**Short Form Unit Details for BEng (Hons), Civil Engineering**

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| **Unit Title** | Environmental Engineering |
| **Level** | Level 6, Year 3 |
| **Reference No.**  ***(showing level)*** | EUA\_6\_424 |
| **Credit Value** | 15 CAT points |
| **Student Study Hours** | Contact hours: 42 hours  Private study hours: 108 hours  Total hours:150 hours |
| **Pre-requisite learning** | None |
| **Co-requisites** | None |
| **Excluded combinations** |  |
| **Unit co-ordinator** | Dr Timothy Hong |
| **Faculty/Department** | Urban Engineering |
| **Short Description** | This unit takes the principles of environmental engineering and applies them to practical applications of analysis and design. The student will be introduced to the principles of water quality, and basic water and wastewater treatment processes, and considers sustainability issues. The student will develop an understanding of the hydrological cycle and surface hydrology, and apply these principles to the calculation of precipitation and unit hydrograph. The student will also learn basics of groundwater flow, and the problem of contamination in groundwater. The unit also introduces air pollution and noise pollution |
| **Aims** | To provide a systematic analysis of the distribution and movement of water and contaminants in the physical environment and to introduce the engineering principles involved in environmental systems. |
| **Learning Outcomes** | **Knowledge and Understanding**:   * Apply the principles of chemical and biological reaction for calculating the water quality parameters * Use water quality models and to understand how such models are applied to calculate water quality changes in streams and demonstrate a critical understanding of water treatment and wastewater treatment * Determine how to measure and analyse precipitation and analyse the rainfall–runoff relationship * Understand the groundwater flow and apply it for calculating the steady-state groundwater flow in the aquifer. Calculate the contaminant concentration in the aquifer using the mathematical models * calculate ground-level air pollutant concentrations using a Gaussian plume model. And demonstrate a critical understanding of the methodologies used for environmental impact assessment and their respective advantages and shortcomings   **Intellectual Skills**:   * Use mathematical methods to analyse engineering problems * Design engineering elements and whole systems to meet a need, critically evaluate, and make improvements * Plan, conduct, and report on an individual research programme.   **Practical Skills**:   * Analyse experimental results and determine their validity and accuracy * Use computer packages   **Transferable Skills**:   * Use Information and Communications Technology * Manage tasks and solve problems, transfer techniques and solutions from one area to another, apply critical analysis and judgement |
| **Employability** | This unit will provide the student with a knowledge and understanding of environmental engineering at an advanced level, thereby enabling the student to work to this level in consulting engineering practices and in organisations and agencies concerned with environmental issues. |
| **Teaching and learning pattern** | Lectures and tutorials supplemented by printed or electronic handouts. There will be an emphasis on problem-solving activities to illustrate the principles and concepts developed. This will be used extensively in the lecture programme and will be further supported in regular tutorial sessions. |
| **Indicative content** | **Main Content** Introduction to water quality  Physical, chemical and biological characteristics of water, water quality parameters  Water quality management  Microbial kinetics, material balances, water quality in rivers, Streeter-Phelps equation  Water treatment processes  Water supply system, pre-treatment, sedimentation, coagulation, filtration, disinfection  Wastewater treatment processes  Sewer network, biological reactions in the wastewater, conventional activated-sludge process, attached growth system, biological nutrient removal process, anaerobic digestion  Basics of Hydrology  Precipitation. evapotranpiration. infiltration. Rainfall-runoff relationship. Unit hydrograph.  Groundwater hydrology  Aquifer types, aquifer properties, urban groundwater hydrology, recharge to groundwater  Groundwater flow  Darcy’s law, groundwater flow in an unconfined aquifer  Groundwater pollution  Contaminants of groundwater, mathematical understanding of the contaminants transport in the groundwater, groundwater remediation  Air pollution  Air pollutants and their sources; effects on human health; dispersion in the atmosphere; Gaussian models for chimney plume dispersal and traffic pollution; measurement techniques |
| **Assessment**  ***Elements & weightings*** | The unit is assessed by a combination of examination and coursework with the proportion of marks allocated to each component given below:  70%: 3-hour end of unit written examination in which students are required to answer all questions.  30%: Coursework based on environmental engineering problems involving both analysis and design. Coursework exercises must be submitted to the Faculty Office no later than 12.00 noon on the submission date. |
| **Indicative Sources**  ***(Reading lists)*** | Many books related to Environmental Engineering are available in the Perry library. **Core materials** are:   * Bedient, P.B., Rifai, H.S., and Newell, C. *Groundwater Contamination*, Prentice Hall, Englewood Cliffs, NJ, 1994. * Colls J. *Air Pollution. An Introduction*. Spon, London, 1997 * Fetter, C. W., *Applied Hydrogeology*, 4th ed., Prentice Hall, Upper Saddle River, NJ, 2001. * Gray N. F. *Water Technology: An introduction for environmental scientists and engineers*. Butterworth-Heinemann, 2005 * Masters, G. M., *Introduction to Environmental Engineering and Science*, Prentice Hall, 1998. * Shaw, E., *Hydrology in Practice*, Chapman and Hall, 3rd edition, 1994. * Tebbutt T.H.Y. *Principles of Water Quality Control*, Butterworth Heinemann, 1998. * Wilson, E. M., *Engineering Hydrology*, MacMillan, 4th edition 1990 |