THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Scheme 1: Basic Scheme

Final Report (2017-18) (Additional Call)

Report due 31 October 2018
Please return by email to The Ad hoc Committee on Planning of eLearning Infrastructure mmcd@cuhk.edu.hk

PART I

Project title: Micro-Modules for Analog and Digital Circuits
Principal supervisor: Marco Ho
Co-supervisor(s) Nil
Department / Unit Department of Information Engineering
Project duration: From March 2018 to October 2018
Date report submitted: 31 October 2018

1. Project objectives

Is the project on track to meet its objectives?
Have the objectives been changed as a result of the experience of working on your MMCDG project?

The project aims at producing 6 interactive videos for pre-lab preparation and in-lab demonstration for the Electronic Circuit Design Laboratory. The project is on track and is expected to meet the objectives.

2. Process, outcomes or deliverables

Please specify the number of micro modules produced, and the course(s) (with course codes and titles) that have used the micro modules in Part IV, and provide more detailed descriptions here. Must specify duration of each micro-modules (in terms of students online contact hours), total duration time of all deliverables and style. (With reference to the "Summary of video presentation styles" developed by CLEAR)
Has the nature of the deliverables been changed?
Have you adjusted your timeline?
Overall, was the project completed satisfactorily?

In total, 6 micro-modules have been completed. Each micro-module contains videos that last from 2 to 10 minutes in total, and also with interactive website and images that would help

them to complete the laboratory exercises. They will be made available to students in IERG1810 Electronic Circuit Design Laboratory. No changes are made to the nature of the deliverables and to the timeline. The project is considered to be completed satisfactorily.

3. Evaluation Plan

Have you altered your evaluation plans?
What monitoring data did you collect?
Does your evaluation indicate that you have achieved your objectives?

Formal evaluation will be done for the next offering of IERG1810, which is expected to be in September 2019. Student surveys will be conducted and benchmarking against conventional teaching will be documented when the micro-modules are delivered to the students.

4. Dissemination, diffusion and impact

Please provide examples of dissemination: website, presentations in workshops or conferences, or publications.
Please provide examples of diffusion: how the project results/process/outcomes/deliverables have been used in your unit and other parts of CUHK or other institutions?
Please provide examples of impact: how the project results (micro modules) can be adapted to other disciplines.

The interactive webpage and micro-modules will be available to the students in IERG1810 Electronic Circuit Design Laboratory. The webpage and videos are organized so that they can easily be accessed using smart phones. The format of the setup can be an excellent reference for future micro-modules development for other laboratory courses in the department.

PART II
Financial data

Funds available:

Funds awarded from MMCDG	$	100,000
Funds secured from other sources (please specify_____)	$	0
Total:	$	100,000

Expenditure:

Item	Budget as per application	Expenditure	Balance
Staff cost	90,000	80,217.46	9,782.54
Media services	10,000	0	10,000
Total:	100,000	80,217.46	19,782.54

PART III

Lessons learnt from the project

Please describe your way forward.
Please describe any of the following item(s) accordingly:

- *Key success factors, if any*
- *Difficulties encountered and remedial actions taken, if any*
- *The role of other units in providing support, if any*
- *Suggestions to CUHK, if any*
    - *Example: what should be done differently?*

The micro-modules will be used for the students in IERG1810 Electronic Circuit Design Laboratory. Students will be required to complete pre-lab reading through the micro-modules. During the lab, if students encounter problems in using the equipment or understanding the instructions, they can visit the interactive website and watch the videos again. One of the key success factors would be the consideration and design that allow visiting the website and video using smartphones. Difficulties lie in the time and effort to record a demonstration of proper usage of the equipment, without giving out all the steps and procedures to the students. The format of the setup can be an excellent reference for future micro-modules development for other laboratory courses in the department.

PART IV
Information for public access

Summary information and brief write-ups of individual projects will be uploaded to a publicly accessible CUHK MMCDG website. Please extract from Part I the relevant information to facilitate the compilation of the publicly accessible website and reports.

1. Keywords

Please provide five keywords (in the order of most relevant to your project to least relevant) to describe your micro-modules/pedagogies adopted.

(Most relevant) Keyword 1: Electronic Circuit Design

Keyword 2: Analog and Digital Circuits

Keyword 3: AC Circuit Analysis

Keyword 4: Digital Logic

(Least relevant) Keyword 5: Finite-State Machine

2. Summary

Please provide information, if any, in the following tables, and provide the details in Part I.

Table 1: Publicly accessible online resources (if any)
(a) **Project website:** *If a publicly accessible project website has been constructed, please provide the URL.*
(b) **Webpage(s):** *If information of your project is summarized in a webpage (say a page in the department's or faculty's website), please provide the URL(s) here.*
(c) **Tools / Services:** *If you have used any tools or services for the project, please provide names of the tools or services in here.*
(d) **Pedagogical Uses:** *If any flipped classroom activities have been conducted, please provide information in here. If relevant, please indicate how your project output can be used to support flipped classroom activities.*
(c) **Others (please specify):** Interactive website available to target students.

Table 2: Resources accessible to a target group of students (if any)			
If resources (e.g. software) have been developed for a target group of students (e.g. in a course, in a department) to gain access through specific platforms (e.g. Blackboard, facebook), please specify.			
Course Code/ Target Students	**Term & Year of offering**	**Approximate No. of students**	**Platform**
Eg1. DEPTXXXX	*1st term 2015*	*50*	*Blackboard*

Eg2: Dept of xxxx	*All 1st year students*	*40*	*facebook*
IERG1810	1st Term of 2018–2019	120	Interactive Website

Table 3: Presentation (if any)	
Please classify each of the (oral/poster) presentations into one and only one of the following categories	**Number**
(a) In workshop/retreat within your unit (e.g. department, faculty)	
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	
(e) In international conference	
(f) Others (please specify)	

Table 4: Publication (if any)	
Please classify each piece of publication into one and only one of the following categories	**Number**
(a) Project CD/DVD	
(b) Project leaflet	
(c) Project booklet	
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	
(e) Conference proceeding	
(f) A chapter in a book accessible internationally	
(g) A paper in a referred journal	
(h) Others (please specify)	

3. A one-page brief write up

Please provide a one-page brief write-up of no more than 500 words and a short video.

The project aims at producing 6 interactive videos for pre-lab preparation and in-lab demonstration for the Electronic Circuit Design Laboratory. An interactive webpage is also developed to tie the lab activities with the underlying engineering concepts. With the prevalence of smartphones, the webpage is designed with access using smartphone in mind. As a result, if during the lab students encounter problems in using the equipment or understanding the instructions, they can visit the interactive website and watch the videos again.

The micro-modules cover the following topics: (1) Basic Electric Circuit Measurements — helping the students to understand the concept of floating equipment or grounded equipment, to learn the measurement method using digital multimeter and oscilloscope, and to verify the Ohm's Law, Kirchroff's circuit laws and Thevenin equivalent circuits; (2) AC Circuit Analysis — introducing the characteristics of some components in alternating current (AC) circuits, the resonance behavior of RLC circuits, measurement techniques for inductance and capacitance, and to bridge them with the theoretic explanation; (3) Operational Amplifier — allowing students to understand the differences of open-loop and closed-loop amplifiers, the construction of high-pass and low-pass filter using amplifiers, and the application of operational amplifier in voltage regulators; (4) Digital Combinational Logic —aiding the students in using discrete logic chips, controlling 7-segment displays, and to verify De Morgan theorems; (5) Flip-flops and Finite-State Machine — helping the students to learn different types of flip-flops, and to use the flip-flops to develop a finite-state machine; (6) Finite-State Machine with VHDL — enabling the students to learn the hardware description language called VHDL, and to use it to develop an electronic rock-paper-scissors game.

The micro-modules will be available to the students in IERG1810 Electronic Circuit Design Laboratory. They will be required to complete pre-lab reading through the micro-modules. A formal evaluation, such as student surveys, will be conducted and benchmarking against conventional teaching will be documented for further improvement in the future.