



UNIVERSITY OF PERADENIYA
DEPARTMENT OF CIVIL ENGINEERING

**POSTGRADUATE PROGRAMMES IN ENVIRONMENTAL &
WATER ENGINEERING**

YEAR 2023

Applications are invited for the Postgraduate Programme in Environmental and Water Engineering for the year 2023. Programme will be commenced from March 2023.

1. INTRODUCTION

The postgraduate programmes in Environmental & Water Engineering conducted by the Department of Civil Engineering, University of Peradeniya are intended for graduates with engineering background and practicing civil engineers in the fields of Water Supply & Drainage, Irrigation, Water Resources Engineering, Hydraulics, Coastal Engineering, Sanitary Engineering and Environmental Engineering.

The objectives of the postgraduate courses are to provide the students with

- a) an advanced knowledge in the aspects of Water & Environmental Engineering applied to the industry.
- b) an exposure and hands-on experience in the use of information technology tools and various application oriented computer software packages in Water and Environmental Engineering.

Thus, the courses have been designed to enhance the capabilities of the students in analyzing, planning, construction, operation and management of water & sanitary engineering works with a particular reference to preserving the quality of the environment.

Facilities in the Laboratories: Computing Centre and the Library of the Faculty of Engineering are available for research and study. Staff of the Civil Engineering Department and Faculty of Engineering associated with the postgraduate programme is:

Prof. S.B. Weerakoon	BScEng, MEng, DEng, FIE(SL), CEng, Int.PE
Prof. K.D.W. Nandalal	BScEng, MEng, PhD, FIE(SL), CEng, Int. PE
Prof. J.J Wijetunge	BScEng, PhD
Prof. G.B.B. Herath	BScEng, MEng, PhD
Prof. K.B.S.N. Jinadasa	BScEng, M Eng., PhD
Prof. (Mrs.) K.G.N. Nanayakkara	BScEng, PhD
Dr. P.B.G. Dissanayake	BScEng, PhD
Dr. (Mrs.) H. K. Nandalal	BScEng, MSc, PhD, MIE(SL), CEng
Dr. (Mrs.) W.C.T.K. Gunawardana	BScEng, PGDip., PhD
Dr. R.M.L.D. Rathnayake	BScEng, MEng, PhD
Dr. (Mrs.) G.M.P.R. Weerakoon	BScEng, MSc, PhD

Dr. N.G.P.B. Neluwala	BScEng, MEng, PhD
Mr. D.D. Dias	BScEng, MSc
Dr. M.M.G.T. De Silva	BScEng, MPhil, PhD, AMIESL
Prof. D.G.G.P Karunaratne	BScEng, PhD
Prof. C.S. Kalpage	BScEng, PhD

In addition, visiting experts from the industry and from foreign and local universities will also be involved in the conduct of lectures, seminars, case studies and discussions.

2. PROGRAMME STRUCTURE AND COURSES

In order to obtain required credits per Term, it is required to conduct classes for at least 6 sessions. Accordingly, the proposed time table for the program is as follows;

Day	Time
Saturday	8.00AM to 10.00 AM
	10.2.00 AM to 12.00 PM
	1.00 PM to 4.00 PM
	4.00 PM to 6.00 PM
Sunday	8.00 AM to 11.00 AM
	12.00 PM to 2.00 PM
	2.00 PM to 4.00 PM

Note. In addition to above sessions, all students will complete an Independent Study/ Advanced Study/ Advanced Research Study of his/her choice related to the course. The discussions and meetings will be scheduled from time to time on Friday, Saturday or Sunday.

Accordingly, the proposed time schedule for the course is as follows;

Semester	Period of the year
Term I	March to July (5 months)
Term II	August to December (5 months)
Independent Study/ Advanced Study/ Advanced Research Study	Term I and Term II and then Continue after December

Examinations in respect of the subjects taught in a term will be held within the term, and the progress of the research/design projects are continuously evaluated during and at the end of each term. At the end of 2 semesters the student will complete taught courses as required.

Item	Description	Number of credits
1	From core course (4 courses x 3 credits + 3 courses x 2 credits)	18
2	From elective courses	
	PG.Dip. (SLQF Level 8)	4
	M.Eng (SLQF Level 9)	7
	M.Sc. Eng. (SLQF Level 10)	12

2.1 Courses Offered

CE 6101 RESEARCH METHODS IN CIVIL ENGINEERING (Optional)

Fundamentals of Research: Definition and Objectives of Research; Qualitative vs Quantitative Research; The Scientific Research Process; Identification, selection, and formulation of research problems; Characteristics of good research problems; Review of literature. **Data Collection, Analysis and Presentation:** Methods and techniques of data collection; Design of Experiments; Sampling and sampling designs; Statistical modelling and analysis including introduction to statistical package; Probability Distributions; Multivariate methods; Concepts of correlation and regression, error analysis; Effective presentation of information using Tables, illustrations, graphs, etc. **Scientific writing and presentation:** Essential components of abstract, introduction, literature review, materials and methods, results, discussion, and conclusions; Formatting of contents; Methods of referencing and the use of referencing tools, Preparing and presenting a technical presentation.

CE 6201 ENVIRONMENTAL HYDRAULICS (Compulsory)

Fluid mechanics for environmental hydraulics: Governing equations of fluid flow, Applications to pipe flows and free surface flows. **Transport and mixing in fluids:** Mixing and transport processes, Fate & transport of pollutants, Wastewater disposal systems. **Environmental modelling:** Hydrodynamic modelling, Pollutant transport and water quality modelling, Multi-dimensional and spatially averaged modelling, Modelling of aquatic systems, Application of water quality models.

CE 6202 ADVANCED HYDROLOGY (Compulsory)

Hydrological processes: Physical principles governing hydrological processes, rainfall-runoff relationship (Conceptual and Physics-based types), Instantaneous Unit Hydrograph (IUH), Synthetic Unit Hydrograph (Clark Method, SCS Method), Impact of Climate Change and Land-use Changes, Depth-Area-Duration relationship. **Hydrologic statistics:** Probability concepts, Probability density functions and Cumulative distribution functions, Hydrologic data handling, Fitting probability distributions testing the goodness of fit. **Frequency analysis:** Extreme value distributions and probability plotting, Frequency factors, Confidence limits, IDF Relationships. **Hydrologic designs:** Risk, Design criteria, Derivation of design storms and design flows, Storm sewer design, Drainage design.

CE 6203 SOFTWARE APPLICATION IN WATER AND ENVIRONMENTAL ENGINEERING (Compulsory)

Software packages related to: Hydrology (eg.HEC-HMS); Hydraulics (eg.HEC-RAS/ FLO2D); Irrigation engineering (eg. Cropwat/WEAP); Water supply and sewer networks (eg. WaterCAD/ SewerGems); Storm water drainage (eg.SWMM); Wastewater treatment plant design (eg.STOAT); Water quality modelling (eg.WASP).

**CE 6204 WASTEWATER TREATMENT AND REUSE
(Compulsory)**

Introduction to wastewater treatment: Quantity and quality, Characterization, Status, Trends and Needs for wastewater treatment and Reuse. **Wastewater management systems :** Decentralized Vs centralized systems, Collection and transport. **Wastewater treatment plant planning and design:** Volume, Design period, Demand calculation, Biological systems, (Conventional, on-site and high-efficiency/high rate), Introduction to Chemical processes (coagulation, oxidation etc), Residuals management. **Wastewater reuse options:** Standards, Treatment options and application, Tertiary treatment options.

**CE 6205 WATER RESOURCES PROJECT PLANNING
(Compulsory)**

Water resources systems analysis and modelling: General concepts of systems analysis, planning, designing and operation of water resources systems, Application of simulation, optimization and multi-criteria decision analysis models. **Multipurpose river basin planning:** Inter-basin and inter-provincial water resources planning and management, Shared water resources and conflict management. **Water policy and governance:** Water law and policy, Water rights, Institutional aspects, Water allocation laws. **Economic analysis and project financing:** Economic and financial evaluations, Financial models, benefit cost analysis, risk and uncertainty, multipurpose development and cost allocations. **Project planning:** Feasibility studies, Planning techniques and project scheduling, Environmental and social aspects, Environmental audit, Project monitoring and post project evaluation, Commissioning and follow-up action.

**CE 6206 WATER SUPPLY ENGINEERING
(Compulsory)**

Water quality parameters and standards: Source water quality and safety, Drinking water standards. **Conventional drinking water treatment:** Unit processes, Treatment mechanisms, Troubleshooting at the drinking water treatment plant. **Design of water treatment unit processes:** Design of the conventional unit processes, Design of the advanced unit processes (plate/tube settlers, filter under drain systems etc.), Selection of pumps and internal plumbing systems, Wash water collection systems. **Distribution networks:** Design of pipe networks (Storage reservoirs, Break pressure tanks, Pipes and Valves), Online measuring techniques, Non-revenue water (NRW) management systems. **Advanced water treatment processes:** Membrane technology, Desalination, Water softening, Precipitation methods, Adsorption, Ion exchange, UV irradiation.

**CE 6207 CLIMATE CHANGE IMPACTS AND ADAPTATION IN WATER SECTOR
(Optional)**

Science of climate change: Climate system, Drivers of climate change, Climate modelling and climate change projections, GCMs. **Impacts of climate change:** Impacts on hydrologic cycle, Impacts on regional climate and water resources, Impacts on water infrastructure, agriculture, food security, health and other sectors. **Adaptation for resilience:** Exposure, vulnerability and risk of climate change, Regional and local adaptations in water sector, Resilience and traditional systems, Governance and policy framework. **Climate projection downscaling:** Statistical downscaling, Dynamic downscaling, Applications in designs of hydraulic structures and water management.

**CE 6208 COASTAL ENGINEERING AND COASTAL ZONE MANAGEMENT
(Optional)**

Wave Mechanics: Wave measurements, Analysis and non-linear wave theories. **Coastal Processes:** Nearshore wave, Hydrodynamic and sediment transport processes; Physical modeling of coastal processes, Mathematical modeling. **Coastal Zone Management:** Coastal environment and landforms. Problems and issues in the coastal zone, Coastal interventions- hard and soft structures, Coastal hazards, Integrated Coastal Zone Management with particular reference to Sri Lanka.

**CE 6209 ENVIRONMENTAL TECHNOLOGY
(Compulsory)**

Global Environmental issues and sustainability: Global Warming, Discharges of Hazardous air pollutants, Inhabitability of Modern Urban Habitat (heat Island Effect, Noise pollution, Sick building syndrome etc.), Introduction to sustainability, Sustainable development goal, Material Life Cycle. **Instrumentation:** Working mechanism behind water quality measuring instruments, Spectrophotometric techniques, Chromatographic techniques, Potentiometric techniques, Mass spectrometry; Laboratory demonstration of instruments, Field level experiments. **Environmental Biotechnology:** Role of microorganisms in geochemical cycles, Application of Environmental Biotechnology in Production of biogas, bioethanol, biodiesel and biohydrogen, Molecular approaches in Environmental Engineering and biotechnology.

**CE 6210 GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING IN
WATER RESOURCES
(Optional)**

Introduction to GIS and software: Raster data, Vector data, Data structures, Data manipulation, Exploring the interface and file management system. **Spatial data structures and sources:** Map projections/coordinate system, World and National datum and transformations, Web and other spatial data sources. **GIS analysis functions and operations:** Creating editing and GIS data, Spatial and overlay analysis, Distance analysis, Application of Hydrology tools. **Layouts, reports, graphs and data interoperability:** Preparing and presenting maps and tables and exporting them to different online formats, Exporting and importing data to and from different formats. **Remote Sensed Data and Image processing techniques:** Use of Elector Magnetic Spectrum in RS, Active and passive remote sensing, Supervised and unsupervised classification, remote sensing application in water resources. **Introduction to Geographic Positioning Systems:** GNSS for GIS data capture, importing and exporting GPS data.

**CE 6211 GROUND WATER HYDROLOGY
(Optional)**

Movement of Groundwater: Steady state and transient groundwater flow in confined and unconfined aquifers. **Well Hydraulics:** Steady and unsteady radial flow, Multiple well systems, Wells near aquifer boundaries, Pump tests. **Groundwater contamination and remediation:** Groundwater quality, Contamination sources, Mechanisms of contamination, Remediation technologies, Groundwater basin management. **Saline water intrusion:** Occurrence of saline water intrusion; Fresh-Saline water interface, Upconing, Control technologies. **Computer-Assisted groundwater flow modeling:** Modeling process, Computer models, Model calibration and

parameter estimation. **Hydrogeology:** Surface investigation of groundwater, Subsurface investigation of groundwater, Artificial recharge of groundwater.

CE 6212 HYDRAULIC STRUCTURES (Optional)

River engineering: River hydraulics, River morphology, River training, dredging & bank protection, Physical and mathematical models, Environmental aspects in river management. **Inland hydraulic structures:** Water retaining, water conveyance and drainage structures and their designs, Flow regulators, Sediment management, Environmental implications of hydraulic structures. **Coastal structures:** Physical features of coasts and near shore processes, Shore protection structures, Land reclamations.

CE 6213 INDUSTRIAL WASTE MANAGEMENT (Optional)

Introduction to industrial waste management : Industrial processes, Industrial waste characterization/testing, Basic industrial waste management concepts and national, regional and international rules and agreements. **In-plant waste management:** Waste Minimization, Life cycle assessment, Cleaner Production, Reclamation and Reuse, Environmental Management Systems and related case studies, ISO standards. **Industrial waste management:** Primary, secondary and tertiary wastewater treatment unit processes for industrial wastewater treatment (with special emphasis on physical and chemical unit processes) Industrial solid and sludge management (Control of sludge generation and industrial sludge treatment and reuse). **Air Pollution Monitoring and Control:** Sources of air pollution, Technologies for monitoring and control of air pollution.

CE 6214 INTEGRATED WATER RESOURCES MANAGEMENT (Optional)

Basic concepts: Components and dimensions of IWRM. **Protection of water resources:** Demand and supply management, Catchment management and recycling and reuse. **Gender in IWRM:** Mainstreaming gender and IWRM nexus, Gender differential roles. Climate change and impacts on water. **Water governance:** Regulations and policy, Management of shared water resources. **Water and ecosystems:** Ensuring water quality, Water supply, Sanitation and health, Pollution control and prevention of waterborne diseases.

CE 6215 IRRIGATION AND DRAINAGE ENGINEERING (Optional)

Irrigation Project Planning: Project identification, Water availability, Performance and economic aspects of irrigated agriculture, Performance indicators. **Irrigation Methods and Design:** Crop water requirement, Irrigation water requirement, Infiltration characteristics of soils for irrigation designs, Design of surface, overhead and drip irrigation systems. **Irrigation Water Management:** Water delivery systems, Yield response to water, Irrigation scheduling techniques, Deficit irrigation strategy, Modern irrigation systems. **Sustainable Irrigation Systems:** Ancient irrigation systems, Recycling of irrigation water, Environmental aspects of irrigation projects, Ground water pollution control. **Drainage Requirements and Systems:** Causes of water logging, Types of drainage systems, Layout and design of drainage systems and their operation and maintenance.

**CE 6216 PUBLIC HEALTH ENGINEERING
(Optional)**

Global sanitation and health : Safe water, sanitation and health consequences in the world, Major water, sanitation and hygiene related diseases, their modes of transmission and appropriate options for breaking the transmission routes. **Good WASH practices :** Multi barrier approach for safe water (select and design low cost water supply systems), Safe water storage and handling, Hygiene promotion, Sanitation ladder. **Sanitation safety plans :** Principles of excreta management, Fecal sludge management (e.g. pond systems, anaerobic digestion). Introduction to water safety plans and Emergency water supply systems (disasters) Quantitative microbial risk assessment techniques.

**CE 6217 SOLID WASTE MANAGEMENT
(Optional)**

Introduction to Solid Waste Management: Waste quantity and quality, Classification of waste, Waste generation rates, Legislation, regulation and control. **Waste Collection & Transport:** Collection of mixed waste or of source separated waste, Collection logistics (route planning etc.), Transfer stations, Case study. **Treatment/disposal Technologies:** Dumping, Sanitary landfills, Mechanical-biological treatment, Incineration, Anaerobic digestion, Composting; Reduce, reuse and recycling. **Green House Gas emission:** Clean Development Mechanism, Energy recovery, Hazardous waste management.

3. ADMISSION REQUIREMENTS FOR THE PROGRAMMES

The postgraduate programmes leading to the following qualifications are available in the postgraduate programmes in Environmental & Water Engineering,

Postgraduate Diploma in Environmental and Water Engineering (SLQF L8):
PG.Dip.(Environmental and Water Engineering)

Degree of Master of Engineering in Environmental and Water Engineering (SLQF L9): *M.Eng. Env&Water*

Degree of Master of the Science of Engineering in Environmental and Water Engineering (SLQF L10): *M.Sc.Eng. (Environmental and Water Engineering)*

The minimum qualifications required of a person for admission to a postgraduate programmes leading to the SLQF L8, SLQF L9 and SLQF L10 are as follows:

3.1 Postgraduate Diploma (SLQF L8): PG.Dip. (Environmental and Water Engineering)

- (a) A first Degree in Engineering/Science (SLQF L5) acceptable to the Faculty Higher Degrees Committee or
- (b) Such other qualification equivalent to a first Degree in Engineering/Science (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for PG.Dip., in a field related to the programme of study.

3.2 Degree of Master of Engineering (SLQF L9): M.Eng. Env&Water

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

3.3 Degree of Master of the Science of Engineering (SLQF L10): M.Sc.Eng. (Environmental and Water Engineering)

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Sc.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

4. COURSE REQUIREMENTS AND THE DURATIONS

4.1 Postgraduate Diploma (SLQF L8): PG.Dip. (Environmental and Water Engineering)

4.1.1 Course requirements

In order to be eligible for the award of the Postgraduate Diploma in Environmental and Water Engineering, a student shall have satisfied the following requirements.

A total of 25 credits earned with at least 2.75 GPA from prescribed courses including an independent study of at least 3 credits.

4.1.2 Minimum and Maximum Duration

The duration of the PG.Dip. programme shall be ten (10) months (minimum).

To be eligible for the award of the Postgraduate Diploma, a student shall fulfill all stipulated requirements within 2 years from the date of registration on a full-time basis (3 years on a part-time

basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

4.2 Degree of Master of Engineering (SLQF L9): M.Eng. Env&Water

4.2.1 Course requirement

In order to be eligible for the award of M.Eng. Env&Water Degree a student shall have a total of 30 credits earned with at least 3.0 GPA from the prescribed courses including an advanced study of at least 5 credits.

4.2.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be twelve (12) months (minimum).

In order to be eligible for the award of the Degree of M.Eng., a student shall fulfill all stipulated requirements within 3 years from the date of registration on a full-time basis (4.5 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

4.3 Degree of Master of the Science of Engineering (SLQF L10): M.Sc.Eng. (Environmental and Water Engineering)

4.3.1 Course requirement

In order to be eligible for the award of M.Sc.Eng. Degree a student shall have;

- (i) earned a total of 30 credits from the prescribed courses with at least 3.0 GPA And
- (ii) successfully completed a research study of 30 credits.

4.3.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be 2 years (minimum).

In order to be eligible for the award of the Degree of M.Sc.Eng., a student shall fulfill all stipulated requirements within 4 years from the date of registration on a full-time basis (6 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

5. COURSE FEE

	M.Sc.Eng. (SLQF L10)	M.Eng. (SLQF L9)	PG.Dip. (SLQF L8)
Local candidates	Rs. 475,000.00	Rs. 400,000.00	Rs. 350,000.00
SAARC countries	USD 3000	USD 2500	USD 2000
Other countries	USD 5000	USD 4000	USD 3000

In addition to above fee a refundable library deposit of Rs. 10,000.00 and Standard Library Deposit of Rs. 4,000.00 should be paid at the time of the registration for the postgraduate programme.

6. APPLICATION PROCEDURE

Applications form must be submitted online through <https://pgciviladmissions.eng.pdn.ac.lk/> on or before **04th of November 2022**.

The following documents should be uploaded along with the duly completed application:

- a) Degree/Diploma/Professional membership certificates and Academic Transcript.
- b) Two Referee Reports (Online). At least one should be from the applicant's teacher at the University.
- c) Birth certificate and National Identity Card.
- d) Letter of consent on granting leave to engage in PG study from the employer (where applicable).
- e) Application processing fee - Proof of payment (deposit slip)
- f) Recent colour photograph (passport posture)

Hard copies of documents (a) – (e) above **should be posted to the Coordinator/ PG Programmes in Civil Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.**

Originals of documents of which the scanned copies are submitted should be produced before admission, on request. Also, applicant should arrange to send the official transcripts directly by the educational institutions concerned to the **Assistant Registrar, Faculty of Engineering, University of Peradeniya, Peradeniya.**

In the event of any discrepancy between the name appearing in the applicant's academic/professional/birth certificates and the name given by the applicant in the application, an affidavit to the effect that the applicant is the one and the same person known by all such names should be sent together with the application form.

Documents submitted in support of an application shall become the property of the University. The applicants will be informed of their acceptance/non-acceptance to the particular programme for which admission has been sought.

A payment of Rs. 2,000.00 has to be done to the below account as the non-refundable application processing fee.

Bank : Bank of Ceylon

Branch : Peradeniya

Name of Account : Research and Fund Account

Account Number : 001274688

Applications which are received late/or are incomplete in any respect are liable to be rejected. **Only shortlisted applicants will be called for an interview.**

The University may at its discretion refuse admission to any applicant.

For inquiries please contact the Coordinator of the programme Dr.(Mrs.) Chandima Gunawardana, Dept. of Civil Eng., Univ. of Peradeniya, Tel: 081 239 3569 e-mail: chandimag@eng.pdn.ac.lk



**UNIVERSITY OF PERADENIYA
DEPARTMENT OF CIVIL ENGINEERING**

POSTGRADUATE PROGRAMME IN GEOTECHNICAL ENGINEERING

YEAR 2023

Applications are invited for the Postgraduate Programme in Geotechnical Engineering for the year 2023. Programme will be commenced from March 2023.

1. INTRODUCTION

The postgraduate programme in Geotechnical Engineering is conducted by the Department of Civil Engineering, University of Peradeniya is intended for graduates with an engineering background and practicing civil engineers in the field of Geotechnical Engineering or graduates looking for postgraduate opportunities in Geotechnical Engineering. The course consists of course units conducted through lectures, tutorials, assignments, laboratory classes, field testings and research projects.

The objectives of the postgraduate courses are to provide the students with

- a) advanced knowledge in the aspects of Geotechnical Engineering applied to the industry or further research.
- b) an exposure and hands-on experience in the use of various research and application-oriented computer software packages in the field of Geotechnical Engineering.

Department of Civil Engineering, University of Peradeniya has excellent testing facilities for laboratory and fieldwork related to Geotechnical Engineering. Facilities available at the laboratories are Computing Centre with state-of-the-art high-performance workstations to run numerical simulations and large-scale and conventional testing apparatus. The Library of the Faculty of Engineering is available for students at any time during the period of study. The staff of the Civil Engineering Department at the Geotechnical Engineering associated with the postgraduate programme in Geotechnical Engineering are:

Prof. K. G. H. C. N. Seneviratne	BScEng, PhD
Prof. S. B. S. Abayakoon	BScEng, MAsc, PhD
Dr. L.C. Kurukulasuriya	BScEng, M Eng., PhD
Dr. D. de. S. Udakara	BScEng, M Eng, PhD
Dr. S. K. Navaratnarajah	BScEng, MSc Eng, PhD
Dr. M.C.M. Nasvi	BScEng, PhD
Dr. T. K. K. C. Deepagoda	BScEng, MSc Eng, PhD
Dr. A. M. R. G. Athapaththu	BScEng, MPhil, DEng

In addition, visiting experts from the industry and local universities will also be involved in the conduct of lectures, seminars, case studies and discussions.

2. PROGRAM STRUCTURE, DURATION AND COURSES

In order to obtain the required credits, it is essential to conduct classes for at least 8 sessions. Accordingly, the proposed timetable for the program is as follows;

Day	Time
Saturday & Sunday	8.00 AM to 11.00 AM
	11 AM to 1.00 PM
	2.00 PM to 4.00 PM
	4.00 PM to 6.00 PM

Note. In addition to the above sessions, all students will complete an Independent Study/ Advanced study/ Advanced Research Study of his/her choice related to the course. The discussions and meetings will be scheduled from time to time (not every week) on Friday, Saturday or Sunday.

Accordingly, the proposed schedule for the course is as follows;

Semester/Course	Period of the year
Term I	March to July (5 months)
Term II	August to December (5 months)
Advanced study/ Research study/ Advanced Research Study	Term I and Term II and then Continue after December

Examinations in respect of the subjects taught in a term will be held within the term, and the progress of the research projects are continuously evaluated during and at the end of each term. At the end of Term II, the student will complete taught courses as required.

Item	Description	Number of credits
1	From compulsory courses (4 courses \times 3 credits + 2 courses \times 2 credits)	16
2	From optional courses:	
	PGDip (SLQF Level 8)	6
	MEng (SLQF Level 9)	9
	MScEng (SLQF Level 10)	14

2.1 Courses Offered

CE 6101 RESEARCH METHODS IN CIVIL ENGINEERING (Optional)

Fundamentals of Research: Definition and Objectives of Research; Qualitative vs Quantitative Research; The Scientific Research Process; Identification, selection, and formulation of research problems; Characteristics of good research problems; Review of literature. **Data Collection, Analysis and Presentation:** Methods and techniques of data collection; Design of Experiments; Sampling and sampling designs; Statistical modelling and analysis including introduction to statistical package; Probability Distributions; Multivariate methods; Concepts of correlation and regression, error analysis; Effective presentation of information using Tables, illustrations, graphs, etc. **Scientific writing and presentation:** Essential components of abstract, introduction, literature review, materials and methods, results, discussion, and conclusions; Formatting of contents; Methods of referencing and the use of referencing tools, Preparing and presenting a technical presentation.

CE 6301 ENGINEERING GEOLOGY AND ROCK MECHANICS **(Compulsory)**

Engineering classification of rock masses: Rock Quality Designation (RQD), Rock structure rating (RSR) , Rock Mass Rating (RMR), and Slope Mass Rating (SMR) in engineering classification of rock masses. **Engineering properties of rocks:** Physical, mechanical, hydraulic and chemical properties of Rock masses, general range of values in different rock types. **Construction materials and energy sources:** Different types of coarse aggregates for civil engineering projects, sources of aggregates, selection of suitable materials for construction purposes, introduction to energy sources such as coal, petroleum, gas and geothermal sources. **Geological consideration for civil engineering projects:** Selection of suitable sites for dams and reservoir projects, tunnels and underground openings, roads, bridges and other constructions, Effect of geological structures and types of foundation on rock. **Failure criteria of rocks:** Theory of rock failures, failure criterion for rocks, Introduction to stereographic analysis , use of stereo-nets for stability analyses. **Underground excavations and rock supports:** Design for tunnel supports on the basis of rock classification.

CE 6302 ADVANCED FOUNDATION ENGINEERING **(Compulsory)**

Shallow foundations: Bearing capacity theories, Shallow foundation design using Eurocode 7, eccentric and inclined loads, bearing capacity on slopes, Bearing capacity of layered soils, foundation settlements. **Design of combined and raft foundations:** flexible and rigid design of combined footings and raft foundations. **Machine foundations:** Types of machines, design criteria, elements of vibration theory, governing equations. **Deep foundations:** Introduction, bearing capacity of group piles, Quality Control and Quality assurance of pile foundation, Design of deep foundations using Eurocode 7, Negative skin friction, Pile group settlement, Rock socketed piles, Laterally loaded piles, Piles subjected to uplift, Design of Caissons in sand and clay. **Design Exercise:** Design of foundation of a building.

CE 6303 SLOPE STABILITY AND EARTH RETAINING STRUCTURES **(Compulsory)**

Mass movements: Classification, causative factors, instrumentation, preventive, remedial and control measures. **Slope Stability Analysis using EC7:** EC7 guidelines for slope stability analysis, Design of slopes to EC7, Limit equilibrium methods, Bishop and Morgenstern Chart. **Design of rigid and flexible earth retaining structures using EC7:** Lateral earth pressure: Rankine's and Coulomb's theory, Introduction to earth retaining structures, EC7 guidelines for designing earth retaining structures, Design of mass concrete retaining wall and cantilever retaining wall to EC7. Introduction to sheet pile walls (Cantilever and anchored sheet pile walls), EC7 guidelines for sheet pile wall design, Fixed and free earth support methods of design of anchored sheet pile walls. Analyse internally stabilized earth walls (MSE walls), Soil nailing. **Case study on slope and retaining failure:** Case studies on slope and retaining wall failures.

CE 6304 PROBLEMATIC SOILS AND GROUND IMPROVEMENT **(Compulsory)**

Problematic soils: Collapsible soils - formation, types, identification methods, construction techniques; **Expansive soils** - identification, testing, swell potential, construction techniques; **Peat** - formation, types, construction techniques; **sanitary landfills** - introduction, settlement considerations. **Geosynthetics:** Types and applications of geosynthetics, Testing geosynthetics to evaluate physical, mechanical and hydraulic properties, designing for drainage, filtration and

reinforcement. **Ground Improvement techniques:** Importance of ground improvement, prerequisites for ground improvement, common ground improvement methods: surface and deep compaction, sand columns, preloading and vertical drains, dynamic consolidation, geotextiles, mechanical and chemical stabilization, preliminary design considerations in ground improvement methods.

CE 6305 APPLICATION OF NUMERICAL METHODS IN GEOTECHNICAL ENGINEERING

(Compulsory)

Basic Numerical Methods: Finite difference method (FDM), finite element method(FEM), boundary element method (BEM), discrete element method (DEM). **Models of soil behaviour:** Model soil behaviour using linear elastic, Mohr-Coulomb, modified Cam Clay. Selection of material parameters for analysis. **Use of Numerical software:** GeoStudio (eg. Slope/W, Sigma/W and Seep/W to analyse slopes, stress-strain and seepage respectively) and PLAXIS (eg. to analyse shallow foundation, deep foundation and embankments).

CE 6306 SITE INVESTIGATION, TESTING AND INSTRUMENTATION

(Compulsory)

Planning of exploration: Planning an exploration program, methods of exploration, exploration for preliminary and detailed design, spacing and depth of bores, data presentation. **Exploration techniques:** Methods of boring and drilling, limitations of various drilling techniques, stabilization of boreholes, bore logs. **Soil and rock sampling:** Disturbed and undisturbed sampling. **Laboratory and Field Testing of soils:** Testing procedure, limitations, correction and data interpretation of laboratory and field testing methods. **Field Instrumentation and Monitoring:** Field instrumentation for load, displacement and pore pressure measurements, Monitoring and interpretation of field measurements.

CE 6307 EARTH AND ROCKFILL DAMS

(Optional)

Types and Features of Earth and Rockfill Dams: Different types of earth and rockfill dams, Functions of earth and rockfill dams, Controlling factors in the selection of dam types, Failures and Damages of embankment dams, Shear strength of embankment. **Design considerations of Earth and Rockfill Dams:** Selection of a dam type, Types of slope protection, Selection of type of slope protection, Foundation Design of rockfill dams, Modification of existing dams. **Treatment for Earthfill Dams:** Foundation treatment of earth-fill dams, Shaping of foundations, Excavation dewatering. **Protective Filters in Earth and Rockfill Dams:** Filter types, Drainage and Transition Filters, Design of filters. **Seepage through Dams:** Methods of analysis of seepage, Numerical analysis of seepage through dams using software. **Stability Analysis of Dams:** Effective and total stress analysis, Loading conditions, Drawdown analysis, Factor of safety criteria, Numerical methods of analysis for different loading conditions using software. **Construction Aspects and Problems:** Case study on construction aspects of a dam: Study of regional geology, Site inspection, In-situ tests to evaluate strength-deformation and hydraulic characteristics, Remedial works. **Dam Instrumentation and Monitoring:** Instrumentation and Monitoring Considerations, Instrumentation types (seepage, water pressure, earth pressure, deformation), Instrumentation installation and construction considerations.

CE 6308 ENGINEERING GEOLOGICAL EXPLORATION
(Optional)

Methods of geological and geophysical explorations for site selections: Detail investigation methods for large projects such as dams and reservoirs, roads, bridges, tunnel construction and other underground openings, subsurface investigation methods of resistivity survey and seismic refraction survey and analysis. **Field and Laboratory testing of rocks:** Determination of physical, mechanical and hydraulic properties of rock masses, chemical tests for mineral identification, sulphate attack, etc. **Landslide investigation, mapping, prevention and control:** Methods of investigation, methods to stabilize unstable slopes. **Environmental Impact Assessment:** Method of assessment, guidelines for dams and reservoirs, etc. **Solid waste management:** Classification of solid wastes, selection of waste disposal sites, management methods.

CE 6309 GEOLOGY FOR ENGINEERS
(Optional)

Rock types: Rock-forming minerals, metamorphic, igneous rocks, sedimentary rocks. **Geological processes:** structure of the earth, internal and external processes, Theory of plate tectonics, plate boundaries, Earthquakes and volcanoes, weathering and erosion, mass movement, Physical features of ground, land formation. **Geological structures:** Faults, Folds, Joints, and other geological structures. **Geological Maps:** Different types of geological maps, introduction to engineering consideration of rocks and rock distribution.

CE 6310 SOIL MECHANICS AND GEOTECHNICAL ENGINEERING
(Optional)

Soil Deposits and Clay Minerals: Different soil deposits and their engineering properties, Genesis of clay minerals: classification and identification. **Compaction, Swelling and Shrinkage behaviour of Soils:** Problems associated with swelling and shrinkage behaviour of soils, factors influencing swell – shrink characteristics, sensitivity, soil suction, soil compaction: factors affecting soil compaction. **Compressibility, Shear Strength and Permeability of Soils:** Compressibility, shear strength and permeability behaviour of fine and coarse-grained soils, mechanisms and factors influencing engineering properties, liquefaction potential.

CE 6311 THEORETICAL SOIL MECHANICS
(Optional)

Failure Theories: Concepts of yield and failure in soils: Failure theories of von Mises, Tresca and their extended form, their applicability to soils.

Theory of Plasticity: Hardening law, flow rule, bound theorems, mechanism for plane plastic collapse, discontinuities, solutions for undrained and drained loading conditions. **Critical State Soil Mechanics:** The critical state line, Roscoe's surface, Hvorslev's surface, Behaviour of sand: Effects of dilation, Elastic and plastic deformation: Cam clay model, Modified Cam clay model, Soil Parameters for design.

CE 6313 GEO-ENVIRONMENTAL ENGINEERING
(Optional)

Basic characteristics of soils: Soil formation, soil texture, structure, particle and pore networks. Phase relationship, physico-chemical interactions between phases, electrokinetics and double layer theory. **Transport of fluids in soils:** Energy state of water in soil, flow in saturated and unsaturated

soils, steady/unsteady flow, governing equations in saturated and unsaturated flow in soil, gas flow in unsaturated subsystems. Governing equations for transport of fluids in soil and groundwater. Introduction to multiphase flow in soil-water-gas systems. **Characterization of environmental contaminants:** Hazardous environmental chemicals, organic and inorganic chemical background in contaminants, analytical methods for physical, chemical and biological characterisation of contaminants. **Contaminant fate and transport in soil and groundwater:** Main contaminant transport mechanisms in subsurface, physical, chemical and biological contaminant transfer in soil, contaminant transport and fate modelling. **Contaminated site characterization and risk assessment:** Preliminary and detailed site investigations, standard risk assessment procedures and methods. **Design and application of site remediation techniques:** Vertical barriers, surface caps, groundwater pumping systems, subsurface drains, soil vapour extraction, electrokinetic remediation, thermal desorption, phytoremediation, pump and treat, permeable reactive barriers, air sparging, landfill cover design and maintenance.

CE 6314 MITIGATION AND CONTROL OF NATURAL GEO-HAZARDS (Optional)

Introduction to Geo-hazards: Different types of geo-hazards, causes for geo-hazards, case studies. **Rockfalls and Landslides:** Classification of mass movements of soils and rocks, failure mechanisms, Investigation and instrumentation, Prevention, control and mitigation, Early warning systems. **Land Subsidence and Sinkholes:** Sinkholes, groundwater depletion. **Volcano and Earthquakes:** Theory of plate tectonics, Volcanoes and Earthquakes. **Salinity intrusion:** Types, causes, mitigation methods. **Manmade hazards:** Eg. - Underground storage of hazardous waste, spill of hazardous materials, mining, landfills.

CE 6315 GEOTECHNICAL CONSTRUCTION (Optional)

Earthmoving: Equipment, Excavation, Lifting, Loading and Hauling. **Piling:** Cast in-situ piles, Driven pile, Quality Control, Handling. **Dewatering and Grouting method:** Cofferdam, Caissons, grouting methods. **Offshore Construction:** Dredging, offshore piling. **Ground Improvement:** Compaction, Dynamic Compaction, Soil stabilisation, preloading, PVD.

CE 6316 FORENSIC GEOTECHNICAL ENGINEERING (Optional)

Forensic Geotechnical and Foundation investigation: Forensic investigation – site visit, non-destructive testing, monitoring, sampling and laboratory testing, report writing. Settlement of structures - types of structures, causes of settlement, allowable settlement. Expansive soil – swelling, types of expansive soil movements, foundation design for expansive soil, pavements. Lateral movement - rock falls, slope failures, landslides, retaining walls, deep excavations, ground improvement, dam failures. Groundwater and moisture problems - moisture migration through floor slabs, moisture migration through basement walls, pipe breaks, surface drainage. **Repairs and crack diagnosis:** Repair of slab-on-grade foundations - reinforced mat, partial removal/strengthening of foundation, concrete crack repairs. Repair of slope failures - Rebuilding, geogrid, soil-cement repair, pipe piles. Crack diagnosis - introduction, pavement cracks, cracks in walls, foundation cracks, ground cracks and fissures.

3. ADMISSION REQUIREMENTS FOR THE PROGRAMMES

The postgraduate programmes leading to the following qualifications are available in the postgraduate programmes in Geotechnical Engineering

Postgraduate Diploma in Geotechnical Engineering (SLQF L8): *PGDip (Geotechnical Engineering)*

Degree of Master of Engineering in Geotechnical Engineering (SLQF L9): *MEngGeotech*

Degree of Master of the Science of Engineering in Geotechnical Engineering (SLQF L10): *MScEng (Geotechnical Engineering)*

The minimum qualifications required of a person for admission to postgraduate programmes leading to the SLQF L8, SLQF L9 and SLQF L10 are as follows:

3.1 Postgraduate Diploma in Geotechnical Engineering (SLQF L8): *PGDip (Geotechnical Engineering)*

- (a) A first Degree in Engineering (SLQF L5), acceptable to the Faculty Higher Degrees Committee (FHDC) or
- (b) Such other qualifications equivalent to a first Degree in Engineering (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for PGDip, in a field related to the programme of study.

3.2 Degree of Master of Engineering in Geotechnical Engineering (SLQF L9): *MEngGeotech*

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the MEng Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

3.3 Degree of Master of the Science of Engineering in Geotechnical Engineering (SLQF L10): *MScEng (Geotechnical Engineering)*

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable

for candidature for the MScEng Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

4. COURSE REQUIREMENTS AND THE DURATIONS

4.1 Postgraduate Diploma in Geotechnical Engineering (SLQF L8): PGDip (Geotechnical Engineering)

4.1.1 Course requirements

In order to be eligible for the award of the Postgraduate Diploma, a student shall have satisfied the following requirements.

A total of 25 credits earned with at least 2.75 GPA from prescribed courses including an independent study of at least 3 credits.

4.1.2 Minimum and Maximum Duration

The duration of the PGDip programme shall be ten (10) months (minimum).

To be eligible for the award of the Postgraduate Diploma, a student shall fulfil all stipulated requirements within 2 years from the date of registration on a full-time basis (3 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

4.2 Degree of Master of Engineering in Geotechnical Engineering (SLQF L9): MEngGeotech

4.2.1 Course requirement

In order to be eligible for the award of the degree of Master of Engineering, a student shall have a total of 30 credits earned with at least 3.0 GPA from the prescribed courses including an advanced study of at least 5 credits.

4.2.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be twelve (12) months (minimum).

In order to be eligible for the award of the degree of Master of Engineering, a student shall fulfil all stipulated requirements within 3 years from the date of registration on a full-time basis (4.5 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

4.3 Degree of Master of the Science of Engineering (SLQF L10): MScEng (Geotechnical Engineering)

4.3.1 Course requirement

In order to be eligible for the award of the Degree of Master of the Science of Engineering, a student shall have;

- (i) earned a total of 30 credits from the prescribed courses with at least 3.0 GPA and
- (ii) successfully completed a research study of 30 credits.

4.3.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be 2 years (minimum).

In order to be eligible for the award of the Degree of Master of the Science of Engineering, a student shall fulfil all stipulated requirements within 4 years from the date of registration on a full-

time basis (6 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

5. COURSE FEE

	M.Sc.Eng. (SLQF L10)	M.Eng. (SLQF L9)	PG.Dip. (SLQF L8)
Local candidates	Rs. 475,000.00	Rs. 475,000.00	Rs. 475,000.00
SAARC countries	USD 3000	USD 2500	USD 2000
Other countries	USD 5000	USD 4000	USD 3000

In addition to above fee a refundable library deposit of Rs. 10,000.00 and Standard Library Deposit of Rs. 4,000.00 should be paid at the time of the registration for the postgraduate programme.

6. APPLICATION PROCEDURE

Applications form must be submitted online through <https://pgciviladmissions.eng.pdn.ac.lk/> on or before **04th of November 2022**.

The following documents should be uploaded along with the duly completed application:

- a) Degree/Diploma/Professional membership certificates and Academic Transcript.
- b) Two Referee Reports (Online). At least one should be from the applicant's teacher at the University.
- c) Birth certificate and National Identity Card.
- d) Letter of consent on granting leave to engage in PG study from the employer (where applicable).
- e) Application processing fee - Proof of payment (deposit slip)
- f) Recent colour photograph (passport posture)

Hard copies of documents (a) – (e) above **should be posted to the Coordinator/ PG Programmes in Civil Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.**

Originals of documents of which the image copies are uploaded should be produced before admission, on request. Also, applicant should arrange to send the official transcripts directly by the educational institutions concerned to the **Assistant Registrar, Faculty of Engineering, University of Peradeniya, Peradeniya.**

In the event of any discrepancy between the name appearing in the applicant's academic/professional/birth certificates and the name given by the applicant in the application, an affidavit to the effect that the applicant is the one and the same person known by all such names should be sent together with the application form.

A payment of Rs. 2,000.00 has to be done to the below account as the non-refundable application processing fee.

Bank : Bank of Ceylon
Branch : Peradeniya

Name of Account : Research and Fund Account

Account Number : 001274688

Documents submitted in support of an application shall become the property of the University. The applicants will be informed of their acceptance/non-acceptance to the particular programme for which admission has been sought.

Applications which are received late/or are incomplete in any respect are liable to be rejected. **Only shortlisted applicants will be called for an interview.**

The University may at its discretion refuse admission to any applicant.

For inquiries please contact the Coordinator of the Geotechnical Engineering programme, Dr. S.K. Navaratnarajah, Department of Civil Engineering, University of Peradeniya, Tel:0777346619, e-mail: navask@eng.pdn.ac.lk



**UNIVERSITY OF PERADENIYA
DEPARTMENT OF CIVIL
ENGINEERING**

**POSTGRADUATE PROGRAMME IN HIGHWAY AND
TRAFFIC ENGINEERING**

YEAR 2023

Applications are invited for the Postgraduate Programme in Highway and Traffic Engineering for the year 2023. Programme will be commenced from **March 2023**.

1. INTRODUCTION

The postgraduate programme in Highway and Traffic Engineering conducted by the Department of Civil Engineering is intended for graduates with engineering background and practicing engineers in the field of highway and transportation engineering. The programme consists of course units conducted through lectures, tutorials, assignments, laboratory classes, field experiments, and research or design projects. These course units have been designed to enhance the capabilities of the students in analyzing, designing, and operate and manage a transportation system.

Department of Civil Engineering, University of Peradeniya has excellent testing facilities in the laboratory and modernized equipment for fieldwork related to Highway and Traffic Engineering. State of art computer software (e.g., PVT VISSIM, Microsoft Civil 3D) is available for analytical and design work. Facilities in the computing centre and engineering library are available for acquire additional knowledge. The course will be taught by a team of highly qualified academic staff.

Dr. AGHJ Edirisinghe,	BScEng MEng, PhD
Dr. IMS Sathyaprasad,	BScEng MEng, DEng
Dr. PBG Dissanayake,	BScEng, PhD, MIEAust, Member PMI, AMIESL
Dr. HK Nandalal,	BScEng, MSc, PhD, CEng, MIESL
Dr. WMVSK Wickramasinghe,	BScEng MEng, PhD, AMIESL
Dr. AMRG Athapaththu,	BScEng, MPhil, DEng, AMIESL
Dr. WRSS Dharmarathna,	BScEng, MPhil, PhD, AMIESL
Dr. Gemunu Gurusinghe	BSc, PhD
Dr. Janaka Kosgolla	BScEng., MSc, PhD
Dr. Dulakshi Karunasinghe	BScEng., PhD
Dr. Kanthi Perera	BSc, MSc, PhD
Dr. C.K. Walgampaya	BScEng, MSc, PhD
Dr. M.M.G.V. Shyamalee	BScEng., MSc, PhD
Eng. Ajantha Karunaprema	BScEng., MPhil
Eng. Jeewana Meegaha	BScEng., MEng
Eng. H.N. Prasanga	BScEng., MEng
Eng. Gayan Wanasinghe	BScEng, MEng

2. PROGRAM STRUCTURE, DURATION AND COURSES

The proposed time schedule for the program is as follows;

Semester	Period of the year
Term I	March to July (5 months)
Term II	August to December (5 months)
Independent Study/ Advanced Study/ Advanced Research Study	Term I and Term II and then Continue after December

The taught part of the courses consists of subjects conducted through lectures, tutorials, assignments, laboratory classes, field classes and design classes and an advanced study/ research. The courses will be conducted over 2 semesters on Saturdays and Sundays from 8 am to 5 pm. The research study shall be carried out from the first semester and the progress is continuously evaluated.

In order to obtain minimum 12 credits per semester , it is required to conduct classes for at least 4 sessions per week. Accordingly the proposed time allocation for each session is as follows;

Day	Time	Description of work
Saturday	8.00 AM to 12.00 NOON	Core Course I
	1.00 PM to 4.00 PM	Core Course I or Elective Course
	4.00 PM to 6.00 PM	Core Course I or Elective Course
Sunday	8.00 AM to 12.00 NOON	Core Course II
	1.00 PM to 4.00 PM	Core Course II or Elective Course

Examinations of the subjects taught in a semester will be held within the semester, and the progress of the research/design projects are continuously evaluated during and at the end of each semester. The core and elective courses to be offered in the year 2023 are as follows (subject to approval);

	Course Code	Course Title	Credits
Core Courses	CE 662	Basic Soil and Rock Mechanics for Highway Engineering	3
	CE 663	Traffic Engineering	3
	CE 664	Pavement Design	3
	CE 665	Traffic Measurements, Analysis and Design	3
	CE 666	Road Safety and Environment	3
	CE 760	Highway Planning	3
Elective Courses	CE 761	Highway Construction Materials and Methods	2
	CE 762	Evaluation of Pavement Materials and Pavements (Lab Course)	2
	CE 763	Highway Evaluation and Maintenance	2
	CE 764	GIS for Highway and Transportation Engineering	3
	CE 765	Quantitative Methods in Traffic Engineering	3
	CE 766	Traffic Management	2
	CE 767	Traffic Impact Assessment	1
	CE 6101	Research Methods in Civil Engineering	2
	CE 6303	Slope Stability and Earth retaining Structures	3

(Course contents are given on pages 6 - 10)

3. ADMISSION REQUIREMENTS

3.1 Postgraduate Diploma (PGDip in Highway and Traffic Engineering)

The minimum qualifications required of a person for admission to a programme leading to the Postgraduate Diploma:

- (a) A first Degree in Engineering/Science (SLQF L5) acceptable to the Faculty Higher Degrees Committee or
- (b) Such other qualification equivalent to a first Degree in Engineering/Science (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for PG.Dip., in a field related to the programme of study.

3.2 Degree of Master of Engineering (MEng in Highway and Traffic Engineering)

The minimum qualifications required of a person to be considered for direct admission to a programme leading to the Degree of Master of Engineering are as follows:

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study

3.3 Degree of Master of the Science of Engineering (M.Sc.Eng. in Highway and Traffic Engineering)

The minimum qualifications required of a person to be considered for direct admission to a programme leading to the Degree of Master of the Science of Engineering are as follows:

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Sc.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

4 ELIGIBILITY TO OBTAIN THE DIPLOMA/DEGREE

4.1 Postgraduate Diploma (PG.Dip.)

Course requirement

A total of 25 credits earned with at least 2.75 GPA from prescribed courses including an advanced study of at least 3 credits.

Duration: 10 months (minimum)

4.2 Degree of Master of Engineering (MEng)

Course requirement

In order to be eligible for the award of the Degree of M.Eng., a student shall have earned a total of 30 credits with at least 3.0 GPA from the prescribed courses including an advanced study of at least 5 credits.

Duration: 12 months (minimum)

4.3 Degree of Master of the Science of Engineering (MSc.Eng.)

In order to be eligible for the award of the Degree of M.Sc.Eng, a student shall have earned a total of 30 credits from the prescribed courses with at least 3.0 GPA and successfully completed a research study of 30 credit

Duration: 24 months (minimum)

5 COURSE FEE

	M.Sc.Eng/ M.Sc	M.Eng./ Master	PG.Dip.
Local candidates	Rs. 475,000.00	Rs. 400,000.00	Rs. 350,000.00
SAARC countries	USD 3000	USD 2500	USD 2000
Other countries	USD 5000	USD 4000	USD 3000

In addition to above fee a refundable library deposit of Rs. 10,000.00 and Standard Library Deposit of Rs. 4,000.00 should be paid at the time of the registration for the postgraduate programme.

6 APPLICATION PROCEDURE

The applications should be submitted online through

<http://pgciviladmissions.eng.pdn.ac.lk/login> on or before 22nd of November 2021.

The following documents should be uploaded along with the duly completed application:

- Degree/Diploma/Professional membership certificates and Academic Transcript.
- Two Referee Reports (Online). At least one should be from the applicant's teacher at the University.
- Birth certificate and National Identity Card.
- Letter of consent on granting leave to engage in PG study from the employer (where applicable).
- Application processing fee - Proof of payment (deposit slip)

f) Recent colour photograph (passport posture)

Hard copies of documents (a) – (e) above **should be posted to the Coordinator/ PG Programmes in Civil Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.**

Originals of documents of which scanned copies are submitted should be produced before admission, on request. Also, applicant should arrange to send the official transcripts directly by the educational institutions concerned to the **Assistant Registrar, Faculty of Engineering, University of Peradeniya, Peradeniya.**

In the event of any discrepancy between the names appearing in the applicant's academic/professional/birth certificates and the name given by the applicant in the application, an affidavit to the effect that the applicant is the one and the same person known by such names should be sent together with the application form.

A payment of Rs. 2,000.00 has to be done to the below account as the non-refundable application processing fee.

Bank : Bank of Ceylon
Branch : Peradeniya
Name of Account : Research and Fund Account
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Documents submitted in support of an application shall become the property of the University.

Application which are received late/or incomplete in any respect are liable to be rejected. **Only shortlisted applicants will be called for an interview.**

The applicants will be informed of their acceptance/non-acceptance to the particular postgraduate programme for which admission has been sought. The University may at its discretion refuse admission to any applicant.

For further details contact Dr.V.S.K.Wickramasinghe
Tel: +94-81-2393517; 070 2566265
Email: vskw@eng.pdn.ac.lk, the Coordinator of the Postgraduate Programme in Highway and Traffic Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.

Courses Offered

CE 6101 RESEARCH METHODS IN CIVIL ENGINEERING (Optional)

Fundamentals of Research: Definition and Objectives of Research; Qualitative vs Quantitative Research; The Scientific Research Process; Identification, selection, and formulation of research problems; Characteristics of good research problems; Review of literature. **Data Collection, Analysis and Presentation:** Methods and techniques of data collection; Design of Experiments; Sampling and sampling designs; Statistical modelling and analysis including introduction to statistical package; Probability Distributions; Multivariate methods; Concepts of correlation and regression, error analysis; Effective presentation of information using Tables, illustrations, graphs, etc. **Scientific writing and presentation:** Essential components of abstract, introduction, literature review, materials and methods, results, discussion, and conclusions; Formatting of contents; Methods of referencing and the use of referencing tools, Preparing and presenting a technical presentation.

CE 6303 SLOPE STABILITY AND EARTH RETAINING STRUCTURES (Optional)

Mass movements: Classification, causative factors, instrumentation, preventive, remedial and control measures. **Slope Stability Analysis using EC7:** EC7 guidelines for slope stability analysis, Design of slopes to EC7, Limit equilibrium methods, Bishop and Morgenstern Chart. **Design of rigid and flexible earth retaining structures using EC7:** Lateral earth pressure: Rankine's and Coulomb's theory, Introduction to earth retaining structures, EC7 guidelines for designing earth retaining structures, Design of mass concrete retaining wall and cantilever retaining wall to EC7. Introduction to sheet pile walls (Cantilever and anchored sheet pile walls), EC7 guidelines for sheet pile wall design, Fixed and free earth support methods of design of anchored sheet pile walls. Analyse internally stabilized earth wall (MSE walls), Soil nailing. **Case study on slope and retaining failure:** Case studies on slope and retaining wall failures.

CE 662 BASIC SOIL AND ROCK MECHANICS FOR HIGHWAY ENGINEERING (Compulsory)

Introduction to soil, soil formation and composition, soil types and structure, Field Investigations, compaction, determination of CBR from DCP test, soil improvement, Rock types, geological structures, geological processes and surface features of earth, Engineering classification of rock masses and suitability of sites for engineering projects and road constructions, Engineering properties of rocks and rock as a construction material, Stereonet analysis, Laboratory Tests (Los Angeles Abrasion value test, Rock Identification).

CE 663 TRAFFIC ENGINEERING (Compulsory)

Traffic variables and traffic flow theory, Fundamental parameters and relations of traffic flow (Eg. Speed, density, Volume, Travel Time, Headway, spacing, Time space diagram, Time mean speed, Space mean speed and there relation, relation between speeds, flow, density, Fundamental Diagrams) ; Traffic stream models: Greenshield's model, Greenbeg's logarithmic model, Underwood's exponential model, Pipe's Generalized model, Multi-regime models. Traffic measurement procedures, Measurement at a point: Traffic volume measurement, Equipment for flow measurements, Data analysing, Concepts of ADP, AADT measurement over a short section: Speed measurements, 15th and 85th percentile speeds, Design speed, Speed distributions Measurement along a length of road: Density measurement, Travel time measurement, Automated traffic measurement: GPS devices, Loop detectors, Video analysis, and other technologies. Highway Capacity Estimation, Capacity and level of service LOS: Definitions, Highway capacity, factors affecting LOS, HCM methods, capacity and LOS calculations on urban street, to lane Highways, Multi lane Highways, freeways. Traffic intersection control Principles of Traffic Control, Traffic signs and road markings, uncontrolled intersection, Channelization, Traffic rotary grade separated intersection. Traffic signal design, Elements of Traffic signal: Design principles of a Traffic signal, Evaluation of a Traffic signal. Specialised traffic studies, Parking studies, accidents studies, fuel consumption and emission studies, congestion studies, toll operation, Pedestrian studies. Intelligent Transport Systems.

CE 664 PAVEMENT DESIGN (Compulsory)

Introduction and description of Pavements, Important, functions, design and construction, maintenance rehabilitation. **Traffic**: Different types of Highway Traffic, measurement of Traffic loads, Effect of load and tire pressure. **Drainage**: Source and effect of water, Estimating flow, surface drainage system, subsurface drainage system, use of software for design of drainage structures. **Distress and Performance**: Distresses in asphalt pavements, consideration of performance. **Economic Analysis and Cost-Saving Concepts**: Engineering economic, concepts of life cycles cost, probabilistic versus deterministic approach, software for running life cycle cost analysis. **Sustainable Pavement Engineering**: Need for pavements, design of layout of pavements, constructions of pavements, use of waste and Byproducts in pavements, workers, Pavements-Building-Nature-Symbiosis, Regulatory Bodies and Impetus for Sustainability, Human factor. **Structural design of Flexible pavements**: Traffic and load distribution concept, materials and layers, Theoretical Considerations for structural Design: mechanistic and empirical design, Computer methods. **Structural Design of Rigid Pavements**: Theoretical Considerations, Different Methods, Limiting Criteria, Longitudinal Reinforcement Design Procedure, Computer methods for Rigid Pavements.

CE 665 TRAFFIC MEASUREMENTS, ANALYSIS AND DESIGN (Compulsory)

Traffic parameters (e.g. Speed, Flow, and Density) and Measuring Methods. Traffic Surveys (Turning Movement Counts, Speed Surveys). Transportation Surveys (e.g. Person Trip Surveys, Bus loading, Origin-Destination Surveys, Travel Time Surveys). Parking Surveys, Data analysis, and Parking facility Designs. Accident Data Collection, Black Spot analysis, Safe Designs. Pedestrian Surveys, Pedestrian Data Analysis, Pedestrian Facility Design. Public transport surveys and non-motorized transportation. Traffic System Design Project (Individual).

CE 666 ROAD SAFETY AND ENVIRONMENT (Compulsory)

Introduction to road safety. Importance of road safety. Local and global statistics of road traffic crashes. **Crash, reporting and collision diagrams.** Different crash reporting systems Concepts of collision diagrams Extracting important data for analysing. **Basics of crash Statistics.** Basic statistics to treat crash data. Data presentations. Predictions, regression analysis. **GIS applications in road safety** Basics of GIS. GIS applications. **Factors that influence safety and analysis of safety data.** Identify reasons for crashes. Introduce accident blackspots. Introduce spatial distribution, time distribution and mad user group distribution. **Safety countermeasures.** Introduction to various countermeasures Selection of suitable countermeasures. Effectiveness of safety countermeasures. Implementing safety countermeasures. **Highway geometry and safety** Horizontal and vertical curve designs Access road Junctions. **Road signing and marking.** Standard road signings and marking. Effect of road signing and marking for safety and convenience Modifications necessary to meet local conditions. **Road safety audits.** Basic concepts in road safety auditing Different stages in road safety auditing. **Issues related to pedestrian safety** Introduction to Pedestrian facilities. Knowledge and Attitudes towards pedestrians facilities of different road user groups. Possible improvements to enhance the safety of pedestrians. Road Safety Management.

CE 760 HIGHWAY PLANNING (Compulsory)

History and finance, and Highway Classification, Transportation and forecasting (Trip generation, trip distribution, modal split, trip assignment)

Driver, vehicle and roadway characteristics, Highway capacity for two lane roads, basic geometric concepts, horizontal curve design, Vertical curve design, Super elevation, Transition curves (spirals), Cross sectional elements, Highway safety and roadside design, Intersection and interchanges

Using International Standards for Highway Design, Traffic control devices, Environmental Mitigation in Transportation Projects, How Transportation Impacts the Environment, Model for Assessing Impacts and Developing Mitigation, Measures, Project Conception, Impact Assessment, Alternatives Analysis, Public Involvement and Review, Enforcement and Post-Project Monitoring, Transportation Planning and Regional Mitigation Approaches.

CE 761 HIGHWAY CONSTRUCTION MATERIALS AND METHODS (Optional)

Granular material for Pavement Construction. Mass-Volume Relationships, Grain Size Distribution: Gradation, Effect of Water, Stiffness and Strength of Soils, Soil Stabilization Concepts and Methods: Chemical and Mechanical, Parent Rock, and Types, Aggregate Production and Aggregate Tests. **Bitumen:** Cut hack Bitumen, Emulsion, and Bitumen Testing. **Asphalt:** Asphalt Binder, Safe Delivery, Storage, and Handling of Asphalts, Asphalt Binder Properties, Asphalt Binder Properties and Pavement Distress and Performance, Recovery of Asphalt Binder from Asphalt mix, Asphalt Emulsions. **Concrete:** Concrete, Aggregates, Cement, Water, Hydration and Steel in Concrete. **Construction of Asphalt Pavements.** Production, Transportation and Laydown, Description and Requirements of Components in Hot Mix, Asphalt- Producing Plants, Equipment Used for Transportation, Laydown, and Compaction, Important Factors, Specifications, Quality Control and Quality Assurance **Construction of Concrete Pavements** Concrete Production, Preparation of Subgrade and Base, Presetting Reinforcements such as Dowel Bars, ciebars and Continuous Reinforcement, Paving, Concrete Placement, Finishing, Quality Assurance/ Quality Control {QC/QA}.

CE 762 EVALUATION OF PAVEMENT MATERIALS AND PAVEMENTS (Optional)

Laboratory Soil Testing: Grain size analysis, Shear Tests, CBR. **In-situ Testing:** Determination of field density of pavement layer, plate bearing test, dynamic cone penetration, Benkelman beam deflection. **Aggregate Testing:** Aggregate Impact Test, Los Angeles abrasion test, polished stone test, Aggregate crushing value test, specific gravity and absorption test, shape test, soundness test. **Bitumen Testing:** Penetration Test, Ductile and elastic recovery test, softening point test, viscosity test, flash and fire point test, water sensitivity test. **Asphalt Testing:** Specific gravity test on asphalt, Marshall stability test on compacted asphalt. **Concrete testing:** Concrete Mix design (Cube Test), Workability, strength and density testing.

CE 763 HIGHWAY EVALUATION AND MAINTENANCE (Optional)

Introduction to Asset Management Systems Introduces the fundamental principles common to other industries (e.g. trucking, rail) that are applicable to a PMS and how they can be applied to pavements. **Pavement Management Systems Overview.** Describes the basic components of a PMS and how the products of can be used as a tool to aid in the development and that system decision-making for the pavement maintenance and construction program for and agency. **Relational Databases and Location Referencing Systems** Details the principles and concepts behind a relational database including the available technology, such as GIS and GPS. **Inventory and History,** Defines what types of data should be collected, how it should be collected and how it is used in a PMS. **Pavement Condition Surveys,** Describes the use of pavement condition survey data in the PMS, how it can be collected and the state-of-the-art of data collection equipment. **Pavement Condition Indices.** Includes the historic development of pavement distress indices, their basic functions, how they are computed, the different types available along with their advantages and disadvantages, and a discussion of the International Roughness Index (IRI). **ESAL Flow Maps.** Participants will be able to more fully appreciate the use and application of ESALs rather than basic traffic volumes in a PMS. **Performance Models.** This module will emphasize the importance of predicting the change in level of service in order to estimate futur. rehabilitation needs and introduce the tools used to predict future conditions. **Remaining Service Life** Participants will gain an understanding of what the remaining service life of a pavement is, how it is used, why it is important, and how it is calculated. **Prioritization,** The focus will be on the priority assessment techniques for prediction models to forecast conditions and prioritization as tools to identify the most cost-effective strategies for various funding levels. **Optimization** Will familiarize the participants with optimization techniques used in a PMS. **Maintenance and Rehabilitation of Asphalt Pavements** Maintenance, Primary Corrective Maintenance Activities, Primary Preventive Maintenance Activities, Recycling. **Maintenance and Rehabilitation of Concrete Pavements,** Joint and Crack Sealing, Slab Stabilization, Diamond Grinding, Load Transfer Devices, Precast Panels for Repair and Rehabilitation, Portland Cement Concrete Overlays, Warranty Projects.

CE 764 GIS FOR HIGHWAY AND TRANSPORTATION ENGINEERING (Optional)

Introduction to GIS and software: Raster data, Vector data, Data structures, Data manipulation Exploring the interface and file management system. **Spatial data structures and sources:** Map projections/coordinate system, World and National datum and transformations, Web and other spatial data sources. **GIS analysis functions and operations;** Creating editing and GIS data. Spatial and overlay analysis, Distance analysis, Conversion and re-sampling techniques. **Layouts, reports, graphs and. data interoperability:** Preparing and presenting maps and tables and exporting them to different online formats, Exporting and importing data to and from different formats. **Network modelling and analysis:** Performing network analyses; developing network **connectivity rules;** network validation and editing Road network analysis. **model**

Builder. Creating a model for complex analysis. **Remote Sensed Data and Image processing techniques:** Use of Elector Magnetic Spectrum in RS. Active and passive remote sensing, SAR data Supervised and unsupervised classification. **Introduction to Geographic Positioning Systems.** GNSS for GIS data capture, importing and exporting GPS data.

CE 765 QUANTITATIVE METHODS IN TRAFFIC ENGINEERING (Optional)

Introduction: Concepts of probability, Sample space and events, Random variables, Probability distributions, Cumulative distributions , Expected values. **Discrete probability distributions.** Binomial distribution, Poisson distribution. **Continuous probability distributions** Normal distribution, Weibull distribution. Sampling distributions. **Sampling distribution** of sample mean, Central limit cheorem, Sampling distribution of sample variance. **Inferences on mean and variance.** Point estimation, Confidence intervals. **Hypothesis testing.** Hypothesis testing for mean, variance and proportions. Single sample and Two samples tests. **Sampling techniques and analysis.** Sampling methods, questionnaire preparation , data analysis. **Simple and multiple linear regression.** Correlation, simple linear regression, multiple linear regression, polynomial regression ,use of 'Dummy' variables in multiple regression. **Residual Analysis.** outliers, Residual plots, Multicollinearity, Statistical tests for examination of residuals, model validation. **Selecting the 'best' regression model.** Forward selection, backward elimination, stepwise regression, Akaike Information Criterion and Baysian Information criterion.

CE 766 TRAFFIC MANAGEMENT (Optional)

Introduction to traffic management, Travel Demand Management (TDM). **Urban traffic management techniques,** local area traffic management. **Managing non- motorizes transport,** bus priority theorem. **Road signs and markings ,** traffic calming and speed control, Traffic demand management and road pricing, HOV promotion, junction control. **Parking management and its applications.** User information systems and intelligent traffic management systems.

CE 767 TRAFFIC IMPACT ASSESSMENT (Optional)

Introduction to TIA: Major Components of a Traffic impact Study. Traffic Data Collection, Highway Inventory, Parking counts, Bus loading and Pedestrians Counts, Travel time Data collection. Intersection Analysis: Capacity estimation. Traffic forecasting and impact assessment. Parking standards and regulations. TIA case study.

CE 6303 SLOPE STABILITY AND EARTH RETAINING STRUCTURES (Optional)

Mass movements: Classification, causative factors, instrumentation, preventive, remedial and control measures. **Slope Stability Analysis using EC7:** EC7 guidelines for slope stability analysis, Design of slopes to EC7, Limit equilibrium methods, Bishop and Morgenstern Chart. **Design of rigid and flexible earth retaining structures using EC7:** Lateral earth pressure: Rankine's and Coulomb's theory, Introduction to earth retaining structures, EC7 guidelines for designing earth retaining structures, Design of mass concrete retaining wall and cantilever retaining wall to EC7. Introduction to sheet pile walls (Cantilever and anchored sheet pile walls), EC7 guidelines for sheet pile wall design, Fixed and free earth support methods of design of

anchored sheet pile walls. Analyse internally stabilized earth wall (MSE walls), Soil nailing.
Case study on slope and retaining failure: Case studies on slope and retaining wall failures.



**UNIVERSITY OF PERADENIYA
DEPARTMENT OF CIVIL ENGINEERING**

POSTGRADUATE PROGRAMME IN STRUCTURAL ENGINEERING YEAR 2023

INTRODUCTION

Postgraduate programme in Structural Engineering is one of the most in demand structural engineering programmes in the country conducted by the Department of Civil Engineering, University of Peradeniya, Sri Lanka. The course consists of compulsory and optional taught courses conducted through lectures, tutorials, assignments, laboratory and design classes and a research study. The optional courses can be selected as per eligibility requirement. The programme will commence from March 2023.

Department of Civil Engineering, University of Peradeniya has excellent laboratory facilities and a team of highly qualified academic staff. Facilities in the Engineering Library, Computer Aided Design Laboratory and Computing/IT Centre are also available for students in furthering their studies and research.

TEACHING PANEL OF THE PROGRAMME

Prof. P. B. R. Dissanayake, BScEng, MEng, PhD, CEng, FIE (SL)

Prof. K. A. S. Susantha, BScEng, MEng, DEng, CEng, MIE (SL)

Dr K. R. B. Herath, BScEng, MSc, PhD

Dr U. I. Dissanayake, BScEng, PhD, CEng, MIE (SL)

Dr L. C. Kurukulasuriya, BScEng, MEng, PhD

Dr (Mrs) S. R. Herath, BScEng, MEng, PhD

Dr H. D. Yapa, BScEng, PhD

Dr (Mrs) C. K. Pathirana, BScEng, MScEng, PhD, CEng, MIE (SL)

Dr K. K. Wijesundara, BScEng, MSc, PhD

Dr A. J. Dammika, BScEng, MEng, PhD

Dr M. C. M. Nasvi, BScEng, PhD, CEng, MIE (SL)

Dr J. A. S. C. Jayasinghe, BScEng, MEng, PhD

Dr C. S. Bandara, BScEng, MScEng, PhD, CEng, MIE (SL)

Dr S. K. Navaratnarajah, BScEng, MS, PhD

Dr H. A. D. Samith Buddika, BScEng, MEng, PhD

Dr (Ms) K. C. Chandrasiri, BScEng, PhD

Dr N. M. S. H. Bandara, BScEng, PhD

In addition, visiting experts will also assist in the programme in different components.

COURSE STRUCTURE

The course structure facilitates postgraduate candidates to follow any preferred level of programme in accordance Sri Lanka Qualification Framework (SLQF) as shown below.

SLQF Level	Diploma/Degree	Credit/GPA Requirements	Duration
SLQF Level 8	PG Diploma in Structural Engineering - PG.Dip.	A total of 25 Credits earned with at least 2.75 GPA from prescribed courses including an independent study of 3 Credits .	10 Months (Minimum)
SLQF Level 9	Master of Structural Engineering – M.Eng.	A total of 30 Credits with at least 3.0 GPA from the prescribed courses including an advanced study of 5 Credits .	12 Months (Minimum)
SLQF Level 10	Master of the Science in Structural Engineering - M.Sc.Eng.	A total of 30 Credits from the prescribed courses with at least 3.0 GPA and successfully completed a research study of 30 Credits .	2 Years (Minimum)

PG Candidates in each level need to earn **18 Credits** from **Compulsory Courses** (3 Credits x 6 Courses) and balance amount of taught courses credit requirements from the **Optional Courses** as per the programme requirements in addition to the Independent Study/ Advanced Study/ Advanced Research Study. The award of the Postgraduate degrees is subject to University rules and regulations including above excerpts. The list of courses to be offered in 2023 is shown below (subject to approval).

Compulsory Subjects		
Course Code	Course Title	Credits
CE6501	Advanced Concrete Technology	3
CE6502	Design of Steel Structures	3
CE6503	Design of Reinforced Concrete Structures	3
CE6504	Finite Element Methods in Structural Mechanics	3
CE6505	Structural Dynamics	3
CE6509	Advanced Foundation Engineering	3
Optional Courses		
Course Code	Course Title	Credits
CE 6506	Wind Engineering	2
CE 6507	Earthquake Engineering	2
CE 6508	Engineering Materials	2
CE6510	Prestressed Concrete Design	2
CE6511	Nonlinear Analysis of Frame Structures	2
CE6512	Forensic Investigations, Repair and Retrofitting of Structures	2
CE6513	Numerical Methods for Civil Engineers	2
CE6514	High-Rise Buildings	2
CE6515	Bridge Engineering	2

Research/Project related Courses				
SLQF Level	Course Code	Course Title	Credits	Diploma/Degree
SLQF Level 8	CE6102	Independent Study	3	PG Diploma in Structural Engineering
SLQF Level 9	CE6103	Advanced Study	5	Master of Structural Engineering
SLQF Level 10	CE6104	Advanced Research Study	30	Master of the Science in Structural Engineering

(Course contents are given at the end of the documents)

The taught subjects will continue over *Two Semesters* on *Saturdays* and *Sundays* from **8.30 AM to 6:00 PM and** timetable has been prepared as shown below by facilitating every category of candidates to earn minimum credits requirement within two semesters. Essentially some of the optional courses may be conducted in parallel as number of time slots available are lesser than number of optional courses in the list. The research component will also be commenced within the first semester and will be continued till the end of the third semester. Examinations of the courses taught in a semester will be held within the semester, and the progress of the research/design projects are continuously evaluated during and at the end of each semester.

Time Slot	Saturday	Sunday
8.30 AM – 11.30 AM	Compulsory (3 Credits)	Compulsory (3 Credits)
12.30 AM – 3.30 PM	Compulsory (3 Credits)	Optional (2 Credits)
4.00 AM – 6.00 PM	Optional (2 Credits)	Optional (2 Credits)

ADMISSION REQUIREMENTS

PG Diploma in Structural Engineering (SLQF Level 8)

- A first Degree in Engineering/Science (SLQF L5) acceptable to the Faculty Higher Degrees Committee or
- Such other qualification equivalent to a first Degree in Engineering/Science (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for PG.Dip., in a field related to the programme of study.

Master of Structural Engineering (SLQF Level 9)

- A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or

- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

Master of the Science in Structural Engineering (SLQF Level 10)

- (a) A first Degree in Engineering of at least 120 credits (SLQF L6) with First or Second Class Honours or
- (b) A first Degree in Engineering of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Sc.Eng. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

COURSE FEE

	M.Sc.Eng. (SLQF L10)	M.Eng. (SLQF L9)	PG.Dip. (SLQF L8)
Local candidates	Rs. 475,000.00	Rs. 400,000.00	Rs. 350,000.00
SAARC countries	USD 3000	USD 2500	USD 2000
Other countries	USD 5000	USD 4000	USD 3000

In addition to above fee a refundable library deposit of Rs. 10,000.00 and Standard Library Deposit of Rs. 4,000.00 should be paid at the time of the registration for the postgraduate programme.

APPLICATION PROCEDURE

The applications should be submitted online through <http://pgciviladmissions.eng.pdn.ac.lk/> on or before 4th of November 2022.

The following documents **should be uploaded** along with the duly completed application:

- (a) Degree/Diploma/Professional membership certificates and Academic Transcript.
- (b) Two Referee Reports (Online). At least one should be from the applicant's teacher at the University.
- (c) Birth certificate and National Identity Card.
- (d) Letter of consent on granting leave to engage in PG study from the employer (where applicable).
- (e) Application processing fee - Proof of payment (deposit slip)

(f) Recent colour photograph (passport posture)

Hard copies of documents (a) – (e) above **should be posted to the Coordinator/ PG Programmes in Civil Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.**

In the event of any discrepancy between the names appearing in the applicant's academic/professional/birth certificates and the name given by the applicant in the application, an affidavit to the effect that the applicant is the one and the same person known by such names should be available. The originals of the documents should be produced on request/at the time of interview. Also, applicant should arrange to send the official transcripts directly by the educational institutions concerned to the **Assistant Registrar, Faculty of Engineering, University of Peradeniya, Peradeniya.**

A payment of Rs. 2,000.00 has to be done to the below account as the non-refundable application processing fee.

Bank : Bank of Ceylon

Branch : Peradeniya

Name of Account : Research and Fund Account

Account Number : 001274688

Application which are received late/or incomplete in any respect are liable to be rejected. **Only shortlisted applicants will be called for an interview.**

The applicants will be informed of their acceptance/non-acceptance to the particular postgraduate programme for which admission has been sought. The University may at its discretion refuse admission to any applicant.

For further details contact:

Dr. A. J. Dammika (Mobile: +94 77 414 5640; Email: dammikaaj@eng.pdn.ac.lk), the Coordinator of the Postgraduate Programme in Structural Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.

or Course Secretary (Mobile: +94 71 769 1566).

DETAILS OF THE COURSES OFFERED

CE 6501: ADVANCED CONCRETE TECHNOLOGY (Compulsory)

Cement production: Constituents; method of production; chemical reactions. **Types of cement:** Cement types; classification. **Chemical and mineral admixtures:** Characteristics; applications. **Aggregate:** Types; classifications; testing. **Proportioning of concrete mixes:** Mix design methods; self-compacting concrete design; zero-slump concrete design. **Concept of high-performance concrete:** Materials; attributes; mix design. **Properties of fresh and hardened concrete:** Fresh/hardened concrete properties; concrete testing. **Compliance criteria, Production of concrete.** Mixing; transporting; compaction; curing. **Temperature effects in concrete:** Temperature development; adiabatic temperature; temperature prediction; temperature control. **Durability of concrete and maintenance:** Carbonation; sulphate attack, ASR/ACR reactions. **Assessment of working life:** Carbonation assessment; half-cell potential assessment. **Special types of concrete and their applications:** Roller compacted concrete; fibre reinforced concrete; shotcrete. **Testing of concrete in structures;** Non-destructive and semi-destructive testing. **Evaluation of concrete in structures, Planning and design of concrete repair , Materials and methods for repair and rehabilitation.**

CE 6502: DESIGN OF STEEL STRUCTURES (Compulsory)

Introduction: Introduction to design of steel structures, materials behaviour, properties of structural steel, steel grades, steel sections. **Limit state design and code of practice:** Simple and continuous structures, limit state design, code of practice, cross section classification, section properties, holistic behaviour of structures. **Design of structural members:** Design of tension members, compression members, restrained and unrestrained beams, stocky and slender columns, special types of struts, columns in simple structures, columns under combined axial loads and moments. **Design of connections:** Connections in simple and continuous structures, design of bolted and welded connections, design of column bases. **Design of portal frames:** Plastic analysis, frame stability, local buckling, lateral distortion, torsional restraints, design of haunches. **Design of plate girders:** Sizing plate girders, section classification, moment and shear capacities, design of end panels and intermediate stiffeners. **Steel – concrete composites:** Design of steel - concrete composite members.

CE 6503: DESIGN OF REINFORCED CONCRETE STRUCTURES (Compulsory)

Introduction: Objectives and methods of analysis and design, Properties of concrete and reinforcing steel, Design concepts. **Limit State Design:** Limit state of collapse, Limit state of serviceability. **Design of RC beams:** Flexure -Singly/doubly RC beams, Flanged beams. Shear design. Bond, anchorage, development length and torsion. Serviceability limit state check. Curtailment. Deep beam design. **Compression Members:** RC Short column, RC Slender column. **Reinforced Concrete Slabs:** One-way slab, Two-way slab, Yield line theory, Serviceability limit state check, Pile cap design. **Design of Water Retaining Structures**

CE 6504: FINITE ELEMENT METHODS IN STRUCTURAL MECHANICS (Compulsory)

Introduction to finite element method: Review of displacement based finite element method – 1D element. **2-Dimensional plane stress/strain element formulation:** Problem differential equation, constant strain triangular (CST) element formulation, 4-node quadrilateral element formulation using isoparametric formulation, Numerical integration; Gauss Quadrature, Gauss point, Higher order elements, shear locking. **Plate bending element formulation:** Derivation of problem differential equation, 4-node rectangular element formulation (one of the earliest plate bending formulation), 4-node quadrilateral plate bending element formulation using Mindlin and Reissner plate theory. **Shell element formulation: Solid element formulation:** 8-node solid element formulation using isoparametric formulation, Higher order elements. **Use of general-purpose finite element programs:** Pre-processor, mesh generation, renumbering for efficiency, post-processors, use of finite element methods in CAD/CAE, applications of general-purpose finite element programs.

CE 6505: STRUCTURAL DYNAMICS (Compulsory)

Dynamics of Simple Structures (Single-Degree-of-Freedom systems) Equation of motion, Free vibrations, Response to harmonic force, Response to periodic force, Response to arbitrary dynamic force. **Multi-Degree-of-Freedom Structures:** Formulation of matrix equations of motion, Analysis of free vibrations, Modal analysis and forced vibrations, Steady state response. **Continuous Structures:** Partial differential equations of motions (for strings, bars, beams), Modal analysis. **Random Vibrations:** Probability theory, random processes, Correlation and spectral density functions, Response to stationary random excitations, Crossing, peak distributions, extreme value analysis, evaluation of fatigue life, Application to wind engineering. **Control of Dynamic Response:** Overview of vibration control, Tuned Mass Dampers, Active control. **Applications of Structural Dynamics:** Model validations, Vibration based structural health monitoring.

CE 6506: WIND ENGINEERING (Optional)

Introduction to Wind Engineering: The nature of wind from meteorological viewpoints, Wind induced damage. **Wind Characteristics:** Description of wind characteristics from engineering viewpoints. **Wind Loading and Bluff-Body Aerodynamics:** Introduction to bluff-body aerodynamics, Aerodynamic drag (CD), lift (CL), moment (CM) and pressure (CP), Effects of viscosity and Reynold number (Re) to flow pattern around bluff-body, Factors affect the aerodynamics coefficients (CD, CL, CM and CP), Periodic vortex induced forces, Random wind forces caused by random wind velocity fluctuations. **Aeroelastic Phenomena:** Classification of wind effects on structure, Static wind load effects, Vortex induced oscillation, Galloping induced oscillation, Flutter induced oscillation. **Wind Resistant Design:** Tall buildings, Long-

span bridges, Wind tunnel tests, Aerodynamic and mechanical approaches to suppress wind-induced responses.

CE 6507: EARTHQUAKE ENGINEERING (Optional)

Nature of Earthquakes; Sources of earthquake ground motions, measures of earthquake intensity and damage potential, seismicity in and around Sri Lanka, effects of earthquakes on structures: lesson learned from past earthquakes. **Response of Simple Structures to Earthquake Ground Motions;** equation of motion for base excitation, solution of the SDOF system, earthquake response spectra. **Seismic Analysis Procedures (Force-based procedure);** linear elastic design spectrum and inelastic design spectrum, analysis procedures for building structures, basic design principles and performance requirements. **Seismic Design Principles for RC Structures;** structural systems/ types of buildings, capacity design principles, ductility in reinforced concrete, capacity design procedure. **Force-Based vs. Direct Displacement-Based Design: Damage Avoidance Design;** base isolation, rocking precast structural systems.

CE 6508: ENGINEERING MATERIALS (Optional)

Introduction: Introduction to materials, material classes and properties, price and availability of materials, material efficient designs. **Polymers:** Generic polymers, GFRP, CFRP and KFRP, mechanical behaviour of polymers, polymer composites, advance engineering applications of polymers and polymer composites. **Ceramics and glasses:** Classes of ceramics and glasses, cement and concrete, rocks and minerals, mechanical properties, high performance ceramics, ceramic composites, ceramic matrix composites (CMC), advanced engineering applications of ceramics, glasses and composites. **Metals:** Ferrous and non-ferrous metals, alloys, light alloys, mechanical properties of metals and alloys, metal matrix composites (MMC), selection of metals and alloys for designs. **Materials and energy:** Energy economy, material contents in products, alternative materials, production process. **Advanced Materials:** Carbon-carbon composites, cellular solids and foams, micro-composites, Nano-materials. **Construction Materials:** Sustainability of construction materials Local and regional materials, Alternative materials for construction.

CE 6509: ADVANCED FOUNDATION ENGINEERING (Compulsory)

Shallow foundations: Bearing capacity theories, Shallow foundation design using Eurocode 7, eccentric and inclined loads, bearing capacity on slopes, Bearing capacity of layered soils, foundation settlements. **Design of combined and raft foundations:** flexible and rigid design of combined. footings and raft foundations. **Machine foundations:** Types of machines, design criteria, elements of vibration theory, governing equations. **Deep foundations:** Introduction, bearing capacity of group piles, Quality Control and Quality assurance of pile foundation, Design of deep foundations using Eurocode 7, Negative skin friction, Pile group settlement,

Rock socketed piles, Laterally loaded piles, Piles subjected to uplift, Design of Caissons in sand and clay. **Design Exercise:** Design of foundation of a building.

CE 6510: PRESTRESSED CONCRETE DESIGN (Optional)

History of prestressed concrete: Use of prestress in non-concrete structures; application on concrete structures; characteristics; attributes. **Prestressing systems:** Pre-tensioning systems; post-tensioning systems; anchoring systems. **Principles of prestressed concrete design:** Stress calculation; stress limits. **SLS and ULS design:** Magnel diagram; tendon profile; deflection; ULS. **Composite section design:** Parasitic forces; concordant profile. **Prestressed concrete slab design.** **New materials:** Fibre reinforced polymer.

CE 6511: NONLINEAR ANALYSIS OF FRAME STRUCTURES (Optional)

Introduction to nonlinear frame analysis: Failure modes observed in reinforced concrete and steel frame structures; plastic hinge development due to moment-axial interaction, shear failure of short element, large displacement induced by torsional response. **Nonlinear frame models:** Frame element with lumped plasticity; plastic hinge, Frame element with distributed plasticity; Displacement based formulation, force-based formulation, Numerical integration; Gauss Quadrature and Gauss Lobatto, Section models, Uni-axial material constitutive models for nonlinear hysteretic response. **Incremental-Iterative solution strategies:** Load control method, Displacement control method; Newton Raphson, Modified Newton Raphson, Krylow Newton Raphson, Arc length method; Convergence criteria. **Analysis of nonlinear geometry:** Co-rotational formulation.

CE 6512: FORENSIC INVESTIGATION, REPAIR AND RETROFITTING OF STRUCTURES (Optional)

Introduction: Role of expert witness, forensic investigation, damage assessment techniques. **Failures in Civil Engineering Structures:** Technical, structural and non-structural failures. Natural hazards and unusual loads: effects on the built environment. **Failure Mechanisms and Guidelines:** Failure mechanisms in concrete and steel elements and structures. Guidelines for Failure Investigation. **Forensic Investigation and Damage Assessment:** Investigation of damaged or failed structures, assessment of damage, case studies. **Strength Evaluation of Existing Concrete and Steel Structures:** Preliminary investigation (review of existing information and condition survey and evaluation). Assessment of loading conditions and selection of evaluation method. **Methods for Assessing Properties of Concrete and Steel:** Visual inspection. Detailed investigation: Stress-wave propagation methods, Infrared thermography, Ground-penetrating radar (GPR), Electrical and magnetic methods for reinforcement, Surface hardness test and coring for concrete, tensile, impact and hardness testing for steel, microstructure and crack investigation of steel, corrosion, fatigue testing. **Repair of Concrete and Steel Elements:** Causes, control and evaluation of cracking of concrete, methods of crack repair. Fatigue assessments, evaluation of crack initiation and

propagation of steel, repair methods. **Strengthening and Stabilization of Concrete and Steel Structures:** Techniques consideration, beam shear capacity strengthening, shear transfer strengthening, stress reduction techniques, column strengthening, flexural strengthening, connection stabilization and strengthening, design and construction of externally bonded FRP systems.

CE 6513: NUMERICAL METHODS FOR CIVIL ENGINEERS (Optional)

Solutions to nonlinear equations: bisection method; method of false position; fixed-point iteration; Newton-Raphson's method; secant method. **Numerical solutions to systems of linear equations:** Gaussian elimination; Jacobi method; Gauss Seidel method. **Interpolation: Linear interpolation;** Newton interpolation; Lagrange interpolation; Spline interpolation. **Approximation and curve fitting:** Linear regression; polynomial regression; **Numerical solutions to ordinary differential equations:** Initial value problems: Euler method, Runge-Kutta methods; Boundary value problem: Finite difference method. **Numerical solutions for partial differential equations: Finite difference method:** Elliptic equations: 1D and multi-dimensional problems; parabolic problems; **Integral Equation Methods:** Collocation method, Galerkin method and Weighted Residual method; Numerical Quadrature: Gaussian Quadrature.

CE 6514: HIGH-RISE BUILDINGS (Optional)

Introduction to High-Rise Building: What is "High-Rise building"?, Different High-Rise building systems, Function of service core, Required professional skills, Special consideration of High-Rise building design. **Design Process and Philosophy:** Structural design considerations, Overall design process, Structure design process, Design philosophy and process, Proportioning for safety, Philosophies in current use, From serviceability to performance. **Building Systems:** Knowledge model for system selection, Determining system suitability, Evaluating system suitability, Assigning suitability values, Selection of structural system, Typical characteristics of residential buildings and commercial buildings, The building structural system (physical and conceptual). **Structural Load Resisting Systems:** Vertical load resisting systems, Lateral Load Resisting Systems, Selection of Lateral Load Resisting Systems. **Performance based Concept for High-Rise Buildings:** Performance based design of new High-Rise buildings, Performance based evaluation of existing High-Rise buildings. **Modeling, Analysis and Design for Lateral Loads:** Computer modeling for accurate analysis (SAP 2000), Analysis and design of shear walls, Analysis and design of transfer girders and deep beams, Analysis and design of High-Rise building for wind loading, Analysis and design of High-Rise building for seismic loading.

CE 6515: BRIDGE ENGINEERING (Optional)

Design considerations: Economical consideration; site selection; aesthetics; geotechnical investigations; hydrological and hydraulic considerations; safety considerations. **Alternative structural configurations and systems:** Use of different materials, Constructability, Modern concepts, FEM applications, Construction methods. **Bridge deck loading and analysis:**

Guidelines and Codes of Practices in highway and railway bridge design including Sri Lankan practices. **Design of superstructure:** Reinforced concrete bridges; Pre-stressed concrete bridges; Steel bridges; Steel-concrete composite bridges. Design exercise is based on a selected bridge type. **Design of substructure:** Abutments; piers; piles and other foundations. **Design of bearings and joints:** Design of Elastomeric bearing, Bridge expansion joints. **Dynamic Analysis of Bridges:** Structural dynamics for bridges, seismic effects, wind effects. **Maintenance of bridges:** Scheme of inspection; identification of defects and repair methods.



UNIVERSITY OF PERADENIYA
DEPARTMENT OF CIVIL ENGINEERING

**POSTGRADUATE PROGRAMMES IN SUSTAINABLE BUILT
ENVIRONMENT**

YEAR 2023

1. INTRODUCTION

Conventional practices of global development have caused many issues such as climate change due to Green House Gas emissions, and reduction in limited natural resources. The built environment and operation of associated industrial activities have been identified as the main consumer of resources and the major contributor to the climate change and other environmental issues. As such, a significant improvement of global environmental conditions could be achieved through effective interventions at planning, design, construction and operation stages of built environment. Accordingly sustainable built environment has been identified as a global trend in the infrastructure development.

This course focuses on introducing the concepts and methods of reducing the environmental burden of activities related to the built environment. The students of this programme will have an opportunity to expose themselves to the concept of “Green Building Techniques” applicable in many disciplines of engineering. The main objective of this programme is the capacity building in the area of sustainable built environment. Further, the graduates will be capable of practicing the concepts of green building techniques in their respective areas of specializations. In addition, they will be eligible to apply to become a Green Building Certified Professional (GBCP) who is authorized by the Green Building Council Sri Lanka (GBCSL) to assess buildings for the award of “Green Building Rating” in Sri Lanka.

This postgraduate programme is conducted by the Department of Civil Engineering, University of Peradeniya. The students have the option of registering either for a postgraduate diploma or a master degree. The course consists of taught courses, industrial assignments, laboratory and design exercises and a research project. The Faculty of Engineering, University of Peradeniya, has excellent physical facilities and a team of highly qualified academic staff to conduct the programme. Further, visiting national and international experts from industry and academia will contribute as resource personnel.

Facilities in the Laboratories: Computing Centre and the Library of the Faculty of Engineering are available for research and study. Staff of the Civil Engineering Department and Faculty of Engineering associated with the postgraduate programme is:

Prof. K. D. W. Nandalal	BScEng, MEng, PhD, FIE(SL) , CEng
Prof. P. B. R. Dissanayake	BScEng, MEng, PhD, CEng, FIE (SL)
Prof. K. P. P. Pathirana	BScEng, MSc, PhD, CEng, FIE(SL), MICE, Int.PE
Prof. G. B. B. Herath	BScEng, MEng, PhD
Prof. D. G. G. P. Karunaratne	BScEng, PhD
Prof. K. G. N. Nanayakkara	BScEng, PhD

Prof. C. S. Kalpage	BScEng, PhD, AMIChemE, AMIESL
Prof. S. D. G. S. P. Gunawardena	BScEng, PhD
Prof. D. A. A. C. Rathnaweera	BScEng, PhD
Prof. C. K. Benaragama	BSc, PGCTm, MSc, MPhil, PhD
Prof. M. Danthurebandara	BScEng, PhD
Dr. P.B.G. Dissanayake	BScEng, PhD, MIEAust, AMIESL
Dr. H.K. Nandalal	BScEng, MSc, PhD, CEng, MIESL
Dr. K.M.A.K. Kulathunga	BScEng, PhD, CMILT, MIEEE, AP-GBCSL AMIESL
Ms. K.K.K. Sylva	BScEng, MEng, MBA
Dr. C. S. Bandara	BScEng, MScEng, PhD, CEng, MIE (SL)
Dr. H. A. D. S. Buddhika	BScEng, MEng, PhD
Dr. T. D. C. M. K. Gunawardena	BScEng, PhD
Dr. P. J. Binduhewa	BScEng, PhD, MIEEE
Mr. D. D. Dias	BScEng, MSc
Mr. Nirodha Gunadasa	B.Sc.(B.E.)(Hons.),M.Sc.(Arch.), AIA(SL),GREENSL®AP
Mr. S.S. Kosgolla	BSc, MSc

2. PROGRAMME STRUCTURE, DURATION AND COURSES

In order to obtain required credits per Term, it is required to conduct classes for at least 6 sessions. Accordingly, the proposed time table for the program is as follows;

Day	Time
Saturday	8.00AM to 11.00 AM
	12.00 PM to 3.00 PM
	3.00 PM to 5.00 PM
Sunday	8.00 AM to 11.00 AM
	12.00 PM to 3.00 PM
	3.00 PM to 5.00 PM

Note. In addition to above sessions, all students will complete an Independent Study/ Advanced study/ Advanced Research Study of his/her choice related to the course. The discussions and meetings will be scheduled from time to time on Friday, Saturday or Sunday. Accordingly, the proposed time schedule for the course is as follows'

Semester	Period of the year
Term I	March to July (5 months)
Term II	August to December (5 months)
Independent study/ Advanced study/ Advanced Research Study	Term I and Term II and then Continue after December

Examinations in respect of the subjects taught in a term will be held within the term, and the progress of the research/design projects are continuously evaluated during and at the end of each term. At the end of 2 semesters, the student will complete taught courses as required.

Item	Description	Number of credits
1	From core course (6 courses x 3 credits)	18
2	From elective courses:	
	PG. Dip. (Level 8)	4
	Masters (Level 9)	7
	M.Sc. (Level 10)	12

2.1 COURSES OFFERED (Subject to approval)

		Compulsory Subjects			
Course Code	Course Title			Credits	
CE690	Fundamentals of Architecture and Economics for Sustainable Planning			3	
CE691	Infrastructure Planning for Sustainable Cities			3	
CE692	Global Environmental Issues and Built Environment			3	
CE693	Building Services Engineering			3	
CE694	Green ^{SL} Rating System for Built Environment			3	
CE696	Sustainable Construction			3	
		Optional Courses			
Course Code	Course Title			Credits	
CE 6101	Research Methods in Civil Engineering			2	
CE 6205	Water Resources Project Planning			3	
CE 6207	Climate Change Impact and Adaptation in Water Sector			2	
CE 6210	GIS and Remote Sensing in Water Resources			2	
CE 6214	Integrated Water Resource Management			2	
CE 6314	Mitigation and Control of Natural Geo-hazards			2	
CE 666	Road Safety and Environment			3	
Research Courses					
SLQF Level	Course Code	Course Title	Credits	Diploma/Degree	
SLQF Level 8	CE6102	Advanced Study	3	PG Diploma in Sustainable Built Environment	
SLQF Level 9	CE6103	Research Study	5	Master of Sustainable Built Environment	
SLQF Level 10	CE6104	Advanced Research Study	30	Master of the Science	

3. ADMISSION REQUIREMENTS FOR THE PROGRAMMES

The postgraduate programmes leading to the following qualifications are available in the postgraduate programmes in Sustainable Built Environment.

Postgraduate Diploma (SLQF L8) : *PG.Dip. (Sustainable Built Environment)*

Degree of Master of Science (SLQF L9) : *MSustBltEnv (Sustainable Built Environment)*

Degree of Master of the Science (SLQF L10) : *M.Sc.(Sustainable Built Environment)*

The minimum qualifications required of a person for admission to a postgraduate programmes leading to the SLQF L8, SLQF L9 and SLQF L10 are as follows:

3.1 Postgraduate Diploma (SLQF L8): PG.Dip.

- (a) A first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management (SLQF L5) acceptable to the Faculty Higher Degrees Committee or
- (b) Such other qualification equivalent to a first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for PG.Dip., in a field related to the programme of study.

3.2 Degree of Master of Science (SLQF L9): MSustBltEnv (Sustainable Built Environment)

- (a) A first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management (SLQF L5) with First or Second Class Honours or
- (b) A first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management (SLQF L5) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management (SLQF L5) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the Masters Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

3.3 Degree of Master of the Science (SLQF L10): M.Sc. (Sustainable Built Environment)

- (a) A first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management of at least 120 credits (SLQF L6) with First or Second Class Honours or

- (b) A first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management of at least 120 credits (SLQF L6) with acceptable postgraduate qualifications or a minimum of one year's experience after obtaining the Degree, in a field related to the programme of study or
- (c) Such other qualification equivalent to a first Degree in Engineering/Science, Architecture, Town & Country Planning, Building Economics and Transport and Logistics Management of at least 120 credits (SLQF L6) as may be recommended by the Faculty Higher Degrees Committee as suitable for candidature for the M.Sc. Degree with a minimum of one year's experience, after obtaining such qualification, in a field related to the programme of study.

4. COURSE REQUIREMENTS AND THE DURATIONS

4.1 Postgraduate Diploma (SLQF L8): PG.Dip. (Sustainable Built Environment)

4.1.1 Course requirements

In order to be eligible for the award of the Diploma in Sustainable Built Environment, a student shall have satisfied the following requirements.

A total of 25 credits earned with at least 2.75 GPA from prescribed courses including an advanced study of at least 3 credits.

4.1.2 Minimum and Maximum Duration

The duration of the PG.Dip. programme shall be ten (10) months (minimum).

To be eligible for the award of the Postgraduate Diploma, a student shall fulfill all stipulated requirements within 2 years from the date of registration on a full-time basis (3 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

4.2 Masters Degree (SLQF L9): MSustBltEnv (Sustainable Built Environment)

4.2.1 Course requirement

In order to be eligible for the award of the Masters Degree a student shall have a total of 30 credits earned with at least 3.0 GPA from the prescribed courses including an advanced study of at least 5 credits.

4.2.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be twelve (12) months (minimum).

In order to be eligible for the award of the Masters Degree, a student shall fulfill all stipulated requirements within 3 years from the date of registration on a full-time basis (4.5 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of Faculty Higher Degrees Committee (FHDC) under special circumstances.

4.3 Degree of Master of Science (SLQF L10): M.Sc. (Sustainable Built Environment)

4.3.1 Course requirement

In order to be eligible for the award of M.Sc. Degree a student shall have;

- (i) earned a total of 30 credits from the prescribed courses with at least 3.0 GPA And
- (ii) successfully completed a research study of 30 credits.

4.3.2 Minimum and Maximum Duration

The duration of the prescribed programme shall be 2 years (minimum).

In order to be eligible for the award of the Degree of M.Sc., a student shall fulfill all stipulated requirements within 4 years from the date of registration on a full-time basis (6 years on a part-time basis) or as decided otherwise by the Faculty Board on the recommendation of FHDC under special circumstances.

5. COURSE FEE

	M.Sc.Eng. (SLQF L10)	M.Eng. (SLQF L9)	PG.Dip. (SLQF L8)
Local candidates	Rs. 475,000.00	Rs. 400,000.00	Rs. 350,000.00
SAARC countries	USD 3000	USD 2500	USD 2000
Other countries	USD 5000	USD 4000	USD 3000

In addition to above fee a refundable library deposit of Rs. 10,000.00 and Standard Library Deposit of Rs. 4,000.00 should be paid at the time of the registration for the postgraduate programme.

6. APPLICATION PROCEDURE

Applications for enrolment must be submitted through <https://pgciviladmissions.eng.pdn.ac.lk/login> on or before **04th of November 2022**.

The following documents should be uploaded along with the duly completed application:

- a) Degree/Diploma/Professional membership certificates and Academic Transcript.
- b) Two Referee Reports (Online). At least one should be from the applicant's teacher at the University.
- c) Birth certificate and National Identity Card.
- d) Letter of consent on granting leave to engage in PG study from the employer (where applicable).
- e) Application processing fee - Proof of payment (deposit slip)
- f) Recent colour photograph (passport posture)

Hard copies of documents (a) – (e) above **should be posted to the Coordinator/ PG Programmes in Civil Engineering, Department of Civil Engineering, University of Peradeniya, Peradeniya.**

Originals of documents of which the scanned copies are submitted should be produced before admission, on request. Also, applicant should arrange to send the official transcripts directly by the educational institutions concerned to the **Assistant Registrar, Faculty of Engineering, University of Peradeniya, Peradeniya.**

In the event of any discrepancy between the name appearing in the applicant's academic/professional/birth certificates and the name given by the applicant in the application, an

affidavit to the effect that the applicant is the one and the same person known by all such names should be sent together with the application form.

A payment of Rs. 2,000.00 has to be done to the below account as the non-refundable application processing fee.

Bank : Bank of Ceylon
Branch : Peradeniya
Name of Account : Research and Fund Account
Account Number : 001274688

Documents submitted in support of an application shall become the property of the University. The applicants will be informed of their acceptance/non-acceptance to the particular programme for which admission has been sought.

Applications which are received late/or are incomplete in any respect are liable to be rejected. **Only shortlisted applicants will be called for an interview.**

The University may at its discretion refuse admission to any applicant.

For inquiries please contact the Coordinator of the programme Dr. P.B.G. Dissanayake, Dept. of Civil Eng., Univ. of Peradeniya, Tel: 081 2393541 e-mail: puijitha@eng.pdn.ac.lk

COURSE DETAILS

CE 690 **FUNDAMENTALS OF ARCHITECTURE AND ECONOMICS OF SUSTAINABLE PLANNING**

(Compulsory)

Fundamentals of Architecture: Sustainable architecture, sustainable landscape practices. **Economics for Sustainable Planning:** economic appraisal methods, lifecycle costing, asset management, value engineering, Environmental economics, sustainability and economics. **Discussion of Case Studies**

CE 691 **INFRASTRUCTURE PLANNING FOR SUSTAINABLE CITIES**

(Compulsory)

Fundamentals of Infrastructure Planning. Concept of Sustainability as applied to Infrastructure Planning, **Land-Use Planning and Urban Form for Energy-Efficiency;** Urban Growth Patterns. **Urban and Rural Transport Planning;** Sustainable Accessibility for Cities and Communities. **Social Infrastructure Planning;** Shelter Health, Education, Employment, Administration, Safety, Recreation and Cultural. **Utility Networks and Facility Location. Infrastructure Planning for Emergencies. Social Organisation and Urban Psychology. Discussion of case studies**

CE 692 **GLOBAL ENVIRONMENTAL ISSUES AND BUILT ENVIRONMENT**

(Compulsory)

Global Environmental Issues: Global warming & climate change, Acid rains, Ozone layer depletion, overconsumption of resources, Loss of biodiversity. **Environmental Impact from Construction Industry:** Direct and indirect impacts, evaluation of overall impacts through LCA and carbon footprint. **Mitigation of impacts:** introduction to sustainable construction industry. **Management and treatment of waste in built environments:** Sustainable resource consumption, Prevention and reduction of waste generation, Wastewater and sewage treatment, Solid waste management. **Mitigation of indoor air pollution:** causes of indoor air pollution, health effect and mitigation of indoor air pollution. **Environmental Management systems:** ISO14001 in construction industry.

CE 693 **BUILDING SERVICES ENGINEERING**

(Compulsory)

Introduction to building services engineering: HVAC Systems and thermal comfort, Fire and safety, Acoustics, Lighting, Electromechanical systems, Building Management Systems (BMS), Preventive Maintenance for sustainable operations. **Building energy:** New energy saving techniques, Renewable energy, Energy storages. **Energy management systems:** ISO50001 in built environment, Introduction to energy auditing methods. **Industrial case studies.**

**CE 694 GREEN^{SL} RATING SYSTEM FOR BUILT ENVIRONMENT
(Compulsory)**

Management of building systems. Sustainable sites of building systems. Water efficiency. Energy and atmosphere. Materials and resources. Indoor environmental quality. Innovation and design process. Society and Cultural awareness. Industrial case studies

**CE 696 SUSTAINABLE CONSTRUCTION
(Compulsory)**

The principles of sustainable construction. Management of construction waste. Occupational health and safety. Modular construction. Lean construction techniques. Understanding government procurement procedures, Working with the supply chain to develop sustainable solutions. Mitigation of environmental impacts due to construction. Renovation and retrofitting of structures. Case studies.

**CE 6101 RESEARCH METHODS IN CIVIL ENGINEERING
(Optional)**

Fundamentals of Research: Definition and Objectives of Research; Qualitative vs Quantitative Research; The Scientific Research Process; Identification, selection, and formulation of research problems; Characteristics of good research problems; Review of literature. **Data Collection, Analysis and Presentation:** Methods and techniques of data collection; Design of Experiments; Sampling and sampling designs; Statistical modelling and analysis including introduction to statistical package; Probability Distributions; Multivariate methods; Concepts of correlation and regression, error analysis; Effective presentation of information using Tables, illustrations, graphs, etc. **Scientific writing and presentation:** Essential components of abstract, introduction, literature review, materials and methods, results, discussion, and conclusions; Formatting of contents; Methods of referencing and the use of referencing tools, Preparing and presenting a technical presentation.

**CE 6205 WATER RESOURCES PROJECT PLANNING
(Optional)**

Water resources systems analysis and modelling: General concepts of systems analysis, planning, designing and operation of water resources systems, Application of simulation, optimization and multi-criteria decision analysis models. **Multipurpose river basin planning:** Inter-basin and inter-provincial water resources planning and management, Shared water resources and conflict management. **Water policy and governance:** Water law and policy, Water rights, Institutional aspects, Water allocation laws. **Economic analysis and project financing:** Economic and financial evaluations, Financial models, benefit cost analysis, risk and uncertainty, multipurpose development and cost allocations. **Project planning:** Feasibility studies, Planning techniques and project scheduling, Environmental and social aspects, Environmental audit, Project monitoring and post project evaluation, Commissioning and follow-up action.

**CE 6207 CLIMATE CHANGE IMPACTS AND ADAPTATION IN WATER SECTOR
(Optional)**

Science of climate change: Climate system, Drivers of climate change, Climate modelling and climate change projections, GCMs. **Impacts of climate change:** Impacts on hydrologic cycle, Impacts on regional climate and water resources, Impacts on water infrastructure, agriculture, food security, health and other sectors. **Adaptation for resilience:** Exposure, vulnerability and risk of climate change, Regional and local adaptations in water sector, Resilience and traditional systems, Governance and policy framework. **Climate projection downscaling:** Statistical downscaling, Dynamic downscaling, Applications in designs of hydraulic structures and water management.

**CE 6210 GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING IN
WATER RESOURCES
(Optional)**

Introduction to GIS and software: Raster data, Vector data, Data structures, Data manipulation, Exploring the interface and file management system. **Spatial data structures and sources:** Map projections/coordinate system, World and National datum and transformations, Web and other spatial data sources. **GIS analysis functions and operations:** Creating editing and GIS data, Spatial and overlay analysis, Distance analysis, Application of Hydrology tools. **Layouts, reports, graphs and data interoperability:** Preparing and presenting maps and tables and exporting them to different online formats, Exporting and importing data to and from different formats. **Remote Sensed Data and Image processing techniques:** Use of Elector Magnetic Spectrum in RS, Active and passive remote sensing, Supervised and unsupervised classification, remote sensing application in water resources. **Introduction to Geographic Positioning Systems:** GNSS for GIS data capture, importing and exporting GPS data.

**CE 6214 INTEGRATED WATER RESOURCES MANAGEMENT
(Optional)**

Basic concepts: Components and dimensions of IWRM. **Protection of water resources:** Demand and supply management, Catchment management and recycling and reuse. **Gender in IWRM:** Mainstreaming gender and IWRM nexus, Gender differential roles. Climate change and impacts on water. **Water governance:** Regulations and policy, Management of shared water resources. **Water and ecosystems:** Ensuring water quality, Water supply, Sanitation and health, Pollution control and prevention of waterborne diseases.

**CE 6314 MITIGATION AND CONTROL OF NATURAL GEO-HAZARDS
(Optional)**

Introduction to Geo-hazards: Different types of geo-hazards, causes for geo-hazards, case studies. **Rock falls and Landslides:** Classification of mass movements of soils and rocks, failure mechanisms, Investigation and instrumentation, Prevention, control and mitigation, Early warning systems. **Land Subsidence and Sinkholes:** Sinkholes, ground water depletion. **Volcano and Earthquakes :** Theory of plate tectonics, Volcanoes and Earthquakes. **Salinity intrusion:** Types, causes, mitigation methods. **Manmade hazards:** Eg. - Underground storage of hazardous waste, spill of hazardous materials, mining, land fills.

CE 666 ROAD SAFETY AND ENVIRONMENT
(Optional)

Introduction to road safety. Importance of road safety. Local and global statistics of road traffic crashes. **Crash reporting and collision diagrams.** Different crash reporting systems Concepts of collision diagrams Extracting important data for analysing. **Basics of crash Statistics.** Basic statistics to treat crash data. Data presentations. Predictions, regression analysis. **GIS applications in road .safety** Basics of GIS. GIS applications. **Factors that influence safety and analysis of safety data.** Identify reasons for crashes. Introduce accident blackspots. Introduce spatial distribution, time distribution and mad user group distribution. **Safety countermeasures.** Introduction to various countermeasures Selection of suitable countermeasures. Effectiveness of safety countermeasures. Implementing safety countermeasures. **Highway geometry and safety** Horizontal and vertical curve designs Access road Junctions. **Road signing and marking.** Standard road signings and marking. Effect of road signing and marking for safety and convenience Modifications necessary to meet local conditions. **Road safety audits.** Basic concepts in road safety auditing Different stages in road safety auditing. **Issues related to pedestrian safety** Introduction to Pedestrian facilities. Knowledge and Attitudes towards pedestrians facilities of different road user groups. Possible improvements to enhance the safety of pedestrians. Road Safety Management.