Post Graduate Course Guide

UNESCO Madanjeet Singh Centre for South Asia Water Management, University of Moratuwa, Sri Lanka

Name of degree programme(s)

M. Sc. / PG Diploma in Water Resources Engineering and Management

Full title

Master of Science Degree / Postgraduate Diploma in Water Resources Engineering and Management

Abbreviated title

M.Sc./ PG Diploma in Water Resources Engineering and Management

Offering Modes

M.Sc. Degree	(Full-time)	One Year
M.Sc. Degree	(Part-time)	Two Years
PG Diploma	(Part-time)	One Year

Course Details

The degree/diploma course is designed to cater candidates with engineering backgrounds, and with an interest in the ever growing, diverse fields of water resources planning, engineering and management. The course content of the above programme has been carefully prepared to enhance the candidates' theoretical knowledge on design and practical applications, while addressing various aspects pertaining to Water Resources Engineering and Management.

Teaching and learning methods are aligned to provide an integrated and interdisciplinary approach. Programme structure brings together the scientific study of water resources with practical planning and management skills, encouraging participants to study water management from a multi - disciplinary perspectives and to seek integrated solutions. Effective use of computer software in water resources and watershed modelling, designing of hydraulic structures, Geographic Information System (GIS) and Integrated Water Resources Management (IWRM) related aspects have also been incorporated. Each module has assignments, design and management coursework with Problem Based Learning (PBL) component which help participating engineers / scientists to solve real life problems related to Water Resources Engineering and Management. Improvement of communication and presentation skills is also achieved through seminars, coursework assignments and oral tests. The compulsory research project (for M.Sc. programs) is envisaged to provide a good opportunity for the candidates to develop their research skills.

Field visits, guest lectures and field measurement/experiment procedures are arranged for the participants on a regular basis to further enhance their learning experience and field exposure, offering them an opportunity to acquire field oriented knowledge and practical,

real-life experience very much needed to handle multifaceted issues in water resources management and water engineering related areas.

The one year M. Sc. (full-time) program offered at the UMCSAWM has been designed to cater for the demand from professional engineers to advance their technical knowhow after gaining adequate experience in the field of engineering while getting exposed to the emerging advanced knowledge dimensions across a wide swathe of domains.

The total credit requirement is 60 for the program (for both fulltime and part-time courses), which is comparable with any other M.Sc. program.

This all-embracing program structure based on taught courses, research and especially with Problem Based Learning (PBL) approach common to all modules brings together the scientific study of water resources with practical planning and management skills, encouraging participants to study water management from a multi-disciplinary perspective and to seek integrated solutions.
The subjects offered would cover the main areas of;

- **Compulsory modules (28 Credits)**
  - Advanced Engineering Hydrology and Watershed Management
  - Advanced Irrigation Water Management for Food and Water Security
  - Advanced River Engineering and Estuary Hydraulics
  - Integrated Water Resources Management
  - Remote Sensing and Geographic Information Systems (GIS) for Planning and Management
  - Research Methods for Water Resources Engineering Planning and Management
  - Water Resources Project Planning & Management
  - Water Supply and Sanitation Systems and Water Quality Management
- **Research Project (20 Credits)**
  - Supervised Research Project (for M.Sc. only) relevant to the course for Master of Science Degree
- **Elective modules (12 Credits)**
  - Advanced Coastal Engineering and Estuary Management
  - Advanced GIS for Water Resources Management
  - Advanced Remote Sensing and Global Positioning Systems
  - Advanced Water Supply and Sanitation Systems for Engineering Applications
  - Climate Change Impacts and Adaptation Options for Water Management
  - Disaster Risk Assessment, Reduction and Mitigation
  - Environmental Assessment of Water and Related Infrastructure Development
  - Service Delivery Assessment Concepts for Water Supply and Irrigation Systems
  - Water Resources Systems and Watershed Management for Planning and Management

Course Outline

The admissions of international and local students to the M. Sc. / P.G. Diploma course are scheduled in May~August every year. The minimum duration of Master of Science Degree

courses is one (01) year (12 months) on full-time basis or 21 months on part-time basis, and the minimum Research Methods for Water Resources Engineering Planning and Management of Post-graduate Diploma is one (01) year (12 months) on part-time basis. The common core modules will be conducted together while other compulsory modules and the electives will be offered separately. The part-time option is available only for local students. During the first 12 months, which is common to both groups, the students will follow a course of intensive lectures and attend seminars. Lectures and research activities for full-time (local and international) students will be conducted from Tuesday to Saturday. The full-time students are expected to commence the research projects from the beginning of the course while the part-time students have the option of late commencement. For part-time (local) students, lectures will be conducted usually only on Fridays and Saturdays. On special occasions, especially when exchange/visiting lecturers are available from overseas, selected activities may be conducted on other days.

All taught courses are offered during the first 12-month period, which consists of three terms. In the first two terms, three subjects are taught per term with written examinations at the end of the term. During the third term, two subjects are offered with the written examinations at the end of the term. During these three terms, students will also engage in the relevant design course work assignments and be continuously evaluated on their assignments, reports and seminars. Those who successfully complete all examinations are eligible to continue for M. Sc. Degree or to obtain P.G. Diploma. Those who register for M. Sc. Degree need to carry out a research project in a specified area under the guidance of a supervisor(s). The research project has to be completed by the end of fourth term and on completion, the results should be submitted in the form of a dissertation. On submission of the dissertation, formal assessment of the research work will be undertaken in line with the University of Moratuwa rules and regulations.

Course Duration

Degree	Minimum Duration	Permitted Duration	Maximum Duration
M. Sc. (Full Time)	12 months	18 months	36 months
M. Sc. (Part Time)	21 months	36 months	48 months
P.G. Dip. (Part Time)	12 months	24 months	48 months

Minimum Qualification(s) for admission to the courses at UMCSAWM

Eligibility Requirements

1.1 The eligibility requirements for the M. Sc. Degree course shall be decided by the Department subject to the minimum eligibility requirements specified in Section 1.2 and approved by the Faculty and the Senate.

1.2 An applicant fulfils the minimum eligibility requirements to follow the prescribed course leading to the Degree of Master of Science, if he/she has:

(a) The Degree of Bachelor of Science of Engineering of the University of Moratuwa, Sri Lanka or an equivalent degree in a relevant field, as approved by the Senate;

OR

(b) At least the Associate Membership of a recognized professional Engineering Institute in a relevant field with a minimum of one (01) year period of appropriate experience, as approved by the Senate;

AND

(c) If English is not the medium of instruction in the first degree of the candidate, valid TOEFL (a minimum of 500 points in paper-based, 173 in computer-based, or 61 in internet-based test) or IELTS (a minimum of 5.0 in Academic Version) scores or equivalent.

Selections will be based on the minimum eligibility requirements above, qualifications and experience, and performance at the interview.

Approved Curriculum and Syllabi

Eligibility Requirements and Performance Criteria for the award of the Master of Science Degree/Postgraduate Diploma in Water Resources Engineering and Management

Eligibility and Performance Criteria

(Formulated Under Clause 6.3 or By Law No. 49:2013)

1. Title of Degree/PG Diploma: Master of Science Degree/Postgraduate Diploma

1.1. Title of Award: Master of Science/Postgraduate Diploma in Water Resources Engineering and Management

1.2. Programme Type: A

1.3. Programme Mode: M.Sc. Degree Full-time (One year)/ Part-time (Two years)
PG Diploma Part-time (One year)

2. Extended Eligibility Requirements

Minimum eligibility requirements, constrained as per clause 2.1 of the By-Law No. 49:2013.

The selection of students to the Master's Degree/Postgraduate Diploma Programme will be made by the Department of Civil Engineering, in accordance with one of the following extended eligibility requirements, approved by the Senate.

2.1. The Degree of Bachelor of Science of Engineering of the University of Moratuwa, Sri Lanka or an equivalent degree in a relevant field, as approved by the Senate;

OR

2.2. At least the Associate Membership of a recognized professional Engineering Institute in a relevant field with a minimum of one (01) year period of appropriate experience, as approved by the Senate;

AND

2.3. If English is not the medium of instruction in the first degree of the candidate, valid TOEFL (a minimum of 500 points in paper-based, 173 in computer-based, or 61 in internet-based test) or IELTS (a minimum of 5.0 in Academic Version) scores or equivalent.

Selections will be based on the minimum eligibility requirements above, qualifications and experience, and performance at the interview.

3. Participation in the Academic Programme

3.1. A minimum of 80% attendance at lectures and during other contact hours will be required, as specified under clause 4.1.1(a) of the By- Law.

3.2. Submission of reports on laboratory work, Problem Based Learning (PBL) projects, and assignments, and participation in seminars and field visits are required, as specified under clause 4.1.1(b) of the By-Law.

3.3. Undertaking research in a specific area is compulsory, as specified in clause 4.1.1(c) of the By-Law.

3.4. The Master's Degree programme is expected to be completed in the normal duration, but may go on till the permitted duration of study without the need of an extension as specified under section 5 of the By-Law.

3.5. It is the responsibility of the student to obtain an extension to the permitted duration, through the Head of Department. Such requests to extend the duration will be taken considering the progress of the student at the time of request.

3.6. Prior approval must be obtained in writing from the University, with the necessary documentation, for leave of absence (as defined by the Senate). Only such leave will be considered for any official purpose, such as considering a subsequent attempt as a first attempt.

3.7. Only approved leave obtained on medical grounds will be normally be considered by the Senate in extending the maximum duration of study.

4. Evaluation and Grading

4.1. The performance of each student in each module will be evaluated by continuous assessment (CA) and end-of-semester examination (WE), where applicable.

4.2. Credit Rating

Each course credit corresponds to 1 hour of lectures or 2 hours of assignment/discussion classes or 3 hours of field/laboratory classes.

4.3. Scheme of Examination and Award of Classes/ Subject Grades

The performance of each student in each module will be evaluated at the end of the respective term. This includes continuous assessment (CA) and end-of-semester examination (WE), where applicable.

4.4. To pass a subject, student should obtain a grade of C+ or above.

4.5. The following grading system will be adopted.

Guideline percentage	**Grade**	**Grade Point**	**Description**
85% and above	A +	4.2	
75% - 84%	A	4.0	Excellent
70% - 74%	A -	3.7	
65% - 69%	B +	3.3	
60% - 64%	B	3.0	Good
55% - 59%	B -	2.7	
50% - 54%	C +	2.3	Pass
	I	0.0	Incomplete
	F	0.0	Fail

4.6. Grade C+ or above is required to pass a module and earn credit for the subject. A minimum of 40% must be obtained separately for both Continuous Assessment (CA) and Written Examination (WE).

4.7. A student who has not obtained a grade of C+ in a subject but has obtained minimum marks for the course work component, receives the grade "Incomplete", "I".

4.8. A student receiving an F grade must repeat all the components.

4.9. "I" grade or "F" grade can be improved to C+ grade by repeating one or more components to satisfy the requirements for a pass in the subject. The maximum grade awarded for a course module after repeating one or more components will be a C+ and it will be used for calculating Grade Point Average. Normally only one re-examination will be allowed.

4.10. Calculation of Grade Point Average

The Grade Point Average (GPA) is calculated from the grade points received by the student (GRADE POINT) and the credits assigned for each of the course units (CREDITS) by the formula

$$GPA = \frac{\sum(GRADEPOINT \times CREDITS)}{\sum CREDITS}$$

4.11. Award of the Degree

A candidate is eligible to be awarded the M.Sc. Degree if the candidate has:

(a) obtained minimum of 40 credits and a minimum GPA of 2.3 from course modules

(b) successfully completed the Research Project (20 credits).

Note 1: No Classes will be awarded. However grades will be given in the transcript.

Note 2: If only the requirements of Section (a) are satisfied, a student may, on request, be considered for the award of a Postgraduate Diploma, as per clause 3.2.2 of By-law No. 3 of 49/2013.

4.12. Date of Award:

Date of award of the M.Sc. degree will be the first (01st) day of the month following the successful completion of the following;

(a) Written examination(s)

(b) Laboratory work

(c) Assignments including Project Based Learning (PBL) components

(d) Examination of the Research Project, Dissertation and/or Project Report including a Viva-voce examination (For M.Sc. Degree only)

5 DOCUMENT 2: Curriculum and Syllabi

Table given below presents the details of the modules, including number of credits, method of evaluation, and whether the module is a compulsory/core module or an elective.

5.1 Title: M.Sc. Degree/Postgraduate Diploma in Water Resources Engineering and Management

[At least 40 credits from the following list (Compulsory 28 credits and 12 credits from elective modules)]

Code	Module	Credits	Evaluation (%)		Description
			Continuous Assessment	Written Exam	
CE 5802	Integrated Water Resources Management	4	100%	-	Compulsory
CE 5804	Remote Sensing and Geographic Information Systems (GIS) for Planning and Management	4	50±10%	50±10%	Compulsory
CE 5806	Water Resources Project Planning & Management	2	100%	-	Compulsory
CE 5809	Research Methods for Water Resources Planning and Management	2	100%	-	Compulsory
CE 5810	Water Supply and Sanitation Systems and Water Quality Management	4	50±10%	50±10%	Compulsory
CE 5811	Advanced Irrigation Water Management for Food and Water Security	4	50±10%	50±10%	Compulsory
CE 5812	Advanced River Engineering and Estuary Hydraulics	4	50±10%	50±10%	Compulsory
CE 5813	Advanced Surface and Groundwater Hydrology	4	50±10%	50±10%	Compulsory
CE 5830	Climate Change Impacts and Adaptation Options for Water Management	4	50±10%	50±10%	Elective
CE 5831	Disaster Risk Assessment, Reduction and Mitigation	4	100%	-	Elective
CE 5832	Advanced GIS for Water Resources Management	4	100%	-	Elective
CE 5837	Advanced Coastal Engineering and Estuary Management	4	50±10%	50±10%	Elective
CE 5838	Advanced Water Supply and Sanitation Systems for Engineering Applications	4	50±10%	50±10%	Elective
CE 5839	Water Resources Systems and Watershed Management for Planning and Management	4	50±10%	50±10%	Elective
CE 5840	Advanced Remote Sensing and Global Positioning Systems	4	100%	-	Elective
CE 5841	Environmental Assessment of Water and Related Infrastructure Development	2	50±10%	50±10%	Elective
CE 5842	Service Delivery Assessment Concepts for Water Supply and Irrigation Systems	2	50±10%	50±10%	Elective

5.2 Supervised Research Project relevant to the course for Master of Science Degree

[20 credits from the Research Project]

Code	Module	Credits	Evaluation (%)		Description
			Continuous Assessment	Written Exam	
CE 6801	Research Project	20	100%	-	For MSc degree only

5.3 Notes:

i). For M.Sc. degree: 40 credits from course modules and 20 credits from CE 6801 Research Project (Total 60 credits)

For PG Diploma: 40 credits from course modules (Total 40 credits)

ii). Total of 28 and 12 credits are required from Compulsory Modules and Elective Modules, respectively. The supervised Research Project relevant to the M.Sc. degree course consists of 20 credits.

iii). Therefore, **40 credits** (incl. 6 embedded credits for projects) are allocated for courses and **20 credits** for the research project.

iv). Elective modules will be conducted depending on availability of staff and selection of a subject by at least five students.

v). Subject allocation may vary depending on the availability of lecturers and the course commencement date.

vi). Each course credit corresponds to 1 hour of lectures or 2 hours of assignment/discussion classes or 3 hours of field/laboratory classes per week.

vii). All modules constitute of an individual Problem Based Learning (PBL) project component, as a part of the continuous assessment scheme, with a minimum of 8 direct contact hours per credit out of which 1 hour is for seminar presentation.

viii). Each subject will have field work/field visits/ and/or industry exposure visits.

ix). Seminars and Presentations - partly with PBL and the others with the final research.

6 DOCUMENT 3: Syllabi of Modules

Given bellow are subject contents. The subject contents are presented adhering to the standards of presenting module syllabus of courses offered by the University of Moratuwa.

6.1 Section 1 – Compulsory Modules [total of 28 credits]

Module Code	CE5802	**Module Title**	Integrated Water Resources Management
Credits	4.0	**Pre – requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Demonstrate the understanding of the concepts of IWRM, principles and importance of water management considering a catchment based approach, recognise the multi user environments and sectoral concerns applicable to water management. • Demonstrate the appreciation of tools and processes for, and practice of water resources management including the importance of economic and financial instruments in water management, concepts of social equity, sustainability and institutional roles in river basin organisations. • Evaluate the role, strengths and limitations of policy approaches used in integrated water resources management. • Demonstrate the understanding of complexities in socio-political and economic contexts affecting water management decision making. • Demonstrate the skill and knowledge to study, critically evaluate a field problem and identify alternatives for water resources management within sectors.	
Outline Syllabus		Outline Syllabus • IWRM Introduction, Global water resources- status and trends, Principles of water management in terms of quantity and quality, Regional and Sri Lankan water management issues related to competing sectors such as forestry, hydropower, industries, irrigation development and environment, Hydro climate disasters in water resources management (8 hrs). • River basin approach in IWRM, Water assessment and plans, Information Systems and Public Consultation, Institutional roles, Management instruments. Analysis of pressures and impacts on water bodies, Modelling and Decision Support Systems (DSS) in IWRM, Sustainable water use- recycling and rainwater harvesting, Urban water management (8 hrs). • Water demand management, Water policy, Valuing water, Virtual water, Water footprints, Environmental flows, Water economics, Governance and trading, Sustainable water use and Catchment management (8 hrs). • Gender and stakeholder concerns and participatory approaches in IWRM, Conflict resolution and negotiation, Water law and institutions (8 hrs). • Project Based Learning, Field Visits, Seminars (24 hrs).	

Module Code	CE5804	**Module Title**	Remote Sensing and Geographic Information Systems for Planning and Management
Credits	4.0	**Pre – requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, student will be able to; • Demonstrate the understanding of the theoretical and practical considerations required for conducting a GIS/RS based resource planning and management analysis for decision support. • Prepare, manipulate, display and analyze spatial data for resource planning and management. • Demonstrate the skill to use a Handheld GPS for field data collection. • Demonstrate the skill and knowledge to study, evaluate, and analyze a planning and management problem, to propose alternative solutions for the inclusion of sustainability dimensions using GIS/RS/GPS techniques. • Synthesize and present a high quality GIS based project output in a report format.	
Outline Syllabus		• Remote Sensing (RS) concepts, reflectance, sensors, resolution. Raster data formats, data sources and storage. Image display, Image correction, Image Enhancement and classification. Application of remote sensing for spatial planning and management (12 hrs). • Introduction to Geographic Information Systems (GIS), concepts, components, capabilities, advantages. Data structures, Raster, Vector, Topology. Data quality, database management, Introduction to maps and mapping, map projection and coordinate system, surface generation. Potential and use of GIS software for sustainable spatial planning and management applications (20 hrs). • Introduction to Global positioning systems. Practical use of handheld GPS, Merits and drawback of different systems in comparison to conventional surveying. Potential uses to capture field data of associated social, economic and environmental data (8 hrs). • Project Based Learning, Field Work and Seminars (16 hrs).	

Module Code	CE5806	**Module Title**	Water Resources Project Planning and Management
Credits	2.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Acquire a knowledge base on Water Resources Project planning and management concepts. • Acquire a knowledge base on Planning Tools-Management Information Systems, Stakeholder consultation, Identification of field problems, project prioritisation. • Demonstrate the capability to identify parameters to carry out Planning and Management of Water Resources Projects. • Demonstrate the capability to identify problems and prioritisation, costs and benefits of water resources projects, development of a Project Concept paper demonstrating the incorporation of sustainability dimensions.	
Outline Syllabus		Outline Syllabus • Introduction – Project planning and management concepts, Historical background, Project planning in South Asia, Donor relationship and concerns in projects. • Policies and procedures in project planning – Government and donor considerations, Incorporation of costs and benefits. • Project planning, formulation, feasibility analysis, project design, project appraisal, negotiations and financing. • Planning guidelines and formats. • Project implementation, procurements, consultancy, monitoring. • Project evaluation-moving and post evaluation. Commissioning and follow-up action. • Planning Tools-Management Information Systems, Incorporation of social and environmental concerns, Economic evaluation techniques (8 hrs). • Practical work on project development, Project & fieldwork (4 hrs). • Project Based Learning, Field Visits, Seminars (16 hrs).	

<table>
<tr><td>Module Code</td><td>CE5809</td><td>Module Title</td><td>Research Methods for Water Resources Engineering and Management</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td></tr>
<tr><td colspan="2">Learning Outcomes</td><td colspan="2">On the satisfactory completion of this module, student will be able to;
Demonstrate the understanding of research, available methods, suitability of data collection and sampling, and selection of appropriate analysis method.
Demonstrate the ability to appropriately use available presentation techniques in research presentation.
Demonstrate the skill and knowledge to study, evaluate and identify a research problem ensuring sustainable development, select an appropriate method of execution, establish a method for evaluation and prepare an action plan for research project completion.
Demonstrate the skill to write a systematic research proposal in a report format and carryout an effective presentation of outputs.</td></tr>
<tr><td colspan="2">Outline Syllabus</td><td colspan="2">Research Skill Development for water resources research – Literature surveys, Problem statements, Objective settings. Research methods and practices, Selection of appropriate methods.
Problem statements, Objective function, Methodology flowcharts, Analysis techniques, Multi criteria evaluation, Work programmes and identification of targets and constraints.
Research tools and techniques, scientific survey methods, Survey sampling, Questionnaire design, testing and data collection. Experimental research. Operational research. Statistical methods, Evaluation and validation of performance. Criterial selection, Project & fieldwork (8 hrs).
Presentation Skill Development – Presentation methods and techniques-writing, speaking, acting or combinations. Tools and selection. Norms, sequence, and delivery. Formats and Guidelines, Use of language and gestures, Time management and cost consciousness (4 hrs).
Project Based Learning, Self-learning, Open ended problem solving sessions and seminars (16 hrs).</td></tr>
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Module Code	CE5810	**Module Title**	Water Supply and Sanitation Systems and Water Quality Management
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Acquire knowledge on surface and groundwater pollution. • Acquire knowledge on the legal framework for pollution control. • Demonstrate the understanding of the properties of water, characteristics of wastewater, impacts on water quality, quality indicators, and water quality standards. • Demonstrate the understanding of the water quality linkages and the influence of human activities on the sustainability of the environment when selecting sustainable development options. • Demonstrate the understanding of the theoretical and practical considerations required for conducting water quality testing. • Demonstrate the knowledge and skill in the use of water quality measurements, sampling, testing and interpretation using water quality indicators. • Demonstrate the skill and knowledge to study, evaluate, and analyze a water quality management problem incorporating sustainability dimension and to propose alternatives for sustainable water quality management.	
Outline Syllabus		Outline Syllabus • Introduction to Water supply systems, Raw water quality, Water source selection, General considerations for drinking water, Drinking water quality standards, Raw water (surface and groundwater) abstraction, Pre-treatment and storage, Conventional water treatment methods, Water treatment and processes, Water supply system components, Non-revenue and unaccounted-for water (6 hrs). • Introduction to sanitation systems, On-site and off-site sanitation systems, Sewerage and drainage systems (combined and separate), Wastewater treatment processes, Removal of organic matter, Nitrogen and Phosphorus, primary, secondary and tertiary treatment, Sludge management (treatment, disposal and reuse), and Solid waste management, Technological options for waste collection, transport, transfer, treatment and disposal (6 hrs). • Introduction to surface and groundwater pollution, Sources of pollution (non-point and point), Legal framework for pollution control, Identification and assessment (or estimation) of pollution, Methods of pollution control (4 hrs). • Characteristics, Standards and Indicators: - General characteristics of water and wastewater – Water quality parameters and measurement; Interpreting water sample results; Sampling, sample preservation and testing; Water related diseases and their control; Water Quality Standards – Drinking water quality guidelines and standards; Objective water quality and discharge standards; Designated water uses and ambient water quality standards; Water Quality Indicators – Water Quality Indices as indicators of Quality; Biological Indicators of Water Quality (8 hrs).	

	• Water quality impacts of human activities on aquatic ecosystems – Surface and groundwater pollution from domestic and industrial sources, Non-point source pollution, DO Sag curve, Impacts from conservative and non-conservative pollutants, Eutrophication, Salt water intrusion into surface and groundwater. Types of aquatic ecosystems and their characteristics, Physical, chemical and biological processes of the environment (8 hrs) • Water Quality Management – Overview of technologies available for water quality management, Legal and institutional support, Addressing the concerns of the society, Use of rapid tests for water quality monitoring and management. Alternatives for water quality management to achieve sustainable development (8 hrs) • Field Visits, Laboratory and Field Testing, Problem based learning on a Water Quality Management Project (16 hrs)

Module Code	CE5811	**Module Title**	Advanced Irrigation Water Management for Food and Water Security
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Identify and demonstrate essential components of irrigation water management and the concerns with respect to food and water security, Stakeholder and social requirements, and Environmental safeguards. • Demonstrate the ability to use modelling techniques for sustainable water management. • Demonstrate the capability to capture and prioritise field problems in consultation with the stakeholders and considering sustainability of water resources. • Acquire knowledge on the computer applications in Irrigation and Drainage for sustainable irrigation water management and demonstrate the capability to solve field problems.	
Outline Syllabus		Outline Syllabus • Reservoir Operation and importance of system water balance (4 hrs). • Irrigation system management: Performance Assessment, Recognition of Stakeholders, Farmer organizations and farmer participation, State organizations and roles, Integrated management of irrigation and drainage systems (4 hrs) • Stakeholder participation and role of women. Water conservation, Irrigation-efficiency, Conflict management and equity, Water allocation and controlling techniques (4 hrs). • Surveying Techniques for irrigation system planning and management for sustainable development (4 hrs), Concepts of planning and Design of Irrigation networks (4 hrs). • Computer essentials for management, system awareness, operating systems and networking, web accessing and information retrieval. Computing techniques, spreadsheet applications, detailed engineering applications using spreadsheets. Programming languages, basic structure of programming, sub-routines, object oriented programming (8 hrs) • Use of computers for preparation of water management schedules, reservoir operation, design works, design of sprinkler systems. Modelling case studies using specific software for irrigation and drainage design (4 hrs) • Practical work on project development, Project & fieldwork, Project Based Learning, Field Visits, Seminars (24 hrs)	

Module Code	CE5812	**Module Title**	Advanced River Engineering and Estuary Hydraulics
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Demonstrate a knowledge on river and estuary hydraulics for sustainable waterway design • Identify and evaluate important parameters and to conceptualise river and estuarine environment for analysis of water and sediment flow, canal and river profiles, associated environmental concerns and to provide mitigation and adaptation options. • Demonstrate knowledge on sediment transport and modelling of estuarine environment. • Demonstrate ability to study and critically evaluate a field problem and carryout numerical/physical modelling of channel /river flow to identify alternatives for sustainable development.	
Outline Syllabus		Outline Syllabus • Open channel/river hydraulics, steady and unsteady flow in channels/rivers, classification and analysis of flow in channels/rivers, flood routing, trans-boundary flows (6 hrs). • Controls and transitions in channels/ rivers, hydraulic structures-conveyance, storage, measurement etc. Hydraulics of channels/pipes, channel/pipe network analysis, hydraulics for hydropower system design, surge chambers, turbines (6 hrs). • Sediment Transport in waterways, unidirectional sediment transport, bed load, suspended load, sediment transport formulae, Erodible channels, Chanel design addressing sustainable dimensions, Sustainable river restoration (6 hrs) • Numerical and physical modelling of channel/river flow including social, economic and environmental constraints as boundary conditions (6 hrs). • Estuarine environmental behaviour, Estuary classification, saltwater intrusion, estuary pollution, estuarine habitats, wetlands, Estuary modelling (4 hrs). • Practical work on project development, Project & fieldwork (4 hrs) • Project Based Learning, Field Visits, Seminars (24 hrs)	

Module Code	CE5813	**Module Title**	Advanced Surface and Groundwater Hydrology
Credits	4.0	**Pre – requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Demonstrate the knowledge of hydrologic processes, surface and groundwater concepts, and techniques for environmentally sustainable water resource management. • Demonstrate the knowledge of groundwater behaviour, models, parameters, optimisation, engineering and management, the ability to design tube wells and other methods for groundwater access. • Apply mathematical modelling for hydrologic evaluations with parameter optimisation, model evaluations and incorporation of water management needs. • Study and critically evaluate a field problem considering contributions from each stakeholder and carryout sustainable surface water and groundwater designs for water management.	
Outline Syllabus		• Surface-water hydrology (22 hrs) – Hydrologic cycle, Measurement and analysis of hydrologic and meteorological data, Hydrological processes; Mathematical modelling of rainfall and runoff, Stakeholder consultation, problem identification, prioritisation, identification of optimum solutions. • Data and data checking, Reservoir studies, Analysis of extreme events, Hydrologic forecasting, Computer tools and applications, Optimization techniques. • Hydrologic design of drainage, Flood control advances in hydrologic computations, Advanced hydrologic modelling and hydraulics modelling, Flood modelling, Introduction to dams and hydropower systems, Dam safety concepts, indicators and management for safety of dams, Design of safe dams, Monitoring and information systems, Incorporation of socio-economic and environmental considerations in the Designs. • Groundwater hydrology (18 hrs)– Introduction to groundwater, Subsurface water distribution, flow, quality and chemical composition, Groundwater development, Institutional arrangements, role of public and private organisations, public participation in groundwater management; Environmental concerns, costs and benefits of groundwater development. • Low river flows and wetlands, Occurrence of groundwater, Analysis of groundwater flow, Mathematical modelling of groundwater, Exploration and measurement, Groundwater yield, Environmental relevance, groundwater exploitation, optimization techniques, methods of groundwater investigation, definitions, porosity, transmissivity, storage coefficient, movement of aquifer water, Sea-water intrusion, vulnerable aquifers and protection methods, nitrate problems, effect of	

	pesticides, risk from industrial chemicals, leachates. Remedies for pollution • Data and information systems for sustainable groundwater management, Analysis and Management tools, Design of tube wells, hydraulics of tube wells, type of tube wells, components of tube wells. Construction and working of tube wells. Pumping equipment. • Project Based Learning and Field Visits, Seminars (16 hrs)

6.2 Section 2 – Elective Modules

[Minimum of 12 credits to be selected]

<table>
<tr><td>Module Code</td><td>CE5830</td><td>Module Title</td><td>Climate Change Impacts and Adaptation Options for Water Management</td></tr>
<tr><td>Credits</td><td>4.0</td><td rowspan="2">Pre-requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td></tr>
<tr><td colspan="2">Learning Outcomes</td><td colspan="2">On the satisfactory completion of this module, students will be able to;
Demonstrate acquiring a knowledge base on climate and climate parameters, climate variability and climate change, climate change trends, stationarity issues, driving forces and impacts, climate models and scales of computation, main predicted changes and influence on islands and continents.
Explain the need for climate change adaptations, considerations related to small islands, climate risks, and analysis.
Acquire a knowledge base on Vulnerability and Adaptation to climate variability and change, contribution of adaptation towards sustainable development.
Demonstrate the capability to investigate climate change, behaviour on watersheds, evaluate effect on water management infrastructure, effect of water issue schedules.
Demonstrate self-learning and solving of open ended problems, methods of verification.</td></tr>
<tr><td colspan="2">Outline Syllabus</td><td colspan="2">Introduction to Climate Change – Historical and recent trends, driving forces, monitoring and predicting, impacts on ecosystems and ecosystem services. Introduction to atmospheric science: Greenhouse effect; past, present and future climate changes
Global Warming. Anthropogenic issues, effects of disciplines -, biophysical environmental impacts, socio-economic and cultural effects. Global and regional level initiatives, international treaties, declarations and global conventions- present status and future needs. GCM and other climatic models, Downscaling, Regional/local scales.
Climate issues of irrigation, agriculture, water supply, floods, droughts and spatial variability, risk and uncertainty, importance of hydrological studies, extreme events and long term normals
Effects on freshwater systems and ecology - surface water, groundwater, glaciers, estuaries, oceans, human dimension, human settlements and infrastructure, aquatic, terrestrial, and estuarine environmental quality.
Analysis for climatic change assessment, statistical analysis of long-term meteorological and hydrological data; weather, trends, climatic and hydrological data analysis, climate change and hydrological modelling.
Engineering and Management options for mitigation and adaptation, alternatives, capture of sequester carbon emissions, reducing global warming, renewable energy technologies, efficient use of energy policy, laws, economics, benefits and costs of mitigating and adaptation options, international cooperation.
Vulnerability, small island, environmental adaptation to climate variability & change, Extreme climatic events.</td></tr>
</table>

	• Self-study, group discussion and seminar on open ended questions, Practical work on project development, Project & fieldwork., Project Based Learning, Field Visits, Seminars (12 hrs)

Module Code	CE5831	**Module Title**	Disaster Risk Assessment, Reduction and Mitigation
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Demonstrate acquiring a knowledge base on principles of disaster risk management and mitigation via components of hazards, vulnerability, capacity and risk assessment. • Acquire an understanding on the national initiatives on Disaster Management. • Assess the impacts arising from meteorological, hydrological, geo/seismic and coastal hazards. • Identify critical design aspects through the lessons from failures and disasters. • Develop strategic planning and mitigation for disaster risk reduction.	
Outline Syllabus		Outline Syllabus • Principles of Risk and Disaster Management – Introduction to Disaster Management, Risk and its Assessments, Hazards, vulnerability and capacity, Disaster Preparedness, Early Warning, Emergency Planning and Management, Response and Standard Operations Procedures, Administrative, Social and Cultural aspects of Disaster Management. • Disaster Management Approach – Regional Aspects, Legislation and implementation, Sri Lankan initiatives, Community Based Disaster Management, Leadership roles in disaster management. • Hazards, Risk Assessment and Mitigation – Hazards in Sri Lanka and in other regional countries. Causes, Occurrence, Forecasting, Early Warning, Preparedness and Mitigation. Real-time/near real-time data acquisition, Nowcasting vs. forecasting, Case Study. • Design – Lessons learnt, Extreme loading, Failure patterns, Strength and durability, Behaviour of structures, Case Studies, Investigations, Impacts, Guidelines on good practice, Codes of practice. • Strategic Planning and Mitigation – Strategic Mitigation and Disaster Risk Reduction, GIS and Remote Sensing in Disaster Management, Urban Planning using Hazard, Vulnerability and Risk Maps/Evacuation Maps. • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (24 hrs)	

Module Code	CE5832	**Module Title**	Advanced GIS for Water Resources Management
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Explain the concepts of GIS and RS, problem solving, differences between models, methods and tools, use remote sensing and GIS tools for advanced project purposes. • Recognize fundamentals in the use of Remote Sensing and GIS software for water resources applications, Demonstrate the capability to conceptualise a problem for spatial analysis, prioritising problems, develop systematic flow chart for spatial analysis, verify and propose alternatives. • Demonstrate capability to consult stakeholders, identify water resources problems, develop spatial analysis models, data acquisition and using overlay models for alternative analysis. • Demonstrate the problem solving capability with respect to spatial planning and management, Demonstration of capability to incorporate roles from database creation to decision making for sustainable management of water resources.	
Outline Syllabus		Fundamentals in the use of Remote Sensing and GIS software for applications, concepts of spatial analysis, incorporating temporal dimension, formats, resolution, classification, incorporation and evaluation of spatial model outputs, GIS and Remote Sensing for hydrologic applications • Off the shelf software, simple and hybrid software -merits and drawbacks, Modelling in GIS and Field application and verification methods and needs. • Model building in GIS for repetitive computations, Modelling in GIS, Qualitative, Quantitative and Semi Quantitative modelling and techniques, incorporating systems concepts, objective function, parameters, prioritisation, assigning weights, use of flexible models. • Model building and Systems approach, physical, environmental, socio economic dimensions, dealing with technical options and superposition of other dimensions, decision parameters and options for sustainable management in an organisational hierarchy. • Case Study application of remote sensing tools for image classification considering the project objectives. Case study application using GIS to construct data layers and carryout query, spatial analysis to provide alternative solutions methods of evaluation and verification • Case study applications in water management- irrigation, soil erosion, watershed management, flood mitigation. • Practical work on project development, Hands on exercises on tool application, comparison of methods, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (12 hrs)	

Module Code	CE5837	**Module Title**	Advanced Coastal Engineering and Estuary Management
Credits	4.0	**Pre-requisites**	None
GPA/ NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Demonstrate acquiring knowledge on the principles of Coastal Zone Management and application to Sri Lanka. • Explain the dynamic coastal environment and the associated hydraulic regimes. • Design coast protection schemes and ability to select appropriate coast protection schemes for given hazard scenario. • Develop plans and layouts of harbours and the use of appropriate structures. • Analyze impact of near shore processes, design rock armoured rubble mound structures and compute forces on piled vertical structures.	
Outline Syllabus		• Coastal Zone Management (CZM) – Development of CZM and Sri Lankan situation, Coastal Hazards and Vulnerability, Environmental Problems and management, Environmental impact assessment for coastal projects, Incorporation of physical, social and economic aspects in assessments. • Coastal Environment – Introduction to the dynamic coastal environment, Tides, Wave generation by wind, Random waves, Probabilistic description of ocean waves, Wave propagation and forecasting, Wave measurements. • Coastal Hydraulics and Processes – Deterministic wave theories, Small amplitude wave theory, Near-shore processes, Sediment transport, Beaches and coastal erosion, Coast Protection Systems considering possible climate change, Climate Change impacts, Artificial, natural and hybrid methods, Case histories. • Port and Harbour Engineering – Planning and Design of Fishery harbours and Commercial Ports considering sustainability dimensions. • Coastal and Harbour Structures – Classification, Wave-structure interaction, Rock and concrete armoured breakwaters, Design of Rock armoured rubble mound breakwaters. Experimental investigations, Wave forces on cylindrical piles and vertical walls. • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (12 hrs)	

Module Code	CE5838	**Module Title**	Advanced Water Supply and Sanitation Systems for Engineering Applications
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Recognize the principles of water, sanitation and hygiene sector. • Critically appreciate the importance of planning, implementation and evaluation of water, hygiene and sanitation interventions and engagement with intended beneficiaries. • Demonstrate critical understanding of sanitation, water and hygiene interventions and of the ways in which such projects can impact on society, economy and environment. • Apply this understanding to the design, evaluation and critique of water supply and sanitation systems for engineering projects and applications.	
Outline Syllabus		• Introduction - Provision of clean water and adequate sanitation as one of the best ways of preventing disease and of maintaining the health of a group of people. • How provision of these services can be undertaken as a preventive strategy. • Concept of undertaking such provision through projects. • Principles and practices - How an understanding of preventive strategy can be put into operation. • Concepts of health and disease and involvement of the environment, economics and the institutions involved as well as the technical aspects of delivery. • Principles and practices relevant to the areas so that a water supply and sanitation project can be devised and implemented. • Advanced Water Supply and Sanitation Systems for Engineering Applications and related case studies, focusing on sustainability aspects. • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (12 hrs)	

Module Code	CE5839	**Module Title**	Water Resources Systems and Watershed Management for Planning and Management
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, student will be able to, • Demonstrate knowledgebase on water resources systems and watershed management for planning and management. • Identify available water resources and how these vary in time. • Build simple optimisation models demonstrating the incorporation of the sustainable development dimensions. • Simulate changes in water quality and relate these to regulations. • Evaluate risk in planning for floods and droughts. • Plan future demand scenarios based on climate change. • Evaluate system management options to optimise water availability.	
Outline Syllabus		• Water Resources Systems (16 hrs)–Introduction to how the physical water resources system works, and illustrate the interaction between quantity and quality (chemical, biological, ecological), between surface water, soil water and groundwater, between stocks and fluxes. Explain major natural functions and human use of water resources systems focusing on river systems including groundwater, wetlands, lakes/reservoirs and estuaries. • Identify basic components to characterise the quantitative and qualitative nature of a water resources system and able to analyse the hydrology of a water resources systems. • Discuss the main issues of debate in an integrated water resources system underpinned by description of the biophysical, chemical and hydrological processes and their interactions, natural functions and human use of a water resources system. • Watershed Management (24 hrs)– History and present needs, Watershed management concerns; erosion, flooding, droughts, pollution, food and energy, water security etc., Mathematical modelling in Watershed Management, Principles of soil and water conservation, Important concepts, tools and techniques in Watershed Management, Socio-political, economic and environmental considerations in Watershed Management, Participatory Watershed Management, Trans-boundary waters and management issues • Integrated watershed management and water conservation. Water management systems for environmental protection • Use of computer application and tools in water resources system management; Simulation and optimisation models using Linear Programming • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (16 hrs)	

Module Code	CE5840	**Module Title**	Advanced Remote Sensing and Global Positioning Systems
Credits	4.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, student will be able to, • Describe and evaluate GPS and RS tools and methods for water resources management considering associated costs and benefits; • Select relevant GPS and/or RS applications and equipment to solve a given water resources management problem • Solve, Evaluate and present a sustainable water resources management spatial analysis case study by demonstrating the effect of different Remote Sensing and GPS options.	
Outline Syllabus		• Introduction, history of remote sensing, sensors, platforms and their characteristics; Satellite data products. • Principles of remote sensing and data analysis, electromagnetic spectrum, atmospheric effects, energy interaction with earth surface features, basic interaction mechanism of soil, vegetation and water. • Remote Sensing concepts, reflectance, sensors, resolution. RS tools including determination of evaporation and soil moisture patterns, and measurement of water levels in surface water systems. • Advanced concepts of Geographical Information System (GIS) and Remote Sensing (RS), and tools relevant for analysis of (problems in and aspects of) water systems considering socio-society, economy and environment • Image interpretation virtual and digital; Image rectification, image enhancement, image classification and accuracy assessment, use of image processing software. • Geographical information system (GIS), definition, essential components of GIS, spatial data structure- raster and vector, spatial and non-spatial relationship, geographic database concepts and analysis, GIS packages and salient features. • Use of remote sensing and GIS techniques in agriculture, vegetation cover mapping, crop acreage estimation and disease detection. • Application of remote sensing and GIS for estimation of surface and groundwater irrigation potential, erosion hazard assessment, water quality assessment, flood inundation mapping and modelling; Drought monitoring; performance evaluation of irrigation commands; Selection of site for artificial recharge, agricultural management and planning. • Project Based Learning, Field Work and Seminars (16 hrs).	

Module Code	CE5841	**Module Title**	Environmental Assessment of Water and Related Infrastructure Development
Credits	2.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		• On the satisfactory completion of this module, students will be able to; • Identify requirement and need of addressing of management issues related to sensitive water environments. • Describe environmental laws, legislation, and applications in EIA process, stakeholder roles, rights and responsibilities. • Plan sustainable water and related infrastructure development, Incorporation of environmental while incorporating. • Conduct environmental feasibility studies to identify impacts, selection of alternatives and propose mitigation measures with related environmental monitoring plans.	
Outline Syllabus		• Sustainable Development of water related infrastructure addressing economic valuation techniques. • Conflicts of development and environment, components of the environment, legislation and institutions for environmental sustainability, methods of evaluation, identification of positive and negative impacts. • Role of sustainability evaluations in the project cycle, environmental impact assessment, sectoral environmental assessments. • Introduction: Human concern; Need for environmental impact assessment (EIA); Requirements and levels of EIA; Potential impacts of water resource development projects. • EIA Procedure: Screening, baseline data, scoping, terms of reference (TOR). • Environmental Clearance: Guidelines, acts and legislations, codes and country practices. • Environmental flow: River as habitat, downstream direct and indirect uses, criteria and methods of assessment. • Soil and Water Quality Management: Effect of project development on soil and water quality, water logging, soil salinity, and contamination, remedial measures. • Rehabilitation: Submergence effects, rehabilitation guidelines, planning, and procedures. • Monitoring: Parameters to be monitored, frequency of monitoring, reporting procedures. • Mitigation measures and selection of alternatives, environmental feasibility studies. • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (12 hrs)	

Module Code	CE5842	**Module Title**	Service Delivery Assessment Concepts for Water Supply and Irrigation Systems
Credits	2.0	**Pre-requisites**	None
GPA/NGPA	GPA		
Learning Outcomes		On the satisfactory completion of this module, students will be able to; • Describe components of service delivery assessment concepts for water supply and irrigation systems. • Recognize framework and key components in service delivery assessment. • Develop schemes for composite system reliability evaluation by identifying service quality criterion.	
Outline Syllabus		• Introduction to service delivery, service delivery cycle, building blocks, areas of evidence, enabling, development and sustaining environment. • Framework and key components in service delivery assessment, institutional and recipient stakeholders, Economic, environmental and field evaluations. • Practical work on project development, Project & fieldwork. • Project Based Learning, Field Visits, Seminars (12 hrs)	

6.3 Section 3 - Supervised research project relevant to the course

[20 credits]

<table>
<tr><td>Module Code</td><td>CE6801</td><td>Module Title</td><td>Research Project</td></tr>
<tr><td>Credits</td><td>20.0</td><td rowspan="2">Pre-requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/ NGPA</td><td>GPA</td></tr>
<tr><td colspan="2">Learning Outcomes</td><td colspan="2">On the satisfactory completion of this module, students will be able to;
Explain specific issues related to the chosen research topic based on how concepts have been built up through cross referencing of related research material, demonstrate the state of the art practice related to the research
Develop solutions through research for problems and shortcomings in Water Resources Engineering and Management related applications, evaluation of alternatives for detailed comparative analysis.
Demonstrate knowledge on the methods of generating results, adequacy of base data for acceptability of research results, result validation methods and indicators, selection of objective functions,
Produce a Thesis to a stipulated format, include technical details, present and discuss results of the research, assumptions, and arrive at quantitative and specific conclusions
Produce scientific publication on outcome of the research.</td></tr>
<tr><td colspan="2">Outline Syllabus</td><td colspan="2">Outline Syllabus
Problem Identification, Contribution from a Research, National, Regional, Local, Order of magnitude solutions, Research methodologies, significance of literature survey, search methodologies, formulating research ideas, referencing research, Demonstration of systems approach for sustainability.
Reading and reviewing research articles, formalized methods of conducting a research, develop methodology flow chart developing and implementing algorithms.
Methodology selection and implementation of research plan, Selection of Data, Spatial and Temporal Resolution, Data checking methods and checking.
Selection of analysis methods, tools, models, appropriateness, generation of results, importance Validity of Results.
Interpretation of results, important points to discuss, drawing appropriate conclusions that are based on the work performed.
Writing research reports, preparing a paper for publication based on research outputs and highlighting of outcomes.</td></tr>
</table>

7 Resource Persons

7.1 Staff/Lecturers

Prof. DCH Senarath

- BSc Eng (Cey), MEng (Sheff), PhD (Birm), MSc. Appld. Psychology (Colombo), CEng, FIE (SL)

Prof. WPS Dias

- BSc Eng (Sri Lanka), PhD (Lond), DIC, CEng, MIStructE, FIE (SL)

Prof. (Mrs.) N. Rathnayake

- BSc Eng (Cey), MEng (Wales), CEng, FIE (SL), Member IWA

Prof. NTS Wijesekera

- BSc Eng (Sri Lanka), PG Dip Hyd Str (Moratuwa), MEng (Tokyo), DEng (Tokyo), MICE (Lond), CEng, FIE (SL)

Prof. SP Samarawickrama

- BSc Eng (Moratuwa), DIC, PhD (Lond), CEng, FIE (SL)

Prof. SS Wickramasuriya

- BSc Eng (Sri Lanka), PhD (NSW), CEng, MIE (SL)

Mr. AHR Ratnasooriya

- BSc Eng (Moratuwa), MPhil (Moratuwa)

Dr. TMN Wijayaratna

- BSc Eng (Moratuwa), M Eng (AIT), D Eng (YNU), CEng, MIE (SL)

Dr. JMA Manatunge

- BSc Eng (Moratuwa), MSc (London), PhD (Saitama), DIC, CEng, MIE (SL)

Dr. MW Jayaweera

- BSc Eng (Moratuwa), PhD (Saitama), CEng, MIE (SL)

Dr. HMR Premasiri

- B.Sc.(Hons)(Peradeniya), M.Phil.(Moratuwa), Ph.D (Keele)

Dr. U Nawagamuwa

- BSc Eng (Moratuwa), MEng (AIT), Dr.Eng (YNU), CEng, MIE (SL)

Dr. RLHL Rajapakse

- BSc Eng Hons (Moratuwa), MSc (Saitama), PhD (Saitama), CEng, MIE (SL)

7.2 Visiting Lecturers

Mr. A. Abeygunasekara

- B Sc. Agriculture (Hons) (Peradeniya), M.A. Agric. Econ. (Wisconsin USA)
- Secretary, Ministry of Water Supply and Drainage

Eng. Mrs. Badra Kamaladasa

- B.Sc. Eng. (Sri Lanka), M.Eng.Sc (Development Technologies) (Melbourne), F.I.E (SL), C Eng.
- Director General of Irrigation, Irrigation Department of Sri Lanka
- President of Sri Lanka National Committee of Large Dams
- President of Sri Lanka Committee of International Committee of Irrigation & Drainage

Eng. Mr. A.H. Jayaweera

- B.Sc. Eng. (Sri Lanka), PG Dip Sanitary Eng. (IHE/Delft, CEng, FIE (SL)
- Director, Field Services, Interim-National Water Resources Authority (I-NWRA)
- National Team Leader Sri Lanka Water Supply & Sanitation Sector Study commissioned by World Bank with the assistance of Aus AID.
- Technical advisor Ministry of Water Supply & Drainage facilitating the national WASH forum participated by Government sector institutions, humanitarian institutions practitioners and implement agencies

Eng. Mr. N.N. Kamaladasa

- B.Sc. Eng. (Sri Lanka), MBA (Sri J'Pura), CEng, FIE (SL)
- CEO, Distance Learning Centre
- Director, Center for Housing Planning and Building
- Writer/Publisher

Eng. Mrs. Nishadi Eriyagama

- B.Sc. Eng. (Hons.) (Peradeniya), M.Eng. (Moratuwa), MIE (SL), C Eng.
- Consultant/Researcher, International Water Management Institute (IWMI) - CGIAR Research Centre Headquarters in Colombo, Sri Lanka.

Eng. Mr. S.M.D.L.K. De Alwis

- IESL part II (Civil Engineering), Dip. in Irrigation Engineering, M Eng. (EWRE&M) SL C Eng. MIE (SL)
- Director of Irrigation (Anuradhapura) , Irrigation Department

Eng. D. N. De Soyza Gunatilleke

- MSc in Sanitary Engineering at UNESCO-IHE, Institute for Water Education, Delft, The Netherlands, March 2005
- Post Graduate Diploma in Environmental Engineering & Management from University of Moratuwa, Sri Lanka, November 1995
- B.Sc. Eng.(Hon.) in Civil Engineering from University of Moratuwa, Sri Lanka, March 1992

Mr. L. R. H. Perera

- B.Sc. Engineering (Civil) in 1997 from University of Moratuwa, Moratuwa, Sri Lanka
- M.Sc. (Hydrology & Water Resources) in 2007 from
- Institute for Water Education (UNESCO IHE), Delft, The Netherlands

Eng. R. R. P. N. Rathnayake

- B.Sc. Eng. (Hon.) in Civil Engineering from University of Moratuwa, Sri Lanka in 1992.
- Postgraduate Diploma in Environmental Engineering and Management from the University of Moratuwa (Research for M.Eng. is completed and submitted)