# Course Outline (Higher Education)

**School:** School of Engineering, Information Technology and Physical Sciences

**Course Title:** SLOPE STABILITY

**Course ID:** MGGGC7105

**Credit Points:** 15.00

**Prerequisite(s):** Nil

**Co-requisite(s):** Nil

**Exclusion(s):** Nil

**ASCED:** 030911

**Description of the Course :**

This course introduces the engineering behaviour of natural and engineered soil / rock slopes, the factors that affect the stability of the slopes, and the analysis methods with and without considering the variation of material properties under various conditions. Some basic knowledge about numerical modelling is also included in the course. After finishing the course, the students are anticipated to be able to analyse the stability of rock / soil slopes using the methods introduced during the course.

**Grade Scheme:** Graded (HD, D, C, etc.)

**Work Experience:**

No work experience: Student is not undertaking work experience in industry.

**Placement Component:** No

**Supplementary Assessment:** Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

**Program Level:**

| Level of course in Program | AQF Level of Program | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 |
| Introductory | | | | | | |
| Intermediate | | | | | | |
| Advanced | | | | | ✔ | |

**Learning Outcomes:**

On completion of the course the student will be able to:

**Knowledge:**

**K1.** Describe the behaviour of natural and engineered soil / rock slopes under various weather and engineering conditions.

**K2.** Explain the factors that may affect the stability of slopes.

**K3.** Describe the difference between deterministic and probabilistic analysis methods for slope stability analysis.

**K4.** Select an appropriate slope stability analysis method subject to geometry of slope, material properties, and uncertainty of observations.

**K5.** Outline the use of advanced numerical modelling tools to analyse the behaviour of slopes.

**Skills:**

**S1.** Choose appropriate material properties and use suitable methods to analyse the stability of different types of slopes.

**S2.** Assess the potential landslide risk of slopes.

**Application of knowledge and skills:**

**A1.** Analyse the stability of slopes considering a range of environmental and engineering processes.

**A2.** Use advanced numerical method tools to simulate the behaviour of slopes.

**Course Content:**

Topics may include:

- Week 1 - Geology and slopes: Geological structure and slope movement, groundwater, seismic effects, initial stress, weathering, previous landslide activities, natural slopes, cut and fill.
- Week 2 - Drained and undrained condition: Total and effective stress theory, short and long term stability, selection of soil strength parameters.
- Week 3 - Slope stability analysis: Infinite slopes, plane failure, wedge failure, tension cracks.
- Week 4 - Slope stability analysis: Slip failure.
- Week 5 - Water effects: Rainfall induced landslides, rapid drawdown, and water rise in dam.
- Week 6 - Discontinuities in rocks and failure modes of rock slopes.
- Week 7 - Analysis of rock slopes: Limit equilibrium analysis, plane failure, wedge failure, Hoek and Bray simplified method.
- Week 8 - Slope stability in Intermediate Geotechnical Materials (IGMs) and case study.
- Week 9 - Numerical modelling: Stress and strain analysis, Introduction of finite element method and finite differential method, parameters required for numerical modelling.
- Week 10 - Slope stability evaluation index: Factor of safety and probability of failure.
- Week 11 - Probabilistic analysis: First order and reliability method, Monte Carlo simulation.
- Week 12 - Case study.

**Values:**

**V1.** Deepen knowledge of geomechanics to solve engineering problems related to soil / rock slopes.

**V2.** Independent judgement around slope stability analysis.

**V3.** Professional responsibility for understanding slope behaviour and slope failure risk and impacts.

### Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

| **Graduate attribute and descriptor** | | **Development and acquisition of GAs in the course** | | | |
|---|---|---|---|---|---|
| | | **Learning Outcomes** (KSA) | **Code** A. Direct B. Indirect N/A Not addressed | **Assessment task (AT#)** | **Code** A. Certain B. Likely C. Possible N/A Not likely |
| GA 1 Thinkers | Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions. | K1-K5, S1, S2, A1, A2 | A | 1-3 | A |
| GA 2 Innovators | Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change. | K1-K5, S1, S2, A1, A2 | B | 1-3 | C |
| GA 3 Citizens | Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately. | K1-K5, S1, S2, A1, A2 | B | 1-3 | C |
| GA 4 Communicators | Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand. | K1-K5, S1, S2, A1, A2 | B | 1-3 | B |
| GA 5 Leaders | Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices. | Not applicable | Not applicable | Not applicable | Not applicable |

### Learning Task and Assessment:

| Learning Outcomes Assessed | Learning Tasks | Assessment Type | Weighting |
|---|---|---|---|
| K1, K2, K3, S1, S2, A1 | Slopes for road embankments and dams. | Coursework â€" Essay (2000 words). | 20-35% |
| K1, K2, K3, K4, S1, S2, A1, A2 | Large excavation in open cuts. | Coursework - Case study and report (4000 words). | 20-35% |
| K3, K4, K5, S1, S2, A2 | Probabilistic and deterministic analysis of slopes. | Coursework - Project. | 30-50% |

**Adopted Reference Style:**

Australian Harvard