

Second Semester

MGH 451: STRUCTURAL GEOLOGY AND HYDROGEOLOGY

Skills, employability and entrepreneurship: These subjects are good opportunity for students to learn not only to know the large-scale earth's features which favour water and mineral accumulations. Similarly, students who pay attention to this subject can become a hydrogeologist. They will be exposed to start their own entrepreneurship. Students are encouraged to undergo internships after the regular offline classes as well as during the vacation.

Structural Geology

Unit 1	Introduction: Importance of structural geology and its relationship with other branches of geology. Dip and strike. Force, stress and strain: Force and acceleration, composition and resolution of forces. Concept of stress and strain; strain analysis using deformation objects.	6 hrs
Unit 2	Folds: Parts of a fold. Geometrical classification of folds. Mechanics and causes of folding. Criteria for recognition of folds in the field.	6 hrs
Unit 3	Faults: General characteristics, nature of movement along faults. Geometric and genetic classification of faults. Mechanics of faulting. Criteria for recognition of faults in the field.	6 hrs
Unit 4	Joints: Geometry and classification. Field studies, importance of joints in geological, structural/civil engineering studies. Unconformities: Different types of unconformities. Recognition of unconformities in the field. Criteria to differentiate between faults and unconformities. Interactive sessions of teaching to enhance students-teacher interactions through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.	8 hrs

Hydrogeology

Unit 5	Introduction: Origin of water, hydrological cycle and its components – precipitation, interception, runoff, evaporation and evapotranspiration. types, importance, occurrence, movement and vertical distribution of ground water; Water bearing geological formations; Springs, classification of aquifers, hydrologic properties of rocks: porosity; permeability; specific yield; specific retention, hydraulic conductivity, transmissivity, storage coefficient. Darcy's law and its applications.	
Unit 6	Groundwater quality: Physical and chemical properties of water, quality criteria for different uses, groundwater quality provinces of India, Groundwater contamination; water table fluctuation, water table contour maps; hydrostratigraphic units.	6 hrs
Unit 7	Wells: Types, drilling methods, construction, design, development and maintenance. Salt water intrusion in coastal and island aquifers; groundwater legislation in rural and urban areas.	4 hrs

Unit 8	Groundwater development and management: Methods of artificial groundwater recharge; rainwater harvesting, problems of over-exploitation of groundwater; water management in rural and urban areas, geological and geophysical methods of groundwater exploration. Interactive sessions of teaching to enhance students-teacher interactions through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.	6 hrs
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References:

1. Field Geology – McGraw Hill Book Co. - Lahee, F. H. (1961)
2. Folding and Fracturing of Rocks - McGraw Hill Book Co. - Ramsay, J.G. (1967)
3. Structural Geology – 3rd edition, Prentice Hall - Billings M.P. (1977)
4. Structural Geology of Rocks and Regions - John Wiley and Sons - Davis, G.H. (1984)
5. Structural Geology Principles, Concepts and Problems, 2nd Edition, New Jersey Prentice Hall - Hatcher, Robert D. (1995)
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11. Groundwater – C. F. Tolman – McGraw-Hill Book Co. Inc.
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16. Handbook of Applied Hydrology - V.T. Chow (Ed) – McGraw-Hill Book Co. New York
17. Hydrogeology – K. R. Karanth – Tata McGraw Hill Publishing Co. Ltd.
18. Ground Water Assessment, Development and Management – K. R. Karanath – Tata McGraw Hill Publishing Co. Ltd.
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22. Elements of Hydrology – V. P. Singh
23. Engineering Hydrology – K. Subramaniam – Tata McGraw Hill Publishing Co. Ltd.
24. Introduction to Hydrology – Viessman, W., Lewis, G. L. and Knapp, J. W. (3rded.) Harper and Row, New York
25. Applied Hydrology – Mutreja, K. N. – Tata McGraw Hill Publishing Co. Ltd.
26. Global Groundwater Resources and Management: Paliwal - Scientific publishers.