# Geology and Soil Mechanics

# Module Information

**2022.01, Approved**

## Summary Information

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|---|---|
| Module Code | 4506ICBTCE |
| Formal Module Title | Geology and Soil Mechanics |
| Owning School | Civil Engineering and Built Environment |
| Career | Undergraduate |
| Credits | 15 |
| Academic level | FHEQ Level 4 |
| Grading Schema | 40 |

**Teaching Responsibility**

| LJMU Schools involved in Delivery |
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| LJMU Partner Taught |

**Partner Teaching Institution**

| Institution Name |
|---|
| International College of Business and Technology |

## Learning Methods

| Learning Method Type | Hours |
|---|---|
| Lecture | 36 |
| Tutorial | 9 |
| Workshop | 30 |

## Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|---|---|---|---|
| APR-PAR | PAR | April | 12 Weeks |

| | | | |
|---|---|---|---|
| JAN-PAR | PAR | January | 12 Weeks |
| SEP_NS-PAR | PAR | September (Non-standard start date) | 12 Weeks |

## Aims and Outcomes

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| Aims | To study the physical and mechanical properties of engineering soils and their application, particularly in relation to short-term and long-term conditions in homogeneous isotropic ground.To study the effects of standing and flowing groundwater on the deformation and failure of engineering earth structures and other forms of construction. |

**After completing the module the student should be able to:**

### Learning Outcomes

| Code | Number | Description |
|---|---|---|
| MLO1 | 1 | Identify & describe the common rock types, their mode of formation and uses within construction |
| MLO2 | 2 | Classify soil types from the determination of their basic soil properties |
| MLO3 | 3 | Identify the primary design parameters for soils |
| MLO4 | 4 | Relate the results from common soil tests to engineering design work |

## Module Content

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| Outline Syllabus | Geology: structure of the Earth; Earth history; geochemical cycle - processes and products; introduction to petrology - broad classification of rocks; structural geology - stratification, bedding, faults, folds and unconformities; geological maps.Engineering classification of soils: Soil description and classification: differences between description and classification, index properties, particle size distribution, soil properties and phase relationships, Fundamental soil properties: particulate nature of soils, three-phase and two-phase states, calculations for soil density, moisture content, void ratio and degree of saturation, characteristics of fine grained soil responsible for development of apparent cohesionEarth-fill: compaction theory, standard laboratory testing and field compaction techniques. Shear strength of soils: shear strength theory, laboratory testing and in-situ determination of shear strength parameters.Stress analysis; the measurement of pressure distributions in a soil mass from loadsapplied to a homogeneous isotropic material.Ground water: Held water, equilibrium water content, soil suction, phreatic surface,permeability, seepage and flow nets, pore-water pressure, and stability and seepageforces.Principles of Effective Stress: Compressibility and consolidation; influence of conditions on failure, stress paths, stress history and its effects, influence on the strength and deformation of soil, drained and undrain behaviour, influence of seepage on effective stressClassification of common rocks: engineering description of rocks to current codes of practiceMode of formation: petrographic classification of igneous rocks, common stable and unstable minerals, diverse nature of sedimentary rocks, grades of metamorphismCalculations and graphs: total stress, pore water pressure and effective stress for soil sequence under hydrostatic conditionsGeotechnical design parameters: common methods for the determination of shear strength, compressibility and permeability to current codes of practice, potential limitations associated with the methodsGround investigation and in-situ sampling: current techniques for the acquisition of soil samples for laboratory testing, impact of sample quality on measured parameters, common methods of in-situ testingLaboratory measurements: e.g. density, moisture content, void ratio, degree of saturation, permeability, porosity, shear strength, liquid limit, chemical natureLaboratory data: shear box tests, volumetric response to shear, unconsolidated undrained and consolidated undrained withPore pressure measurement triaxial tests, triaxial shear strength parameters by Mohr's Stress Circles and stress path methodsPermeability tests: constant head and falling head permeameters, process results from field pumping tests (in terms of coefficient of permeability and radius of the cone of depression)One-dimensional consolidation test: oedometer tests for coefficient of volume compressibility |
| Module Overview | |
| Additional Information | |

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---|---|---|---|---|
| Portfolio | Portfolio – Laboratory Reports | 50 | 0 | MLO1, MLO2, MLO3, MLO4 |
| Exam | Written Examination | 50 | 2 | MLO1, MLO2, MLO3, MLO4 |

## Module Contacts

**Module Leader**

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Karl Jones | Yes | N/A |

**Partner Module Team**

| Contact Name | Applies to all offerings | Offerings |
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