



**INSTITUTE OF TECHNOLOGY OF CAMBODIA**

**CONSORTIUM MEETING  
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**PHNOM PENH**

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**STRATEGY & PERSPECTIVE**

**2017-2018**

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## I. Strategic Plan of ITC for 2018-2022

### *Overall Objective*

The overall objective of this strategic plan is for ITC to become one among the best Higher Education Institutions in ASEAN countries, leading in Science Technology and Engineering by increasing human capital – both students and faculty members – in all engineering fields relevant to the Cambodian economy and fill the technical gap within other regional economies by strengthening research and innovation capacity in STEM.

Six specific objectives will have to be reached in order to achieve this overall goal.

No.	Objective
Obj1	- To improve the governance model of ITC;
Obj2	- To contribute to the development of Cambodia by increasing the number of technicians and engineers in relevant areas and bringing support and assistance to the development of STEM in partner universities;
Obj3	- To become a leading institution for Research and Innovation in the ASEAN;
Obj4	- To train engineers to innovation and entrepreneurship in order to create high skilled jobs and answer to future challenges of the Cambodian economy;
Obj5	- To ensure access to high-range information technology;
Obj6	- To make ITC a model for social and environmental responsibility.

The detail of strategic plan for 2018-2022 is presented in Annex 3:

## II. Strategy and Perspective for 2017-2018

Toward the goal of excellent education and research in the field of engineering and technology, ITC imposes the following strategy for this year

No.	Strategy	Objectives
S1	Enhance teaching and learning environment	Upgrade classroom and lab facilities
		Improve IT services
		Improve library facilities
S2	Enhance quality of training	Recruit highly skill faculty staffs
		Improve skill of faculty staffs
		Update curriculum accordance with the industrial need
		Establish e-learning model

S3	Enhance quality of research	Establish professorship for ITC's faculty staffs
		Evolution Master's and doctoral program
		Implement lab based education
		Enhance research capability of faculties
		Enhance partnership with local and international partners.
		Enhance partnership with leading universities in the world

### ***II.1. P1: Human resource development***

In line with the strategic plan of ITC, it is always prioritized to increase the number highly skilled faculties who obtain master and doctor's degree. Each department has a role to send excellent students to continue higher education in the leading universities and to recruit highly skilled fresh graduates to become the faculty staffs of ITC. As every year each department has proposed the human resources develop plan in line with the mission and vision of ITC.

### ***II.2. P2: Enhance quality of teaching and learning***

Reinforce capacity building of faculty staffs through training at leading universities, dispatch foreign professors to ITC, increase research activities and collaborate with industries are the key important for ITC. In addition, attract the excellent students to study at ITC are also very important.

<b>No.</b>	<b>Objectives</b>	<b>Target departments</b>
1	Start to implement LBE project under the technical and financial support from JICA	GEE, GIM, GIC and GGG
2	Increase number of faculty exchanges in all engineering fields to partner universities for skill improvement	All
3	Increase number of expert professors to ITC for lecture, joint research with faculty staffs	All
4	Increase number of students for internship in foreign country	All
5	Increase number of foreigner students to exchange study at ITC	All
6	Increase number of scholarship for students	All

### ***II.3. P3: Orientation of majors at beginning of entrance exam to ITC***

*Situation Analysis :*

- Students prefer to choose major since applying the application for entrance exam to ITC (Result from survey)
- High School students do not want to enroll to the entrance exam when they can not choose their preferable department.

- Drop rate of students at year 1 and year 2 are very high. The drop rate is due to the hopeless of selection preferable department.
- Maths and Physics courses could be more specific to relevant specialized department.
- Statistic shows that the excellent students from high school still outperform after take foundation year at ITC, as the result they can choose the preferable major as they want since the very beginning of entrance exam to ITC.
- Other trend such as family, other universities in Cambodia, students prefer to choose major before entering to the universities due to they have known well the specialization at ITC through website, facebook, brochure, open house, STEM Festival, career forum that were organized by universities/ministries as well as at ITC.

### *Proposal*

ITC proposes to allow students to choose the major at the beginning of applying the entrance exam to ITC.

### ***II.4. P4: Modify curriculum***

#### ***GRU Department propose to modify its curriculum for 2017-2018***

The department of Rural Engineering has two options: Rural Infrastructure and Water Resources Engineering and Water and Ecological Engineering. Therefore, some courses related to environment are proposed to be deleted from the first option (Table 1) and has been moved to the new option. Number of hours have been added to the existing courses such as Irrigation and Drainage, Water Induced Disaster Risk Assessment, On-site Safety Management, Hydropower Development and Pumping Station, Hydraulic Structures, Multi-Disciplinary Design Project (Annex 1).

A new course “Land management” is proposed to add into the first option in order to allow students improve knowledge on land management which is important for rural development and future urbanization (Table 2).

Table 1: Courses proposed to delete from Option: Rural Infrastructure and Water Resources Engineering

<b>COURSE</b>	<b>Code</b>	<b>Lecture</b>	<b>Tutorials</b>	<b>Practice</b>	<b>Credits</b>
<b>I4 S1</b> Environmental Studies	GRUI41ENV	32			2
<b>I4 S2</b>					
Water Quality Analysis	GRUI42QDE	32			2
Plumbing	GRUI42PRI	32			2
<b>I5 S1</b>					
Wastewater treatment and urban	GRUI51TEU	16	16	16	2

drainage					
Drinking Water Supply	GRUI51AEP	16	32		2
Introduction to Hydrologic Modeling	GRUI51MOD	16	0	0	1

Table 2: Courses proposed to add into Option: Rural Infrastructure and Water Resources Engineering

<b>I5 S1</b>				
Land Management	GRUI51LM	16	32	2

The new option on Water and Ecological Engineering will be started from the academic year 2017-2018. At least 30 students will be selected for this new option. Students will be oriented to a new major on water, ecology and environment in response to the sustainable development of the country.

### ***II.5. P5: Proposed Project for 2017-2018***

#### *Project LBE*

ITC will start to implement Lab Based Education (LBE) in the four departments GEE, GIM, GGG and GIC with technical and financial supports by JICA. The LBE is a research model that consists of a team leader who is a lecturer with a Ph.D degree and makes research teams that include 4th/5th year engineering students and, if possible, master's students, and conduct research.

The numbers of LBE research group have been initially proposed in Table 3:

Table 3: Name of Laboratory (research field) under LBE project

<b>No.</b>	<b>Name of Laboratory/Research fields</b>	<b>Target department</b>
1	Applied Thermal Energy Laboratory	GIM
2	Thermal Power and Combustion Laboratory	GIM
3	Robotics and Control Systems Laboratory	GIM
4	Engineering Design and Manufacturing Laboratory	GIM
5	Telecommunication System Engineering Laboratory	GEE
6	Power System Engineering Laboratory	GEE
7	Power Electronic Laboratory	GEE
8	Geo-resources Laboratory	GGG
9	Geotechnical Laboratory	GGG
10	Big Data Lab	GIC
11	Spoken Language Processing Lab	GIC

#### *Joint Project Proposal with World Bank*

ITC is among other top selected universities will develop a joint project proposal with World Bank for the 2nd phase. The concept notes of this project aim as follow:

Improving teaching

- Facilities
- Curriculum
- Human resources
- Training (short term & long term)

Improving research

- Window 1: provide grant for only selected universities
- Window 2: provide grant for non selected universities

*Project KA1*

ITC has applied several mobility projects under Erasmus+ KA1 as indicated in Table 4. The aim of KA1 is to allow mobility of students and faculty staffs between ITC and with partner universities in Europe.

Table 4: List of proposed project for Erasmus+ KA1.

<b>No.</b>	<b>Project Title</b>	<b>Partner</b>
1	Materials and Structures	University Paris 13
2	Food Technology, food quality, nutrition	Supagro - Montpellier with the collaboration of AgroSup Dijon, ENSAT-INP Toulouse, Polytech Lille.
3	Entrepreneurship in the food industry	AgroSup Dijon
4	Energy engineering	INP Toulouse and INP Grenoble
5	Practicals in Foundation year	IUT Orsay (Université de Paris-Saclay)

*Project Erasmus KA2 “capacity building in Higher Education” indicated in Table 5.*

Table 5: List of proposed project for Erasmus+ KA2.

<b>No.</b>	<b>Project Title</b>	<b>Partner</b>
1	WANASEA: "Strengthen the production, management and outreach capacities of research in the field of WATER and NATURAL resources in South-East Asia"	Université de Nantes

**II.6. P6: Evolution Master Program**

Inline with ITC’s 2015-2016 perspectives, full-time master programs were put in place of the part-time ones in this academic year 2016-2017 (for all existing program). However, the numbers of applicants and enrolled students were limited and this can incur high expenses for ITC if this tendency continues. An effective choice to reduce expenses and encourage more students to enroll is to implement thematic master programs and internationalize the existing

programs. Currently, we have only MGCI being an international program (double degree with INSA Rennes). Reviewing the curriculum, it is possible to consider a mutualization between MGCI and MGIM (possibly GGG and GRU), keeping the double degree feature with INSA-Rennes. We thus propose to transform the current MGCI into a thematic one: “Master of Materials Science and Structure”. This new thematic master will:

- Conserve its originality of double degree
- Allow recruiting students from various department (GCI, GRU, GIM, GGG), hence tending to increasing number of enrolled students
- Permit lecturers and professors from various departments to work on the same thematic area

(See the Annex 2 for the proposed program).

This thematic master program will be implemented in academic year 2017-2018 if accorded.

### ***II.7. P7: Development of Research Activity***

#### *Research and Innovation Centre:*

ITC has a mission to develop scientific research and transfer technology to private sector and society for development of Cambodia. To achieve this mission, ITC has several objectives of research activities.

1	Promoting research activities
2	Continuous improvement for highly-qualified researchers
3	Upgrade lab facilities
4	Expand and strengthen research collaboration with national and international community
5	Expand and strengthen research collaboration with private sector

To achieve the overall objective of Research and Development, ITC aim to work on the following activities for this fiscal year 2017-2018

1. Organize scientific event at ITC (07 May 2017)
2. Hosting the AUN/SEED-Net Regional Conference (RC) on Geological and Geo-resources Engineering in the Japanese Fiscal Year 2017
3. Strengthen research ability by doing internal training or/and external training, and participation of faculty staffs at conferences
4. Continue to direct to thematic research linkage with master and doctoral programs, or/and the needs of country
5. Conduct deeply investigation about the motivation of faculty staffs for research: training (research ability), occupation inside and/or outside, curiosity on science, revenues, promotion
6. Enable research project between ITC and public/private sectors
7. Provide consulting for companies



8. Management of innovation and research centre at ITC
9. Dispatch researchers in local and international private companies.
10. Dispatch foreign experts to form the structuring of research at ITC (intellectual property, evaluation quality of the research, etc.,)
11. Dispatch Cambodian experts to foreign partner universities to study the research structuring at university
12. Reinforce project management capacity for researchers
13. Establishment of local professorship criteria
14. Reinforce laboratory equipment maintenance.

*Department:*

- Increase technical capacity of lab-assistant in terms of quality assurance and control
- Enhance scientific research writing skill for researcher
- Increase interest and participation of student research assistant through student conference & research seeding fund
- Increase number of research proposals in all field of engineering
- Increase number of projects with industry
- Establish/disseminate research funding sources
- Enhance Proposal writing skill for faculty staffs

***II.8. P8: Improvement Library System***

*The new building supported by Government of Cambodia is under construction. As the result, ITC will construct new library in this new building in order to increase its capacity and modernize it.*

In line with the mission of ITC, we aim to work on the following points.

- Capacity building on library management and service operation
- Improve and update library resources
- Improve and update library services
- Provide more trainings / workshops to students and researchers
- Build partnerships and cooperation with regional and global library for development
- Promote using library services to students and researchers

***II.9. P9: Local and International cooperation***

*University-Industrial Linkage office perspective*

Within this fiscal year 2017-2018 the University-Industrial Linkage office aims to work on the following points:

- Increase the visibility of each department to enterprises partnership
- Increase the capacity university-industries relationship to representatives of industrial linkage at the department level.

- Promote the applied research in the department in response to the need in society.
- Increase quality of soft skill and technical skill to ITC students
- Reinforce cooperation with former industries

*Department perspective:*

- Increase linkage between related national ministries, government agencies, research institutes through technical assistance, cooperation and research;
- Increase technical training for SMEs

**II.10.P10: Cyber University and Multimedia Center**

**Perspective 2017-2018**

- To develop eight (8) online courses
- To extend three (3) university members
- To cooperate with international leading academic institutions
- To build up human resource capacity in professional skills
- To update network facilities for supporting learning and research activities

To achieve our overall objective, ITC aim to work on the following activities.

- Promote online course program to head and deputy-head of departments and provide some supports to reach targets
- Direct communication with university leaders or decision makers join the Cambodia Research and Education Network (CamREN)
- To provide external training (at abroad) with our partnerships and local training with e-Learning Center of ITC to scale up number of skilled persons
- To upgrade learning facilities

### III. ANNEX

#### III.1. Annex 1: Program of Option: Rural Infrastructure and Water Resources

<b>I4 S1</b>		<b>384</b>			<b>15.5</b>
Hydraulics	GRUI41HYL	16	16	16	2
Earth Dam Design & Construction	GRUI41OET	16	16	16	2
Reinforced Concrete Design	GRUI41CBA	16	32		2
GIS and Remote Sensing	GRUI41SIG	32		48	3.5
Structural Analysis	GRUI32ADS	16	32		2
Construction materials	GRUI41CMA	16		32	2
English	GRUI41LAN			32	1
French	GRUI41LFR			32	1
<b>I4 S2</b>		<b>384</b>			<b>20</b>
Construction of rural roads	GRUI42CRR	32	16	16	3
Groundwater Exploitation	GRUI42EES	32			2
Intro. Integrated Water Resources Management	GRUI42WRM	16			1
Irrigation and Drainage	GRUI42IRD	32	32		3
Water Induced Disaster Risk Assessment	GRUI42WRA	16	32		2
On-site Safety Management	GRUI42SDT	32			2
Hydropower Development and Pumping Stations	GRUI42SHP	32	16	16	3
English	GRUI42LAN			32	1
French	GRUI42LFR			32	1
Intership I4	GRUI42SDE	1-2 months			2
<b>I5 S1</b>		<b>384</b>			<b>18</b>
Land Management	GRUI51LM	16	32		2
Climate Change Impacts and Adaptation	GRUI51CIA	32			2
Hydraulic Structures	GRUI51HYS	32	32	32	4
Water Resources Economics	GRUI51WRE	32			2
Cost Estimating and Contracting	GRUI51MDM	16			1
Project Management	GRUI51PLA	32			2
Multi-Disciplinary Design Project	GRUI51MDP	32	32		3
English	GRUI51LAN			32	1
French	GRUI51LFR			32	1
<b>I5 S2</b>					<b>9</b>
Internship	GRUI52SDF	3 months			9
<b>TOTAL</b>					<b>93</b>

# « Matériaux et Structures »

**Janvier 2017**

## **Introduction**

L'Institut de Technologie du Cambodge a un programme de master double diplôme avec l'INSA de Rennes. Ce programme a été mis en place depuis 2010 avec le département de Génie civil de l'ITC. D'autres départements ont programmes leurs propres masters, mais le souhait général est maintenant de mutualiser les masters entre départements.

Deux réunions ont été organisées : le 16 décembre 2016 et le 18 janvier 2017, pour étudier la faisabilité de faire évoluer la thématique du master vers « Matériaux et Structures » avec une implication plus large des départements GCI, GGG, GIM et GRU. GRU n'a pas participé aux réunions et a émis un avis défavorable sur cette participation.

Dans ce projet, on propose de développer plusieurs thématiques pouvant satisfaire les 3 départements impliqués.

### **Contexte**

Les masters organisés par département ne permettent pas un développement efficace de la recherche à l'ITC. En effet, les compétences des docteurs sont atomisées dans des départements différents, alors qu'il faudrait favoriser les regroupements. Les études d'ingénieur permettent l'apprentissage des phénomènes chimiques, physiques, mécanique des matériaux et des structures. Le master actuel GCI va orienter la recherche de fin d'étude sur des matériaux, des structures, les sols, les barrages etc. Mais d'autres départements par exemple GIM, GGG et GRU comportent des enseignements proches qui pourraient permettre aux diplômés de poursuivre leurs études dans le master GCI en l'adaptant. On propose donc de faire évoluer le master CGI en un master accessible aux étudiants de 3 départements au minimum (GGG, GIM et GCI) intitulé Master Matériaux et Structures.

### **Perspectives**

Le master "Matériaux et Structures" permettrait d'ouvrir des perspectives de développer une plateforme de recherche sur le même thème, ouverte aux étudiants et chercheurs des départements GCI, GRU, GIM, GGG.

### **1. Objectifs**

Ce projet est élaboré pour transformer le master GCI en master « matériaux et structure » à l'ITC, un master thématique qui

- conserve son originalité de double diplôme et
- permet de recruter des étudiants de GCI, GRU, GIM et GGG
- permet d'inclure dans le corps enseignant des professeurs de ces départements impliqués dans cette thématique

### **2. Principes**

En général, tous les cours et activités académiques doivent être valides par l'INSA pour pouvoir avoir le double diplôme

- a) La validation du double diplôme

La validation se fait pour

- Les UEs (Unité d'enseignement) : le contenu doit être le même et reconnu par l'INSA

- Les enseignants : tous les enseignants doivent être perfectionnés et communiquent souvent aux professeurs chargés des UE à l'INSA
- Les examens : tous les examens doivent être effectués de la manière rigoureuse (se déroulent en même temps en France et au Cambodge avec une surveillance étroite)
- Stage recherche : tous les stages de recherche doivent être co-encadrés par un enseignant local et professeur de l'INSA.
- La soutenance : le TFE doit être défendu devant le jury composé des membres de l'ITC et ceux de l'INSA.
- Le calendrier : le calendrier doit être suivi particulièrement pour les examens et les soutenances.

b) Les UE (Unité d'Enseignement) actuelles

Les UE à valider sont les suivantes :

A. 3 UE de Tronc commun

- (1) UE1 - Thermomécanique des milieux continus
- (2) UE2 - Comportement thermique et Mécanique des matériaux
- (3) UE3a - Méthodes numériques
- (4) UE3b - Méthodes expérimentales

B. UE de spécialité : Choix d'une UE au minimum

- (5) UE 4: Mécanique des matériaux fragiles
- (6) UE 5: mécanique des structures et des ouvrages
- (7) UE 6: matériaux du génie civil
- (8) UE 7: transferts de masse et de chaleur en génie civil
- (9) UE 8: milieux hétérogènes, composites et homogénéisation

C. UE optionnelles: Choix de 2 UE au maximum

- (10) UE A: Mécanique de la mise en forme
- (11) UE B: Dynamique, chocs et impacts
- (12) UE C: Caractérisation mécanique à petite échelle
- (13) UE D: Matériaux en service
- (14) UE E: Pratiques industrielles en Génie Civil
- (15) UE F: Mécanique avancée des sols et des roches
- (16) Autre :
- (17) Autre :

D. UE et éléments constitutifs supportant des épreuves : 3UE Obligatoires

- (18) Initiation à la recherche
- (19) Langue vivante
- (20) Stage

### 3. Evolution proposée vers le master "Matériaux et Structures"

a) Nouvelle liste d'UE

On propose quatre grands domaines d'application correspondant aux besoins exprimés par les départements. Pour ces 4 domaines, des profils d'UE sont proposés.

- La première colonne concerne plus particulièrement la thématique actuelle (génie civil). Il n'y a donc pas de changement.
- La seconde colonne est dédiée aux travaux de génie civil souterrains (mines). Elle correspond aux besoins spécifiques du département GGG
- La troisième colonne a une coloration matériaux et s'adresse aux étudiants des 3 départements. Les enseignants-chercheurs de GGG et de GIM pourront y intervenir.

#### Domaines d'applications et UE correspondantes

Description	Génie civil	Construction souterraine	Matériaux
UE de Tronc Commun : 3 UE			
	UE1	UE1	UE1
	UE2	UE2	UE2
	UE3a	UE3a	UE3a
UE de Specialite			
	UE6	UE6	Autre : Matériaux pour l'ingénieur ?
UE Mutualisees			
	UE F	UE F	UE A: Mécanique de la mise en forme
	Autre : Constuction mixte acier-beton	Autre : Excavation profonde et structure souterraine (Dr. Por Sopheap)	UE B: Dynamique, chocs et impacts
		Autre: Dimensionnement avancé de fondations (Dr. Por Sopheap)	

b) Validation : GIM et GGG

Les départements GIM et GGG pourront s'impliquer dans les enseignements actuels. Des missions de perfectionnement en France ou des missions d'enseignement pour perfectionner les enseignants à l'ITC sont à envisager. Les UE qui exigent le perfectionnement sont UE A, UE B, et autre (Structure souterraine). Toutes ces actions feront appel à des projets de financement AUF ou Erasmus+.

Pour résumer, l'évolution du master proposée conduit au tableau suivant :

Tableau des UE du master « Matériaux et Structures »

<b>Description</b>	<b>Nom de UE</b>
UE de Tronc Commun : 3 UEs	
1	UE1
2	UE2
3	UE3a
UE de Spécialité	
1	UE6
2	Autre: Matériaux pour l'ingénieur (GGG)
UE Mutualisées (2 choix)	
1	UE A (GIM)
2	UE B (GIM)
3	UE F (GCI)
4	Autre : Construction mixte acier-beton (GCI)
5	Autre: Excavation profonde et structure souterraine (GGG)
6	Autre: Dimensionnement avancé de fondations (GGG)

On voit dans ce tableau que les UE de tronc commun et de spécialité sont les mêmes – avec une petite modification : modifier le domaine d'application de l'UE "matériaux pour le génie civil" en "matériaux pour l'ingénierie". Le choix de UE mutualisées se fait selon l'orientation de recherche – ou de carrière professionnelle - des étudiants.

Le stage de recherche pourra se faire dans les départements GCI, GGG et GIM, dans l'attente de la création d'une Unité de Recherche transversale "Matériaux et structures". Les professeurs de 3 départements proposeront des sujets de stage à la fin du semestre I.

#### **4. Actions à mener**

Dans ce contexte il est important de valider ensemble les nouveaux cours et mettre à jour tous les cours existants.

La validation des UE peut se faire par des missions de perfectionnement (séjours d'enseignants cambodgiens en France) ou mission d'enseignement.



- a) Mise à jour des UE déjà validées
  - a. Missions d'enseignement: UE3a
  - b. Perfectionnement : UE1, UE2, UEF

La mise à jour des connaissances est nécessaire (pas de mission de perfectionnement depuis 3 ans)

b) Nouvelles UE

Missions d'enseignement et de perfectionnement: UE A, UE B et autres (Matériaux pour l'ingénieur, **Excavation profonde et structure souterraine, Dimensionnement avancé de fondations**)

Les missions concernant les UE A, UE B et structure souterraine permettront d'impliquer les 3 départements dans ce nouveau master.

c) Les moyens :

- missions-invitations de l'ambassade de France
- programmes ERASMUS + existants (Insa Rennes) ou en cours de montage.
- appui AUF aux formations doctorales
- autres sources de financement (UNESCO, Banque mondiale, ...)

**Conclusion**

Le projet d'évolution du master GCI en master "Matériaux et Structures" recueille un accord commun de GCI, GIM et GGG. On espère renforcer de cette manière la recherche dans des matériaux et de structures par des étudiants et les enseignants de ces 4 départements.

Une présentation de ce projet – avec l'appui de partenaires français du Master – est envisagée à la réunion du consortium en mars 2017.

L'étape ultérieure sera la création d'une Unité de Recherche (UR) en liens avec ces 3 départements et mobilisant collectivement leurs moyens expérimentaux. Cette UR pourra élaborer des programmes avec les partenaires français et étrangers, voire constituer des équipes internationales.

Participation : Han Virak, Bun Kimngun, Nguon Kollika, Sim Tepmony, Seang Chansopheak, Didier Lecomte.

### III.3. **Annex 3:** Strategic Plan for 2018-2022

#### **INTRODUCTION**

Since its establishment in 1964, the Institute of Technology of Cambodia has enjoyed a proud record of success and achievements in serving the country through human resources development, institutional capacity building and working intensely on the economic and infrastructure development of Cambodia. ITC has, for more than four decades, established a link between the French and English speaking networks in the region and in the world. With its numerous collaborators, administrators, students, faculty staff and alumni, this institution offers a unique multilateral context for an exchange of views with ministries, local authorities, NGOs, the private sector and partner institutions.

ITC has a mission to train students with high quality education in the fields of engineering, sciences and technologies and to develop innovative technology transfer. Students are provided with a strong scientific base and technical know-how and skills which allow their integration and evolution in the labor market.

Based on the decision of the annual board meeting, the future orientation of ITC is to expand the engineering education area and develop research platforms in order to sustain the development of the country. This requires strengthening the basic scientific knowledge, developing research programs in connection with the private sector and national and international stakeholders, supporting communities, fostering economic development through entrepreneurship programs, and to help our graduate students integrating the global economy. Ultimately, it is important for ITC to keep its own identity of a multilingual institution maintaining and expanding a network with French and English speaking universities, to provide an education that motivates teaching staff and students, stimulates creativity and inspires future ambitions, to develop an internationally recognized research in adequacy with the needs of the society.

*Dr. OM Romny, Director General, ITC*

#### **OVERALL OBJECTIVE**

**The overall objective of this strategic plan is for ITC to become one among the best Higher Education Institutions in ASEAN countries, leading in Science Technology and Engineering by increasing human capital – both students and faculty members - in all engineering fields relevant to the Cambodian economy and fill the technical gap within other regional economies by strengthening research and innovation capacity in STEM.**

Between the academic years 2005/2006 and 2015/2016, the number of students in engineering at the Institute of Technology of Cambodia was multiplied by 5 (from 700 to 3500). In spite of this important increase, the number of technicians, engineers and scientists is still insufficient for Cambodia's development.

Therefore, ITC must increase the number of students with qualifications for the most demanding sectors of Cambodia : civil engineering, manufacturing and processes, energy, water and environmental utilities, health, food and beverages.

ITC must also support the development of new activities in manufacturing (electronics, automotive, ...) the sustainable exploitation of natural resources, the development of the agri-food industry and information and communication technologies.

Although ITC is already the leading Higher Education Institution in Cambodia, the gap with institutions in developed countries reflects the lack of High Tech companies established in Cambodia. To fill this gap, not only the present needs of the economical sector should be met, but the higher education institutions should anticipate the development of **high technology industrial activities**, the expectations **to produce and consume safe and high quality agricultural products**, the integration of **local and global environmental issues** in all aspects of economy, the huge expected development of **information technologies** in all economic areas (including education, health and tourism and agriculture).

Six specific objectives will have to be reached in order to achieve this overall goal.

- To improve the governance model of ITC;
- To contribute to the development of Cambodia by increasing the number of technicians and engineers in relevant areas and bringing support and assistance to the development of STEM in partner universities;
- To become a leading institution for Research and Innovation in the ASEAN;
- To train engineers to innovation and entrepreneurship in order to create high skilled jobs and answer to future challenges of the Cambodian economy;
- To ensure access to high-range information technology;
- To make ITC a model for social and environmental responsibility.

## **SPECIFIC OBJECTIVES & EXPECTED RESULTS & ACTIVITIES**

### **1. Specific Objective 1: To improve the governance model of ITC**

#### **Result 1.1: ITC is improving its autonomy**

Although the decisions concerning the university's autonomy depend mainly on the RGC university policy, ITC will develop original models in the 4 domains of university: organizational, financial, staff recruitment, academic programs.

*Activity 1.1.1: ITC implements **original and efficient models** to increase its autonomy :*

The **key challenges related to ITC's autonomy** are:

reinforcing its Consortium of supporting foreign universities in order to improve the academic policy and advise the Direction Board on the development of Research and Innovation.

using fundraising as a lever to increase funding for research and innovation and manage these funds in an autonomous way

finding a sustainable business model which allows expansion of the number of graduates and a high international ranking but preserves the ITC tradition of a university open to the poorest students.

recruiting and providing decent salaries to high potential academic staff

developing relevant academic programs with respect to Cambodian needs

adopting a quality assessment policy and obtaining official accreditation from an independent institution

**Result 1.2: ITC has adopted a new organization in order to adapt to the new challenges faced by its growth**

In order to train an increasing number of engineers for the Cambodian economy, the ITC organization model must evolve with the creation of faculties, the development of a Post-Graduate (Doctoral) School and the development of a Research and Innovation Center.

*Activity 1.2.1: the Institute of Technology of Cambodia is organized according to the Royal Sub-decree of March 17<sup>th</sup>, 2015*

The ITC is organized in Faculties, a Doctoral School and a Research and Innovation Center.

*Activity 1.2.2: The Doctoral School (governance, staff, regulations) is designed to work closely with Universities in Cambodia for the development of Science and Technology, Engineering and Architecture.*

The implementation of the Doctoral School is based on the Sub-Decree No.151 ANKr.BK. of the Royal Government of Cambodia dated on October 06, 2010 And the Prakas No. 2914 AYK.BrK of MOEYS dated on July 23,2012. It will also take into account the will of the MOEYS to support the development of one single Doctoral School in Science, Technology and Architecture led by ITC.

*Activity 1.2.3 : Several Research Units and an Incubator are implemented in the Research and Innovation Center.*

Strategic development of Research can only be achieved if the objectives are clear, with specific structures, material and human resources being dedicated to these objectives. Therefore, the Research and Innovation Center will incorporate Research Units aiming to address important issues for the Cambodian economy – with an ambition to incorporate researchers from partner universities in Cambodia or among the consortium partners. These Research Units will be composed of research groups with more specific goals and tasks.

**Result 1.3: ITC has adopted new teaching methods**

The teaching model developed at ITC in the 1990s is obsolete. Before 1995, access to science was limited due to language barriers, prices and scarceness of books. The students spent a lot of time in class with the teachers and the teaching method was based on face-to-face knowledge transfer with a large theoretical base. Research was restricted to Western countries and only for Postgraduates students. Soft skills in Engineering Schools were limited to language and Work Laws basic elements. Twenty years later, access to knowledge is easily provided by online courses, MOOC and e-books. Electronic journals provide an updated information of Research frontier developments with no restriction.

The increasing number of students in Cambodia requires to implement a new model of teaching methods taking this evolution into account

To operate this change, three major (r)evolutions are required at ITC:

- the language proficiency: most of the scientific information on the Internet is in English. English has become the language of communication between scientists. Important efforts must be made to give ITC students professional proficiencies in English. Because ITC is one of the few places in SE Asia where students have the opportunity to master 2 European languages (English and French), the proficiency in French must also developed to reinforce this open mindedness and flexibility of ITC students.

- the access to information should be facilitated : ITC must ensure high speed internet and free access to electronic journals for all students

- the number of teaching hours face-to face is reduced in order to encourage creativity and personal development and allow students to spend more time on team or project based work,

#### *Activity 1.3.1: Implementation of a new language policy*

A new language education policy is implemented in order to:

- provide high standards foreign language to ITC students to give them access to an international environment: research, mobility, internships, exchange programs, international corporations, ...

- increase the international visibility of the institution

- promote multilingualism and reinforce French and English as languages of learning and teaching at the ITC.

#### *Activity 1.3.2: E-learning, online education and MOOC are used intensively at ITC*

The development of online education in the E-learning center of ITC is not only a support to ITC students. It is also a support to partner universities. Therefore courses in Khmer are to be developed as well as courses in English or French.

#### *Activity 1.3.3 : The weekly presence in class of students is reduced to 24 hours.*

The increase of the number of students and the evolution of technology for the past 20 years have changed the way students learn: more lab and practical; more personal and team work in research or innovation projects; more communication and soft skills. This change in education requires to decreasing the number of hours in class.

**Result 1.4: a new policy for the recruitment of highly qualified faculty members is defined and applied**

*Activity 1.4.1: new categories of teaching and research staff are appointed at ITC:*

The status of Lecturer, Assistant Professor, Associate Professor and Full Professor will be clearly defined, with a specific salary policy that valorizes qualifications and competences.

*Activity 1.4.2: an official document stating the qualification and evaluation criteria will be adopted.*

The qualifications criteria, composition of evaluation committees and selections procedures are defined for the recruitments to the positions of Lecturer, Assistant Professors, Associate Professors, Professors at ITC.

**Result 1.5: a quality assessment policy is implemented**

*Activity 1.5.1: ITC implements a self-assessment of the quality of its training programs: bachelor (engineer) and masters in 2017.*

To assess the quality of its program, ITC will adapt the self-assessment methodology developed by AUF in 2016.

*Activity 1.5.2: ITC implements a quality assessment procedure*

The procedure will be based on the recommendations of AUF, addressing the following points:

- Assessment of the training programs in their environment: academic, economical, ...
- Detailed content of the teaching programs, including language policy
- Enrollment and follow up of students and graduates
- Monitoring of the training programs: quantitative and qualitative
- Adequacy of human and material resources; communication policy

**2. Specific Objective 2: To contribute to the development of Cambodia by increasing the number of technicians and engineers in relevant areas and bringing support and assistance to the development of STEM in partner universities;**

The development of Special Economic Zones has enabled to set up manufacturing activities in automotive and machinery, electrics and electronics, and other various assembly activities including the garment industry. Although these activities are cheap labor intensive, they will require more and more engineers to develop and adapt.

But the RGC, with its Cambodia Industrial Development Policy (2015-2025) points out the needs to develop small & medium enterprises, with the necessary development of skilled human resources, technician and engineers.

Among them, the agricultural sector employs a large majority of Cambodian workers but has a lack of qualified mid-management for post-harvest technologies and the food industry.

The Ministry of Education, Youth and Sports emphasizes the role of ITC as a flagship for the development of education in Science, Technology and Engineering in Cambodian Universities.

Therefore, ITC shall increase the number of students to fill these gaps. The university will improve and modernize the campus facilities, develop new campuses and support the development of technology and engineering by building capacities of partner universities in the provinces.

**Result 2.1: ITC brings an important contribution to the increase of well trained engineers for the benefit of Cambodian development.**

*Activity 2.1.1: ITC develops new engineering curricula*

It is the task of ITC to investigate new developments of Science, Technology and Engineering in connection with the development of new industrial sectors in Cambodia.

Some activities related to the Cambodian economy are not fully covered by ITC engineering studies and will be examined in order to develop new courses and new curricula. For example, industrial engineering applied to manufacturing, transport or logistics, engineering for health and pharmaceuticals, and engineering for sustainable urban development.

Some areas are only partly covered such Solid waste, Water and air Treatment Engineering and should be better addressed in the existing curricula. With the development of data acquisition systems (including smartphones) and the enormous capacity of Data storage devices, Data Analysis should be taught at bachelor and master levels.

It will be necessary, within the next 5 years, to investigate the needs for new curricula in bioengineering, material sciences and engineering, urban development and logistics.

*Activity 2.1.2: ITC support services (library and technical service) are developed*

Through capacity building (training and increasing the number of related staff), ITC bring to students and staff good quality services

- library and access to scientific databases to all students.
- full technical support and maintenance of scientific equipment for practical and research labs

*Activity 2.1.3: ITC brings its expertise to 2 universities in Cambodia (University of Battambang and University of Svay Rieng) for the development of STEM programs.*

The development of Special Economic Zones near the borders of Vietnam and Thailand in the provinces of Svay Rieng, Pursat and Banteay Meanchey has enabled to set up manufacturing activities in automotive and machinery, electrics and electronics, and other various assembly activities including the garment industry. Although these activities are labor intensive, they will require more and more technicians or engineers who can design the production lines of factories,

manage the supply chains of raw materials and goods, manage energy use as well as environmental, hygiene and safety programs.

To fill these gaps, capacity building programs need to be developed locally. The University of Battambang (UBB) and The Svay Rieng University (SRU) are the target universities that will supply the STEM human resources for industrial development in the North-western and the South-Eastern areas in Cambodia. However the STEM education is not yet established and these universities have a lack of lecturers. ITC will provide long term training for UBB and SRU lecturers to pursue master and doctoral degrees.

Efforts will be made to provide online-courses and e-books both in English and Khmer to bring a high level of scientific and technical books to Cambodian students from the provinces less exposed to international contacts.

*Activity 2.1.4: ITC is supported by the MOEYS and develops partnerships with donors, industry and NGOs to increase the number of scholarships and fellowships for undergraduate students coming from the Provinces.*

The increase of the number of students is accompanied by a policy of scholarships and fellowships towards .

This policy is intended to maintain and increase the number of students coming from the provinces. These students, when graduated, are more likely to contribute to the economy of their province of origin, either by pursuing an academic carrier in a local University, by working as engineer and mid-management staff in the special economic zones or being an entrepreneur in their home town.

## **Result 2.2: Two new campuses are developed.**

The Phnom Penh campus is too small to accept more students. Therefore the development of a new campus in Kampong Cham was decided. This new development of ITC is aimed at:

- increasing the number of students in foundation year
- developing curricula in the agri-food sector,

A second campus is also in project in Phnom Penh.

*Activity 2.2.1: ITC designs and build a new campus in Kampong Cham*

The new Campus will be located on an area of *1ha* of land close to the center of Kampong Cham

*Activity 2.2.2: ITC implements a training center in the agrifood sector*

The new campus will have specific facilities for training technicians and engineers on post-harvest technologies and food technologies (food processing, conservation and packaging).

*Activity 2.2.3: ITC recruits new teachers and opens new classes for the Foundation Year.*



*Activity 2.2.4: ITC designs and build a new campus in Phnom Penh*

**Result 2.3: The Doctoral school of ITC is fully operational**

The development of a Doctoral School in Science, Technology and Engineering is a challenge both for ITC and the Higher Education System in Cambodia.

The Doctoral School will run specific programs for graduate students enrolled in Master and PhD studies from Cambodian Universities involved in Science, Engineering and Technology.

The objective of the Doctoral School is to train qualified scientists and engineers bringing them additional skills such as:

- cross-disciplinary engineering and scientific skills. For example to address energy issues in industry, an electrical engineer will need to address new areas of science and engineering such as waste and biomass conversion into energy, hydraulics and fluid mechanics.
- a deeper knowledge of mathematics, probability and statistics
- a general culture on environmental issues : climate change, biodiversity, industrial ecology
- a solid background in soft skills : communication skills, project management, team work, leadership.

And for those wishing to follow a carrier of scientific research :

- bibliographical search, research methodology, research ethics, good laboratory practice as well as the ability to write scientific paper and reports in correct English.

The graduate students (Master and PhD) will expected to address difficult issues such as:

- measure, compute and analyze a huge amount of information and use this information to take decisions under multiple constraints: technical, economical, financial, environmental, social,...
- run complex systems : networks, factories, supply chains, cities, harbors, healthcare systems...
- develop original research activities in connection with Cambodian needs, working in a team in an international environment.

*Activity 2.3.1: The Doctoral School is implemented in partnership with STEM universities in Cambodia.*

This activity necessitates to detail, in agreement with the MOEYS:

- the core program i.e the teaching program common to all Master and PhD programs within the Doctoral School
- the governance rules of the Doctoral School

*Activity 2.3.2: The enrollment of Doctoral students is engaged with strong international partnership and students spend a significant time of their Doctoral studies at ITC (sandwich or cotutelle theses)*

In order to build research capacity at ITC, a significant number of PhD students will achieve part of their research works at ITC in designated Research Units, in collaboration with foreign partners (Belgium, France, Japan, ... )

*Activity 2.3.3: ITC runs a quality assessment program of the Doctoral School.*

In agreement with all partner universities, belonging to the Doctoral School will commit partner universities into a quality approach:

- an assessment of the Master and PhD programs in their environment: academic, economical, ...
- a detailed description of the teaching programs, including language policy, student evaluation.
- a detailed procedure enrollment and follow up of students and graduates as well as the communication policy
- an annual monitoring of the training programs: quantitative and qualitative
- an assessment of the adequacy of human and material resources;

#### **Result 2.4: ITC has reformed Master programs in the Doctoral School**

The reform of Master's programs at the ITC aims to open up new horizons for students holding a Bachelor's degree in Science, Technology or Engineering

- by giving a broader general education focused on Cambodian and regional needs
- by mixing the students population (mixing between departments and different universities of origin) to learn how to collaborate (mutualisation of resources).
- by addressing complex problems to find appropriate solutions through the problem / project approach.
- by introducing students to research issues, methodology and writing of scientific articles

*Activity 2.4.1: The 6 current master programs are assessed.*

The ITC offered graduate programs (now managed by the Doctoral School) since 2010 with the creation of masters in 6 departments. This program has received support from the AUF, France (FSP) and Belgium (ARES-CCD Walloon cooperation program).

Until 2016, the master programs give not full satisfaction. Indeed, of the 6 masters, 4 took place during the evening or the weekend, and only two were done during the day. Yet, after the change in full day programs for the 6 masters – at the intake 2016 -, the number of students enrolled is still low and the drop-out rates are high. One reason for this failure is the small added value of the "technological" master's degree compared to the engineering training. The other reason is the competition with Masters programs abroad with a lot of scholarships being awarded to Cambodian undergraduate students.

The assessment of the current master programs will allow to take decision to maintain, evolve or drop the current master programs.

Evolution of the programs should therefore implicate more versatility in the topics, more mixing between departments, more connections with the Cambodian needs.

*Activity 2.4.2: New model master programs are developed in conjunction with Cambodian needs and Research topics at ITC*

The new Master programs will follow multidisciplinary areas:

- Sustainable Water and Resources Management (GCA, GRU, GGG)
- Energy Engineering and Management (GCA, GIM, GEE, GGG)
- Applied Statistics, Data Sciences and Modeling (all departments)
- Digital Technologies, Embedded Systems and Robotics (GEE, GIM, GIC)
- Material Sciences and Structure (GCI, GIM, GGG)
- etc.

This multidisciplinary approach would give an advantage to engineers trained with a master's degree in order to move to new areas, both in research and in professional fields.

Groups composed of faculty from all departments are formed to elaborate the content of the future master programs in connection with the future Research Units and needs of the Cambodian economy. Strong connections between the different master programs will be established:

- with a strong methodological core
- with blocks of teaching units that will be common to the different masters
- with a number of elective courses that will be accessible to all master students.

*Activity 2.4.2: The new master programs are implemented*

Discussions are engaged with partner universities of the consortium in France, Belgium, Japan, Thailand, ... in order to developed co-diplomas and support the creation of Joint Research Units. The new master programs will benefit from a strong communication support.

**Specific Objective 3: to become a leading institution for Research and Innovation in the ASEAN;**

Modern research needs researchers of different backgrounds working in a collaborative way. But until now, research projects at ITC were developed within teaching departments with little interaction between researchers, which is not optimal for the development of a research with high international standards. Therefore to improve and develop Research at ITC, the challenges to be met in the following years are:

- to introduce Research and Innovation at undergraduate level to attract the best students in the Doctoral school
- to develop a research strategy at ITC and organize researchers in Research Units, with strong international connections
- to work closely with MEYS and donors to implement research funding schemes and valorize local expertise

**Result 3.1: Laboratory Based Education is implemented to train undergraduate students to research and innovation**

ITC is willing to introduce Laboratory Based Education (LBE) in order to simultaneously enhance research and education. LBE, promoted by Japanese Universities of the consortium, consists of introducing research at undergraduate level. Engineering students work in team led by a Master student and supervised by a PhD holder. A convenient space is arranged for LBE implementation at ITC. The involvement of undergraduate students allows an effective use of laboratory equipment and also strengthening the linkage between university and industries. Students spend less time to general teaching in class, tutorials, lab sessions... and the increase of knowledge is driven by curiosity, personal search and team work.

*Activity 3.1.1: LBE is implemented in 4 engineering departments at ITC*

The experience is initiated with 4 departments: GIM, GEE, GGG and GIC.

*Activity 3.1.2: Lecturers from UBB and SRU trained at ITC with LBE.*

Lecturers from partner universities are selected as master's/doctoral students of ITC, participate in LBE model teams and produce master's theses/dissertations based on the research outputs.

*Activity 3.1.3: The sustainability of LBE is assessed.*

To run LBE, especially when using expensive equipment, needs important funding for consumables, maintenance and repair. Therefore an economic model has to be developed with industrial partners and donors to make the process sustainable.

**Result 3.2: Research at ITC is organized in Research Units**

The proposed organization in Research Units (R.U.) will create clusters of individual PhD holders. R.U. will have strong links with external stakeholders both in Cambodia and in partner countries. In order to transform Research Units into International Joint Research Units, partnership with foreign institutions are a priority.

Research units:

- are strongly connected to the Doctoral School : masters and PhD programs
- allow to mutualize high tech equipment
- may incorporate researchers from Cambodian and foreign institutions (e.g for France: IRD, CNRS, CIRAD, ... ) for short or long periods
- include human resources from all departments
- have a strong international visibility
- can apply for grants at international level
- are eligible for joint structures with partners

Furthermore, international partnership will encourage faculty staff for doctoral or post-doctoral positions in the laboratories of national and international partners.

The number of Research Units should be small. A straightforward analysis of on going projects at ITC in 2016 shows that the area of **Water and Environmental Science and Engineering** covers an important number of existing projects at ITC.

- Water resources management
- Waste and drinking water treatment
- Solid waste processes/management

Therefore the creation of a Research Unit in Water and Environmental Science and Engineering is a high priority for ITC, because it will stimulate team work and creativity by putting together a non negligible number of researchers already involved in a number of activities connected to this field.

Other Research Units will be created. Although not definitive, the mentioned topics reflect the tendency to cluster competences:

- **Food technology, food safety and nutrition**
- **Energy engineering and management**
- **Information Technology, mechatronics and robotics**
- **Materials and structures**
- ...

Among these Research Units, it is expected to set-up research clusters with international partners. The Research Units will be thus International Joint Research Units.

Such a cluster already exists. The "Cambodian Connected Renewable Energy Center" was set up in 2016 between INP Toulouse and the Department GEE at ITC which would be part of the future Energy Engineering and Management Research Unit. Other groups are likely to develop as an IT group focused on epidemiology and health (with Institut Pasteur du Cambodge and IRD), a Nutrition group (with CIRAD and IRD), or a food technology group (with CIRAD).

*Activity 3.2.1: ITC will redefine the role of the international consortium to match the needs of Cambodia in Engineering Research and the necessary constraints of research: available resources and funding.*

Creating Research Units is a complex process, which requires evaluating :

- the needs of Research for Cambodia in Science Technology and Engineering
- the ITC assets such as scientific partnerships, human resources and available equipment to implement high quality research in a reasonable time (it is known that a good researcher needs 3 to 5 years training).
- the funding possibilities: international funding focuses on global issues like environmental protection or food safety. It is clear that funding High Technology research with international aid will never happen. This kind of research is relevant of a government's policy. The dependence on international funding therefore shows the limits of Project Based funding.

This assessment work will be done by highly qualified scientists with a wide spectrum of competences. This is a new role for the ITC consortium: to advise ITC Directorate board on the foundation of the future Research Units

The Scientific Council will evaluate the strength and weaknesses of Research at ITC and formulate an advice on the Research Strategy.

*Activity 3.2.2: A call for collaboration with International Universities is launched for the creation of International Joint Research Units (top down approach)*

The ITC board will mobilize funds (donors, MOEYS, ) in order to impulse the creation of International Joint Research Units. The level of funding is high (150-500 k\$/year)

The best way and the fastest way to implement internationally recognized research is to engage partnerships at international levels with foreign researchers full –time based at ITC.

ITC will launch a call in the direction of the Consortium Universities to support the creation of International Joint Research Units.

### **Result 3.3: Research activity is increased significantly**

The

*Activity 3.3.1: ITC engages a new policy of publication*

ITC is engaged in a policy of publication and dissemination of research results through:

- organizing international conferences under the auspices of International Scientific Societies
- training researchers to scientific writing and communication
- rewarding researchers and teachers-researchers when they have a publication accepted in a peer-review journal

*Activity 3.3.2: Calls for Research Projects are launched in the direction of PhD holders at ITC (bottom up approach)*

The ITC board mobilizes funds (donors, MOEYS, ... ) in order to launch research projects towards the small community of PhD holders at ITC. The level of funding is small (10 k\$/year).

The projects are assessed in 2 ways:

- scientific value: is the project compatible with international standards with high potential of ISI publication ?
- sustainability for Cambodia: how the project when completed can add value to Cambodia's economy, science or technology ?

The call is launched every year with a competitive scheme. Scientific values of the projects are assessed by external referees.

*Activity 3.3.3: Researchers are trained to apply for International Funding and manage Research projects*

Modern Research largely depends on the ability of researchers to be successful in their applications to International calls. Therefore, researchers need to be trained to write proposals and apply to international research funding schemes. They should also develop skills on planning, project management, and report writing

They are assisted by a Research Project specialist having a good knowledge of accounting rules and with experience / training in the Research Funding Environment.

**Specific Objective 4: To train engineering students to innovation and entrepreneurship**

To be aware of the possibilities of entrepreneurship, students need to be involved very early in their studies in collaborations with start-up companies, participate to training programs on leadership, technology development, hackathons, or international technical contests

The present education model at ITC, leaves little space to personal development. Students need more time for practicing activities such as:

- project based learning
- soft skills
- initiation to research (LBE)
- the development of personal projects : social or environmental involvement on the Campus, participation to junior enterprises.

Therefore the development of innovation and entrepreneurship at ITC is strongly dependent on the change on the education model, with more e-learning activities, more practical study, more personal development, less class courses.

**Result 4.1: ITC students are creative technology users**

*Activity 4.1.1: ITC students do more practical training in Foundation Year*

The "Foundation Year", actually 2 years, offer basic courses in science (mathematics and physics), languages (French and English). High scores are required to enter at ITC and the competition is hard.

To encourage students to address technical issues, the practice of physics and applied mathematics is enhanced with increasing lab work and project based learning.

*Activity 4.1.2: ITC is opening a 4R- FabLab and a program of "Learning By Doing"*

A program of "learning by doing" supported by specific equipment, and in particular, the set-up of a Campus Fab Lab open to all students and run by the students.

Several departments have initiated studies – including research work – on the concept of Recycling in the Cambodian context. Therefore the 4R concept Reduce-Reuse-Recycle-Recover will be used in the development of this specific Fab Lab, which will cover:

- plastics
- electricity , electronic and communication equipment
- inorganic solid waste
- organic solid waste and biomass by-products

*Activity 4.1.3: Technical platforms are set-up with Industrial Partners*

The development of technology-based platforms allows to bring sophisticated equipment, software and skills to students and researchers. To prevent obsolescence, such platforms are necessarily based on a public-private partnership.

The deal with the companies are the following

To ITC, the company brings its expertise at the cutting edge of technology (equipment, processes, analytical instruments, software) and is involved in ITC teaching and research programs in various forms:

- introductory seminars presenting the company,
- technical visits and implementation of demonstration equipment,
- training of staff and students with equipment, processes or high-tech software
- tutoring realistic and original technical projects
- offering and tutoring Internship in the company or in the competency center

To the company, ITC provides a high level scientific environment:

- Bachelor and Master programs with a broad scientific knowledge and management skills
- Potential employees with a sound technical background and good language skills
- a collaborative workplace where multidisciplinary projects can be initiated and developed

These platforms are fully compatible with the LBE.

**Result 4.2: The Industry Linkage Unit between ITC and the professional sector works efficiently in the following areas: continuing education, professional integration and service delivery.**

*Activity 4.2.1 Events are organized in collaboration with industries and especially SMEs in Cambodia*

- ITC-Industries consortium annual meeting to show service attendance, Research and Development opportunities and questionnaire on the quality of training.
- Invite partner companies to visit ITC facilities and identify possibilities of collaboration.
- Arrange visits (at least three per year) of the department teaching staff to discuss about possible research collaboration.
- Update the directory of ITC expertise with human resources, services and equipment

*Activity 4.2.2 Joint programs are developed with partners companies in continuing education*



### *Activity 4.2.3 Alumni are mobilized for ITC*

ITC follows up and mobilizes alumni:

- updated data base;
- financial support to the alumni association;
- organization of events with alumni of different departments;
- a complete follow-up of the young graduate placements with an annual survey

### **Result 4.3: ITC has developed a culture of entrepreneurship**

#### *Activity 4.3.1: ITC has opened of a Junior Enterprise Program*

ITC, in order to prepare the students to enter the business world, will set up a “Junior Enterprise” Program, within which junior enterprises respond to request for tender and execute related works, with compensation and assistance by ITC teachers.

#### *Activity 4.3.2: ITC has developed its own Incubator*

Based on the FabLab, LBE practice and the development of Technological Platforms with companies, students are familiar with a technical environment. Their creativity is enhanced and they can work in a team for solving problems.

After obtaining their degree, engineers who want to create a business based on innovation can apply to the Incubator. The Incubator will be supported by experienced partners in accompanying startup companies.

The Incubator has 3 missions:

- Training project initiators through seminars, participation to competitions, serious games, problem solving... This training will be organized by international partners (University, companies, consultant, ...)

- Support technical development of a product/ process/service in a pre-incubator

Projects holders will have access to the technical environment of ITC (workshop, computer rooms, FabLab, Technological Platforms) in order to design, make prototypes. The duration of the support would not exceed 2 years, depending on the nature of the project. Technical development will lead to a proof of concept for

- Support Incubation : networking with specialists, business plan planning, fund raising, ...

### **Result 4.4: ITC has developed a partnership with a National/International University for the development of a Master program "Business and leadership for Engineers".**

#### *Activity 4.4.1: ITC develops a curriculum in "Business and leadership for Engineers"*

The curriculum takes advantage of :

- the specific abilities of ITC engineers in mathematics, project based education, technical skills
- the competences brought by its partner university on : leadership, team work, law (business and intellectual property), management, marketing, quality management...
- a strong focus will be carried on entrepreneurship

*Activity 4.4.2: ITC has started a Master program opened to Cambodian Engineers*

The master program is opened in week-ends and/or evening to Engineers working in their companies.

**Specific Objective 5: To ensure access to high-range information technology**

Modern Higher Education Institutions, like the whole society itself, rely on information technology at every level of decision. Therefore, the management of information at ITC should be fully digitally supported. This includes:

- administration,
- human resources,
- accounting,
- teaching and pedagogy,
- academic records,
- library,
- research,
- internal and external communication;
- records and quality assessment;
- etc.

**Result 5.1: The information system at ITC is 100% computerized**

*Activity 5.1.1: A Higher Education Information System is chosen*

Based on a benchmarking on existing solutions in the context of ASEAN countries, a Higher Education information system is chosen to manage information at ITC

*Activity 5.1.2: The material and human resources of the IT service are increased*

The material and human resources are increased and the IT service is organized in order to support the implementation of computerized management tools.

*Activity 5.1.3: Capacity building is developed for the training of the ITC staff*

Training of the personnel includes :

- Information Technology staff for the implementation of the HE information system
- ITC end-users (training of trainers)

## **Result 5.2: High speed Internet and full access to Information for all**

ITC provides high speed Internet to all students

*Activity 5.2.1: ITC install high speed Internet*

Accessibility is insured through:

- WIFI everywhere with
- dedicated and casual working spaces outside and inside the buildings

*Activity 5.2.2: Information is made accessible to students and staff*

All information related to academic affairs, programs, timetables, important events, are shared through the Intranet with students and staff.

### **3. Specific Objective 6: To make ITC a model for social and environmental responsibility**

The educational role of ITC is not limited to Science, Technology and Engineering. ITC must also be a model for sustainability:

- students from minorities (gender, disability, ethnic minorities) should feel at home at ITC as well as the mainstream students.
- students with diverse professional goals should know how they can use their knowledge and skills to bring to their future companies, administrations, colleagues a clear vision of the ethic, social and environmental challenges that the world is facing, and Cambodia in particular. This young generation must carry a radical change, which means that technical challenges must also match with sustainability challenges.

### **Result 6.1 ITC pays a special attention to support women, disabled persons and ethnic minorities**

The development of a policy to support women, disabled persons and ethnic minorities must be clearly illustrated by concrete commitments such as the promotion of applicants, the necessary adaptation of buildings and the development of a scholarship program.

*Activity 6.1.1: ITC cooperates with NGO to increase the recruitment of female students, and students with disabilities, students from ethnic minorities.*

*Activity 6.1.2: ITC adapt its structures and new buildings to the specific needs of female students and students with disabilities*

*Activity 6.1.3: ITC engages a Scholarship program to support the living of female students, students with disabilities and students from ethnic minorities.*

### **Result 6.2: ITC has a strong focus on Education for Sustainability**

The program raises students and staff consciousness on sustainability issues.

*Activity 6.2.1: An educational program for staff and students is launched*

- Education on Health, Sustainability Issues is encouraged (students credits, continuous education for academics and non-academics)
- Awards, labels and prizes are encouraged (healthy behavior, environmental consciousness...)
- Collaborations with NGOs is encouraged

**Result 6.3: ITC has organized sustainable campuses**

*Activity 6.3.1: A continuous assessment of ITC campus sustainability is made*

The sustainability of the ITC is analyzed through Life Cycle Assessment tools, with

- Greenhouse gas emissions (fuel and electricity consumption, activity impact...)
- Health assessment of the population of students

*Activity 6.3.2: ITC has an Integrated Waste Recycling Policy*

The Waste Recycling Policy is focused primarily on

- Household waste into fertilizers
- Plastics recovery and valorization

The 4R-Fab Lab is also an educational tool to promote waste recycling in ITC.

*Activity 6.3.3: ITC cuts its energy consumption and produces its own energy from renewable sources:*

- Energy consumption cuts (% to be monitored) using environment friendly devices for air-conditioning; building design (new buildings), green materials.
- Tree plantation (CO2 sequestration and building shading)
- Photovoltaic plant design and construction