

MUZAFFARPUR INSTITUTE OF TECHNOLOGY
Muzaffarpur



COURSE FILE
of
Engineering Geology
(01 1305)



Course Instructors:

Dr. A. K. SINHA, Associate Professor

Dr. VIKASH KUMAR, Associate Professor

DEPARTMENT OF APPLIED SCIENCES AND HUMANITIES

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VISION OF THE DEPARTMENT

To get recognized as a prestigious civil engineering program at national and international level through continuous education, research and innovation.

MISSION OF THE DEPARTMENT

- To create the environment for innovative and creative idea generation in the engineers to serve the nation with new technologies in Civil engineering
- To develop students' skill for work in industry, academia and public sector organizations with their technical capabilities to succeed in their fields
- To build up feeling of participation, competitiveness, moral and ethical values among students
- To promote their technical knowledge, leadership and management skill to serve nation at any level of difficulty.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates are expected to attain Program Educational Objectives within three to four years after their graduation. Following PEOs of the Department of Civil Engineering have been laid down based on the needs of the program's constituencies:

- PEO1:** Contribute to the development of civil engineering projects being undertaken by Govt. and private or any other sector companies.
- PEO2:** Pursue higher education and contribute to teaching, research and development of civil engineering and related field.
- PEO3:** Successful career as an entrepreneur in civil engineering industry

PROGRAMME OUTCOMES (POs)

PO1	Engineering knowledge: Ability to apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to get the solution of the engineering problems.
PO2	Problem analysis: Ability to identify, formulate, review research literature and analyze complex engineering problems.
PO3	Design/development of solutions: Ability to design solutions for complex engineering problems by considering social, economic and environmental aspects.
PO4	Conduct investigations of complex problems: Use research-based knowledge to design, conduct analyze experiments to get valid conclusion.
PO5	Modern tool usage: Ability to create, select, and apply appropriate techniques, and to model complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Ability to apply knowledge by considering social health, safety, legal and cultural issues.
PO7	Environment and sustainability: Understanding of the impact of the adopted engineering solutions in social and environmental contexts.
PO8	Ethics: Understanding of the ethical issues of civil engineering and applying ethical principles in engineering practices.
PO9	Individual and teamwork: Ability to work effectively as an individual or in a team as a member or as a leader.
PO10	Communication: Ability to communicate clearly and effectively through different modes of communication.
PO11	Project management and finance: Ability to handle projects and to manage finance related issues.
PO12	Life-long learning: Ability to recognize the need for, and have the preparation and ability to engage in, independent and life-long learning.

COURSE OBJECTIVE AND COURSE OUTCOMES

Institute/college Name	Muzaffarpur Insittute of Technology, Muzaffarpur
Program Name	B.Tech. Civil (III semester)
Course Code/course credits	01 1305 (4)
Course Name	Engineering Geology
Lecture/ Sessional (per week)	3/2
SEE duration	

BACKGROUND

Civil engineering is an exciting combination of science, art, professional skill and engineering achievement which has to always rely on the ground/ geological formations on which its structures stand. Geology is therefore vital to success in civil engineering. Technical perfection alone can not ensure the economy, success or safety of civil engineering constructions. Suitability of sites is the prime requirement which depends heavily on the crucial geological factors like in situ rock types, the associated geological structures, ground water conditions etc. Site investigation exposes the geological drawbacks, if any, that are to be removed or taken care of before the actual execution of the project in order to ensure risk-free investment of time, money and energy.

The students of civil engineering are introduced to the basics of geology in general and engineering behavior of rocks in particular with which they often deal during the course of planning, design, cost estimation and execution of civil engineering projects.

COURSE OBJECTIVES

The course should enable the students to

- 1 - appreciate the importance of geology in civil engineering by going through case histories of failure of civil engineering constructions in the past;
- 2 - learn about minerals, rocks, their modes of formation and their physical and mechanical properties;
- 3 - understand the various natural dynamic processes and agents and their influence on the surface features, natural materials and civil structures;
- 4 - recognize geological structures in rock mass, their origin and their impact on civil engineering structures;
- 5 - appreciate the importance of geo-explorations, geological maps and geological reports and develop an understanding for their utilization for safer, stable and economical civil structures.

COURSE OUTCOMES (COs)

On completion of the course, the students should be able to

- CO1 - recognize the fundamentals of the Earth as a planet, earth's dynamic actions and their importance for civil engineering structures;
- CO2 - appreciate the usefulness and utilization of natural materials in civil engineering works;
- CO3 - broadly assess the dynamic actions of natural forces on civil engineering structures and recommend remedial measures;
- CO4 - analyze and interpret geological reports and information and the latest geological exploration methods for suitable site selection;
- CO5 - ascertain safe, stable and economical civil structures.

MAPPING OF COs AND POs

POs → COs ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	2
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	3	2	3	-	2	-	-	-	-	2
CO4	3	3	2	3	3	-	-	-	-	-	2	2
CO5	-	-	3	-	-	3	2	2	-	-	2	3

Correlation level: 1 - Slight (Low)

2 - Moderate (Medium)

3 - Substantial (High)

COURSE SYLLABUS

Theory:

1. Basic Geology: General Geology, Mineralogy, Petrology (igneous, sedimentary and metamorphic), Structural geology, Crystallography. **Lectures: 06**
2. Engineering properties of rocks: Geomorphology (Geomorphic processes - weathering, erosion, origin and formation of solids). **Lectures: 06**
3. Geological hazards (landslides, earthquakes and volcanoes), Groundwater, Recent concepts in Geology, Plate tectonics and Sea – floor spreading. **Lectures: 07**
4. Applied Geology: Geophysical mapping: seismic, resistivity, gravity, radar, geotomography, logging; Geological exploration of an engineering site. **Lectures: 08**
5. S. I. Desk Study: Site investigation Boreholes: Remote sensing, GIS and GPS: Basic principles and their applications in studying and monitoring Lithosphere, Hydrosphere, Cryosphere and Atmosphere. **Lectures: 08**
6. Cut Slopes in rocks and clays; Geological factors affecting the construction of dams, reservoirs and tunnels; Criteria and factors for site selection for Dam, tunnels, waste/radioactive disposal sites; Indian Geology, Outline of stratigraphy of India. **Lectures: 10**

Text Books:

TB1: Principles of Engineering Geology by Johnston. R. B. and DeGraff. J. V., John Wiley and Sons, New York.

TB2: Fundamental of Engineering Geology by Waltham, T., Spon Press, London.

TB3: A Textbook of Engineering and general Geology by Singh. P., S. K. Kataria and Sons, New Delhi.

TB4: A Textbook of Geology by Mukherjee P. K., Te world press Pvt. Ltd., Kolkata.

TB5: Engineering Geology by D V Reddy, Vikash Publishing House Pvt. Ltd.

TB6: Element of Mineralogy in Engineering Geology by Read, H. H. Rutley's, CBS Publisher.

TB7: Experiments in Engineering Geology by Gokhale, K. V. G. K. and Roa, D. M.,Tata McGraw Hill.

Reference Books:

RB1: A Textbook of Geology by G.B.Mahapatra, CBS Publishers.

RB2: Engineering Geology and Rock Mechanics by B.P.Verma, Khanna Publishers.

RB3: Remote Sensing & GIS by Basudev Bhatta, Oxford University Press.

Practical:

Mineralogy, Optics, Study of rocks in hand specimen and under microscope; Topographical maps; Structural Geological maps; Structural Geological problems; Engineering Geographical maps and Engineering Geological experiments; Geological fieldwork in and around Patna.



Muzaffarpur Institute of Technology (MIT), Muzaffarpur

(Under the Department of Science & Technology Govt. of Bihar, Patna)

Department of Civil Engineering

TIME TABLE FOR B. TECH 3rd SEMESTER (July-December 2018)

Lecture No.	I	II	III	IV		V	VI	VII
Day	9:00 AM-10:00 AM	10:00 AM - 11:00 AM	11:00 AM - 12:00 PM	12:00 PM-01:00 PM	RECESS	02:00 PM-03:00 PM	03:00 PM-04:00 PM	04:00 PM-05:00 PM
Monday	LE & A (BH) 14	B. SC. 14 (NK)	E. GEOLOGY (VIK) 14	MATH (SKJ) 14	RECESS	WEEKLY TEST (14)		
Tuesday	OBIP (T) (NK) 14	B.SC (SM) 14	MATH (SKJ) 14	LE & A (BH) 14	RECESS	B.SC. LAB (NK + PK)		
Wednesday	OBIP (NK) 14	B.SC (SM) 14	FM (AR) 14	IE & A (IH) 14	RECESS	FM LAB (AR + VK) / E. GEOLOGY LAB (VIK + AKS)		
Thursday	MATH (SKJ) 14	FM (NK) 14	FM (T) (NK) 14 14-MENTORING	FM (T) (AR) 14 14-MENTORING	RECESS	B.SC. LAB (NK + PK)		
Friday	IE&A (T) (IH) 14	FM (NK) 14	E. GEOLOGY(AKS)14	MATH (T) (SKJ) 14	RECESS	FM LAB (NK + RS) / E. GEOLOGY LAB (VIK, AKS)		
Saturday	OBIP (NK) 14	CIVIL ENGG DRAWING (SK+CBR+VK+ KU)			RECESS	E. GEOLOGY(VIK)14	IE&A (T) (IH) 14	

Course Code /	Subject Name	Faculty Name
CE 1303	Building Science	Prof. Shivangi Mishra (SM), Prof. Nisaj Kumar (NK)
CE 1305	Engineering Geology	Dr. Ashutosh Kumar Sinha (AKS), Dr. Vikash Kumar (VK)
CE 1307	Fluid Mechanics	Prof. Anil Kumar Raut (AR), Prof. Nisaj Kumar (NK)
CE 1303P	Building Science	Prof. Valsar Kumar (VK), Prof. Nisaj Kumar (NK)
CE 1305P	Engineering Geology	Dr. Ashutosh Kumar Sinha (AKS), Dr. Vikash Kumar (VK)
CE 1307P	Fluid Mechanics	Prof. Nisaj Kumar (NK), Prof. Rishi Srivastava (RS)
CE 1314P	Civil Engineering Drawing	Dr. Sanil Kumar (SK), Prof. C.B. Ray (CBR), Prof. Yijay Kumar (VK), Prof. Kamesh Kumar (KK)

Professor- In Charge Time Table

HOD Civil Engineering

MUZAFFARPUR INSTITUTE OF TECHNOLOGY B.Tech. 3rd (Third) Semester (2017 Batch) TIME TABLE FOR ENGINEERING GEOLOGY (WITH EFFECT FROM 16.07.2018)

PERIODS →	I	II	III	IV	R	V	VI	VII
DAYS ↓	9-10 AM	10-11 AM	11 AM-12 PM	12-1 PM		2-3 PM	3-4 PM	4-5 PM
MON			E.GEO		E			
TUE					C			
WED					E	----E.GEO LAB-----		
THURS					S			
FRI			E.GEO		S	----E.GEO LAB-----		
SAT					S	E.GEO		

STUDENT LIST

SL. NO.	ROLL NO.	AKU REG. NO.	NAME
1	17C01	17101107018	SONU KUMAR
2	17C02	17101107028	RAJNISH KUMAR
3	17C03	17101107002	GAURAV PANDEY
4	17C04	17101107016	MOHIT KUMAR
5	17C05	17101107005	PRASHANT KUMAR
6	17C06	17101107014	NATASHA
7	17C07	17101107062	ANIL KUMAR NAYAK
8	17C08	17101107006	NITESH KAPIL
9	17C09	17101107004	SAURAV KUMAR
10	17C10	17101107017	RAJNRANJAN KUMAR
11	17C11	17101107001	SHUDHANSHU ROY
12	17C12	17101107011	DIVYANSHU SHEKHAR
13	17C13	17101107019	ARUN KUMAR SINGH
14	17C14	17101107010	ABHISHEK RAJ
15	17C15	17101107008	PREM PRAKASH
16	17C16	17101107012	JITENDRA KUMAR
17	17C17	17101107007	INDRAJEET KASHYAP
18	17C19	17101107003	DEEPAK KUMAR CHAUHAN
19	17C20	17101107013	SHREYA PATEL
20	17C21	17101107021	DHANANJAY KUMAR
21	17C22	17101107020	SHUBHAM BHARADWAJ
22	17C23	17101107009	SHIVAM JHA
23	17C24	17101107022	VIMAL BHASKAR
24	17C25	17101107015	BIRU KUMAR
25	17C26	17101107025	ADITYA KUMAR THAKUR
26	17C27	17101107026	RAVISH KUMAR
27	17C28	17101107023	RAHUL KUMAR
28	17C29	17101107033	KUNDAN KUMAR
29	17C30	17101107024	PRABHASH KUMAR
30	17C31	17101107047	GAURAV KUMAR
31	17C32	17101107029	VIKASH KUMAR
32	17C33	17101107060	MD FURQUAN ALI
33	17C34	17101107030	RANJAN SAH
34	17C35	17101107058	MD NAUMAN AKHTAR
35	17C36	17101107038	DEEPAK KUMAR

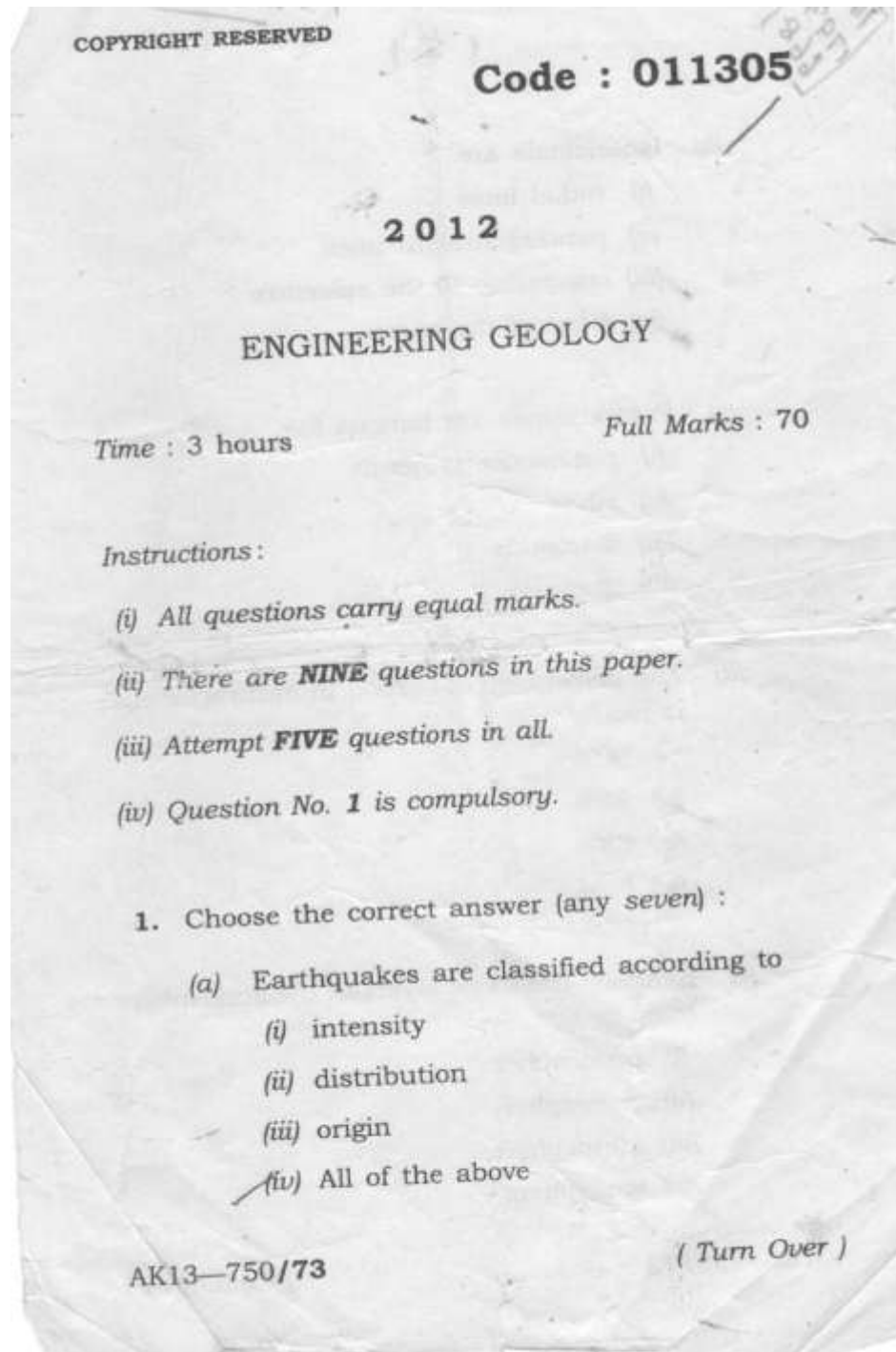
36	17C37	17101107041	NICKY KUMARI
37	17C38	17101107039	DEVESH KUMAR
38	17C39	17101107037	AJAY KUMAR
39	17C40	17101107053	CHANDRAMANI KUMAR
40	17C41	17101107042	AKRITI SINGH
41	17C42	17101107032	MOHIT KUMAR
42	17C43	17101107054	PRINCE MANI
43	17C44	17101107036	RUPAK KUMAR
44	17C45	17101107061	BINDA KUMAR
45	17C46	17101107034	ADITYA KUMAR
46	17C47	17101107031	VIKASH KUMAR
47	17C48	17101107035	SHASHI KUMAR
48	17C49	17101107049	ALOK RAJ
49	17C50	17101107051	MANJESH KUMAR
50	17C51	17101107045	UDAY RANJAN
51	17C52	17101107052	SONU KUMAR
52	17C53	17101107050	RAKESH KUMAR
53	17C54	17101107044	SHASHI RANJAN
54	17C55	17101107059	SHASHI RAJ
55	17C56	17101107048	RUPESH KAZI
56	17C57	17101107043	RAUSHAN KUMAR
57	17C58	17101107040	SANIYA SINGH
58	17C59	17101107046	NAVED HASAN
59	17C60	17101107027	RAGANI KUMARI
60	17C61	17101107056	DHIRAJ KUMAR
61	17C62	17101107057	SAMEER KUMAR

COURSE PLAN

Topic No.	Topic	No. of lectures	Text book
1.	Basic Geology	6	TB3, TB4, TB6, RB1
	General Geology	1	
	Mineralogy	1	
	Petrology(igneous, sedimentary and metamorphic)	2	
	Structural geology	1	
	Crystallography	1	
2.	Engineering properties of rocks	6	TB3, TB4, RB1
	Geomorphology	1	
	Geomorphic processes - weathering, erosion	3	
	Origin and formation of solids	2	
3.	Geological hazards	7	TB1, TB3, TB4, TB5
	Landslides	1	
	Earthquakes	2	
	Volcanoes	1	
	Groundwater	2	
	Recent concepts in Geology- Plate tectonics and Sea –floor spreading	1	
4.	Applied Geology	8	TB1, TB2, TB7, RB2
	Geophysical mapping: seismic, resistivity, gravity, radar, geotomography, logging	6	
	Geological exploration of an engineering site	2	
5.	S. I. Desk Study	8	TB1, RB3

	Site investigation: Boreholes	1	
	Remote sensing, GIS and GPS: Basic principle and their applications in studying and monitoring Lithosphere,Hydrosphere, Cryosphere and Atmosphere.	7	
6.	Cut Slopes in rocks and clays	10	TB2, TB3, TB4, TB5
	Geological factors affecting the construction of dams, reservoirs and tunnels	2	
	Criteria and factors for site selection for Dam, tunnels, waste/radioactive disposal sites	5	
	Indian Geology, Outline of stratigraphy of India	3	
	Total Number of Lectures	45	

University exam question paper:



(2)

(b) Isoseismals are

- (i) radial lines
- (ii) parallel straight lines
- (iii) concentric to the epicentre
- (iv) None of the above

(c) Panna mines are famous for

- (i) radioactive minerals
- (ii) silver
- (iii) diamonds
- (iv) titanium

(d) The percentage of carbon in anthracite coal is nearly

- (i) 99%
- (ii) 95%
- (iii) 88%
- (iv) 80%

(e) Kennelly-Heaviside layers in the atmosphere refer to

- (i) ozonosphere
- (ii) troposphere
- (iii) mesosphere
- (iv) ionosphere

AK13—750/73

(Continued)

(3)

(f) The age of the earth is estimated to be at least

(i) 2×10^3 years

(ii) 20×10^3 years

(iii) 20×10^6 years

(iv) 2×10^9 years

(g) The colour of basalt is normally

(i) grey or white

(ii) black or dark brown

(iii) pink or red

(iv) yellow or orange

(h) Tsunami is

(i) a large rounded mound of sand often found in sandy desert

(ii) a line connecting points of equal precipitation

(iii) an intrusive igneous rock, that is coarse grained, composed of quartz, feldspar and mica

(iv) powerful seismic sea waves generated by an earthquake

(i) Adamantine is a kind of

(i) colour

(ii) sleek

(iii) lustre

(iv) structure

AK13—750/73

(Turn Over)

(4)

- (j) An aquifer confined at the bottom but not at the top is termed as
- (i) confined aquifer
 - ~~(ii) unconfined aquifer~~
 - (iii) semiconfined aquifer
 - (iv) perched aquifer

2. What are crystals? How can they be classified broadly? Describe each system with examples of minerals crystallized in the respective systems.

3. How are minerals identified in the field/in the laboratory? What are the standard methods for identification of minerals? Add a note on the economic significance of minerals.

4. Distinguish between igneous, sedimentary and metamorphic rocks on the basis of composition, texture, petrographical, geological, geographical distribution. List the typical rocks of each group.

5. What are folds? How are they formed? Describe with neat sketches the different types of folds. Explain the engineering significance of folds with typical case in points.

K13-750/73

(Continued)

(5)

6. What is meant by weathering of rocks? Describe in detail the types of rock weathering. Discuss the weathering pattern of rocks in Civil Engineering.
7. What is meant by artificial recharge structures of ground water? Describe in detail the various techniques and design of artificial recharge structures. Discuss benefits and limitations of artificial recharge structures in ground water development and management.
8. Prove the relation

$$H = \frac{x}{2} \sqrt{\frac{V_2 - V_1}{V_2 + V_1}}$$

where, H is the thickness of top layer, x is the distance between the shock point and placement of geophone, V_2 and V_1 are velocities of the seismic waves in upper and lower strata.

9. Define remote sensing. Give the applications of remote sensing with respect to the natural hazards and that of archaeology.
