Nepal Engineering Council Registration Examination

ENGINEERING GEOLOGY SYLLABUS (AEgE)

1. **Fundamental of Engineering Geology** (AEgE01)
   1.1. Introduction of geology and its interrelationship with other subjects: Geography, Climatology, Geodesy, Oceanography, Astronomy and Civil Engineering (AEgE0101)
   1.2. Different branches of geology and their interrelationship: Physical geology, Petrology, Mineralogy, Geophysics, Structural geology, Hydrogeology, Geochemistry, Economic geology, Environmental geology (AEgE0102)
   1.3. Definition of engineering geology and importance in civil engineering projects (AEgE0103)
   1.4. Preparation of engineering geological map in the field. (AEgE0104)
   1.5. Importance of engineering geological study in the context of Nepal. (AEgE0105)
   1.6. Brief study of case histories of some civil engineering construction projects due to geological challenges in the Nepal Himalaya. (AEgE0106)

2. **Origin of Earth and evolution of the Himalaya (AEgE02)**
   2.1. The Earth: Origin, age, components and internal structure. (AEgE0201)
   2.2. Geological history of Earth: Geological time scale, origin and evolution of life, major geological events in the Earth's history. (AEgE0202)
   2.3. Plate tectonics and formation of the Himalaya: Types of plate boundaries, Mid-Oceanic Ridge, evolution of Himalaya. (AEgE0203)
   2.4. Geology of different tectonic division: Concept and criteria of the division, geology of the following tectonic divisions: Indo-Gangetic plain, Siwalik, Lesser Himalaya, Higher Himalaya and Tibetan-Tethys zone. (AEgE0204)
   2.5. Physiographic sub-division of the Nepal Himalaya: Terai, Siwaliks, Hill, Middle Mountain and High Mountain. (AEgE0205)
   2.6. Major engineering geological problems in different tectonic and physiographic units of the Nepal Himalaya and their mitigation. (AEgE0206)

3. **Mineralogy and Petrology (AEgE03)**
   3.1. Crystal: Definition, crystal morphology, symmetry elements and crystal system. (AEgE0301)
   3.2 Minerals: Physical, chemical and optical properties of minerals, classification of rock forming minerals and their engineering importance. (AEgE0301)
   3.3 Petrology: Definition of petrology, petrogenesis and petrography, rock cycle.
   3.4 Rock classification: Classification. Structure and texture of igneous, sedimentary and metamorphic rock. (AEgE0301)

3.5 Macroscopic study of rocks with their physical and engineering properties: Granite, Rhyolite, Gabbro, Basalt, Pegmatite, Syenite Shale, Siltstone, limestone, Sandstone, Conglomerate, Breccia, slate, Phyllite, Schist, Gneiss, Quartzite and Marble. (AEgE0305)

3.6Engineering significance of different rock types. (AEgE0306)

4. Structural Geology (AEgE04)

4.1. Rock deformation process: Types of stress, stages of deformation. (AEgE0401)
4.2. Primary structures: lamination, cross-bedding, graded bedding, ripple marks and bedding plane. (AEgE0402)
4.3. Secondary structures: lineation, foliation, badinage, crenulation cleavage, folds, fractures, joints, faults and thrusts. (AEgE0403)
4.4. Engineering significance of geological structures, construction of geological cross-section and interpretation. (AEgE0404)
4.5. Measurement of orientation of geological structures: Dip, strike, trend, plunge, plotting of rock attitude in geological map, important of geological compass and hammer. (AEgE0405)
4.6. Geological structures: Identification and criteria of primary and secondary structures in the field. (AEgE0406)

5. Hydrogeology (AEgE05)

5.1. Definition and scope: Hydrological cycle, surface water-groundwater interaction, water surface and piezometric surface and river channel morphology. (AEgE0501)
5.2. Origin and movement of groundwater: Darcy's law, porosity and hydraulic conductivity, permeability, transmissivity and storage coefficient, fluctuation in ground water levels. (AEgE05002)
5.3. Aquifer: Definition of aquifer, aquiclude and aquitard, types of aquifer. (AEgE0503)
5.4. Geological factors for formation of different hydrological condition. (AEgE0504)
5.5. Over exploitation of groundwater and groundwater mining, groundwater problems in urban areas. (AEgE0505)
5.6. Different types of aquifer systems in the Nepal Himalaya (Terai, Hills and Mountains). (AEgE0506)

6. Physical Geology (AEgE06)

6.1. Introduction: Definition, different geological agents. (AEgE0601)
6.2. Geomorphological process: Weathering, erosion and transportation. (AEgE0602)
6.3. Geological cycle. (AEgE0603)
6.4. Geological agents: Landform produced by river, glacier, groundwater, wind and sea-water. (AEgE0604)
6.5. Relationship between Atmosphere, Hydrosphere and Biosphere. (AEgE0605)
6.6. Study and interpretation of topographic and geological map. (AEgE0606)

7. Engineering geology in site selection, investigation and construction. (AEgE07)

7.1. Engineering geological documentation during different engineering projects: Planning, investigation, construction and maintenance. (AEgE0701)

7.2. Engineering geological investigation in different engineering projects: road and canal, buildings, bridge, dams and reservoirs, tunneling and underground excavation. (AEgE0702)

7.3. Rock slope engineering: Measurement and plotting of discontinuity line and plane, stereographic projection. (AEgE0703)

7.4. Kinematic analysis: Types of rock slope failures (plane, wedge and toppling failure), rosette diagram. (AEgE0704)

7.5. Rock mass classification systems: Definition, Terzaghi-rock load classification system, Deree-RQD index classification, Wickham-Rock Structure Rating (RSR), Bieniawski's RMR, Barton's Q system, Laubscher's MRMR, Modified Hoek-Brown Failure criterion for jointed rock masses, New Austrian Tunneling Method (NATM). (AEgE0705)

7.6. Problems with parameters in existing rock mass classification system. (AEgE0706)

8. Geological hazards (AEgE08)

8.1. Major geological hazards: Definition of different geological hazards (mass movement, flood, Glacial Lake Outburst Flood (GLOF), earthquake, volcano). (AEgE0801)

8.2. Types of mass movements: Definition and classification, cause and effects, associated hazards (Landslide Dam Outburst Flood), mitigation measures. (AEgE0802)

8.3. Earthquake and seismicity: Definition, principle and origin of earthquake, seismicity of the Nepal Himalaya, Magnitude and intensity, causes and effects, prediction of earthquake. (AEgE0803)

8.4. Volcanism and associated hazards: Types of volcano, types of volcanic landforms, prediction of volcano and hazards. (AEgE0804)

8.5. Glacial lake and GLOFs hazards in the Nepal Himalaya. (AEgE0805)

8.6. Understanding of geo-hazard history of the Nepal Himalaya. (AEgE08)

9. Reserve estimation and construction material survey. (AEgE09)

9.1. Reserve estimation: searching, exploration and estimation of construction materials. (AEgE0901)

9.2. Aggregates and construction materials: clay, silt, sand, limestone, marble, slates and building stones. (AEgE0902)

9.3. Exploration methods: use of topographical map, geological map, aerial and satellite maps. (AEgE0903)

9.4. Estimation of quality and quantity of different construction materials. (AEgE0904)

9.5. Basic information of different quarry sites of iron and limestone in Nepal. (AEgE0905)

9.6. Application of geomorphology in searching of construction materials. (AEgE0906)

10. Project Planning, Design and Implementation (AALL10)

10.1 Engineering drawings and its concepts: Fundamentals of standard drawing sheets, dimensions, scale, line diagram, orthographic projection, isometric projection/view, pictorial views, and sectional drawing. (AALL1001)

10.2 Engineering Economics: understanding of project cash flow; discount rate, interest and time value of money; basic methodologies for engineering economics analysis (Discounted Payback Period, NPV, IRR & MARR); comparison of alternatives, depreciation system and taxation system in Nepal. (AALL1002)

10.3 Project planning and scheduling: project classifications; project life cycle phases; project planning process; project scheduling (bar chart, CPM, PERT); resources levelling and smoothing; monitoring/evaluation/controlling. (AALL1003)

10.4 Project management: Information system; project risk analysis and management; project financing, tender and its process, and contract management. (AALL1004)

10.5 Engineering professional practice: Environment and society; professional ethics; regulatory environment; contemporary issues/problems in engineering; occupational health and safety; roles/responsibilities of Nepal Engineers Association (NEA). (AALL1005)

10.6 Engineering Regulatory Body: Nepal Engineering Council (Acts & Regulations). (AALL1006)