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Institute of Technology of Cambodia

Dual Education Program

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Dual Education Program
on
Master Program of Water and Environment

Concept Note
Dual Education with CSW

1. Introduction about dual education

Dual Education is a complementary program of training mode between theory and practice in environment of university and company. It is called "dual education" because students have to apply their alternative skills at two places simultaneously which relate academic studies to professional works of companies. The students conduct the studies as the learners for partial days of week in the school while the students contribute and coordinate their acquisitioned skill as trainees at the company for the rest of week.

The dual education program has successfully been applied in several countries such as Spain, France, Germany and Switzerland. Its implementation leads to increment of high youth employment rate along with high demand of relevant skills. It also enhances the education curricula for competitive job markets. For examples of institution in Spain, University of Lleida has started up the dual education programs of master degree in Industrial Engineering and Computer Engineering. The program attract not only the local companies but also the international companies. Similar to Institut Pere Martell, it has involved with more than 400 industries under the circumstance of dual education program, i.e. Toyota, Canon, Big, Minicar Pons, .etc. Its successfulness lead to 100% of students ready to work. In 2018, Institut Pere Martell achieves the students in the dual education program with 80% of employment rate. Beside, Institut Cal·lípolis has also applied the programs, it earns the good relationship with 64 companies in which it is mostly from the local region. It has the recognition of the society and work readiness of students. Meanwhile, Universitat Rovira i Virgili has implemented the dual education program titled as "working experience program". Even though the title is different, the concept and implementation are still the same in order to obtain the high rate of employability. Within the program, the institution and companies mainly earn the adaptation of curricular aspect to the real world demand, the best students whom the companies are looking for, and boost the territory development and environment.

The dual education program in Cambodia has also been applied in TVET which is under the development plan for vocational training policy 2017-2025. TVET emphasize the role of skills development, to reduce poverty through provision of basic skills to the rural poor and to support individual development by providing skills. These five priority policies are (1) linking training to market demand; (2) ensuring training quality for enhanced productivity; (3) strengthening public-private partnerships; (4) ensuring equity in training; and (5) promoting TVET for social-economic development. There are 38 TVET institutions in Cambodia where 8 located in Phnom Penh and 30 located in provinces. Within the number of 83.000 students, there is only 66% of total student be able to employed after graduation. However, there is no dual education program of higher education in Cambodia. The higher education students have to find the jobs. The companies usually complain about the employability of students which face the non-flexible course rather than the real working environment. It is inadequate and inappropriate teaching/learning materials, equipment and environment. Therefore, the dual education program of higher education are proposed.

The **Dual Education Program** of higher education aims to strengthen the relation-bound between academic institution and company, ensure and adapt the qualified students to the professional environment of workplace and working-demand, enhance the recognition of institution, modernize the syllabus of theoretical and practical training, and mobilize the available resources to success the work.

Under the project of Erasmus, TEEDE Project (Towards Excellence in Engineering curricula for Dual Education) aims to develop dual education program at higher education 10 universities in 4 countries (Cambodia, China, India, and Russia). The concept proposed to develop dual education of Master program at Water and environment unit and PhD program of Food Technology and Nutrition Unit.

2. Master program of water and environment at ITC

Institute of Technology of Cambodia (ITC) is an academic institution which specializes in the engineering majors. Currently, ITC has developed a master program of Water and Environment by modified the existed master program of Water Resources Engineering into specific programs following the demand of labor market. There are three majors in this thematic master program namely Water Resources Engineering, Urban Water and Sanitation Engineering, and Environmental Engineering and Management. The system is designed for ITC and non-ITC students who hold bachelor degree in a related field of water and environment. They are required to take course works includes core course, research oriented course, and elective course as well as research works (Table 1 and Table 2). However, the students have to look for jobs after graduation.

Table 1. Program structure of master program of water and environment for ITC and non-ITC students as normal education program

Description	**ITC Students**				**Non-ITC Students**			
	I5/M1		M2		M1		M2	
Semester	I	II	III	IV	I	II	III	IV
Core course	18-22		6		18	9		
Research oriented course			6				6	
Elective course			6				6	
Mini project						6		
3-month internship plus I5 thesis		9						
4-month professional internship/research work at ITC				Required				Required
Master thesis				12				12
Total credit	57				57			

Table 2. Course study of master program in Water and Environment

Core Course	Research Oriented Course	**Water Resources Engineering**		**Urban Water and Sanitation Engineering**		**Environmental Engineering and Management**	
		Elective Course	Specialized Course	Elective Course	Specialized Course	Elective Course	Specialized Course
1. Hydrology 2. Applied Statistics 3. GIS and Remote Sensing 4. Entrepreneurship 5. Project Management	1. Research Methodology 2. Seminar of Water and Environmental Engineering 3. Water and Environmental Laboratory 4. Mini Project	1. Hydrogeology 2. Hydraulic Structure 3. Water Chemistry 4. Environmental Monitoring and Modeling 5. Water Policy and Planning 6. Earth Dam Design and Construction 7. Water Induced Disaster Risk Assessment 8. Urban Pollution Control 9. Hydropower Development and Pumping Stations 10. Climate Change Impacts and Adaptation	1. IWRM 2. Water Quality Analysis and Management 3. Sustainable Solid Waste and Hazardous Management 4. Process Engineering 5. Irrigation and Drainage 6. Agriculture Water and Irrigation System Management 7. Urban Flood Management and Disaster Risk Mitigation 8. Water Resources System Engineering 9. Watershed Management and Sustainable Hydropower Development	1. Hydrogeology 2. Hydraulic 3. Water Chemistry 4. Environmental Monitoring and Modeling 5. Water Policy and Planning 6. Sustainable and Green Energy Systems 7. Water Induced Disaster Risk Assessment 8. Urban Pollution Control 9. EIA 10. Climate Change Impacts and Adaptation	1. IWRM 2. Water Quality Analysis and Management 3. Sustainable Solid Waste and Hazardous Management 4. Process Engineering 5. Micro-biology and Toxicology 6. Water Treatment and Distribution System Design 7. Urban Drainage and Sewerage System Design 8. Wastewater and Sludge Treatment Process 9. Management of Water Supply and Sanitation	1. Water Chemistry 2. Environmental Chemistry 3. Hydraulic 4. Environmental Monitoring and Modeling 5. Micro-biology and Toxicology 6. Water Policy and Planning 7. Water Induced Disaster Risk Assessment 8. Urban Pollution Control 9. Climate Change Impacts and Adaptation 10. Environmental and Ecological System Modeling	1. IWRM 2. Water Quality Analysis and Management 3. Sustainable Solid Waste and Hazardous Management 4. Process Engineering 5. Engineering Environmental Sustainability 6. EIA 7. Sustainable and Green Energy Systems 8. Industrial Resource Management and Cleaner Production 9. Air Pollution Control and Monitoring

3. Role of ITC

Role of ITC is to:

- Ensure the qualified students as candidates to the companies for selection process as trainees or staffs.
- Update the curricula and educate the students to meet the companies' requirements.
- Be a coordinator to maintain the relationship between students, companies and ITC.
- Monitor the stay at the company regularly by meeting or e-contact.
- Follow up and evaluate the competences and skills
- Provide available access of laboratory to the selected candidates for partial fund of equipment use.

4. Role of CSW

Center for Sustainable Water (CSW) is an organization which work in the fields of water and sanitation. It is also a partner of ITC. Currently, CSW struggles to deal with the water and sanitation problems in Cambodia to reach the SDG6 by 2030. Hence, CSW require to 12,000 of new WASH professional youths. It is a good opportunities to enhance the relationship between ITC and CSW under the dual equation program. CSW are proposed to have roles to:

- Provide the vacancy positions related to the fields.
- Provide the qualified staffs with the requirement degree as mentors and evaluators to access/train the students to work and contribute more achievement.
- Follow up and evaluate the competences and skills
- Provide the salary contract under condition of fulltime/special working/tuition fee with the minimum labor cost of Cambodian standard salary policy for training and fulltime salary contract after graduated in term of company evaluation and students' decision.

5. Proposed option

Criteria for dual education program is mainly in accordance with the academic and attitude achievement. To ensure the dual education program for the students, there are two options to be proposed:

- **Option 1:** ITC, selected candidates and CSW have to prepare and agree on the contract (Section 7) under the support of CSW. CSW needs to prepare another contract for the trainees as permanent staffs once the students graduate depending on the evaluation of CSW and the decision of trainees.

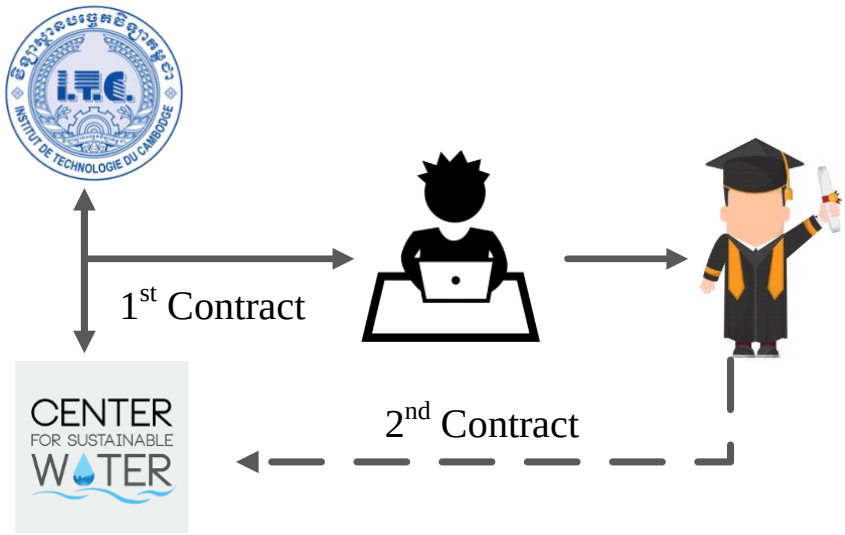

Fig. Proposed option 1 for dual education program

- **Option 2:** ITC, selected candidates and, Agence Française de Développement (AFD), CSW have to prepare and agree on the contract (Section 7) under the support of AFD. However, CSW needs to prepare another contract for the trainees as permanent staffs once the students graduate depending on the evaluation of CSW and the decision of trainees. However, the students is provided the most priority to work as the official government in the ministry.

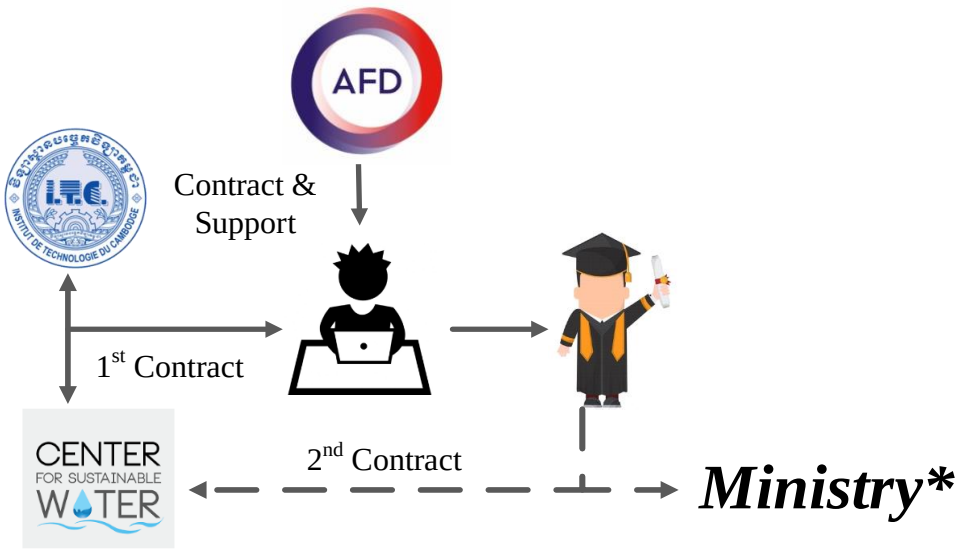

Fig. Proposed option 2 for dual education program

6. Tuition fee

ITC provides the opportunity to the students to enroll the program by either competitive scholarships or competitive class enrollments before starting the program. The tuition fee is free and might come up with allowance in term of scholarship while normal enrollment requires to pay the tuition fee according the degree. The tuition fee of Master and PhD degree program are 1,000 and 1,900 USD/year, respectively. The access in the program can be found in Table 3.

Table 3. Access of Master and PhD degree program

Degree	Items included	Item NOT included
Master	1. Enrollment 2. Course work 3. Library and internet access 4. Research work (Supervising and ITC laboratory)	5. Books 6. Consumables 7. Laboratory (outside of ITC) 8. Field trip 9. Communication fee 10. Conference and publication 11. Indoor allowance
PhD	1. Enrollment 2. Course work 3. Supervising 4. ITC laboratory 5. Computer and internet 6. Book/Journal/Library access 7. Others (printing, paper, etc.)	8. Conference and publication (air ticket) 9. Indoor allowance 10. Field trip 11. Oversea exchange 12. Consumables

7. Contract and Agreement

Before training started as the companies' staffs, the contract and agreement (1) between students, CSW and ITC have to be made under three options:

- **Full-time salary contract**: CSW have to pay the students fulltime salary as the permanent staffs or salary per working hours.
- **Special salary contract**: CSW has to pay the students tuition fee for at least one year and special salary for the working afford of students with the minimum labor cost of Cambodian standard salary policy.
- **Scholarship contract**: CSW has to pay the students tuition fee for at least one year once the students start training at CSW.

With these three options, CSW has to accept the selected candidates to work in CSW after graduated basing on the **CSW post-evaluation, students' decision, or reasons to decline the permanent staff contract**. The extra contract and agreement (2) might be prepared by CSW and selected candidates following the internal policy of CSW in case of working in CSW.

8. Procedure of implementation

The procedure of implementation of dual education program is shown in Fig 1. The students able to enroll in ITC have to be the qualified students which obtain good transcript results and English efficiency, high motivation, and strong reliability in which someone can put trust in. In the first year (M1), the students require to take the course work for 57 credits including 6-9 credits of mini project or senior-project (I5) thesis. The internship can be free or paid depending on the agreement between students and CSW/companies. However, the students have to solve the problems and make some output to the company as the trainee in order to gain the trust and further work, or the students have to do the mini projects related to school project, innovation project to solve social problems, or company projects which are obtained by factory visit, problem presentation of companies or problem observation. In the second year (M2), the qualified students, who are selected by **Graduate School Committee**, have opportunity to study in the normal education program or the **proposed dual education program** while the non-qualified students require to learn in the **normal education program** automatically. The selection process is made following the criteria of mini project, commitment, academic results and attitude achievements. In the study period, the total credit is 57 credits the same as M1 credit. But, the number of learning and training hours are different. After that, the company screen the selected candidates for the interview. The successful candidates can enroll to the proposed dual education program with the contract and agreement between ITC, candidates and companies as mention in Section 7. The training work requires at least two mentors in which one is from ITC and another one is from companies. **The credit of course transfer can be made by the evaluation between the two mentors in term of the related flexible course work/research work and assigned company work as memory of activities (professional working report).** The successful students in this program will obtain the degree in dual education program.

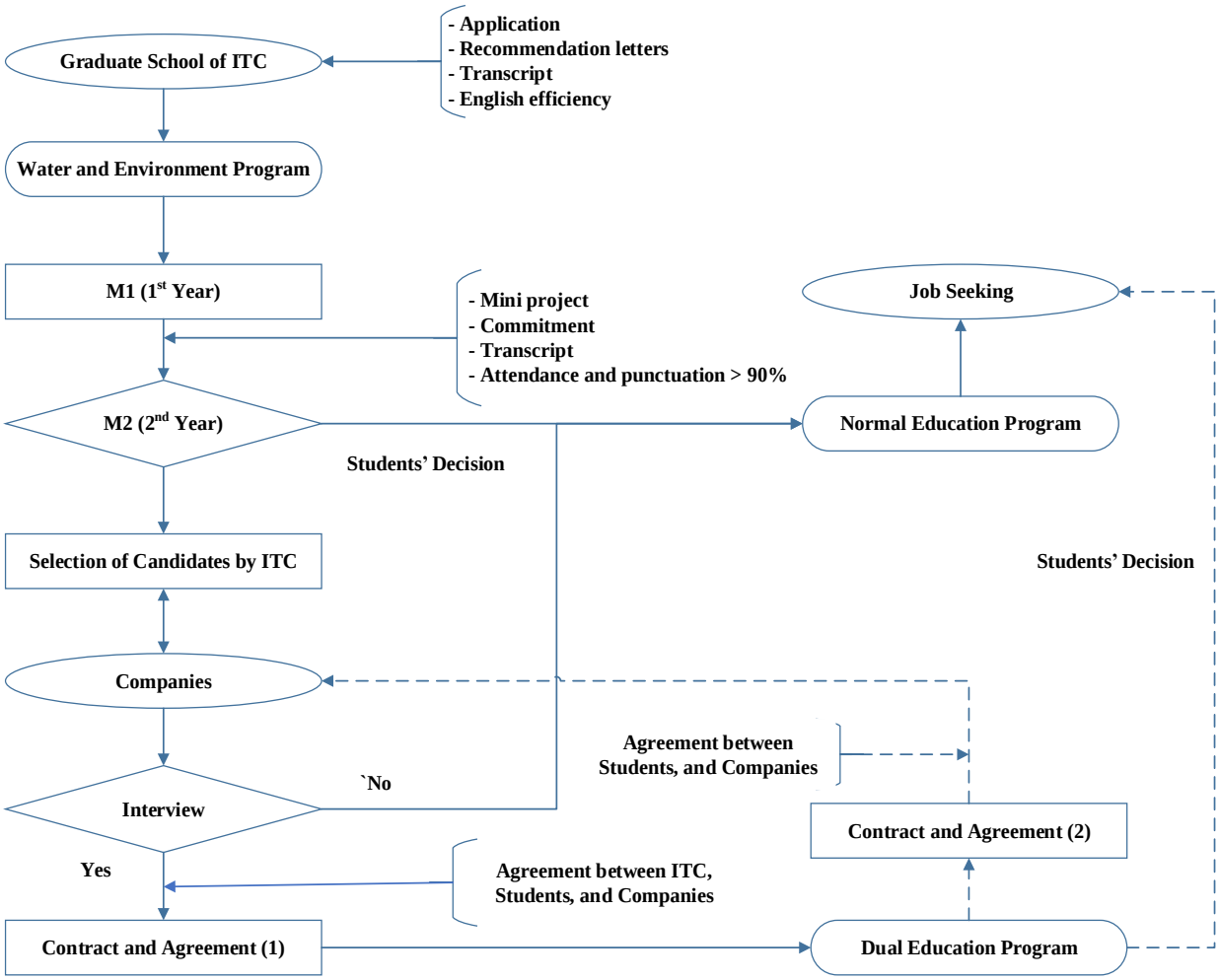

Fig. 1. Procedure of implementation

To clarify the credit transfer, the courses in Table 2 can be credited only one or two courses depending on the parallel project or work the selected candidate do. The credit is made upon having the agreement between mentors of CSW and ITC in the field of course transfer. The selected candidates have to do a professional report and do presentation as defending after training. Meanwhile, the options for schedule of dual education program are proposed as following along with the contract and agreement in Section 7:

- **Option 1**: The schedule of normal education program (Table 4) and dual education program (Table 5.a) are the same except the professional internship and working project, respectively. There are 65% and 35% of course and training in the normal program, whereas 45% and 55% of course and training in the proposed option 1, respectively. CSW and ITC have to find the existed projects or innovation projects, which qualify for the master degree program and are able to publish in scientific journals, within the fields of CSW as well as the selected candidates. Therefore, CSW and ITC have co-responsibility for the selected candidates' works.

Table 4. Schedule of normal education program

M1 (57 credits = 912 h)												M2 (57 credits = 480 h)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Intern												Pro. Intern				
										Defend												Defend	

Table 5.a. Option 1 as internship-working project for schedule of dual education program

M1 (27 credits = 432 h)												M2 (30 credits = 480 h + 320 h)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Intern												Working Project				
										Defend												Defend	

- **Option 2:** The selected candidates have to be trained at CSW once the course studies finish. The course studies can be compacted. Hence, they can be accomplished before 1 month or 1.5 months, and then the course transferred can be taken place at CSW. With this option, the percent course and training increase to 40% and 60%, respectively. After that, the selected candidates can work as the full-time staffs with the working projects (Table 5.b).

Table 5.b. Option 2 as immediate working project for schedule of dual education program

M1 (27 credits = 432 h)												M2 (30 credits = 480 h + 568 h working)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Intern												Working Project				
										Defend												Defend	

- **Option 3:** The course studies and course transferred at CSW have to conduct simultaneously by 2-day working a week or half shift working a whole third semester. Once the courses finish, the working project can be carried out in the fourth semester (Table 5.c). With this option, the percent course and training increase to 35% and 65%, respectively.

Table 5.c. Option 3 as adapting-working project for schedule of dual education program

M1 (27 credits = 432 h)												M2 (30 credits = 480 h + 760 h working)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Intern							2 Day Working					Working projects				
										Defend												Defend	

- **Option 4:** After M1 thesis defend, the selected candidate are suggested to work in CSW as the internship staffs at CSW for free or paid depending on the policy of CSW for minimum one month before the third semester started. The further screening process of CSW might take place during this period; however, CSW have to do the contract and agreement with ITC and students in term of working policy and salary (Section 7). The working project as the master thesis projects are also made in CSW and ITC (Table 5.d). With this option, the percent course and training increase to 30% and 70%, respectively.

Table 5.d. Option 4 as screening/adapting-working project for schedule of dual education program

M1 (27 credits = 432 h)												M2 (30 credits = 480 h + 896 h working)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Intern					Free/paid		2 Day Working					Working Project				
										Defend												Defend	

- **Option 5:** The training program have to be started by semester II when the students do internship. The students, CSW, or ITC have to propose a topic as an extendable project for a whole master degree program. According to ITC policy, the students require to present their progress reports exactly the same as M1 thesis (mini project) at the end of semester II. The projects are going to extend and produce further significant results for master thesis at the end of semester IV. Nevertheless, the student are available to train at CSW in semester III only 2 day working a week or half shift working (Table 5.e). With this option, the percent course and training increase to 20% and 80%, respectively. After finishing the course studies, the students are able to work full time at CSW for working project. The master thesis defend is made following the whole project.

Following the five proposed options, the mentors from ITC and CSW, and selected candidate are suggested to produce the scientific papers regarding as the achievement of CSW and ITC and the students. Meanwhile, the agreement and contract have to be followed in Section 7 after the graduation.

Table 5.e. Option 5 as extended working project for schedule of dual education program

M1 (27 credits = 432 h)												M2 (30 credits = 480 h + 1712 h working)											
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
		S I					S II							S III					S IV				
		Course												Course									
							Working Project + 2 Day Working during Course																	
										Defend												Defend	

9. Monitoring and Evaluation

The key indicators of program evaluation are:

- Sustainability of the program
- Employability of students in term of degree, position and work readiness
- Employment rate.

10. Project Outcome

The benefits of dual education program result the good outcome to:

- **Student**: Double training between ITC and companies to earn working experiences in innovates and reality with grants, working contract, profession employability under the certificate of dual education program.
- **Company**: Guarantying model of professional training for the most qualified staffs along with the company need, recovery of cost and time for internal training or staff training in workplace during initial working period, prolong the relationship of companies and students/ITC within business processes and working environment, and recognition of candidate degree and position.
- **ITC**: Linkage between institution and companies with co-responsibility.

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About company

SOLAR GREEN ENERGY(CAMBODIA) CO.,LD, called SOGE, Established in 2004 to work in Renewable Energy Sector especially in Solar Energy field. SOGE providing high quality and standard of products-services with highest responsibility. We sell all kind of Solar systems such as SOLAR ON&OFF GRID, SOLAR WATER PUMP, SOLAR STREET LIGHTS, SOLAR HYBRID and SOLAR BACK-UP SYSTEM. We also supply components related to Solar Energy field such as: Solar Panels, Inverters, Batteries, Charge Controllers, Light Bulbs and Other Solar components.

Schedule

Time Table: Master Student 2019~2020

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
7:00 – 8:00				ITC Master Course		DCLab Project
8:00 – 9:00	SOGE Electronics		SOGE Electronics	ITC Master Course	SOGE Electronics	
9:00 – 11:00		ITC Master Course				
11:00 – 1:00						
1:00 – 3:00	ITC Master Course	ITC Master Course		SOGE Electronics		
3:00 – 5:00						
6:00 – 8:30	DCLab Seminar					

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Dual Education Program
on
Doctoral Program of Food Technology and Nutrition

About partner

Institut Pasteur in Cambodia is a Cambodian nonprofit institute created in 1953 to contribute to diagnosis, research and prevention of infectious diseases. Our Institute is part of the Institut Pasteur International network comprising 33 members in 26 countries. 220 persons work in our Institute including foreign researchers and more than 25 Cambodian and International students.

Academic program

	Description	Credit
1	Subject study	21
1.1	Additional subject and/or subject of PhD program	12
1.2	Orientated subject	9
2	Thesis	33
2.1	Proposal defence	3
2.2	Publication	6
2.3	Conference	3
2.4	Seminar	3
2.5	Thesis defence	18
Total credit		54

Schedule

Cycle for PhD Training Program (Plan for 3 Years)

Selection and Enrollment Process							
Activities' period	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**
Announcement and application							
Screening and interviewing							
Announcing selection result							
Enrolment and (re)-registration							
Assigning supervisors for new PhD students							
Commencement of new academic year							

Year 1												
Activities' period	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**
Course												
Research	*Student can start doing (primary) research in the first year, but often not recommended*											
Deadline for submitting 3 orientation courses												
Progress Reports												

Year 2												
Activities' period	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**
Course												
Research												
Submission of progress reports												
Defense of detailed research plan/ Half-way evaluation												

Year 3												
Activities' period	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**
Coure	*Not recommended*											
Research												
Submission of progress reports												
Writing manuscript												
Submit (thesis) manuscript												
Trial defense of thesis												
Formal defense of thesis												
Jury's decision												

Note:

1. Students can participate or present research results in seminars and conferences in anytime during the study period
2. Students can publish reseach papers in anytime during the study period

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