

PRACTICAL

Practical: 60Hours

(A)

Practical: 00Hou

Full Marks: 60

- (i) Megascopic and Microscopic studies of Igneous, Sedimentary and Metamorphic rocks.
- (ii) Megascopic studies of Sedimentary structures.
- (iii) Graphic representation of Modal analyses in QAP and APF diagrams
- (iv) Graphic representation of chemical analyses in ACF, AKF and AFM diagrams.
- (v) Calculation of C.I.P.W. Norm and Niggli Values
- (vi) Morphometric analysis of drainage system.
- (vii) Excercises on satellite imagery/photo interpretation

(B)

Full Marks : 40

(i) Geological Mapping of at least two weeks duration in a geologically complex area and Field WorkReport based on it

Note: Every student will be required to prepare Field work/ training report in proper format which will be evaluated during the practical examination.

⁷मसो मा ज्योरित^{र्भभ}े

SEMESTER III

4Papers

PAPER IX CORE COURSE [CCGEOL307]:

Total 100 x 4 = 400 Marks

(Credits: Theory-04, Tutorial-01)

Theory: 60 Hours; Tutorial:15 Hours

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GEOMORPHOLOGY AND REMOTE SENSING IN GEOLOGY

Geomorphology

Unit I

Fundamental concepts – significance of structure, process and time ; A brief account of concepts of evolution of landforms ; Characteristic features of landforms ,Characteristics and types of fluvial landforms , Fluvial cycle ,concept of peneplains, stream rejuvenation, causes and effects; Aeolian landforms , Arid Cycle of erosion ; Glacial landforms, periodicity of glaciation and its causes; Karst topography , Relationship of geologic structures to topography; Volcanic landforms

Unit II

Geomorphology of the coasts, classification of shorelines and their evolution. Evidences of eustatic changes and their causes.. Influence of lithology on relief. Development of landforms of flat lying, tilted, folded, dome and faulted structures; Development of drainage systems, Drainage Patterns, Drainage analysis in Geological interpretation. Geomorphic features of India; Application of Geomorphology in groundwater, mineral and oil exploration and Engineering projects.

Remote Sensing in Geology

Unit III

Electromagnetic spectrum and its properties, Atmospheric Windows; Interaction of electromagnetic radiation with matter, Spectral signatures; Basic ideas of Thermal Infra-red and Microwave Remote Sensing; Photogrammetry- recent advancements and applications; Remote Sensing Satellite programmes and their characteristics;

Unit 4:

Basic principles of Image interpretation and Digital image techniques; Principles and applications of GIS;

Image characters and their relations with ground objects based on tone, texture and pattern;

Interpretation of topographic and tectonic features; Identification of Igneous, Sedimentary and Metamorphic rock types in images;

Unit 5

Principles of terrain analysis; Morphometric analysis; Geomorphological mapping based on genesis of landforms; Terrain evaluation for strategic purposes.

Suggested Books:

- □ Richard J. Huggett 2007 Fundamentals of Geomorphology, Routledge
- Keith A. Sverdrup, Alison Duxbury, Alyn C. Duxbury, 2006 Fundamentals of Oceanography, McGraw-Hill Higher Education
- □ Thornbury, W.D., 1969 Principles of Geomorphology, Wiley.
- □ Worcester, P.G., 1948 A text book of Geomorphology
- □ B.W. Sparles, 1981 Geomorphology, Longman Group Ltd.
- □ George Allen & Coates, 1980 Coastal Geomorphology
- Ditty, A.F., 1972 Introduction to Geomorphology, Methuen.
- □ Bloom, A.L. 1979 Geomorphology, Prentice Hall.
- Arthur L. Bloom, 2004 Geomorphology: a systematic analysis of late Cenozoic landforms, Waveland Pr Inc,

मेमसो मा ज्योरितर्भाष

- □ Miller, V.C. 1961: Photogeology; McGraw Hill
- □ Sabbins, F.F., 1985: Remote Sensing-Principles and Applications; Freema
- Lillesand, T.M. and Keifer, R.W.1987; Remote Sensing and Image Interpretation; John Wiley
- □ S.N.Pandey,1987:Principles and Applications of Photogeology; Wiley Eastern, New Delhi
- □ Gupta R.P.1990:Remote Sensing Geology; Springer Verlag
- □ Compton. R.R.(1962)Manual of Field Geology-
- □ Angela L. Coe (2010)Geological Field Techniques, Blackwell
- □ Oya, M.2001: Applied Geomorphology for Mitigation of Natural Hazards, Springer

(Credits: Theory-04, Tutorial-01)

SEMESTER III

[CCGEOL308]:

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

PAPER X CORE COURSE

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

ECONOMIC GEOLOGY

Theory: 60 Hours; Tutorial:15 Hours

Unit 1

Concepts of Ore Genesis; Distribution of Ore deposits-Global Perspective; Mode of occurrences and morphology of ore bodies, Controls of Ore localization; Classification of Ore deposits; Processes of Ore formation – Magmatic, Sedimentary, Metamorphic associations and Weathering processes; Ore deposits and Plate Tectonics.

Unit 2

Occurrence and distribution in India of metalliferous deposits - base metals, iron, manganese, aluminium, chromium, nickel, gold, silver, molybdenum. Indian deposits of non-metals – Diamond, mica, asbestos, barytes, gypsum, graphite, apatite and beryl. Gemstones, refractory minerals, abrasives and minerals used in glass, fertilizer, paint, ceramic and cement industries. Building stones. Phosphorite deposits. Placer deposits, rare earth minerals.

Unit 3

Coal: Origin, mode of occurrence and types of coal; Proximate and Ultimate analysis; Concept of Macerals and Microlithotypes; Classification, rank, and grade of coal; Important coal basins of India with special reference to Jharkhand. Fundamentals of Coal Bed Methane.

211221115

Unit 4

Petroleum: Origin and migration of Petroleum, Properties of source and reservoir rocks, Petroleum Traps; Geological and geophysical methods of petroleum exploration; Petroliferous basins of India; Atomic Minerals: Atomic fuel resources of India – distribution and prospects.

Unit 5

Geological Mapping techniques; Geological criteria for mineral prospecting; Basic principles of Geochemical Exploration ;Principles and application of surface geophysical exploration techniques; Brief outline of various well logging techniques; Strategic, critical and essential minerals. India's status in mineral production vis a vis world scenario; National Mineral Policy.

Suggested Books:

- □ Arogyaswami, R.P.N. (1996): Courses in Mining Geology, Oxford and IBH Publ.
- □ Bagchi, T.C., Sengupta, D.K., Rao, S.V.L.N. (1979): Elements of Prospecting and Exploration, Kalyani Publ.
- □ Banerjee, P.K. and Ghosh, S. (1997): Elements of Prospecting for Non-fuel Mineral deposits, Allied Publ.
- □ Chaussier, Jean Bernard and Morer, J. (1987): Mineral Prospecting Manual., North Oxford Academic.
- □ Clark, G.B. (1967): Elements of Mining, (3rd Ed.), John Wiley.
- Dobrin, M. B.; Savit, C. H. (1988): Introduction to Geophysical Prospecting, McGraw-Hill.
- □ Keary, P., Brooks, M. and Hill, I. (2002): An introduction to geophysical exploration, (3rd Ed.),Blackwell
- Rider, M. H. (1986): Whittles Publishing, Caithness. The Geological Interpretation of Well Logs, (Rev. Ed.).
- □ Robert, D. (1985): Encyclopedia of Well Logging
- □ T.S. Ramakrishna (2006), Geophysical Practice in Mineral Exploration and Mapping GSI, Bangalore
- D Mookherjee, A. (2000): Ore Genesis-A Holistic Approach, Allied Publisher
- Dhanraju, R. (2005): Radioactive Minerals, Geol. Soc. India, Bangalore.
- □ Craig J M and Vaughan D J (1981)Ore Petrography and Mineralogy, John Willey
- □ Evans (1973) Ore Geology and Industrial Minerals
- □ Cogen B and Dey A K(1975) Mineral and Nuclear Fuels of India, Oxford Pub.
- Bagchi, T.C., Sengupta, D.K., Rao, S.V.L.N. (1979): Elements of Prospecting and Exploration, Kalyani Publ.
- Banerjee, P.K. and Ghosh, S. (1997): Elements of Prospecting for Non-fuel Mineral deposits, Allied Publ.
- Chaussier, Jean Bernard and Morer, J. (1987): Mineral Prospecting Manual., North Oxford Academic.

गेम्सो मा ज्योतिर्गम्

P.G. GEOLOGY CBCS CURRICULUM M.Sc. Semester III Elective GE/ DC Course Code ECGEOL302 Select One GE/ DC Elective from the following Groups: **Group A: Fossil Fuel geology Group B: Sedimentology** Group C: Hydrogeology **Group D: Ore Geology Group E: Environmental Geology**

SEMESTER-III PAPER XI ELECTIVE COURSE CODE [ECGEOL302A]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP A. FOSSIL FUEL GEOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Elementary idea about coal preparation, Washing and beneficiation of coal, Blending of coal; coal carbonisation, coal gasification, coal liquefaction and coal combustion,; Briquetting of coal Unit 2

Assessment of coal reserves; Geological, Geobotanical and Geophysical survey for coal; Gondwana palynology and its application for coal exploration;

Unit 3

Mining of coal- underground mining and open cast mining; Coal Mining hazards and its mitigation; Trace elements in coal; Coal as environment pollutant; Conservation of coal

Unit 4

Unit Geological and geographical distribution of coal deposits of Jharkhand

Unit 5

Geological and geographical distribution of coal and Lignite deposits in India except Jharkhand;

P.G. GEOLOGY Suggested Books:

CBCS CURRICULUM

- □ Chandra, D., Singh, R.M. Singh, M.P. (2000): Textbook of Coal (Indian context), Tara Book Agency, Varanasi.
- □ Scott, A.C. (1987): Coal and Coal-bearing strata: Recent Advances, Blackwell Scientific Publications.
- □ Singh, M.P. (1998): Coal and organic Petrology, Hindustan Publishing Corporation, New Delhi.
- □ ,G.H., Teichmuller, M., Davis, A., Diessel, C.F.K., Littke, R. and Robert P. (1998): Organic Petrology, Gebruder Borntraeger, Stuttgart.
- □ Thomas, Larry (2002): Coal Geology, John Wiley and Sons Ltd., England.
- □ Van Krevelen Stach;, E., Mackowsky, M-Th., Taylor, G.H., Chandra, D., Teichumullelr, M. and Teichmuller R. (1982): Stach Textbook of Coal Petrology, Gebruder Borntraeger, Stuttgart.
- □ Taylor, D. W. (1993): Coal :Typology-Physics-Chemistry-Constitution), Elsevier Science, Netherlands



SEMESTER III

PAPER XI ELECTIVE COURSE CODE [ECGEOL302B]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP B. SEDIMENTOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit –1

Concept of basin analysis; Tectonic classification and evolution of sedimentary basins; Plate tectonics in relation to type and evolution of basins.

Unit-2

Sedimentary facies and facies models with Indian analogues; Paleocurrent analysis and its applications.

Unit-3

Processes and characteristics of depositional environments such as fluvial, estuarine, deltaic, lagoonal, barrier beach, tidal flats, deep-sea environments, lacustrine, aeolian, glacial etc.

Unit 4

Sedimentary basins of India. /. Plate tectonics in relation to type and evolution of basins.

Unit-5

Concept of sequence stratigraphy, regional unconformities, systems tracts and parasequences.

Suggested Books:

- D Blatt, H., Middleton, G.V. and Murray, R.C. (1980): Origin of Sedimentary Rocks, Prentice-Hall Inc.
- □ Collins, J.D., and Thompson, D.B. (1982): Sedimentary Structures, George Allen and Unwin, London.
- Lindholm, R.C. (1987) A Practical Approach to Sedimentology, Allen and Unwin, London.
- Dettijohn;, F.J. (1975): Sedimentary Rocks (3rd Ed.), Harper and Row Publ., New Delhi.
- □ Reading, H.G. (1997): Sedimentary Environments and facies, Blackwell Scientific Publication.
- □ Reineck, H.E. and Singh, I.B. (1973): Depositional Sedimentary Environments, Springer-Verlag.
- □ Selley, R. C. (2000) Applied Sedimentology, Academic Press.
- □ Tucker, M.E. (1981): Sedimentary Petrology: An Introduction, Wiley and Sons, New York.
- Tucker, M.E. (1990): Carbonate Sedimentolgy, Blackwell Scientific Publication

SEMESTER III

PAPER XI ELECTIVE COURSE CODE [ECGEOL302C]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

ଏଗ । ସ ଆନ

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP C. HYDROGEOLOGY

Unit 1

Occurrence of groundwater in different rock types; Geologic structures favouring groundwater occurrence; Occurrence of groundwater in various hydrostratigraphic units of India; Groundwater provinces of India.

Unit 2

Components of Groundwater basin characterization: slope characteristics, lithology and associated geological structures, soil type and thickness, etc.; Geomorphic controls for groundwater accumulation; Drainage pattern, their relationship with lithology and geologic structure; tools.

Unit 3

Groundwater basin characterization and prioritization by Remote Sensing and GIS

Unit 4

Surface and subsurface geological and geophysical methods of groundwater exploration; Identification of groundwater potential zones by various Remote sensing techniques, Application of GPR in groundwater exploration, Use of radio isotopes in hydrogeological studies.

Unit 5

Groundwater problems and management related to foundation work, mining, reservoirs, tunnels and effects of water in landslides; Environmental effects of over-exploitation of groundwater; Water logging problems;

Suggested Books

- □ C.F. Tolman (1937): Groundwater, McGraw Hill, New York and London.
- D.K. Todd (1995): Groundwater Hydrology, John Wiley and Sons.
- □ F.G. Driscoll (1988): Groundwater and Wells, UOP, Johnson Div. St. Paul. Min. USA.
- □ H.M. Raghunath (1990): Groundwater, Wiley Eastern Ltd.,
- □ H.S. Nagabhushaniah (2001): Groundwater in Hydrosphere (Groundwater hydrology), CBS Publ..

2

Theory: 60 Hours; Tutorial: 15 Hours

- □ K. R. Karanth (1989): Hydrogeology, Tata McGraw Hill Publ.
- □ S.N. Davies and R.J.N. De Wiest (1966): Hydrogeology, John Wiley and Sons, New York.
- □ Patra, H. P., Adhikari, Shyamal Kumar, Kunar, Subrata(2016)Groundwater Prospecting and Management, Springer
- □ Jakeman, A.J., Barreteau, O., Hunt, R.J., Rinaudo, J.-D., Ross, A. (2016) Integrated Groundwater Management: Concepts, Approaches and Challenges, Springer
- □ Ramanathan, A., Johnston, S., Mukherjee, A., Nath, B. (Eds.)2015, Safe and Sustainable Use of Arsenic-Contaminated Aquifers in the Gangetic Plain
- □ A Multidisciplinary Approach; Springer
- C.W. Fetter Jr.(2016)Applied Hydrogeology (4th Edition) 4th Edition Pearson Education Ltd.
- □ Kevin M. Hiscock (2009) Hydrogeology: Principles and Practic, Wiley-Blackwell
- □ Singhal, B.B.S. Gupta R.P.(2010)Applied Hydrogeology of Fractured Rocks, Springer

```
_____
```



SEMESTER III

PAPER XI ELECTIVE GE/ DC COURSE CODE [ECGEOL302D]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

GIEBIR

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP D. ORE GEOLOGY



Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Non-magmatic processes of mineralization, Occurrence and distribution in India of iron and base metal deposits.

Unit 2

Occurrence and distribution in India of manganese, aluminium, chromium, nickel and gold deposits. Energy and fuel minerals, PGE and associated ores.

Unit 3

Indian deposits of non-metals: mica, asbestos, gypsum, graphite and apatite. Gemstones, refractory minerals, abrasives and minerals used in glass, fertilizer, paint, ceramic and cement industries.

Unit 4

Strategic, critical and essential mineral. India's status in mineral production. National Mineral Policy. Marine mineral resources and Laws of Sea. Mineral concession rules.

Unit 5

Various methods of sampling. Surface and sub-surface explorations. Definition and outline of UNFC classification of mineral reserves and resources. Grade and recovery of ores. Methods of ore reserves estimation.

P.G. GEOLOGY

Suggested Books

- □ Edwards, R. and Atkinson, K. (1986) Ore Deposit Geology. Chapman and Hall, London.
- □ Craig, J.M. and Vaughan, D.J. (1981) Ore Petrography and Mineralogy. John Wiley.
- Evans, A.M. (2012) Ore Geology and Industrial Minerals. Third Edition (Reprint), Blackwell Publishingand Wiley India Pvt. Ltd.
- □ Sawkins, F.J. (1984) Metal Deposits in relation to Plate Tectonics. Springer Verlag.
- □ Stanton, R.L. (1972) Ore Petrology. McGraw Hill.
- □ Torling, D.H. (1981) Economic Geology and Geotectonics. Blackwell Sci. Publ.
- Deposits. John Wiley.
- □ Klemm, D.D. and Schneider, H.J. (1977) Time and Strata Bound Ore Deposits. Springer Verlag.
- □ Guilbert, J.M. and Park, Jr. C.F. (1986) The Geology of Ore Deposits. Freeman.
- D Mookherjee, A. (2000) Ore genesis -a Holistic Approach. Allied Publishers.
- □ Wolf, K.H. (1981) Hand book of Strata Bound and Stratiform Ore Deposits. Elsevier.
- Densen, M.L. and Bateman, A.M. (1981) Economic Mineral Deposits. John Wiley and Sons, New York.
- □ McKinstry, H.E. (1972) Mining Geology. Prentice-Hall Inc.
- □ Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH Publishing Co., New Delhi. Thomas, L.J. (1978)An Introduction to Mining. Methuen, Brisbane.
- □ Clark, G.B. (1967) Elements of Mining. Asia Publishing House.
- □ Sinha, R.K. & Sharma, N.L. (1993) An Introduction to Mineral Economics, Wiley Eastern
- □ Chaterjee, K.K. (1993) An Introduction to Mineral Economics, Wiley Eastern.



SEMESTER III

PAPER XI ELECTIVE COURSE CODE[ECGEOL302E]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP E. ENVIRONMENTAL GEOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Natural resources and its conservation. Concept of ecosystem and its biotic and abiotic factors. Types of resources – conservation of soil, forest, minerals. Mineral resources in India and environmental issues. Alternative energy resources.

Unit 2

Desert and Desertification; Impacts of global warming on surface water, groundwater resources and Glaciers; Mass movement-types, Factors influencing slope stability. Solid Waste management.

Unit 3

Human impact on soil, water, climate and atmosphere. Impact assessment of degradation and contamination of surface water and groundwater quality due to industrialization and urbanization; organic and inorganic contamination of groundwater and its remedial

measures; Water logging problems due to the indiscriminate construction of canals, reservoirs and dams

Unit 4

Geogenic and anthropogenic causes of water contamination; Issues of Arsenic and Fluoride contamination in groundwater ,Methods for amelioration of Arsenic and Fluoride contamination in groundwater, Problems of Arsenic and Fluoride contamination in Jharkhand; Application of Remote Sensing for Water resources, Snow and Glacier and Wetland management

Unit 5

Global initiatives for mitigation of environmental issues; Indian Constitution and Environment; Environmental protection and conservation laws in India viz. The Prevention and Control of pollution Act, 1974, Water (Prevention & Control) Act 1974, The Forest (Conservation) Act, 1980, Air (Prevention and Control of Pollution) Act 1981, Environmental (Protection) Act, 1986, Hazardous Waste Handling and management act 1989, Ozone Depleting Substances (Regulation and Control) Rules, 2000, National Green Tribunal Act 2010 etc.

Suggested Books

- □ Abhijit Dutta. Environmental Issues and Challenges
- D B. K. Sharma Environmental Pollution
- □ Bell, F.G. (1999): Geological Hazards, Routledge, London.
- □ Bryant, E. (1985): Natural Hazards, Cambridge Univ. Press.
- □ Keller, E.A. (1978) Environmental Geology
- □ Rekha Ghosh and D. S. Chatterjee : Environmental Geology
- D Valdiya, K.S. (1987) Environmental Geology- Indian Context
- D Patwarrdhan, A.M. (1999) The Dynamic Earth System
- □ Smith, K.(1992) Environmental Hazards
- □ Subramaniam, V.(2001) Textbook of Environmental Hazards
- □ Strahler and Strahler :Environmental Geology

SEMESTER III

PAPER XII ELECTIVE GE/ DC COURSE PRACTICAL [ECGEOL303(P)]:

(Credits: Practical-05)

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Marks

Pass Marks =45

Instruction to Question Setter:

End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

ELECTIVE PRACTICAL GE/ DC

Practical: 60Hours

ECGEOL 303 P Group A: Fossil Fuel Geology

Credit: 5

- Megascopic study of varieties of coal
- Megascopic study of coal bearing rocks
- Drawing and labelling of parts of Gondwana fossils from different coalfields
- Borehole problems and calculation of coal reserves from borehole data
- Study of different coal and oilfields of India
- Study of crude oil samples from oilfields of India
- Estimation of oil reserves

<u>OR</u>

ECGEOL 303 P Group B: Sedimentology

Credit: 5

- Graphic plot of size data and calculation of statistical parameters
- Microscopic study of Clastic rocks
- Megascopic study of Clastic rocks
- Mechanical sedimentary structures and their environmental significance

OR ECGEOL 303 P Group C: Hydrogeology

Credit: 5

- Determination of porosity of aquifer materials
- Study of hydrological properties of soil and rocks
- Construction of water table and piezometric maps and their interpretations

- Interpretation of geological cross section for locating water bearing horizons
- Flow net analysis
- Pumping test for evaluation of aquifer parameters
- Construction of lithologs

<u>OR</u>

ECGEOL 303 P Group D: Ore Geology (Practicals on Elective GE/DC)

Credit: 5

- Study of morphological features of ore bodies
- Megascopic study of important ores-their texture and structure
- Megascopic study of important industrial, non-metallic minerals, precious and semi-precious stones.
- Estimation of grade of ores
- Study of metallogenic provinces of India

<u>OR</u>

ECGEOL 303 P Group E: Environmental Geology

या ज्या र

Credit: 5

- Analysis of pH and electrical conductivity in water
- Preparation of oceanic and atmospheric circulation maps
- Preparation of seismic zonation maps of India and world
- Demarcation of flood prone areas in the outline map of India
- Preparation of volcanic hazard zonation map
- Preparation of oceanic and atmospheric circulation maps

N.P UNIVERSITY

SEMESTER IV

4 Papers

Total 100 x 4 = 400 Marks

PAPER XIII CORE COURSE [CCGEOL409]:

(Credits: Theory-03, Practical-02)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA ्यावद्याल

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

HYDROGEOLOGY, ENGINEERING GEOLOGY, ENVIRONMENTAL **GEOLOGY, MINING GEOLOGY** Theory: 60 Hours; Tutorial:15Hours Sec. 14

Unit-1

Role of groundwater in the hydrological cycle; Controls of geology on groundwater occurrence and distribution; Classification of aquifers and aquifer systems; Darcy's law; Hydraulic conductivity, transmissivity, storage coefficient and specific capacity; Water table contour maps and flow net analysis. Causative factors of groundwater level fluctuations and environmental influences

Unit-2

Chemical characteristics of groundwater in relation to various uses – domestic, industrial and irrigation; Groundwater contamination and problems of arsenic, fluoride and nitrates; Management of groundwater resources: Artificial recharge to groundwater and rainwater harvesting;; Groundwater exploration; Hydrogeomorphic mapping using various Remote Sensing techniques ;Groundwater provinces of India.

Unit-3

Engineering Properties of rocks, and Soils; Properties and selection of .Construction Materials; Landslides and stability of Hill slopes; Geological investigation for Engineering Projects.: Geological investigations and criteria for sites selection of Dam sites, Reservoirs Tunnels and Bridges; Engineering Projects- Case Histories from India.

Unit 4

Components of environment. Carbon dioxide in atmosphere, global warming caused by CO₂ increase in the atmosphere. Impact assessment of degradation and contamination of surface water and ground water quality due to industrialization and mining. Soil Quality degradation due to irrigation, use of fertilizers and pesticides. Introduction to climatic changes, causes of climatic changes, world climate during geological periods. Impact of climate on society. Impact of man on climate.

Unit 5

Mining of surface and underground mineral deposits involving diamond drilling, shaft sinking, drifting, cross-cutting, winging, stoping, room and pillaring, top- slicing, sub -level caving and block caving. Types of drilling methods. Mining Hazards: mine inundation, mine fire and rock burst.

Suggested Books:

- □ Arogyaswami, R.P.N. (1996): Courses in Mining Geology, Oxford and IBH Publ.
- □ Clark, G.B. (1967): Elements of Mining, (3rd Ed.), John Wiley.
- Dobrin, M. B.; Savit, C. H. (1988): Introduction to Geophysical Prospecting, McGraw-Hill.
- □ Keary, P., Brooks, M. and Hill, I. (2002): An introduction to geophysical exploration, (3rd Ed.), Blackwell
- Rider, M. H. (1986): Whittles Publishing, Caithness. The Geological Interpretation of Well Logs, (Rev. Ed.).
- □ Robert, D. (1985): Encyclopedia of Well Logging
- □ T.S. Ramakrishna (2006), Geophysical Practice in Mineral Exploration and Mapping GSI, Bangalore
- D.K. Todd (1995): Groundwater Hydrology, John Wiley and Sons.
- □ H.M. Raghunath (1990): Groundwater, Wiley Eastern Ltd.,
- □ K. R. Karanth (1989): Hydrogeology, Tata McGraw Hill Publ..
- □ S.N. Davies and R.J.N. De Wiest (1966): Hydrogeology, John Wiley and Sons, New York.
- □ Krynine, D.H. and Judd, W.R. (1998): Principles of Engineering Geology, CBS Publ..
- □ Schultz, J.R. and Cleaves, A.B. (1951): Geology in Engineering, John Willey and Sons, New York.
- □ Singh, P. (1994): Engineering and General Geology, S.K. Kataria and Sons, Delhi.



PAPER XIV ELECTIVE COURSE CODE [ECGEOL404A]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs) =100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP A. FOSSIL FUEL GEOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Origin and nature of oil and gas; Amount, type and maturation of organic matter; Migration of Petroleum;

Unit 2

Reservoir rocks - petrology of reservoir rocks, porosity and permeability; Reservoir traps – structural, stratigraphic and combination traps.

Unit 3

Identification and characterization of petroleum source rocks, Oil and source rock correlation; Palaeodepositional and palaeoenvironmental models with the help of microfossils and Palynology;

Unit 4

Quantitative evaluation of oil and gas, Geological, Geochemical and Geophysical exploration of Petroleum.

Unit 5

Petroleum basins of India, important oil fields of India; Brief idea about global occurrence of Petroleum; Position of oil and natural gas in India, Future prospects and economic scenario.

Suggested Books:

- D Barker, C. (1996): Thermal Modeling of Petroleum Generation, Elsevier Science, Netherlands.
- □ Holson, G.D. and Tiratso, E.N. (1985): Introduction of Petroleum Geology, Gulf Publishing, Houston, Texas.
- □ Hunt, J.M. (1996): Petroleum Geochemistry and Geology (2nd Ed.), Freeman, San Francisco.
- □ Jahn, F., Cook, M. and Graham, M. (1998): Hydrocarbon exploration and production, Eslevier Science.
- Makhous, M. (2000): The Formation of Hydrocarbon Deposits in North African Basins, Geological and Geochemical Conditions, Springer–Verlag.
- □ North, F.K. (1985): Petroleum Geology, Allen Unwin.

- □ Selley, R.C. (1998): Elements of Petroleum Geology, Academic Press.
- □ Tissot, B.P. and Welte, D.H. (1984): Petroleum Formation and Occurrence, Springer–Verlag R.C. Chapman (1973) Petroleum Geology, Elsevier Scientific Pub. Co.



PAPER XIV ELECTIVE COURSE CODE [ECGEOL404B]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MS

Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

ALC BILL

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP B. SEDIMENTOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit-1

Concept of soil, components of soil, soil profile; Process of soil formation, pedogenic processes, Factors of soil formation;

Unit 2

Classification of soil, mineral and chemical composition of soils, mineral stability during weathering; Soil organic matter form and function;

Unit-3

Fabric analysis - size and shape, concepts of size and shape, grade scale, methods of analysis, presentation of data, analysis and field grading; Concepts of structure fabric: Soil fabric, soil structure, soil texture and field grading units;

Unit-4

Paleosols - field recognition, description, origin and causes; Paleosol in stratigraphic records; Significance of paleosol study; Paleosols and human evolution.

Unit-5

Calcrete - definition, classification, calcrete formation, pedogeniccalcrete soil profile, macro features in calcretes, micromorphology (petrography), calcretes from Quaternary and ancient sedimentary sequences; significance of calcretes; Laterite - characteristics, genesis, Indian occurrences.

Unit-6

Causes of Soil erosion and degradation, A brief introduction to methods of soil conservation.

P.G. GEOLOGY Suggested Books :

CBCS CURRICULUM

- □ Boul, S.W., Hole, F.D., Mc Craken, R.J. and South, R.J. (1997): Soil Genesis and classification. 4th Edn, State University Press.
- □ Braddy, N.C. (2002): Nature and Properties of Soils.
- □ Govinda Rajan, S.V. and Gopala Rao, K. H.G. (1979): Studies of Soils of India.
- □ Sposito, Garrison. (1989): The Chemistry of Soils, Oxford Univ. Press.
- □ Terzaghi, K. and Pock, R.G. 1996): Soil Mechanics in Engineering (3rd Ed.), John Wiley.
- □ Wright; V. Paul (1992): Paleosols: their recognition and interpretation, Blackwell Scientific Publ.
- □ Wright, V. Paul and Tucker, M.E. (1991): Calcretes. Blackwell Scientific Publ..



PAPER XIV ELECTIVE COURSE CODE [ECGEOL404C]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP C. HYDROGEOLOGY

Unit 1

Theory: 60 Hours; Tutorial: 15 Hours

Watershed- concept, classification; Components of watershed; rainfall, temperature, topography, nature of soil and depth, lithology and geological structures, drainage pattern, land use pattern Valley to basin concept in water management

Unit 2

Natural and artificial recharge of groundwater, Rain water harvesting techniques for rural and urban areas; Physical structures for water resource management in Rural areas; Use of Remote sensing and GIS in Watershed Management;

Unit 3

Water management physical structures and their characteristics such as Ridge area treatment, gully plug, contour bunding, check dams, gabion structure, percolation tanks etc. Traditional methods for water resource management in India;

Unit 4

Basic components of Watershed Guidelines of India, Participatory approach for programme implementation of watershed. Water management and Panchayati Raj Acts;

Unit 5

Legislations related to water resources: Basic Constitutional provisions, Water Pollution Acts, National Water Policy

P.G. GEOLOGY Suggested Books

- □ Isobel W. Heathcote(2009)Integrated Watershed Management: Principles and Practice, Wiley
 - □ J V S Murty(2008)Watershed Management New Age Int.
 - □ K. R. Karanth (1989): Hydrogeology, Tata McGraw Hill Publ.
 - □ Watershed Guidelines: Govt. of India
 - □ Rao, K. L.; India's water wealth C.G.W.B . Publications
 - □ Constitution of India
 - In Jharkhand Panchayati Raj Act



PAPER XIV ELECTIVE GE/ DC COURSE CODE [ECGEOL404D]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP D. ORE GEOLOGY

Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Geological prospecting of minerals. Different types of geophysical methods for exploration-gravity, magnetic, electrical, seismic. Geochemical exploration-nature of sample anomaly, strength of anomaly and controlling factors.

Unit 2

Ore beneficiation, basic principles and importance, Criteria for selecting different ore dressing mechanism. Surface and underground mining methods factors in selection of open cast and underground mining methods, room and pillar method, longwall method. Environmental aspect of mining activities.

Unit 3

Different varieties and ranks of coal, origin of coal, maceral analysis of coal, concept of coal maturity, peat, lignite, bituminous and anthracite coal. Proximate and Ultimate analysis, Application of coal petrography, Gondwana and tertiary coalfields of India, Uses of coal for various industries.

Unit 4

Origin of petroleum, migration and entrapment of oil, character of source and reservoir rocks, structural, stratigraphic and mixed traps. Geographical and geological distribution of onshore and offshore petroliferous basins of India.

Unit 5

Mineralogy and geochemistry of radioactive minerals. Radioactive methods for prospecting of mineral deposits. Occurrence and distribution of radioactive minerals in India. Radioactive methods in petroleum exploration-well logging techniques.

P.G. GEOLOGY

Suggested Books

- □ Edwards, R. and Atkinson, K. (1986) Ore Deposit Geology. Chapman and Hall, London.
- □ Craig, J.M. and Vaughan, D.J. (1981) Ore Petrography and Mineralogy. John Wiley.
- Evans, A.M. (2012) Ore Geology and Industrial Minerals. Third Edition (Reprint), Blackwell Publishing and Wiley India Pvt. Ltd.
- □ Sawkins, F.J. (1984) Metal Deposits in relation to Plate Tectonics. Springer Verlag.
- □ Stanton, R.L. (1972) Ore Petrology. McGraw Hill.
- □ Torling, D.H. (1981) Economic Geology and Geotectonics. Blackwell Sci. Publ.
- □ Barnes, H.L (1979) Geochemistry of Hydrothermal Ore Deposits. John Wiley.
- □ Klemm, D.D. and Schneider, H.J. (1977) Time and Strata Bound Ore Deposits. Springer Verlag.
- □ Guilbert, J.M. and Park, Jr. C.F. (1986) The Geology of Ore Deposits. Freeman.
- □ Mookherjee, A. (2000) Ore genesis -a Holistic Approach. Allied Publishers.
- □ Wolf, K.H. (1981) Hand book of Strata Bound and Stratiform Ore Deposits. Elsevier.
- □ Jensen, M.L. and Bateman, A.M. (1981) Economic Mineral Deposits. John Wiley and Sons, New York.
- □ McKinstry, H.E. (1972) Mining Geology. Prentice-Hall Inc.
- □ Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH Publishing Co., New Delhi. Thomas, L.J. (1978)An Introduction to Mining. Methuen, Brisbane.
- □ Clark, G.B. (1967) Elements of Mining. Asia Publishing House.
- □ Sinha, R.K. & Sharma, N.L. (1993) An Introduction to Mineral Economics, Wiley Eastern
- □ Chaterjee, K.K. (1993) An Introduction to Mineral Economics, Wiley Eastern.



PAPER XIV ELECTIVE COURSE CODE [ECGEOL404E]:

(Credits: Theory-04, Tutorial-01)

Marks: 30 (MSE: 20Th. 1Hr + 5Attd. + 5Assign.) + 70 (ESE: 3Hrs)=100 Pass Marks (MSE:17 + ESE:28)=45

Instruction to Question Setter:

Mid Semester Examination (MSE):

The Mid Semester Examination shall have three components: a) Two semester Internal Assessment Test (SIA) of 20 marks each, b) Class Attendance score (CAS) of 5 marks each and c) Assignment of 5 marks. "Best of two" shall be applicable for computation of marks for SIA

End Semester Examination (ESE):

A total of EIGHT questions will be set in which question no. 01 will be Short Answer Type and Compulsory. Any four questions shall have to be answered by the examinees out of the remaining seven questions. The questions will be of equal marks and will be so framed that the students are able to answer them within the stipulated time

GROUP E. ENVIRONMENTAL GEOLOGY Theory: 60 Hours; Tutorial: 15 Hours

Unit 1

Natural Hazards: Its causes, prediction and forecasting, control measures and its proper management. Problems of urbanization, human population and their impact on environment

Unit 2

Distribution, magnitude and intensity of earthquakes; Seismic hazard zones; Neotectonics in seismic hazard assessment; volcanic hazards, their causes and control.

Unit 3

Landslide, soil creeping, mass movements; Coastal erosion, coastal inundations, cyclones, Tsunamis its causes and mitigation measures. Application of Remote Sensing techniques for Natural Hazards management.

Unit 4

Floods, causes of floods, flood hazard, management of floods; Water logging, problems of water logging in India; Consequences of developments in flood plain areas.

A 1 4 4 1

Unit 5

Concept of Environmental Impact Assessment (EIA). Environmental Impact Assessment of mining on air, water, noise, land and soil; Hazards related with mining activities in India; Pollution in the mining areas and mitigation measures Land degradation in mining areas; Stabilisation of overburden in open cast mining areas; Management of underground mining areas. Impacts of mining on water availability.

P.G. GEOLOGY Suggested Books

- □ Bell, F.G. (1999): Geological Hazards, Routledge, London.
- □ Bryant, E. (1985): Natural Hazards, Cambridge Univ. Press.
- □ Keller, E.A. (1978) Environmental Geology
- □ Valdiya, K.S. (1987) Environmental Geology- Indian Context
- □ Patwarrdhan, A.M. (1999) The Dynamic Earth System
- □ Smith, K.(1992) Environmental Hazards
- □ Subramaniam, V.(2001) Textbook in Environmental Hazards
- □ Tank, R.W. Focus on Environmental Hazards
- □ Strahler and Strahler: Environmental Geology
- □ Truk and Truk: Environmental Geology

मिस् सा ज्योतिर्गमव

SEMESTER IV

PAPER XV ELECTIVE GE/ DC COURSE PRACTICAL CODE[ECGEOL405(P)]: (Credits: Practical-05)

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Marks Pass Marks =45

Instruction to Question Setter: End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

GROUP A. ELECTIVE PRACTICAL - FOSSIL FUEL GEOLOGY Practical: 60Hours

- Megascopic study of Coal and Coal bearing strata
- Proximate analysis of coal
- Drawing and labelling of parts of Gondwana Plant Fossils from different coalfields.

^{गेभ}सो मा ज्योरि

- Identification of different palynomorphs
- Microscopic examination of coal macerals
- Microscopic study of Heavy minerals
- Borehole problems and calculation of reserves from borehole
- Study of Geological Maps and Sections of important oil fields of India

PAPER XV ELECTIVE GE/ DC COURSE PRACTICAL CODE [ECGEOL405(P)]: (Ci

(Credits: Practical-05)

Pass Marks =45

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Marks

Instruction to Question Setter:

End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

GROUP B. ELECTIVE PRACTICAL - SEDIMENTOLOGY Practical: 60Hours

- Graphic plot of size data and calculation of statistical parameters.
- Study of Mechanical, Chemical and Biogenic Sedimentary structures and their sedimentological significance
- Megascopic and microscopic study of clastic and non-clastic rocks.
- Study of vertical profile sections of selected sedimentary environments;
- Study of Heavy Minerals.
- Graphic representation of Trace Element data and Heavy Minerals
- Recognition of marine fossil groups in assorted assemblage and identification of their classes





PAPER XV ELECTIVE GE/ DC COURSE PRACTICAL CODE

(Credits: Practical-05) Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Pass Marks =45

SEMESTER-IV

Instruction to Question Setter: End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

GROUP C. ELECTIVE PRACTICAL - HYDROGEOLOGY Practical: 60Hours

- Determination of porosity of aquifer materials.
- Determination of temperature, pH, T.D.S., conductivity TSS, alkalinity, dissolved oxygen, hardness etc.
- Construction of Water Table and piezomentric surface maps and their interpretations.
- Interpretations of geological cross sections for locating water bearing horizons.
- Pumping test for evaluation of aquifer parameters.
- Construction of litholog and their interpretations.
- Graphical representation of hydrochemical data on Piper Trilinear diagram.
- Plotting and interpretation of resistivity data.
- Delineation of watershed on topographical and satellite imageries.





PAPER XV ELECTIVE GE/ DC COURSE PRACTICAL CODE [ECGEOL 405(P)]

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100

(Credits: Practical-05) Pass Marks =45

Practical: 60Hours

SEMESTER-IV

Instruction to Question Setter: End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

GROUP D. ELECTIVE PRACTICAL - ORE GEOLOGY

- Megascopic study of important ores and their textures.
- Megascopic study of important industrial, metallic and non-metallic, precious and semi-precious stones.
- Ore petrographic study of ore minerals and establishment of paragenetic sequence
- Exercises on ore reserve calculations.
- Estimation of grade of ores.
- Flowchart analysis of ore beneficiation techniques.
- Preparation of polished sections



P.G. GEOLOGY CBCS CURRICULUM PAPER XV ELECTIVE GE/ DC COURSE PRACTICAL CODE [ECGEOL405(P)]

(Credits: Practical-05)

Marks: 80 (ESE Pr: 6Hrs) + 20 Prac Records and Viva Voce =100 Marks

SEMESTER-IV

Instruction to Question Setter: End Semester Practical Examination (ESE Pr):

Practical Course would be of 100 marks but there will be no Internal Written examination. The total 100 marks will have two components: 80 marks for practical and 20 marks will be awarded on the performance in viva voce.

^{लेभ}सो मा ज्यो तिर्भर्भ

GROUP E. ELECTIVE PRACTICAL - ENVIRONMENTAL GEOLOGY

Practical: 60Hours

- Analyses of alkalinity, acidity etc. in water samples.
- Analyses of pH and Electrical Conductivity in water.
- Preparation of ocean and atmospheric circulation maps.
- Preparation of seismic and volcanic zonation maps of India and world.
- Demarcation of flood prone areas in the outline map of India
- Presentation of chemical analyses data
- Plotting of chemical classification diagram
- Demarcation of landslide prone areas.
- Preparation of natural hazard map

PAPER XVI CORE COURSE (PROJECT)/DISSERTATION [CCGEOL410]:

(Credits : 05)

Marks: 100 (ESE: 3Hrs)=100

Pass Marks =45

Guidelines to Examiners for End Semester Examination (ESE):

Overall project dissertation may be evaluated under the following heads:

- *Motivation for the choice of topic*
- Project dissertation design
- Methodology and Content depth
- Results and Discussion
- Future Scope & References
- Participation in Internship program with reputed organization
- Application of Research technique in Data collection
- Report Presentation
- Presentation style
- Viva-voce

PROJECT WORK/DISSERTATION

Each student has to submit **two** copies of the project/dissertation work duly forwarded by the Supervisor and Head of Department concerned. The forwarded copies will be submitted in the University Department of Geology, N.P University for evaluation.

CEIR

The paper will consist of

- (a) Field work/Lab work related to the Elective Paper.
- (b) Preparation of dissertation based on the work undertaken.
- (c) Presentation of project work in the seminar on the assigned topic in the P.G.

Department of Geology, N.P University, Medininagar and open viva there on.

Note: - The students will select topics for the project work in consultation with faculty members of the department.

DISTRIBUTION OF MARKS FOR EXAMINATIONS AND FORMAT OF QUESTION PAPERS

Table-V: Distribution of marks of Theory Examinations of Mid-Semester								
Topic	Code	Full Marks	Pass	Time	Group-A (Short	Group-B	Total No. of	
			Marks		answer type	(Descriptive	Question	s to Set
					Compulsory	Questions) No.		
					Questions)	Of Questions x	Group	Group
					No. of Questions	Marks = F.M	Α	В
					x Marks=F.M.			
Mid	T30*	30	17	1 Hr.	5x1 =5	3 (Out of	05	5
Sem*		(20+5+5)				5) x 5 =15		

Distribution of marks for Mid-Semester Evaluation

Table-V: Distribution of marks of Theory Examinations of Mid-Semes

*There shall be 20 Marks Theory examination for Mid-Sem, 05 marks for Attendance/regular interactions & 05 marks for Seminar/Assignment/term paper given by faculty concerned in Classrooms.

Distribution of marks for End-Semester Evaluation

Table-VI: Marks distribution of Theory Examinations of End-Semester

Торіс	Code	Full Marks	Pass Marks	Time	Short answer type Compulsory Questions, No. of Questions x Marks=F.M.	Descriptive Questions, No. Of Questions x Marks = F.M	Total No. of Questions to Set
End Sem	T70	70	28	3 Hrs.	Q. No. 1 (7x2) =14	4 (Out of 7) x 14 =56	8

गेमसो मा ज्यो तिर्गम⁵

#Question No. 1 carry 07 short answer type questions of 2 marks.

FORMAT OF QUESTION PAPER FOR MID SEM EXAMINATION

N.P University, Medininagar

Mid Sem (SIA) Examination	Exam Year				
Paper Subject/ Code					
F.M. =20	Time=1 Hr				
General Instructions:					
i. Group A carries 5 short answer type compulsory questions.					
ii. Answer 2 out of 4 subjective descriptive questions given in Group B.					
iii. Answer in your own words as far as practicable.					
iv. Answer all sub parts of a question at one place.					
v. Numbers in right indicate full marks of the question.					
1 i. Group A ii. iii. iii. iii. iii. iii. iv. iv. iv. v. iv. iv.	[5x1=5]				
2 Group в	[7.5]				
3	[7.5]				
4 5	[7.5] [7.5]				

CBCS CURRICULUM N.P UNIVERSITY FORMAT OF QUESTION PAPER FOR END SEM EXAMINATION

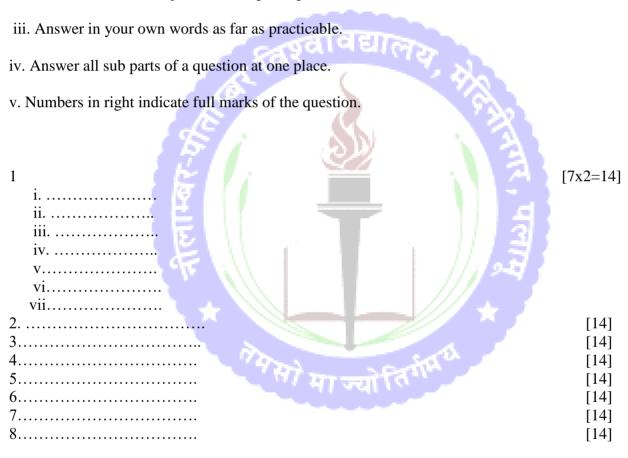
N.P University, Medininagar

End Sem Examination		Exam Year
	Paper	
	Subject/ Code	
F.M. =70	P.M.= 28	Time=3 Hrs.

General Instructions:

i. Q.1 carries short answer type compulsory questions.

ii. Answer 4 out of 7 subjective descriptive questions.



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