



INSTITUTE OF TECHNOLOGY OF CAMBODIA

CONSORTIUM MEETING INTERNATIONAL SUPPORT

PERSPECTIVE & STRATEGY 2023-2024



22-23 March 2023

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1 INTRODUCTION

Since its establishment in 1964, the Institute of Technology of Cambodia (ITC) has received greater recognition for its successes 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, for more than four decades, has established a link between the French and English-speaking networks in the region and in the world. With its numerous collaborators, administrators, students, faculty staffs and alumni, this institution offers a unique multilateral context for an exchange of views with ministries, local authorities, NGOs, the private sectors 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 sectors and national and international stakeholders, supporting communities, fostering economic development through entrepreneurship programs, and helping 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 staffs and students, stimulates creativities and inspires future ambitions, and to develop an internationally recognized research in adequacy with the needs of the society.

The vision of Institute has been set out based on the Rectangular Strategy Phase 4 of the Royal Government of the 6th legislative term of the National Assembly **“to improve work, equity and effectiveness, to form a basis towards achievement of Cambodia’s Vision for 2050”**.

2 PERSPECTIVE AND STRATEGIES

2.1 Perspectives

To become a leading institution with efficiency and excellence offering the academic, research, science, technology, innovation and engineering in technology transfer to the community.

ITC has adopted the new Strategic Plan (2021-2030) based on the Rectangular Strategy (Phase IV) of the government together with the National Strategic Development Plan (2019-2023). This Strategic Plan will provide directions for effective implementation of the Action Plans and address the challenges in order to improve the engineering education quality in a competitive environment.

Two main objectives of ITC Strategic Plan (2021-2030) to be reached by 2030 are as follows:

- 1- To train 17200 students with high qualification towards the Cambodia Vision 2030
- 2- To implement 175 applied projects with technology transfer and start-up for harmonization and development towards the Cambodia Vision 2030

2.2 Strategy of ITC

ITC has developed 5 main strategies to meet the 10 year objectives as follows:

- 1- Establish and apply academic program responding to the market needs with national and international recognition
- 2- Develop human resources and modernize technology for good governance, management and financial affairs
- 3- Develop physical infrastructure and modernize the laboratories
- 4- Establish the investment projects and applied research projects targeting to start-up and technology transfer
- 5- Modernize the data information system for dissemination of activities and results to the communities

2.3 Result Framework

The Result Framework for 10 Years: 2021 to 2030-Institutional Level is presented in Table 1.

Table 1: Result Framework for 10 Years: 2021 to 2030-Institutional (Institute) Level

Indicators	-	Basis	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
1. Number of students graduated from national program with minimum quality standard	Admitted postgraduate students	0	0	0	20	100	180	260	340	440	540	640	640
	Graduated postgraduate students	0	0	0	0	18	90	162	234	306	396	486	486
	Admitted engineers students	0	0	140	1180	3760	6600	8090	9690	11450	13270	15090	15090
	Graduated engineering students	0	0	0	0	126	1070	3497	6138	7524	9012	10649	10649
	Admitted technical students	0	0	150	800	1500	2200	2900	3600	4300	5000	5700	5700
	Graduated technical students	0	0	0	135	731	1395	2046	2697	3348	3999	4650	4650
2. Number of students graduated from international program	Admitted postgraduate students	0	0	0	30	80	130	220	310	400	490	580	580
	Graduated postgraduate students	0	0	0	0	27	76	124	209	295	380	466	466
	Admitted engineers students	0	0	0	25	75	230	460	690	1000	1360	1720	1720
	Graduated engineering students	0	0	0	0	0	23	70	213	435	656	950	950

3. Number of Research Studies in connection with development		62	83	93	103	108	114	121	129	137	145	153	153
4. Number of Research Studies on Technology Transfer		0	0	0	0	0	0	0	2	2	2	4	4
5. Number of Business Startup Projects		0	0	0	0	0	4	4	8	11	14	18	18
6. Number of international programs		0	0	0	1	2	7	9	9	14	15	15	15
7. Number of national programs with minimum quality standard		0	0	2	13	15	18	19	22	24	25	25	25
8. Number of students who have received middle income (at least five times of unskilled workers' salaries)		0	0	0	0	62	385	1089	1925	2487	3083	3753	3753
9. Number of Center of Excellence		0	0	0	0	1	1	2	2	3	3	4	4
10. Number of publication of international scientific articles		39	59	84	109	139	169	204	239	279	319	359	359

3 OVERALL PROGRESS OF PERSPECTIVES 2022-2023

In the academic year 2022-2023, ITC proposed 18 main activities in total, in which 6 activities for modification and improvement of engineering programs, 4 activities for curriculum updating of graduate programs, 2 activities for establishment of international programs (pre-degree foundation program and civil engineering), 3 activities for establishment of center/platform, 1 for implanting all research projects, and 2 for capacity building of ITC staffs. As results, 10 main activities (engineering and graduate programs) were completed within the academic year. All necessary documents for international program of pre-degree foundation were technically prepared but, however, this program could be implemented from academic year of 2023-2024. For the international program of civil engineering, most of documents are prepared but some modifications are required such as name of the program and its enrollment criteria. The 3 proposed centers are not aimed to complete by 2023 and ton of preparation is

needed especially on financial support. 84 research projects in total were implementing from all 5 research units. 25 of them are completed and other 59 projects are continued implementing in 2023-2024. All capacity building on T&L and research skill, both inbound and outbound, of ITC staffs were completed within the schedule. Summary of the progress activities is illustrated in Table 2.

Table 2: Overall progress of the proposed activities in perspective 2022-2023

No.	Main activities proposed in 2022-2023	Unit	# Proposed	# Achieved by Feb 2023	Status
I	Revision/Establishment of Engineering Programs				
1	Curriculum revision of GGG (revision of 2 courses for I3 and 5 courses for I4)	Program	1	1	Completed
2	Curriculum revision of GIC: total course revision = 21 (revision of course name and duration=13; new course=7; remove course=1)	Program	1	1	Completed
3	Revision of course name of GRU	Course	1	1	Completed
4	Revision of course name in I4-Méca of GIM	Course	1	1	Completed
5	Revision of subject name in I4-Indu of GIM	Course	1	1	Completed
6	Revision of course names of GTR	Course	4	4	Completed
II	Revision/Establishment of Graduate Programs				
7	Revision of Master Program Curriculum of Water and Environmental Engineering (WEE)	Program	1	1	Completed
8	Revision of Master Program Curriculum of Energy Technology and Management (ETM)	Program	1	1	Completed
9	Revision of Master Program Curriculum of Agro-Industrial Engineering	Program	1	1	Completed

10	Revision of Master Program Curriculum of Mechatronics, Information and Communication Engineering	Program	1	1	Completed
III	Revision/Establishment of International Programs				
11	Establishment of Pre-Degree Foundation Program	Program	1	1	<ul style="list-style-type: none"> - Technical documents and HR preparation are completed. - Effective from 2023-2024.
12	Towards the Establishment of International Program in Civil Engineering	Program	1	0	<ul style="list-style-type: none"> - Technical documents and HR preparation are completed. - Name of the program was modified. - Will submit to MoEYS for approval and launch in 2023-2024.
IV	Establishment of labs/centers/platforms				
13	Toward the establishment of Cambodian Coastal Research Center	Center	1	0	<ul style="list-style-type: none"> - The center is in initial stage, yet ready for 2023. - Seeking financial support is
14	Towards the Establishment of Center of Research and Technology Transfer (CRTT)	Center	1	0	<ul style="list-style-type: none"> - The center is in initial stage, yet ready for 2023. - Seeking financial support is
15	Establishment of Risk Management Platform for Air Pollution in Cambodia	Platform	1	0	<ul style="list-style-type: none"> - 5 years projects (Jul 2022 - Jun 2027) supported by JICA. - Only admin office for project was established but the platform will be established in 2027.
V	Implementation of Research Projects				

16	Implementing research projects for all 5 research units	Research project	84	25	<ul style="list-style-type: none"> - 25 research projects are completed. - 59 projects are continued implementing in 2023.
V	Capacity Building of ITC staffs				
17	Capacity building on T&L and research of ITC staffs (inbound)	Person	18	18	Completed
18	Capacity building on T&L and research of ITC staffs (outbound)	Person	13	13	Completed

4 PERSPECTIVES AND ACTION PLAN FOR 2023-2024

4.1 Propose main activities/outputs in perspective 2023-2024

There are 21 main activities for perspective in academic year 2023-2024. 3 activities for modification and improvement of curriculum of associate degree programs; 5 for curriculum modification/improvement and establishment new programs; 4 for establishment of international programs; 1 for laboratory establishment; 1 for human resources plan; and 7 for newly institutional development project implementation. The summary of the proposed activities is shown in Table 3.

Table 3: Proposed main activities/outputs of ITC's perspective 2023-2024

No.	Main activities proposed in 2023-2024	Unit	Faculty/Department	Estimated completion date
I	Revision/Establishment of Diploma Programs			
1	Propose to modify the associate degree program "Mechanical and Plumbing System" from subject-based to competency-based training (<i>see Annex 1</i>)	Program	GIM	Jun 2023
2	Propose to change name of associate degree program from "Rural Engineering" to "Water Supply and Plumbing" (<i>see Annex 2</i>)	Program	GRU	Jul 2023

3	Propose to change name of associate degree program from "Civil Engineering" to "Civil and Structural Engineering Design and Supervision (CSEDS)" and modify from subject-based to competency-based training (see Annex 3)	Program	GCI	Jul 2023
II	Revision/Establishment of Engineering Programs			
4	Propose to modify of Chemical Engineering program of Faculty of Chemical and Food Engineering (see Annex 4)	Program	GCA	Aug 2023
5	Create new program under faculty of Geo-resources and Geotechnical Engineering (see Annex 5)	Program	GGG	Aug 2023
6	Create new program namely "Program of Materials Science and Engineering" under GGG faculty (see Annex 6)	Program	GGG	Aug 2023
7	Modify/improve the Architectural Engineering program of Faculty of Civil Engineering (see Annex 7)	Program	GCI	Aug 2023
8	Modify/improve the engineering program in Data Science (see Annex 8)	Program	AMS	Sept 2023
III	Revision/Establishment of Graduate Programs			
	N/A			
IV	Revision/Establishment of International Programs			
9	Establishment of international program "Bachelor of Software Engineering" – 4 Years Program under department GIC (see Annex 9)	Program	GIC	Sept 2023
10	Establishment of international program "Bachelor of Construction Management and Infrastructure" – 4 Years Program under in faculty GCI (see Annex 10)	Program	GCI	Sept 2023
11	Establishment of international program "Bachelor of Electronics and Smart Automation System" – 4 Years	Program	GEE	Sept 2023

	Program under in department GEE (see Annex 11)			
12	Establishment of international program "Bachelor Degree of Engineering and Sustainable Business (BESB)" – 4 Years Program under faculty of HWR (see Annex 12)	Program	GRU	Sept 2023
V	Establishment of labs/centers/platforms			
13	Establishment of two labs: 1) Digital-control Fabrication Lab or FABLAB (MIT) and 2) Electromagnetic Compatibility or EMC Lab	Lab	RIC	Sept 2023
VI	Human Resources Development			
14	<ul style="list-style-type: none"> - Increase of staffs with Ph.D holder from 93 to 104 - Increase of staffs with Master holder from 172 to 183 	Person	ITC	Oct 2023
VII	Institutional Development Project Implementation			
15	Implementation the project: "SATREPS: Establishment of Risk Management Platform for Air Pollution in Cambodia" - JICA	Project	ITC	Jul 2022 - 2027
16	"Institutional Support to Institute of Technology of Cambodia" – ARES-CCD	Project	ITC	Sept 2022 - 2027
17	"Science and Technology Project in Upper Secondary Education (STEP UP)" - ADB	Project	ITC	2023 - 2029
18	"Skills for Future Economy (SFE)" - ADB	Project	ITC	2023 - 2029
19	"Research and Training Platform on Power System" – EU/AFD	Project	ITC	2023 - 2027
20	"Energy Transition Sector Development Program (ETSDP)" - ADB	Project	ITC	2023
21	"Project for Strengthening Engineering Education and Research for Industrial Development in Cambodia (ITC-LBE) Phase 2" - JICA	Project	ITC	Start implementation in 2024

4.2 Baseline and projected data of number of students, staffs and labs

The number of students, PhD staff, lab for baseline 2022-2023 and projected 2023-2024 is given in Table 4.

Table 4: Number of students, staffs, and labs for baseline 2022-23 and projected 2023-24

Faculty	Department/ Option	Baseline Academic Year 2022-2023								
		No. Technician Student	No. Eng. Student	No. Master Student	No. PhD Student	No. Master Staffs	No. PhD Staffs	No. Support Staffs	No. Lab (Teaching)	No. Lab (Research)
	Tronc Commun		2936			12	1	2	3	
Faculty of Civil Eng.	GCI	277	625			6	14	7	4	
	Arch		217			11	2			
	Transport		80			2	2			
Faculty of Electrical Eng.	GEE	238	439			16	6	4	8	4
	GTR	28	128			7	5	2	4	3
	GIM	117	357			28	9	5	10	3
	GIC		238	13	3	16	2	12	9	2
	AMS		90			14	4	1	2	
Faculty of Chemical and Food Eng.	Food	228	400			15	12	11	6	3
	Chemical		137			13	5			0
Faculty of Hydrology and Water Resources Eng.	WRI		168			10	11	12	11	2
	WEE		116			7	7			2
Faculty of Geo-resources and Geotechnical Eng.	GGG		179			15	13	3	6	2
TOTAL		888	6110	13	3	172	93	59	63	21

Faculty	Department/ Option	Planned Academic Year 2023-2024								
		No. Technician Student	No. Eng. Student	No. Master Student	No. PhD Student	No. Master Staffs	No. PhD Staffs	No. Support Staffs	No. Lab (Teaching)	No. Lab (Research)
	Tronc Commun		3000			15	2	2	3	
Faculty of Civil Eng.	GCI	270	678			5	16	7	6	
	Arch		257			11	2			
	Transport		141			5	2			
Faculty of Electrical Eng.	GEE	260	491			16	10	4	8	4
	GTR	80	138			8	6	4	5	3
	GIM	133	404			28	9	7	16	4
	GIC		264	15	3	16	3	11	12	2
	AMS		190			14	4	2	2	
Faculty of Chemical and Food Eng.	Food	326	413			15	14	13	8	3
	Chemical		138			15	5			0
Faculty of Hydrology and Water Resources Eng.	WRI	0	185			13	11	12	11	2
	WEE	15	124			10	7			2
Faculty of Geo-resources and Geotechnical Eng.	GGG		216			12	13	3	6	2
TOTAL		1084	6639	15	3	183	104	65	77	22

4.3 Pedagogy

- Implement Fab-lab (through HEIP project)
- Implement Lab-based education (through JICA project)
- Implement competency-based training
- Implement project-based learning
- Increase hand-on practice in the lab and field
- Introduce e-learning classes (encourage staff to develop more E-Learning courses)

4.4 Quality Assurance

- Strengthen the internal quality assurance system
- Enhance the capacity of internal quality assurance official
- Make internal assessment mechanism to monitor and evaluate educational quality
- Provide the students to assess qualification of teaching staff by evaluation sheet (twice a year)
- Concentrate on the information, data analysis concerning to learning, teaching and academic program in order to find out strengths and weakness and to raise recommendation to make reform
- Make internal self-assessment report
- Provide the assessment in educational training application from external circle like from ACC as well as from Higher Educational Department General (MoEYS)
- Require regular staff meeting to discuss the challenges and find proper solution/improvement
- Require regular meeting to raise and solve problems in teaching and learning
- All lecturers are advised to check the performance of students regularly by having quizzes, assessments, presentations, mid-term exam and final exam.
- Join training with ACC, DGHE and HEIs relevant to develop IQA
- Join every meeting and activities related to IQA at ITC
- Improve assessment tool and assessment mechanism for good IQA
- Make action plan to develop IQA guideline including action to strengthen and develop capacity of ITC staff
- Manage Seminar/Workshop related to QA, Learning and Teaching.

4.5 Promote Research and Innovation

➤ Activities/Strategy of Research 2023 - 2024

- Strengthen triple-helix collaboration (University, Industry, Government)
- Expand research collaboration with local and international partners
- Increase peer-reviewed publication
- Upgrade ITC journal to ASEAN Citation Index
- Increase the number of proposals to be submitted for funding
- Promote the research outputs to communities
- Continue capacity building of researchers and motivating them
- Increase the number of graduate students
- Commercialize the products developed
- Increase lab analysis service and short training service
- Prepare for lab accreditation
- Apply for patents

➤ Capacity building for researchers

1. Project proposal writing training
2. Journal publication writing training
3. Project and team management training

Action Plan 2023 – 2024

➤ Laboratory Management

- To organize two training on the principle of analytical instruments for research students and researchers at the beginning of the new Semester 1 and 2 (February and August)
- To organize laboratory orientation and exams at least two times per semester.
- To develop standard operating procedures for microbiology and major ion analysis for water and fertilizer samples.
- To extend laboratory utilization through research collaboration and external service

➤ Research, Development and Dissemination

- To apply for research funds, at least one on water and environment (e.g., JSPS)
- To join a research project with a collaborating partner (e.g., AFRICAM)
- To join and organize research workshops, training, and seminar related to water and environment

➤ Toward ACI for Techno-Science Research Journal

- Improve quality of publication toward the application for ASEAN Citation Index – plan for the application is within 2024
- Complete journal website and launch the online platform – all manuscript submission and editorial process will be done through the online in 2023
- Organize the 4th workshop on improving scientific paper writing to junior researchers, graduate students, and engineering year 5 students

4.6 Research Projects implementing in 2023-2024

In academic year 2022-2023, 84 research projects in total have been implementing at ITC from all 5 research units. As results, 25 research projects are completed successfully and other 59 projects are continued implementing in 2023-2024. There are 21 new projects are approved and have been conducting their research activities. So, there are 80 research projects in total. The 21 new research projects can be seen in Table 5 and all 80 projects are listed in Annex 13.

Table 5: Detail of 21 new research projects in 2023-2024

No.	Name of PI	Sex	Research title	Period	Budget
1	Dr. TAN Reasmey	F	Removal of diclofenac and caffeine from different water sources using activated carbons made from different wastes	2022-2023	EU/AFD
2	Dr. SROY Sengly	F	Assessment on nutritional profiles, storage stability and sensory evaluation of dried fish powder made by low-value small fish species	2022-2023	LBE-JICA
3	Ms. SIENG Sreyvich	F	Development of alternative salt process to manufacture refined table salt from coarse salt	2022-2023	AFD

4	Dr. MITH Hasika	M	Development of high nutritional value farmed fish and safe processed products (smoked and fermented fish) in Cambodia	2022-2027	ARES
5	Dr. VALY Dona	M	Plagiarism Detection System for Khmer Language	2022-2023	LBE JICA
6	Mr. CHHORN Sopheaktra	M	Controller system for smart greenhouse	2022-2023	HEIP + YG
7	Mr. CHHORN Sopheaktra	M	SOLAGEO's Internet of Energy	2022-2023	HEIP + Trade without Border
8	Ms. OUM Sotheara	F	Development of omnidirectional semi-autonomous mobile robots for robot competition	2022-2023	AI Farm
9	Mr. LY Leangchheng	M	Design a boat for SUV car	2022-2023	
10	Dr. NGET Rithea	M	Design and Implementation of Health Data Collection Communication Protocol Using Physical-Layer Network Coding	2022-2023	LBE JICA
11	Mr. CHIN Chan Daraly	M	The vehicle as an intelligent thing	2022-2025	
12	Dr. CHRIN Phok	M	Smart farming for qualified vegetable using mechatronics techniques	2022-2023	LBE JICA
13	Dr. Doung Piseth	M	Evaluation of Mechanical Behavior of Post-Installed Bundled Reinforcement Used for Concrete Connections	2022-2023	LBE/JICA
14	Dr. Seang Sirisokha	F	Geological, Geochemical Characteristics and Genesis of Gold Mineralization, Gemstone and Rare Earth Element in Ratanakiri, Kampot, and Pailin province, Cambodia	2022-2023	LBE/JICA
15	Dr. Yos Phanny	M	Physical Properties and Mineralogy of Ancient Brick from Temples at Sambor Prei Kuk area, Kampong Thom, Cambodia	2022-2023	LBE/JICA
16	Dr. Kan Kuchvichea	M	Designing and Implementing a Pilot to Promote Waste Circularity in Phnom Penh	2022-2023	UNDP
17	Dr. BUN Saret	M	Occurrence and Distribution Analysis of Microplastics in Different Environmental Mediums of Cambodia	2022-2023	EU/AFD
18	Dr. HEU Rina	F	Investigation of the Effects of Algal Bloom in TSL Source Water on Water Supply Treatment Efficiency	2022-2023	EU/AFD

19	Dr. THENG Voulay	F	Preventing zoonotic diseases emergence	2022-2027	AFD-RD
20	Ms. DOEURN Seyha	F	Antimicrobial Resistance Circulation along the Mekong and its Delta (ARCIMED)	2022-2023	FSPI (French Government)
21	Dr. PEN Sytharith	M	Ecosystem-base Adaptations for Sustainable Groundwater Resources Management in the Transboundary Cambodia-Vietnam Mekong Delta Aquifer, Lower Mekong Region (GEBA)	2022-2023	Stockholm Environment Institute (SEI)

4.7 Promote University-Industry Linkage (UIL) 2023-2024

➤ Mission of UIL

From academic year 2022-2023, UIL is reforming its mission to more focus on target result outputs towards quality improvement of academic programs, research, and services in whole ITC including the governance of UIL.

The main missions of UIL are as follow:

- (1) Improvement of the quality and relevant of academic programs in all levels
- (2) Improvement of research activities and collaboration especially on research product outreach and commercialization
- (3) Upgrading the services from all sectors in ITC such lab testing, training, consultancy, and renting services.

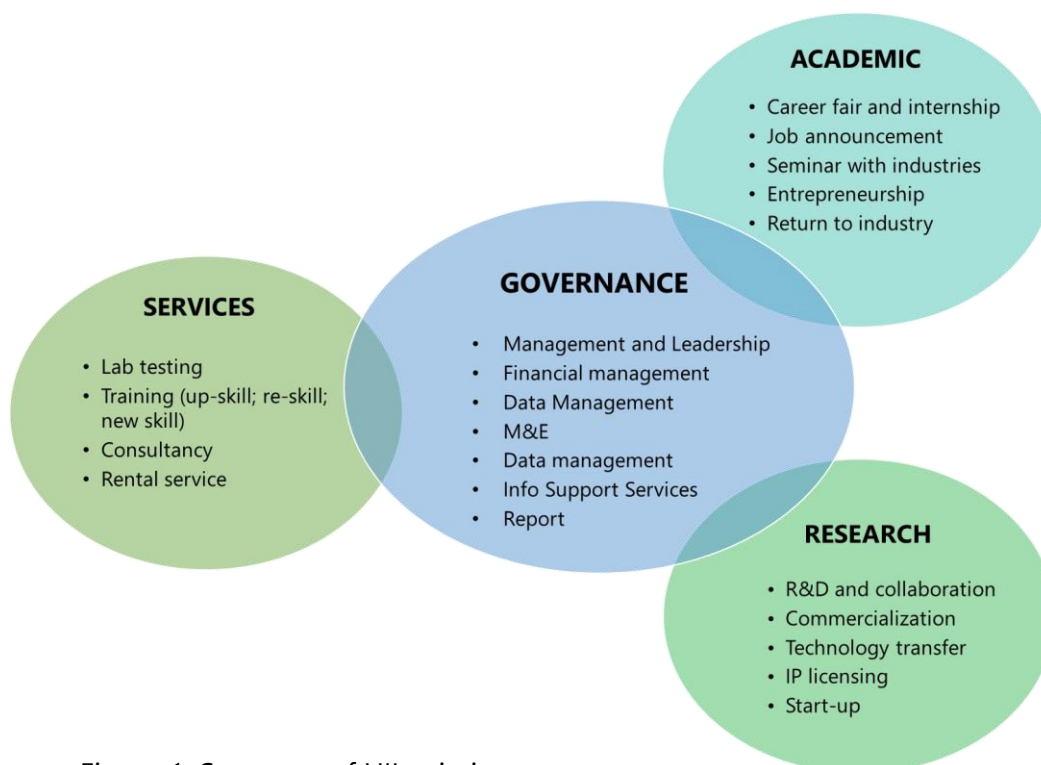


Figure 1: Summary of UIL mission

Table 6: Goal and Mission of UIL

Goal UIL contributes to enhances the quality and relevance of academic programs, research and services towards Cambodia Vision 2030 and 2050.	
Mission (Outcome)	Main Activities
1. Support the academic programs in all levels to enhance the quality of graduates for better jobs and better pays	1.1. Produce clear coordination mechanism and guideline between UIL office and all programs in charge person for smoother operation. 1.2. Initiate and introduce the new concept of internship scheme trough project-based learning with industry. 1.3. Organize annual event on career fair with all relevant stakeholders. 1.4. Coordinate the join activities with the faculty/head of programs and industries to improve the 21 st century skills to lecturers and students.
2. Support the research activities toward product commercialization through closely link with industry	2.1. Create a communication platform in both physical and online for information access between ITC and industries. 2.2. Organize regular promotion events to promote research collaboration link with industry toward product prototype/start-up/ commercialization.
3. Support all relevant stakeholders to improve the quality of services	3.1. Produce the list of all type of services including testing, training, equipment rental, and consultancy from relevant stakeholders. 3.2. Develop marketing promotion materials related to ITC's services. 3.3. Support training to faculty/department staffs on content development of skill/professional training. 3.4. Produce better mechanism and regulation for consultancy service in ITC.

Perspectives of UIL for 2023-2024

Table 7: Proposed main activities/outputs of UIL's perspective 2023-2024

No.	Result indicators for UIL	Timeframe	Responsible	Strategy
1	Develop strategy and result framework for UIL 2024-2026	Oct 2023	- Dr. Oeung Chantha - Dr. Bun Kim Ngun - Dr. Yin Molika - All faculty/depart - RIC	Meet and discuss with the stakeholders
2	Develop drafted data management for UIL Office and department-UIL	June 2023	- Dr. Yin Molika - All faculty/depart - RIC	Use the exiting info to build the format for the data management

3	Organize joint activity with stakeholder (i.e., CJCC) to promote internship scheme and career fair	July-Sep 2023	<ul style="list-style-type: none"> - Dr. Yin Molika - All faculty/depart 	<ul style="list-style-type: none"> • Invite company to join career fair • Improve career fair agenda for the benefits of all parties (students, ITC, company) • Budget HEIP and others
4	Organize joint activity with stakeholder (i.e., CJCC) to promote research outreach with industry	July-Sep 2023	<ul style="list-style-type: none"> - Dr. Yin Molika - RIC 	Budget HEIP and others
5	Develop promotional booklets (3) for whole ITC's service: 1/testing; 2/training; 3/consultancy	Jan 2024	<ul style="list-style-type: none"> - Dr. Yin Molika - All faculty/depart - RIC 	<ul style="list-style-type: none"> • Create a format for each service • Budget HEIP and others
6	Train on the entrepreneurship at CJCC	Jul-Oct 2023	<ul style="list-style-type: none"> - UIL office - All faculty/depart - RIC 	Budget HEIP and others
7	Visit industries (2 visits/year) about industries need and possible collaboration	Dec 2023	<ul style="list-style-type: none"> - UIL office - All faculty/depart 	<ul style="list-style-type: none"> • Contact potential companies for visiting opportunity • Budget HEIP project (4 visits/year in provinces) • Encourage for the visit in Phnom Penh
8	ITC-Industries consortium meeting (once/year) to get the feedback from industries for improvement of ITC	Dec 2023	<ul style="list-style-type: none"> - All relevant person 	<ul style="list-style-type: none"> • Organize attractive consortium meeting • Work with projects (LBE/ADB) to engage more companies
9	Starting UIL's tasks in ARES project (Result no 1: Structurer et développer la promotion des services de la valorisation de la recherche)	2023-2027 (5 years)	<ul style="list-style-type: none"> - Prof. Frédéric Debaste - Dr. Chanmoly Or - Dr. Molika Yin 	Set the activities and budget plans

4.8 Promote Library and Cambodian Cyber University Network

➤ STEM Library

Perspective of STEM Library in two academic years 2023-2025

Table 8: Proposed main activities/outputs of STEM Library's perspective 2023-2025

No.	Target outputs for Library	Activities	Possible fund support
1	Library equipment and resources are upgraded	1.1 Replace basic equipment in library (needed to start the activities) 1.2 Acquisition books as reference for teaching (with the participation of ITC,10%) 1.3 "Migrate and Improve catalog software from PMB to Koha (for reinforce collaboration with other HEIs library)" 1.4 Library Consumable (maintain useful materials for daily operation and hardware accessories)	- ARES-CCD - Others
2	Library's staff competency is enhanced	2.1 Recruit a competence staff for reference service (full time) 2.2 Building staff competency (south-south training) 2.3 Mission North-South on Open Access 2.4 Mission South-North for OA and IR 2.5 Training on the use of IR System 2.6 Mission North-South Evaluation	- ARES-CCD - Others

➤ Cambodian Cyber University Network (CCUN)

Institute of Technology of Cambodia has been implementing distance learning programs with many years of experience with foreign higher education institutes within the framework of the ASEAN Cyber University Network. Response to the closure of higher education institutions in whole or in part due to the spread out of virus Covid-19, Cambodian Cyber University Network (CCUN), initiated by Ministry of Education, Youth and Sport, is established within six public universities at the initial stage and technical support provided mainly by the Institute of Technology of Cambodia. The 6 universities are:

- 1) Institute of Technology of Cambodia
- 2) Royal University of Phnom Penh

- 3) Royal University of Agriculture
- 4) National University of Battambang
- 5) Svay Rieng University
- 6) Heng Samrin Tbhong Khmum University

Indicators, result outputs, and perspective of CCUN 2023-2024

Table 9: Indicators, result outputs and perspective of CCUN 2023-2024

Indicators	Result outputs	Possible fund support
<ul style="list-style-type: none"> Number of academic programs is developed and used in CCUN Number of e-learning contents has developed and used in CCUN Number of students enrolled through CCUN 	<ol style="list-style-type: none"> 6 universities are connected in CCUN Upgrade HEIs (6) capacity on e-learning content development and operation create common courses to use among HEIs (6) credit transfer among HEIs (6) student continue the education during COVID-19 connect to global/regional education network 	<ul style="list-style-type: none"> public investment program of MoEYS
<p>Perspective of CCUN in 2023-2024:</p> <ol style="list-style-type: none"> Prepare formal CCUN steering committee document Create domain name www.ccun.edu.kh Setting up network infrastructure of HEI (RUPP, RUA, NUBB, SRU, UHST) to connect to CCUN Training on content development Learning Management System (LMS) user training at each HEI 		

4.9 Promotion of Soft Skills

Soft skill is an essential course which promotes personal attributions that sit outside the professional qualifications and work experience. Soft skills will be mainstreamed into technician and engineering program at ITC for building students' soft capacities. Among the other skills, Team Work is one of the principle skills to be considered. 2 Trainings on Teamwork will be given to ITC students annually.

Teamwork involves building relationships and working with other people using a number of important skills and habits:

- Working cooperatively
- Contributing to groups with ideas, suggestions, and effort
- Communication (both giving and receiving)
- Sense of responsibility

- Healthy respect for different opinions, customs, and individual preferences
- Ability to participate in group decision-making

5 CHALLENGES

- Managing capacity building projects and collaborative projects requires more time and effort which need more capable administrative staff to help.
- Research facilities such as laboratories and journals are not yet fully capable or structured for advanced research, making it difficult for students to access and do research.
- Low number of available scholarships and research grants for research students, making it difficult to promote research activities and to attract outstanding students to work and study at ITC.
- Limited number of classrooms compared to total enrolled students

ANNEXES

ANNEX 1

Detail of modification of Associate Degree Program “Mechanical and Plumbing System” from subject-based to competency-based training

1. BACKGROUND

Associate’s Degree (DUT) in Industrial and Mechanical Engineering was a three-year program established in 1994 and then changed to be a two-year program in 2012. The program is under the department of Industrial and Mechanical Engineering known in short as “GIM” which the abbreviation from the department name in French (Génie Industrielle et Mécanique). The program was designed to train skilled workforces in mechanical and industrial engineering to meet the ever-growing demands from SMEs, factories, and engineering firms. As the construction sector experienced high growth in recent years, the demand for skilled human resources in mechanical electrical and plumbing (MEP) systems in the building has increased significantly and has absorbed more than half of our graduates (according to our tracer study conducted in 2022). Therefore in 2021, we modified the curriculum and change the program to be Associate’s degree in Mechanical and Plumbing Systems.

Due to the design that try to cover wide area of skills in industrial and mechanical engineering, we have feedback from employers about the skills gap of our graduates and the need to provide them with long on-the-job training before they can fully onboard the given role. The competency-based training (CBT) model has been introduced to ITC and specifically to our department in 2019 through a project titled “Skills for Competitiveness, S4C” (S4C/ADB/AFD-Loan No.3791/8365-CAM). The CBT is known to be an effective teaching model for reducing the skill gap and producing work-ready graduates. Therefore, we have modified and adopted the CBT model and re-orientated our associate’s degree program.

The modification of this existing program is complemented to the two new Associate’s Degree programs in Industrial Machining and Industrial Engineering. The three Associate’s Degree programs provide more specialized skills within the larger engineering field of Industrial and Mechanical Engineering, which will equip the students with a good skills-set and work attitude.

2. PROPOSE MODIFICATION

The Associate’s Degree program is based on the competency-based training model, CBT, with 4 basic competencies and 7 core competencies. There are totally 60 credits, equivalent to 1536 of total teaching hours. The basic competencies are designed to provide students necessary skills and knowledge in using necessary mathematical calculations and computer software to complete the job and introducing soft skills, safety, health and environment in workplaces and work attitude. The core competencies are: 1-perform CAD operations for mechanical systems in building, 2- perform installation, testing and commissioning of cooling systems, 3- perform installation, testing and commissioning of electricity for mechanical systems, 4- perform technical sales, 5- perform site coordination and reporting, 6- perform installation, testing and commissioning of firefighting and plumbing systems, and 7-perform after-sale services of mechanical systems in building.

On completion of the course, students should be able to:

- Interpret technical drawings, operate CAD software to produce drawings mechanical systems in building.
- Perform installation, testing and commissioning of cooling, firefighting, and plumbing systems in building.
- Install electrical system and wiring to power the mechanical systems in building.
- Plan and coordinate MEP jobs at site and make report to site manager.
- Perform technical sale for engineering products and projects.
- Provide the after-sale services of engineering products to the customers.

Table 1.1: Curriculum of the existing Diploma degree in Industrial and Mechanical Engineering

Subjects	Number of hours (Lecture, Exercise, Practice)					Number of credits			
Group:	1A		2A		Total	Lecture	Exercise	Practice	Total
Semester:	I	II	I	II					
Mathematics	48				48	1	1		2
Informatique	48				48	1		1	2
Technical drawing	48				48	1	1		2
Mechanical design I	80				80	3	1		4
Metrology and Control	32				32	2			2
Material Sciences	64				64	2		1	3
Thermics, Thermodynamics	64				64	2	1		3
Mechanics		64			64	2	1		3
Strength of materials		64			64	2		1	3
Hydraulics		48			48	1	1		2
Mechanical production I		64			64	2		1	3
AutoCAD		48			48	1		1	2
Electrotechnics		48			48	1		1	2
Internal combustion engine		48			48	1		1	2
Total T1-GIM						22	6	7	35
Internship Report								2	2
Mechanical design II			48		48	1		1	2
Hydraulics and Pneumatics Sys			48		48	1	1		2
Mechanical production II			48		48	1		1	2
Machine tools num. control			48		48	1		1	2
Maintenance of Machines			48		48	1		1	2
Sys of mechanical welding			48		48	1		1	2
Refrigeration and Air Cond			48		48	1		1	2
Maintenance of cooling sys			48		48	1		1	2
Final year internship				384	384			9	9
Total T2-GIM						8	1	18	27
Total per semester	384	384	384	384	1536	30	7	25	62
Total general	768		768		1536				

Table 1.2: Curriculum of the associate degree in Mechanical Systems in Building

	Number of hours (Lecture, Exercise, Practice)									Number of credits			
Group	1A		2A		Lecture	Exercise	Practice	Ratio Lecture /Total Hours	Total	Lecture	Exercise	Practice	Total
Semester	I	II	I	II									
	Basic competencies												
Mathematics	48				16	32		33%	48	1	1	0	2
Informatique	48				16		32	33%	48	1	0	1	2
Health, Safety, and Environment at Workplace	32				32		0	100%	32	2	0	0	2
Life skills	32				32			100%	32	2	0	0	2
	Core competencies												
Perform CAD operation for Mechanical sys.	64	128			64		128	33%	192	4	0	4	8
Perform installation, testing, and commissioning of cooling system	128	64			64		128	33%	192	4	0	4	8
Perform installation, testing, and commissioning of electricity for mechanical system	32	96			32	32	64	25%	128	2	1	2	5
Perform sales of MEP products		48	0		16	32	0	33%	48	1	1	0	2
Perform coordination and reporting for M system installation at site		48	0		16		32	33%	48	1	0	1	2
Total T1-MSB										18	3	12	33
Internship Report									0			2	2
Perform installation, testing, and commissioning of plumbing and firefighting system		0	192		64		128	33%	192	4	0	4	8
Perform after-sale services of MEP sys.			192		64		128	33%	192	4	0	4	8
Final year internship				384								9	9
Total T2-MSB										8	0	19	27
Total per semester	384	384	384	384	1536					26	3	31	60
Total general	768		768		1536								

ANNEX 2

Detail of proposal to change name of associate degree program from “Rural Engineering” to “Water Supply and Plumbing”

1. BACKGROUND

Technician degree program at GRU called “Rural Engineering” which was implemented until 2018. The program was design to be similar to the Engineering program of Water Resources Engineering and Rural Infrastructure (WRI) but lesser number of hours for teaching and learning. This technician program is focus more on rural aspect and it is no longer attractive to the student. Then, there were less students register to the program until we cannot open it. Currently, the water supply is highly increased for domestic and industrial use and government set the goal to have everyone household in Cambodia access to safe and clean water. In this circumstance, there are many private water supply operators doing business with various condition and limited technical support and many of them lacking of technician who has the right skill. Recently, government has set the criteria for each water operator to have the technician to work on the operation of the water treatment plant and supply system. By looking the capacity at GRU and the urgent need of technician to work on water supply company, we would like to propose to change our technician degree program from “Rural Engineering” to “Water Supply and Plumbing”.

2. OBJECTIVE OF THE NEW PROGRAM

The purpose of this program is to provide students with technical skill on piped water supply through the basics of calculating production, such as treatment basins and reservoirs, as well as sizing and installing plumbing networks in urban areas and rural residential areas. The program will also provide technical plumbing skills in the building by determining the size and type of pipes in the building with the selection of the appropriate type and size of pump use.

3. PROGRAM LEARNING OUTCOME

The students who graduate from this program must have the technical skill on water supply system and plumbing. During and after completion this technician degree, will all have the job at water supply companies and nation water supply authority. Below are the program learning outcome:

- PLO1: Has ability to determine the size and installation of pipe water
- PLO2: Can perform the water treatment by using the correct chemical substance with effective way
- PLO3: Has ability to create the master plan for pipe network management and location of customer
- PLO4: Be able to effectively select and operate the pump
- PLO5: Be able to monitor the water losses from the system
- PLO6: Can install the pipe network in the building

4. JOB OPPORTUNITY AFTER GRADUATION

After graduate from this program, the student has opportunity to work with private water operator, company, national authority and NGOs:

- Water supply company and public and private
- Contracting company on network and plumbing
- NGOs working related to clean water and hygiene
- Pipe product and supply company
- Companies which supply the clean water related material and tools
- Become contractor for installation of plumbing in the construction building

5. CAPACITY

▪ Human Resources:

- Current human resources at the faculty of hydrology and water resources engineering, we have 17 PhD, 17 Master and 12 supporting staff.
- Host series of up-skill training for department's staffs to effectively improve the course content and teaching method
- Working with private water supply operators and authority to improve the capacity of the teaching staff with the real practices

▪ Lab Facility and Practices

1. Fluid Hydraulic
 - Water pressure in pipe
2. Water Treatment Process
 - Turbidity, iron, manganese, lead, or arsenic treatment
 - Disinfectant: E-coli and coliform
3. Mapping and drawing: GIS Lab equipped with software of Google Earth, ArcGIS/QGIS, and AutoCAD
4. Surveying: topography, GPS, DGPS
5. Pipe network:
 - Pipe installation (connection equipment, specifically for HDPE and PVC),
 - Pipe test (Strength along pipe and at connection),
 - Leakage detection: by leakage detector,

▪ Program Marketing:

The faculty will promote the program by:

- Make agreement with water supply and operator companies for accepting the internship and job
- Some courses/subjects, the students will practice at the company
- Work closely with all relevant stakeholders to promote internships,
- We have partners to provide the job for the student after graduation
- All students who successfully graduate are guaranteed to have the job

- Lecturers who have real experience in the sectors of water supply and plumbing
- Technical persons who currently working for the water operator but lack of this skill, are encouraged to take this program and they can practice at their work place.
- Host annual promotional events with industry engagement
- Develop attractive brochures and other promotion materials for both online and offline campaign

6. PROPOSE MODIFICATION OF CURRICULUM OF TECHNICIAN DEGREE PROGRAM

For the upcoming academic year, the program of Technician degree at GRU will be change as in the table below.

Table 2.1: Summary of propose modification

Gr	No.	Name of course	Current Situation "Rural Engineering"				New proposal "Water Supply and Plumbing"			
			C	TD	TP	Credit	C	TD	TP	Credit
T1-S1	1	Mathematics	16	32		2	Delete			
	2	Technical Drawing	16	32		2	Delete			
	3	Informatics (Office)	16		32	2	16		32	2
	4	Hydraulics	16	16	16	2	16	16	16	2
	5	Hydrology	16	16	32	2.5	16	16	32	2.5
	6	Soil Sciences	16	16	32	2.5	Delete			
	7	Construction materials	16		48	2.5	Delete			
	8	Introduction to Water Supply and Sanitation	New				32			2
	9	Electricity	New				32	24	8	3
	10	Environment	New				32			2
	11	Communication and Ethics	New				32			2
	Total Credit		112	112	160	15.5	144	56	88	15.5
T1-S2	1	Surveying	16	16	64	3.5	Delete			
	2	Groundwater Exploitation	32			2	Delete			

	3	Computer Aids for Designs	16		32	2	Delete			
	4	Soil Mechanics	16	16	32	2.5	Delete			
	5	Hydropower Development and Pumping Stations	16	16	16	2	Delete			
	6	Geographic Information System	16		32	2	Delete			
	7	Reinforced Concrete Design and Analysis	32	16		2.5	Delete			
	8	Year 1 Internship			64	2			64	2
	9	ArcGIS/Google Earth – Mapping	New				32		32	3
	10	Basic Surveying and AutoCAD	New				16		64	3
	11	Building Sanitation and Plumbing Design	New				32	32		3
	12	Water Treatment Process and Technology	New				32	16	16	3
	13	Pipe Distribution Design	New				32	32		3
	14	Pump and Mechanical Tools for Water Distribution System	New				32			2
	Total Credit		144	64	240	18.5	176	80	176	19
T2-S1	1	Rural Road Construction	16	16	16	2	Delete			
	2	Site Engines	32			2	Delete			
	3	Irrigation-drainage	16	32		2	Delete			
	4	Water Supply System	16	16	16	2	Delete			
	5	Hydraulic Structure	16	16	16	2	Delete			
	6	Earth Dam	16			1	Delete			
	7	Wastewater Drainage System	16	16	16	2	Delete			
	8	Plumbing	16	16	16	2	Delete			
	9	Planification, Contract and Cost Estimation	32			2	Delete			
	10	Site Safety	16			1	Delete			
	11	Water Treatment Practices	New				16	32	64	4
	12	Pipe Network Installation and Monitoring	New					32	64	3

	13	Plumbing installation and control	New					32	64	3
	14	Efficient Energy Consumption and Management	New				32			2
	15	Cost Estimating and Contracting	New				32	16		2.5
	16	Work Safety and Hygiene	New				32			2
	Total Credit		192	112	80	18	112	112	192	16.5
T2-S2	1	Internship and Final Report Defend				9				9
	Grand total number of Credit		448	288	480	61	432	248	456	60

7. CURRICULUM OF THE PROGRAM

The curriculum of Technician degree program of Water Supply and Plumbing from the academic year 2023-2024 will be as in table below:

Table 2.2: New Curriculum of Water Supply and Plumbing

Gr	No.	Name of course	New proposal			
			C	TD	TP	Credit
T1-S1	3	Informatics (Office)	16		32	2
	4	Hydraulics	16	16	16	2
	5	Hydrology	16	16	32	2.5
	8	Introduction to Water Supply and Sanitation	32			2
	9	Electricity	32	24	8	3
	10	Environment	32			2
	11	Communication and Ethics	32			2
Total Credit			144	56	88	15.5
T1-S2	8	Year 1 Internship			64	2
	9	ArcGIS/Google Earth – Mapping	32		32	3
	10	Basic Surveying and AutoCAD	16		64	3
	11	Building Sanitation and Plumbing Design	32	32		3

	12	Water Treatment Process and Technology	32	16	16	3
	13	Pipe Distribution Design	32	32		3
	14	Pump and Mechanical Tools for Water Distribution System	32			2
	Total Credit		176	80	176	19
T2-S1	11	Water Treatment Practices	16	32	64	4
	12	Pipe Network Installation and Monitoring		32	64	3
	13	Plumbing installation and control		32	64	3
	14	Efficient Energy Consumption and Management	32			2
	15	Cost Estimating and Contracting	32	16		2.5
	16	Work Safety and Hygiene	32			2
	Total Credit		112	112	192	16.5
T2-S2	1	Internship and Final Report Defend				9
	Grand total number of Credit		432	248	456	60

ANNEX 3

Detail proposal to change name of associate degree program from “Civil Engineering” to “Civil and Structural Engineering Design and Supervision (CSEDS)” and modify from subject-based to competency-based training

1. BACKGROUND

Under the Workforce Development Project for Skills for Future Economic supported by the bank of ADB, GCI is going to improve the Associate’s degree program into Civil and Structural Engineering Design and Supervision “CSEDS” (expected) in 2023 or 2024 base on the project implementation timeline. The program is designed as a competency-based by the consultant of ADB from Singapore, the old program is completely changed into the new one. The program has 7 modules for 3 semesters and one semester of internship. Among 7 modules, there is one module of basic competency and 6 modules of technical knowledge. This will provide GCI students the opportunities to well skill in doing shop drawings, site management

2. CURRICULUM

Through consultation with all stakeholders including the experts of ADB project. The competency-based curriculum was finalized and shown in Table 3.1.

Table 3.1: Curriculum of Civil and Structural Engineering Design and Supervision (2 years program)

			Hours			
		Core Modules/Competencies	C	T	P	total
Sem 1	M1	Perform Engineering Graphics	64		96	
	M2	Perform Building Information Modelling	64		128	
	M3	Team works and organizations	32			384
Sem 2	M4	Perform Building Structures and External Works	64		128	
	M5	Perform Reinforced Concrete Detailing and Design	64		128	384
1st Year Internship					64	
Sem 3	M6	Perform Steel Structure Detailing and Design	64		96	

	M7	Perform Project Management and Elementary Quantities	128		96	384
Sem 4	Final Year Internship					
	Subtotal		480		736	
	Total		1,216			

Table 3.2: Curriculum for associate degree in civil engineering using subject-based

	No	Courses	C	TD	TP	Credit
T1-S1	1	Wood Design	32			2
	2	Technical drawing	16	32		2
	3	Site Engine	32			2
	4	Informatics	16		32	2
	5	Plumbing System and Sanitary Equipment	32			2
	6	Mathematics	16	32		2
	7	Strength of Materials 1	32	32		3
	8	Surveying	48		32	4
					384	
T1-S2	1	Structural analysis	32	32		3
	2	Reinforced concrete 1	32			2
	3	Drawing of BTP	16		32	2
	4	Construction Materials	32		32	3
	5	Contracts	16			1
	6	Strength of Materials 2	32			2
	7	Site Safety	16			1

	8	Building Technology	48	32		4
	9	Site technology	32			2
	10	T1 Final year internship				2
					384	
T2-S1	1	AutoCAD	16	32		2
	2	Reinforced Concrete 2		32		1
	3	Prestressed Concrete	32			2
	4	Steel Design	16	32		2
	5	Electricity in Building	16			1
	6	Soil Mechanics	16	32		2
	7	Cost estimation	16	32		2
	8	Planning	32			2
	9	Bridge Design	32			2
	10	Road Design	16	32		2
					384	
T2-S2	1	Final year thesis internship				9

ANNEX 4

Detail of proposed modification of Chemical Engineering program of Faculty of Chemical and Food Engineering

3. BACKGROUND

Chemical Engineering is a 5-year engineering program established in 2017 under the Faculty of Chemical and Food Engineering. This program is a combination of industrial process, bio-process, environment, chemistry and engineering. Chemical engineers could be responsible in chemical production, synthesis, industrial development and design, and purification of materials that are associated to fuels biodiesel, and lubricants (petroleum), pharmaceuticals, cosmetic, fertilizers, synthetic fibers, microelectronic components, plastics and food products. Chemical engineers are involved in minimizing and reducing the use of energy to make these products in safe and sustainable ways and lower the impact on the environment.

The existing program, due to lack of laboratory and lab equipment, several main courses such as Analytical Chemistry, chemical thermodynamic, transport phenomena, material science etc. (more detail existing program in text below), there is no practical in laboratory. In the last five years, with the support from government (ministry of education youth and sport), development partners (WB, ADB, and EU etc.), ITC have been developed and invest more on infrastructure that could support the program with more laboratory practice. On the other hand, the existing program, there are some fundamental courses mix in different semester since 1st semester of year 4 till the 1st semester of year 5. With the update program, all the fundamental course for chemical engineering will offer only in the 1st semester of year 4. From 2nd semester of year 4 and 1st semester of year 5, the program will shape the students to specialization such as petroleum engineering, pharmaceutical and cosmetic engineering, Textile Chemistry and Processing, water and waste water engineering and Agro-chemical engineering. The reason that the program shapes the students to different specialization of chemical engineering is because of the specific specialization of chemical engineering (such as petroleum engineering, pharmaceutical and cosmetic engineering, Textile Chemistry and Processing etc.) still have very limit jobs market that could not allow to create each specialization. However, by doing this, in the future, when there is market needs on each specialization such as petroleum engineering, pharmaceutical and cosmetic engineering, Textile Chemistry and Processing etc. faculty could modify the program and create those specialization to fit with market.

4. PROPOSE MODIFICATION OF CURRICULUM OF CHEMICAL ENGINEERING

For the upcoming academic year, the program of chemical engineering requested to modify 23 courses in total, in which, 17 courses are modified name, duration and order between semester, 2 courses are deleted and 4 courses are added.

Table 4.1: Summary of propose modification of 23 courses in Chemical Engineering program

Gr	No.	Name of course	Current Situation				New proposal			
			C	TD	TP	Credit	C	TD	TP	Credit
I3Che-S1	1	Heat and Mass Transfer	48	0	32	4	16	32	32	3
I3Che-S2	1	Analytical Chemistry	16	32	0	2	16	16	16	3
	2	Fluid Mechanics	32	16	48	4	16	32	32	3
	3	General Microbiology	48	0	32	4	32	0	32	3
	4	Unit Operation II	16	0	0	1	16	8	24	2
I4Che-S1	1	Chemical Reaction and Kinetics	32	0	32	3	Delete			
	2	Analytical and Instrument Chemistry (Move from I4 Sem2)	48	0	32	4	16	32	32	3
	3	Computing Software for Chemical Reaction (Move from I5 Sem1)	32	0	32	3	32	0	32	3
	4	Fundamental Catalyze Reaction (Move from I4 Sem2)	32	0	0	2	32	0	0	2
	5	Transport Phenomena (add TP)	48	0	0	3	32	16	16	3
	6	Industrial Chemical Process I and II (Move from I5 Sem1)	96	0	32	7	32	0	0	2
I4Che-S2	1	Materials Science (reduce course and add TP)	96	0	0	6	48	0	32	4
	2	Textile Chemistry and Processing (new course)	0	0	0	0	32	0	32	3
	3	Petroleum Chemistry (Move from I4 Sem1)	48	0	32	4	48	0	32	4

	4	Water Chemistry and Waste Water Treatment (change name from Water Chemistry and (add more TP)	16	8	24	2	48	0	32	4
I5Che-S1	1	Automation and Control	32	0	0	2	Delete			
	2	Agro-chemical processing and analysis (new course)	0	0	0	0	48	0	32	4
	3	Biochemical Progress (move from I4 Sem1)	32	0	0	2	32	0	0	2
	4	Chemistry for Cosmetics and Pharmaceutical (new course)	0	0	0	0	48	0	32	4
	5	Chemical Plant Safety and Environmental Assessment (change name from Chemical Plant Safety)	32	0	0	2	32	0	0	2
	6	Chemical Engineering Project Management (change name from Project Management)	32	0	0	2	16	0	0	1
	7	Chemical Industrial Concept Design (new course)	0	0	0	0	32	0	0	2
	8	Chemical Engineering Seminar (change name from Seminar)	16	0	0	1	16	0	0	1

3. CURRICULUM OF THE MODIFIED PROGRAM

This curriculum is designed for an engineering degree that illustrates the whole three years program in the Chemical Engineering, Faculty of Chemical and Food Engineering from the 3rd year to 5th year.

The curriculum of the Chemical Engineering in the academic year 2023-2024 is shown below:

Table 4.2: Curriculum of Chemical Engineering after revision

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	64	64	2
2	English			0	0	32	32	1
3	Statistics			16	32	0	48	2
4	Fundamental Chemistry			32	16	48	96	4
5	Physical Chemistry			16	20	12	48	2
6	Heat and Mass Transfer			16	32	32	80	3
7	Unit Operation I			16	0	0	16	1
Total for 1st semester I3				96	100	188	384	15

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	64	64	2
2	English			0	0	32	32	1
3	Analytical Chemistry			16	16	16	48	2
4	Fluid Mechanics			16	32	32	80	3
5	Numerical Method			16	20	12	48	2
6	General Microbiology			32	0	32	64	3
7	Unit Operation II			16	8	24	48	2
Total for 2nd semester I3				96	76	212	384	15

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Chemical Reaction and thermodynamics			32	0	32	64	3
4	Analytical and Instrument Chemistry			16	32	32	80	3
5	Computing Software for Chemical Reaction			32	0	32	64	3

6	Fundamental Catalyze Reaction			32	0	0	32	2
7	Transport Phenomena			32	16	16	64	3
8	Industrial Chemical process I			16	0	0	16	1
9	Internship							2
Total for 1st semester I4				160	48	176	384	17

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Industrial Chemical process II			16	0	0	16	1
4	Material Science			48	0	32	80	4
5	Textile Chemistry and Processing			32	0	32	64	3
6	Petroleum Chemistry			48	0	32	80	4
7	Water Chemistry and waste water treatment			48	0	32	80	4
Total for 2nd semester I4				192	0	192	384	18

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Agro-chemical processing and analysis			48	0	32	80	4
4	Biochemical Process			32	0	0	32	2
5	Chemistry for Cosmetics and Pharmaceutical			48	0	32	80	4
6	Chemical Plant Safety and Environmental Assessment			32	0	0	32	2
7	Chemical Engineering project management			16	0	0	16	1

8	Entrepreneurship			32	0	0	32	2
9	Chemical Industrial Concept Design			32	0	0	32	2
10	Chemical Engineering Seminar			16	0	0	16	1
Total for 1st semester I5				256	0	128	384	20

Curriculum for 5th year (I5) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Final Year Internship							9
Total for 2nd semester I5								9

ANNEX 5

Detail proposal to create new program under faculty of Geo-resources and Geotechnical Engineering

1. BACKGROUND

Department of Geo-resources and Geotechnical Engineering was established in late 2011 to response for urgent needs for management and development of the resource's sustainability of minerals and petroleum in Cambodia. According to Prokas No. 726 of Ministry of Education Youth and Sports, Department of Geo-resources and Geotechnical Engineering has upgraded to Faculty of Geo-resources and Geotechnical Engineering, which consists of two departments, Department of Geo-resources and Geotechnical Engineering, and Department of Petroleum Engineering. However, due to narrow of job market in the field of petroleum, the Faculty of Geo-resources and Geotechnical Engineering has been implementing only one engineering program – Program of Geo-resources and Geotechnical Engineering with multidisciplinary fields, such as mining, petroleum, and geotechnical engineering. In response to the current urgent needs of human resources for the specific field of mining and petroleum engineering, and geotechnical engineering in industries and government institutions, faculty is proposing to separate the current program of "Geo-resources and Geotechnical Engineering" into two new departments namely (1) Department of Geo-resources and Petroleum Engineering and (2) Department of Geotechnical Engineering. The modification of the current program is not only providing specific and deeply competencies/skills to undergraduate students, but also support the national policy "The development of ore mineral, oil and gas, to make/develop these resources as the new sources of income and increase Cambodia's economy" and the National Policy on Mineral Resources 2018 -2028 in producing skilful human resources in the field of geo-resources to increase productivity, absorb domestic labour force and minimize the foreign specialist.

Currently, seven companies have active gold exploration licenses, all of which are in the four provinces of Monduliri, Ratanakiri, Battambang and Preah Vihear. In June 2021, Ministry of Mines and Energy (MME) issued the license for Australian mining company, Renaissance Minerals (Limited) Cambodia, as Cambodia's first commercial gold miner and has started gold refining in Keo Seima district, Monduliri Province. Cambodia has netted more than \$15 million from gold production as of end-December, which has yielded over 5.3 tonnes of gold bars – a semi-finished product that is smelted at a mine, usually at about 90 per cent purity. Renaissance will attract a total of 462 workers, including Cambodians. Cambodia expects the project to generate \$185 million per annum in pre-tax cash flow, with \$40 million from royalties and taxes transferred to the national budget from Renaissance. Furthermore, MME provided license to Delcom Campuchia Plc., to start gold extraction in Preah Vihear province in August, 2022 (Khmer Times, 2022), which is capable of producing gold around 340 kilogrammes per year. Thus, the annual royal income from this firm is expected at \$0.6 million. Moreover, five cement companies are operating, which can supply cement approximate 7 million tons per year that support domestic demand, and minimize the import cement. In late 2017, approximate 260 quarries of construction materials were granted the licenses with the investment approximate 5 million US dollar. In term of petroleum sector, Cambodia, 6 offshore

blocks and 19 onshore blocks have been delineated for possible oil exploration. In 2019, Canadian-owned company EnerCam Resources Co Ltd received approval from the government for a 7,300sq km onshore oil and gas exploration concession (Block 8). Currently, EnerCam is also interest in Cambodia's first petroleum production in offshore block A and studying the possibility of investing in oil extraction from Cambodia's offshore Block A after the government terminated an agreement with Singapore-based KrisEnergy Ltd. These companies have provided opportunities to our students and graduates both internship and jobs in the position of geologist, geophysicist, and engineers (mining, petroleum, geotechnics, drilling, planning, geo-environment) etc.

Furthermore, the current job market of geotechnical engineering is increasing sharply. From the past decade 2009 to 2019, 7.1% GDP growth with increasing about 2% of construction and real estate reported by World Bank, producing 220,000 jobs. In 2022, GDP of Cambodia was growth about 5.5% and will be 6.6% estimated growth in 2023. Geotechnical engineer is not only works at construction company, but mainly also work in mining industries to support soil investigation, tunnelling, retaining wall, surface and underground mines.

Current engineering program in faculty (one program only):

- Program of "Geo-resources and Geotechnical Engineering"

Propose to crate new engineering program in faculty (two programs from current):

- Program of "Geo-resources and Petroleum Engineering"
- Program of "Geotechnical Engineering"

2. PROGRAM OF GEO-RESOURCES AND PETROLEUM ENGINEERING

- Name in French: Programme de Génie Géo-ressources et Pétrolier
- Name in Khmer: វិទ្យាសាស្ត្រធនធានដី និងប្រេងកាត

2.1. Program Education Objectives (PEOs)

The program of Geo-resources and Petroleum Engineering is a 5-year engineering program under the faculty of Geo-resources and Geotechnical Engineering at the Institute of Technology of Cambodia prepares students for lifetime careers as productive and innovative engineers adaptive to the new situation and emerging programs with the utmost awareness of ethical, social, and environmental concerns so that, within five years after graduation, they will:

- PEO1:** Having knowledge and competency in the Geo-resources and Petroleum Engineering field that involves activities related to the exploration and production of ore and hydrocarbons within the upstream, midstream, and downstream.
- PEO2:** Having good leadership, proactive and soft skills such as critical thinking, teamwork, team management, and project management.

PEO3: Possessing an interest in lifelong learning for continuous personal development.

PEO4: Having the high level of the right attitude, responsibility, and commitment to serve society with a strong sense of technology ethics.

2.2. Program Learning Outcomes (PLOs)

The engineering program of Geo-resources and Petroleum Engineering under the Faculty of Geo-resources and Geotechnical Engineering at ITC aims to instill in our graduates the following attributes:

A – KNOWLEDGE

PLO1: Ability to apply engineering knowledge, mathematics, physics, and chemistry in Geo-resources and Petroleum Engineering.

PLO2: Ability to design and conduct experiments, analysis, and interpretation of experimental data.

B – COGNITIVE SKILLS

PLO3: Ability to investigate complex problems related to Geo-resources and Petroleum Engineering using research-based knowledge.

PLO4: Ability to apply critical thinking skills to analyze and solve problems in engineering.

PLO5: Ability to demonstrate professional development and entrepreneurship skill.

C – INTERPERSONAL SKILLS AND RESPONSIBILITY

PLO6: Ability to apply professionalism with ethical principal practices.

PLO7: Ability to work cooperatively on engineering projects.

PLO8: Ability to improve professional development and lifelong learning.

PLO9: Ability to demonstrate knowledge and understanding of engineering management principles and economic decision-making in a multidisciplinary environment.

D – NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION

PLO10: Ability to apply technical communication skills in written and oral presentations with reliability.

E – PSYCHOMOTOR SKILLS

PLO11: Ability to select and apply appropriate techniques and resources for product development.

2.3. Course hours and credits

For each semester from 3rd year to 5th year, students will take about 8 to 9 courses, including languages (French and English), to fulfill about 15 to 18 credits equivalent to 384 hours.

Total credits for the program are required about 92 credits (including the final year project which is 9 credits) equivalent to 1920 class hours in total.

The credit to be equivalent to teaching hour as follow:

- 16 hours of teaching course (C) = 1 credit
- 32 hours of the tutorial (TD) = 1 credit
- 32 hours of laboratory practice (TP) = 1 credit

2.4. Curriculum of the program

This curriculum is designed for an engineering degree that illustrates the whole three years program in the Faculty of Geo-resources and Geotechnical Engineering from the 3rd year to 5th year. The curriculum of Geo-resources and Petroleum Engineering in the academic year 2023-2024 is shown below:

Table 5.1: Curriculum of Geo-resources and Petroleum Engineering

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Statistics			16	32		48	2
2	French					64	64	2
3	English					32	32	1
4	Geodesy and Survey			32	32		64	3
5	Computer aides drawing			16		16	32	1.5
6	General Geology			32			32	2
7	Hydrogeology			32			32	2
8	Geochemistry			32			32	3
9	Principles of Geographic Information Systems			16	32		48	2
Total for 1st semester I3				176	96	112	384	17.5

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					64	64	2

3	Structural Geology			32			32	3
4	Fluid Mechanics			16	16	0	32	1.5
5	Rock Mechanics			16	16		32	3
6	Petroleum Geology			48			48	3
7	Sedimentology and Stratigraphy			32			32	2
8	Mineral Deposits			48			48	3
9	Geostatistics			32				2
Total for 2nd semester I3				240	16	128	384	19.5

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					32	32	1
3	Principles of Remote Sensing			16		16	32	2
4	Applied Geophysics			32		32	64	3
5	Rock Blasting Technology			16	16		32	1.5
6	Mineral Exploration			32	32		64	3
7	Petroleum Chemistry and Refinery			32		32	64	3
8	Petrology and Mineralogy			32	0	32	64	3
Total for 1st semester I4				160	48	176	384	17

Curriculum for 4th year (I4) semester 2:

No	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					32	32	1
3	Cement Production Technology			32			32	2
4	Oil and Gas Resources Development			48			48	3
5	Mining Engineering			32	32		64	3
6	Mineral Processing			32		32	64	3

7	Basic Geological Mapping			32	16		48	2.5
8	Well Log Analysis			32			32	2
9	Natural Gas Engineering			32			32	2
Total for 2nd semester I4				240	48	96	384	19.5

Note: students are compulsory to conduct internship at least 4 weeks in the end of 4th-year. 2 modes of internship: i) full time at company/industry/government institution and ii) full time at ITC. Internship report is required.

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					32	32	1
3	Research Methodology			32			32	2
4	Work Safety and Ethics			32			32	2
5	Geo-environment			32			32	2
6	Special Course on Energy Technology			32			32	2
7	Reservoir Engineering			32	32		64	3
8	Project Management			32	32		64	3
9	Economics Engineering			32			32	2
10	Drilling Technology			32			32	2
11	Internship							2
Total for 1st semester I5				256	64	64	384	22

Curriculum for 5th year (I5) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Final Year Project/Internship	I5GGG 2FYI						9
Total for 2nd semester I5								9

2.5. Human Resources

Faculty of Geo-resources and Geotechnical Engineering has sufficient human resources with master and PhD holders in the field of Geo-resources and Petroleum Engineering, who were graduated from Japan, Thailand, Indonesia, Malaysia, Australia, Cambodia (Table 6.7). Furthermore, faculty has sent the future staffs to pursue master doctoral degree at partner universities in abroad (Table 8) which will graduate next year and two years. Based on the number of current staff and strategy plan of faculty, GGG will be capable to run the new program of Geo-resources and Petroleum Engineering.

Table 5.2: Human resources of Program of Geo-resources and Petroleum Engineering

No.	Name	Sex	Degree	University	Specialty
1	Eng Chandoeun	M	PhD	Kyushu University, Japan	Geophysics
2	Kret kakda	M	PhD	Kyushu University, Japan	Geophysics
3	Sreu Tola	M	PhD	Kyushu University, Japan	Petroleum Engineering
4	Seang Sirisokha	M	PhD	Kyushu University, Japan	Economic Geology
5	Or Chanmoly	M	PhD	Kyushu University, Japan	Petroleum Engineering
6	Chea Samneang	M	PhD	Kyushu University, Japan	Petroleum Engineering
7	Pich Bunchoeun	M	PhD	Hokkaido University, Japan	Geo-environment
8	Pech Sopheap	F	Master	Gadjah Mada University, University, Indonesia	Petroleum Geology
9	Sio Sreymean	F	Master	Gadjah Mada University, University, Indonesia	Geological Engineering
10	Oy Kimhouy	F	Master	Gadjah Mada University, University, Indonesia	Geological Engineering
11	Heng Muoy Yi	F	Master	Universiti Sains Malaysia, Malaysia	Applied Geophysics
12	Vamoeurn Nimol	M	Master	The University of Melbourne, Australia	Information Technology
13	Heng Ratha	M	Master	Institute of Technology of Cambodia	Petroleum Geology
14	Say Sokvireak	M	Master	Gadjah Mada University, University, Indonesia	Geological Engineering

Table 5.3: Future Human resources of Program of Geo-resources and Petroleum Engineering

No.	Name	Degree	Field Study of	University	Expected graduate
1	Mr. Phan Idol	Master	Mineral Processing	Kyushu University, Japan	Sept, 2023
2	Mr. Meakh Sovanborey	Master	Petroleum Engineering	Kyushu University, Japan	Sept, 2023
3	Mr. Tharn Tina	Master	Petroleum Engineering	Chulalongkorn University, Thailand	Aug, 2024
4	Mr. Buth Chitra	Master	Mining Engineering	Chulalongkorn University, Thailand	Aug, 2025
5	Mr. Syn Sak	Master	Petroleum Engineering	Curtin University, Australia	Feb, 2025

2.6. Laboratory Facilities

The faculty has 8 laboratories for supporting the research and practical class works for Program of Geo-resources and Petroleum Engineering and Program of Geotechnical Engineering are shown below:

Table 5.4: Laboratory facilities and function for program at GGG

No	Name of Laboratory	Equipment	Function
1	Sample Preparation	<ul style="list-style-type: none"> - Large Scale Cutting Machine - Small Scale Cutting Machine - Precision Cutting Machine - Rock Polishing Iron Plate - Rock Polishing Glass Plate - Electric Hot Plate - Mineral Separating Machine - Stainless Mortar - Iron Motar - Ultrasonic Cleaner - Diamond Polishing machine (Big) - Diamond Polishing machine (small) 	<ul style="list-style-type: none"> - Cutting, polishing, and preparing rock and soil samples - Experiment on mineral processing - Experiment on liquid and solid separating of minerals

		<ul style="list-style-type: none"> - Centrifuges with rotor (Pro-Analytical) - Electric Balance - Hand Auger Equipment 	
2	X-Ray	<ul style="list-style-type: none"> - X-Ray Diffraction (XRD) - X-Ray Fluorescence (XRF) 	Minerals and chemical characterization
3	Petroleum	<ul style="list-style-type: none"> - Instructional Gravimetric Capillary Pressure System - Bench Top Liquid Permeability Measurement System - Floor Stand Manual Drill Press - Instructional Gas Permeameter - Instructional Helium Porosimeter - Universal Strength Testing - Pressure Volume Temperature apparatus - Viscometer - Densitymeter - Gasometer - Stirrer - High precision digital scale 	Petroleum exploration, oil and gas reservoir characterization, rock and soil properties analysis
4	Geotechnics	<ul style="list-style-type: none"> - Electric Furnace - Electrical Oven - Micro-Deval Apparatus - Unconfined Compression Tester - Hydrometer Analyzer - Liquid Limit Apparatus (Cassagrand) - Stirrer (Oriental Motor) - Extruder - Electric Balance Big size - Agate Mortar, small, medium, and large sizes - Direct shear - Unconfined compression test apparatus - Point Load Index test apparatus for rock - Oil rotary vacuum pump - Sieve and small ball mill 	To support geotechnical and geo-resources investigation
5	Microscope	<ul style="list-style-type: none"> - Binocular Polarizing Metallurgical Microscope - Trinocular Polarizing Metallurgical Microscope - Heating/Freezing Stage Apparatus (Fluid Inclusion) 	Minerals characterization

6	Computer	30 computers	Practical work on GIS, Remote sensing, AutoCAD
7	Nanostructure and Chemical analysis	- MP-AES - SEM/EDS - UV-vis	Chemical and morphology analysis
8	Exploration Geophysics	- Magnetometer - Two Seismograph -48channels - Four workstations and one mobile workstation	Geo-resources and geotechnical exploitation

3. PROGRAM OF GEOTECHNICAL ENGINEERING

- Name in French: Programme de Génie Géotechniques
- Name in Khmer: វិទ្យាសាស្ត្រគោសល្យគ្រឹះភូគព្ភសាស្ត្រ

3.1. Program Education Objectives (PEOs)

The Geotechnical Engineering program under faculty of Geo-resources and Geotechnical Engineering at Institute of Technology of Cambodia prepares students for lifetime careers as productive and innovative engineers adaptive to new situation and emerging programs with utmost awareness of ethical, social and environmental concerns so that, within five years after graduation, they will:

- PEO1:** Having knowledge and competency in Geotechnical Engineering related fields such as Shallow and Deep Foundation Design, Earth Structure Design, Soil/Rock Slope Stability Analysis, and Road and Embankment Design for professionalism.
- PEO2:** Having good leadership, proactive and soft skills such as critical thinking, teamwork, team management, and project management.
- PEO3:** Possessing the interest in lifelong learning for continuous personal development.
- PEO4:** Having the high level of the right attitude, and responsibility and committing to serve society with a strong sense of technology ethics.

3.2. Program Learning Outcomes (PLOs)

Engineering program of Geotechnical Engineering under Faculty of Geo-resources and Geotechnical Engineering at ITC aims to instill in our graduates the following attributes:

A – KNOWLEDGE

- PLO1: Ability to apply engineering knowledge, mathematics, physics, and chemistry in Geotechnical Engineering.
- PLO2: Ability to design and conduct of experiments, analysis and interpretation of experimental data.

B – COGNITIVE SKILLS

- PLO3: Ability to conduct investigation of complex problems related to Geotechnical Engineering using research-based knowledge.
- PLO4: Ability to apply critical thinking skills to analyze and solve problems in engineering.
- PLO5: Ability to demonstrate on professional development and entrepreneurship skill.

C – INTERPERSONAL SKILLS AND RESPONSIBILITY

- PLO6: Ability to apply professionalism with ethical principle practices.
- PLO7: Ability to work cooperatively in engineering projects.
- PLO8: Ability to improve professional development and lifelong learning.
- PLO9: Ability to demonstrate knowledge and understanding of engineering management principles and economic decision-making in multidisciplinary environment.

D – NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION

- PLO10: Ability to apply technical communication skills in written and oral presentation with reliability.

E – PSYCHOMOTOR SKILLS

- PLO11: Ability to select and apply appropriate techniques and resources for product development.

3.3. Course hours and credits

For each semester from 3rd year to 5th year, students will take about 6 to 7 courses, including languages (French and English), to fulfill about 15 to 18 credits in equivalent to 384 hours.

Total credits for the program are required about 92 credits (including final year project which is 9 credits) equivalent to 1920 class hours in total.

The credit to be equivalent with teaching hour as follow:

- 16 hours of teaching course (C) = 1 credit
- 32 hours of tutorial (TD) = 1 credit
- 32 hours of laboratory practice (TP) = 1 credit

3.4. Curriculum of the program

This curriculum is designed for engineering degree which illustrate the whole three years **Geotechnical Engineering program** in Faculty of Geo-resources and Geotechnical Engineering from 3rd year to 5th year.

Table 5.4: Curriculum of Geotechnical Engineering in academic year 2023-2024

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Statistics			16	32		48	2
2	French					64	64	2
3	English					32	32	1
4	Computer Aides Drawing (CAD)					32	32	2
5	General Geology			32			32	1.5
6	Hydrogeology			32			32	2
7	Construction of Materials			16		16	32	1.5
8	Strength of Materials			32	16		48	2.5
9	Soil Mechanics I			32		32	64	3
Total for 1st semester I3				128	48	144	384	18

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					64	64	2
3	Structural Geology			32			32	2
4	Fluid Mechanics			32			32	2
5	Rock Mechanics			32		32	64	3
6	Soil Mechanics II			32		32	64	3
7	Geostatistics			32			32	2
8	Geodesy and Surveying			32		32	64	3
Total for 2nd semester I3				192	0	192	384	18

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French				32		32	1
2	English				32		32	1
3	Structural Analysis			32	16		48	2.5
4	Applied Geophysics			32		32	64	3
5	Rock Blasting Technology			16	16		32	1.5

6	Tunnel Engineering			32	16		48	2.5
7	Slope Stability Analysis & Earth Retaining Structure			32	32		64	3
8	Foundation Design and Analysis I			32	32		64	3
Total for 1st semester I4				174	112	96	384	17.5

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					32	32	1
3	Foundation Design and Analysis II			32	32		64	3
4	In-situ Geotechnical Investigation			32	32		64	3
5	Mining Engineering			32	32		64	3
6	Reinforced Concrete			32	16		48	2.5
7	Deep Excavation			32	16		48	2.5
8	Computer Software for Solving Geotechnical Problems			16	16		32	1.5
Total for 2nd semester I4				176	144	64	384	17.5

Note: students are compulsory to conduct internship at least 4 weeks in the end of 4th-year. 2 modes of internship: i) full time at company/industry/government institution and ii) full time at ITC. Internship report is required.

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French					32	32	1
2	English					32	32	1
3	Research Methodology			32			32	2
4	Work Safety and Ethics			32			32	2
5	Geo-environment			32			32	2
6	Engineering Project Management and Development			32	16		48	2.5
7	Road Engineering			32	32		64	3

8	Ground Improvement			32	32		64	3
9	Bridge Design and Engineering			32	32		64	3
10	Internship							2
Total for 1st semester I5				208	176	0	384	21

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Final Year Project/Internship	I5GGG 2FYI					384	9
Total for 2nd semester I5							384	9

3.5. Human Resources

Faculty of Geo-resources and Geotechnical Engineering has sufficient human resources with master and PhD holders in the field of Geotechnical Engineering, who were graduated from Japan, Thailand, Indonesia, Malaysia, Australia, Cambodia (Table 6.16). Furthermore, faculty has sent the future staffs to pursue master's degree at partner universities in abroad (Table 5.5) that graduates next year and two years. Based on the number of staff and strategy plan of faculty staffs, GGG will be capable to run new program of Geotechnical Engineering.

Table 5.5: Human resources of Program of Geotechnical Engineering

No.	Name	Sex	Degree	University	Specialty
1	Boeut Sophea	F	PhD	Hokkaido University, Japan	Rock Mechanic Engineering
2	Por Sopheap	M	PhD	Chulalongkorn University, Thailand	Geotechnical Engineering
3	Horng Vuthy	M	PhD	Hokkaido University, Japan	Geotechnical Engineering
4	Kaing Sainglong	M	Master	Kyushu University, Japan	Geotechnical Engineering
5	Sieng Peou	M	Master	Ecole Nationale Supérieure des Mines de Paris, France	Geotechnical Engineering
6	Kong Sotheara	M	Master	University of the Philippines-Diliman, Philippine	Geotechnical Engineering

7	Seng Mengly	M	Master	Chulalongkorn University, Thailand	Geotechnical Engineering
8	Hong Pisith	M	Master	Tokai University, Japan	Geotechnical Engineering

Table 5.6: Future Human resources of Program of Geotechnical Engineering

No.	Name	Degree	Field of Study	University	Expected graduate
1	Mr. Roeun Daro	Master	Geotechnical Engineering	Chulalongkorn University, Thailand	Aug, 2023
2	Mr. Lann Tongsan	Master	Geotechnical Engineering	Chang'an University, China	Aug, 2024
3	Mr. DOMPHOEUN Rithy	Master	Geotechnical Engineering	International Institute of Technology, Thammasat, Thailand	Aug, 2023

ANNEX 6

Detail of establishment of new program namely “Materials Science and Engineering” under faculty of Geo-resources and Geotechnical Engineering

1. BACKGROUND

Engineering degree of Materials Science and Engineering program will be established with accordance to the improvement trend of industry in Cambodia. In conjunction with fourth phase of rectangular strategy and industrial development policy 2015-2025 of Cambodian government, human resources in Materials Science and Engineering are being one of important factors. Materials science and engineering with modern production and engineering are the priorities science and technology domains stated in the Science, Technology and Innovation Roadmap 2030 (The STI Roadmap 2030). With current development in Cambodia, there 48 special economic zones with more than 95 companies/industries (ODC). In this last decade, many big industries started moving to Cambodia. There are 3 car-tire factories with capital of about 1,000 million USD, one is operating its tire production line, one is planning to finish their construction in coming May 2023 and the last one will start operation soon. Rubber is one of the major productions to support Cambodian economic. Cambodia produces raw rubber increasing to about 340, 000 tonnes in 2020.

There are 8 automobile assembly factories (Table 7.1), among which Toyota assembly plant was agreed by both Prime Ministers, Cambodia and Japan, on 28th September 2022 to establish soon in Cambodia. With about 3 decades present in Cambodia, garments factories are one of the major industries and produces huge job opportunities.

Table 6.1: Car assembly companies in Cambodia

No	Company name	Budget (million \$)	Job opportunities
1	Hyundai-KH Motor	-	-
2	International VCV Industry	4.07	820
3	Daehan	-	-
4	PMA Automotive (Cambodia) Co, LTD	21	441
5	EM Automobile Co., LTD	16.3	515
6	K (Cambodia) Co., LTD	7.3	166
7	GTV Motor Co., LTD	15.6	738
8	Toyota Tsusho Manufacturing (Cambodia) Co., LTD	36.7	150

Ceramic production in 2021, Cambodia imports from many countries such as China, Switzerland, Thailand, Spain and Hong Kong with total budget of about USD 179.46 million according to the United Nations COMTRADE database on international trade. There are many industries are working on brick production for building construction as Cambodia is abundance in clay. Most brick kilns are found in province next to river such as Kandal province, Kampong Chhnang province, and so on. Ceramic tile, decoration brick and other ceramic applications are very potential for local use with alignment of blooming of construction site in the country. However, the knowledge for ceramic tile and glazing technique are still limited.

Cambodia is also full of sand resources from both river and sea. Sand is another potential material for using in concrete, cement and glass production. Ministry of Mines and Energy reported that in 2020 and 2021, total sand from Mekong and Bassac reivers was about 23 million cubic meter used for construction purposes. Moreover, Cambodia had supplies huge cubic meter (about 72 million tonnes) of sea sand to Singapore. Several students from Faculty of Geo-resources and Geotechnical Engineering of ITC had studied the quality of Cambodian sand from Sihanouk ville. The studies showed good quality of sand with less iron oxide, that possible for glass production.

With the fast increasing of these industries, Cambodia will need huge number of human resources with materials science and engineering knowledge to support such a fast growth in the next 5 years.

2. PROGRAM OF MATERIALS SCIENCE AND ENGINEERING

- Name in French: Programme de Science et Génie des Matériaux
- Name in Khmer: វិស្វកម្ម និងវិទ្យាសាស្ត្រសម្ភារៈ

2.1. Program Education Objectives (PEOs)

The Materials Science and Engineering program under faculty of Geo-resources and Geotechnical Engineering at Institute of Technology of Cambodia prepares students for lifetime careers as productive and innovative engineers adaptive to new situation and emerging programs with utmost awareness of ethical, social and environmental concerns so that, within five years after graduation, they will:

- PEO1:** Having knowledge and competency in Materials Science and Engineering related fields such as development of metallurgical materials, ceramics and polymers for professionalism.
- PEO2:** Having good leadership, pro-active and soft skills such as critical thinking, team work, team management.
- PEO3:** Possessing interest in lifelong learning for continuous personal development.
- PEO4:** Having high level of the right attitude, responsibility and committing to serve society with a strong sense of technology ethics.

2.2. Program Learning Outcomes (PLOs)

Engineering program of Materials Science and Engineering under faculty of Geo-resources and Geotechnical Engineering at ITC aims to instill in our graduates the following attributes:

A – KNOWLEDGE

- PLO1: Ability to apply engineering knowledge, physics, chemistry and mathematics in Materials Science and Engineering.
- PLO2: Ability to design and conduct of experiments, analysis and interpretation of experimental data.

B – COGNITIVE SKILLS

- PLO3: Ability to conduct an investigation of complex problems related to Materials engineering using research based knowledge.
- PLO4: Ability to apply critical thinking skills to analyze and solve problems in engineering.
- PLO5: Ability to demonstrate on professional development and entrepreneurship skill.

C – INTERPERSONAL SKILLS AND RESPONSIBILITY

- PLO6: Ability to apply professionalism with ethical principle practices.
- PLO7: Ability to work cooperatively in engineering projects.
- PLO8: Ability to improve professional development and lifelong learning.
- PLO9: Ability to demonstrate knowledge and understanding of engineering management principles and economic decision-making in multidisciplinary environment.

D – NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION

- PLO10: Ability to apply technical communication skills in written and oral presentation with reliability.

E – PSYCHOMOTOR SKILLS

- PLO11: Ability to select and apply appropriate techniques and resources for product development.

2.3. Course hours and credits

For each semester from 3rd year to 5th year, students will take about 7 to 8 courses, including languages (French and English), to fulfill about 15.5 to 19.5 credits in equivalent to 384 hours.

Total credits for the program are required about 96.5 credits (including final year project which is 9 credits) equivalent to 1920 class hours in total.

The credit to be equivalent with teaching hour as follow:

- 16 hours of teaching course (C) = 1 credit
- 32 hours of tutorial (TD) = 1 credit

- 32 hours of laboratory practice (TP) = 1 credit

2.4. Curriculum of the program

This curriculum is designed for engineering degree which illustrate the whole three years **Materials Science and Engineering program** in Faculty of Geo-resources and Geotechnical Engineering from 3rd year to 5th year. Curriculum of Materials Science and Engineering in academic year 2023-2024:

Table 6.2: Curriculum of Materials Science and Engineering

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Statistics			32	16		48	2.5
2	French			0	0	64	64	2
3	English			0	0	32	32	1
4	Introduction to Materials Engineering			48	0	0	48	3
5	Computer aides drawing			16	32	0	48	2
6	Materials properties			48	0	0	48	3
7	Materials Characterization Technique			16	0	32	48	2
8	Thermodynamics of materials			48	0	0	48	3
Total for 1st semester I3				208	48	128	384	18.5

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	64	64	2

3	Strength of materials			32	32	0	64	2
4	Polymer science and technology			48	0	32	80	3
5	Ceramic science and technology			48	0	0	48	3
6	Glass science and Technology			48	0	32	80	4
7	Basic numerical coding			16	16	0	32	1.5
Total for 2nd semester I3				176	48	160	384	15.5

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Ceramic Fabrication			16	0	32	48	2
4	Ceramic characterization			16	0	32	48	2
5	Polymer characterization			16	0	32	48	2
6	Metal Processing Technology			32	0	32	64	3
7	Corrosion in Metal			32	32	0	64	3
8	Finite Element Analysis			16	32	0	48	2
Total for 1st semester I4				128	64	192	384	16

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Rubber technology and characterization			32	0	32	64	3
4	Latex technology and characterization			32	0	32	64	3
5	Surface Technology			32	0	32	64	3
6	Textiles science and technology			32	16	0	48	2.5
7	Failure Analysis			32	16	0	48	2.5
8	Cement Production technology			32	0	0	32	2
9	Internship + Report			-	-	-	-	
Total for 2nd semester I4				192	32	160	384	18

Note: students are compulsory to conduct internship at least 4 weeks. 2 modes of internship: i) full time at company/industry/government institution and ii) full time at ITC. Internship report is required.

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	French			0	0	32	32	1
2	English			0	0	32	32	1
3	Quality Control of Textiles			32	0	32	64	3
4	Metal Joining Technology			32	0	32	64	3
5	Start-up			32	0	0	32	2

6	Safety Engineering			32	0	0	32	2
7	Materials Selection and Design			32	32	0	64	4
8	Engineering Economics			16	16	0	32	2
9	Basic numerical coding			16	16	0	32	1.5
Total for 1st semester I5				192	64	128	384	18

Curriculum for 5th year (I5) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Final Year Project/Internship	I5GGG 2FYI					384	9
Total for 2nd semester I5							384	9

2.5. Human Resources

Under Faculty of Geo-resources and Geotechnical Engineering (GGG), new Program of Materials Science and Engineering (MSE) is proposed for establishment. The Program of Materials Science and Engineering has sufficient human resources with master and PhD holders in the field of Materials Science and Engineering, who graduated from Japan, Thailand, Malaysia, Indonesia and Cambodia (Table 6.3). Currently, MSE has 14 staffs including 4 female staffs. Among 14 staffs, MSE has 3 official staffs and 11 contract staffs. Furthermore, faculty has sent the future staffs to pursue master and PhD degree at partner universities in abroad (Table 6.4) that graduates next year and two years. Based on the number of staff and strategy plan of faculty staffs, GGG will be capable to run new program of Materials Science and Engineering.

Table 6.3: Human resources of Program Materials Science and Engineering

No.	Name	Sex	Degree	University	Specialty
1	Yos Phanny	M	PhD	Kyushu University (Japan)	Polymer, Natural Rubber and Latex

2	Kry Nallis	F	PhD	Universiti Sains Malaysia (Malaysia)	Polymer composites Engineering
3	Bun Kimngun	M	PhD	Universiti Sains Malaysia (Malaysia)	Ceramic Engineering
4	Hin Raveth	M	PhD	INSA de Rennes (France)	Ceramic/Glass Engineering
5	To Dara	M	PhD	Yokohama National University (Japan)	Metallurgical Engineering
6	Liv Yi	M	PhD	Girona University (Spain)	Composites Material Engineering
7	Sreng Laymey	F	Master	Institute of Technology of Cambodia (Cambodia)	Polymer, Natural Rubber and Latex
8	Aun Srean	F	Master	Chulalongkorn University (Thailand)	Polymer, Thermoplastic
9	Chea Monyneath	F	Master	Chulalongkorn University (Thailand) Nagaoka University of Technology (Japan)	Ceramic Engineering
10	Hong Piseth	M	Master	Tokai University (Japan)	Geotechnical Engineering
11	Seab Piseth	M	Master	Gadjah Mada University (Indonesia)	Metallurgical Engineering
12	Chhoun Bora	M	Master	Gadjah Mada University (Indonesia)	Metallurgical Engineering
13	Pich Yanghav	M	Master	Institute of Technology of Cambodia (Cambodia)	Metallurgical Engineering
14	Den Rithy	M	Master	Gadjah Mada University (Indonesia)	Metallurgical Engineering

Table 6.4: Future staffs of GGG for Program Materials Science and Engineering

No.	Name	Degree	Field of Study	University	Expected graduate
1	Mr. Yann Theara	Master	Thermoplastic for packaging	Chulalongkorn University, Thailand	2024

2	Mr. Phann Panhaneath	Master	Natural fiber composites polymer	Chulalongkorn University, Thailand	2024/2025
3	Ms. Pen Linda	Master	Ceramic/Glazing	Chulalongkorn University, Thailand	2024/2025
4	Ms. Moeun Vicheka	Master	Metallurgical Engineering	Chulalongkorn University, Thailand	2024/2025
5	Mr. Chann Socheata	Master	Glass Engineering	Institute of Technology of Cambodia, Cambodia	2024
6	Mr. Heng Kimhong	PhD	Glass Engineering	Institute of Technology of Cambodia, Cambodia	2024

2.6. Laboratory Facilities

Program of Materials Science and Engineering has 8 laboratories for supporting the research and practical class work. Rubber processing laboratories was setup with support from Higher Education Improvement Project (HEIP) with capability of rubber compounding with physical and mechanical analysis. Latex processing laboratory was setup with budget from HEIP and Government budget. It provides opportunities for researchers and students to prepare various types of latex applications and properties analysis. Plastic processing laboratory consists of extruder, shredder, hot pressed machine and universal tensile machine. Furthermore, ceramic laboratory, glass processing and strengthen laboratory and materials laboratory are also used for all research and practical work. In future, MSE wishes to improve its laboratories by expecting various priority equipment as listed in Table 7.10.

Table 6.5: Laboratory facilities and function for MSE

No	Name	Equipment	Function	Person in charge
1	Rubber Processing lab (HEIP)	<ul style="list-style-type: none"> - Two-roll mills - Rheometer - Mooney viscometer - Rebound resilience - Vulcanizing machine - Hardness tester (shore A and D) - Air oven - De-Mattia fatigue - Sample cutter set 	Rubber compounding with physical and mechanical analysis	Ms. Sreng Laymey and Dr. Yos Phanny

		- Compression set		
2	Latex Processing lab (HEIP + Government PB)	<ul style="list-style-type: none"> - Stirrer motors - Whipping motors - Ceramic plate - Ceramic glove mold - Foaming mold - Hardness tester (shore A0) 	Preparing various types of latex applications and properties analysis	Dr. Yos Phanny and Ms. Sreng Laymey
3	Plastic processing lab (UNESCO)	<ul style="list-style-type: none"> - Shredder - Extruder - Hot pressed - Tensile tester 	Mixing, pressing and properties analysis	Dr. Chan Sarin
4	Ceramic Processing lab (HEIP)	<ul style="list-style-type: none"> - Oven - Furnace with temperature speed control (1500 °C) - Plaster mold - Three-point bending - Four-point bending - Compression 	Ceramic sample preparation and properties analysis	Ms. Chea Monyneath
5	Glass Processing lab (HEIP)	<ul style="list-style-type: none"> - Drop test - Kiln for glass strengthening 	Glass strengthening preparation and properties analysis	Dr. Hin Raveth
6	Materials Lab (GIM)	<ul style="list-style-type: none"> - Micro-hardness tester - Torsion machine - Furnace - Charpy pendulous - Microstructure machine - Universal Tensile machine - Extruder - 3D Printer - Polishing 	Metal properties testing and plastic sample production through 3D printing	Ms. Mut Mesa
7	XRD and XRF lab (JICA)	<ul style="list-style-type: none"> - Table top XRD - XRF 	Chemical and mineral analysis	Dr. Bun Kimngun

8	Nanostructure and Chemical analysis lab (JICA-LBE)	<ul style="list-style-type: none"> - MP-AES - SEM/EDS - UV-vis 	Chemical and morphology analysis	Dr. Yos Phanny and Ms. Heng Muoyyi
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Table 6.6: Future priority equipment for laboratories capacity improvement

No	Equipment	Remark
	Rubber internal mixer	Supporting rubber processing
	Rubber extruder	Supporting rubber processing
	Auto-clave for rubber vulcanization	Supporting rubber processing
	Water bath	Supporting latex processing
	Latex mechanical stability test	Supporting latex processing
	Latex viscosity test	Supporting latex processing
	Latex volatile test	Supporting latex processing
	FTIR	Supporting property analysis
	STR	Supporting property analysis
	DSC	Supporting property analysis
	TGA	Supporting property analysis
	Plastic internal mixers	Supporting plastic processing
	Plastic two-roll mill	Supporting plastic processing
	Plastic blow molding	Supporting plastic processing
	Plastic extruders	Supporting plastic processing
	Plastic thermal forming	Supporting plastic processing
	Sand cast equipment set	Supporting metal processing
	Metal fatigue test	Supporting property analysis
	Furnace for metal melting	Supporting metal processing
	Furnace for glass processing	Supporting glass processing
	Textile pigment dying	Supporting property analysis
	Fire test	Supporting property analysis
	Textile hardness	Supporting property analysis
	Yarn test	Supporting property analysis
	Textile color test	Supporting property analysis

ANNEX 7

Detail of proposed modification of Architectural Engineering program of Faculty of Civil Engineering

1. BACKGROUND

Faculty of Civil Engineering Department (FCE): The faculty has set the strategy for the development of the 3 departments as follow such as increasing number of students, creating new programs. For the department of civil engineering GCI has set the number of enrolled students to be at year 3 and the department of transportation and infrastructure has commitment to cooperate with foreign universities and ministry in teaching and learning in order to make students well formed in the fields. More cooperation will be concluded with French institutions. The department GAR is running a project of human resources management and expected to get 3 Ph. D staff at the end of year 2024 now GAR is working on the curriculum improvement to allow students more skill and competences. At the same time, group of researchers agree to join and propose a research unit "Building Designs and Built Environment". The documents are submitted to RIC. The new improved curriculum with the research unit approved will let GAR to propose a master program and Ph. D. program of architecture

Architectural engineering department has got cooperation with university of Liège and currently operate a project for development since 2020. 3 future teaching staff of the department are being formed by do their Ph. D in co-direction of Uliège and ITC. In perspective to improve the curriculum to make education more effective, discussions were made between GAR and professors and researchers of architectural engineering in Uliège Prof. Dr. Pierre Leclercq, Dr. Calixte Xaviera, we concluded the following proposed curriculum. The improvement of curriculum in this engineering degree will be shown in table 3.

2. PROPOSE MODIFICATION OF CURRICULUM OF ARCHITECTURAL ENGINEERING

For the upcoming academic year, the program of architectural engineering requested to modify 17 courses in total, in which, 14 courses are modified duration and shift among Course (C), Tutorial (TD) and Practice (TP), 2 courses are deleted and 1 course is added.

Table 7.1: Summary of propose modification of 17 courses in GAR

Gr	No.	Name of course	Current Situation				New proposal			
			C	TD	TP	Credit	C	TD	TP	Credit
13GAR-S1	1	Architectural Design Workshop I	16	32	0	2	16	0	32	2
	2	Sketching and Color	16	32	0	2	0	32	0	1

	3	Ornaments and Elements of Khmer Architecture	16	32	0	2	0	32	0	1
	4	Statistics	16	32	0	2	Delete			
I3GAR-S2	1	Architectural Design Workshop II	32	32	0	3	16	0	64	3
	2	Informatics (MATLAB)	16	16	0	1.5	Delete			
	3	Surveying	32	0	0	2	0		32	1
	4	Technical Elements of Architecture (TCB1)	New				32	0	0	2
I4GAR-S1	1	Architectural Design Workshop III	32	32	0	3	16	0	64	3
	2	Reinforced concrete	16	32	0	2	0	32		1
	3	Building Construction Technology	32	0	0	2	16	0	0	1
	4	Landscape Architecture	32	32	0	3	32	0	32	3
I4GAR-S2	1	Architectural Design Workshop IV	32	32	0	3	16	0	64	3
	2	Interior Design	32	32	0	3	16	0	32	2
	3	Computer Graphic Design II (3Ds Max)	16	32	0	2	32	0	32	3
I5GAR-S1	1	Architectural Design Workshop V	32	32	0	3	16	0	64	3
	2	Thesis Writing and Methodology	32	0	0	2	16	0	0	1

3. CURRICULUM OF THE PROGRAM

This curriculum is designed for an engineering degree that illustrates the whole three years program in the Architectural Engineering, Faculty of Civil Engineering from the 3rd year to 5th year.

The curriculum of the Architectural Engineering in the academic year 2023-2024 is shown below:

Table 7.2: Curriculum of Architectural Engineering

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Anglais	GARI31LAN		0	0	32	32	1
2	Français	GARI31LFR		0	0	64	64	2
3	Atelier d'Architecture I (Maison traditionnelle)	GARI31ATA		16	0	32	48	2
4	AutoCAD	GARI31AUC		0	32	0	32	1
5	Croquis et Couleur	GARI31CRC		0	32	0	32	1
6	Géométrie Descriptive	GARI31GED		32	0	0	32	2
7	Histoire de l'Architecture Khmer	GARI31HAK		32	0	0	32	2
8	Matériaux de construction	GARI31MDC		16	0	32	48	2
9	Ornement et Eléments de l'Architecture Khmer	GARI31OEK		0	32	0	32	1
10	Théorie general de d'Architecture	GARI31THA		32	0	0	32	2
Total for 1st semester I3				128	96	160	384	16

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Anglais	GARI32LAN		0	0	64	64	2
2	Français	GARI32LFR		0	0	32	32	1
3	Atelier d'Architecture II (Bioclimatique)	GARI32ATA		16	0	64	80	3
4	Dessin par Ordinateur I (Sketch-Up)	GARI32DPO		16	32	0	48	2
5	Histoire d'Architecture Mondiale	GARI32HAM		16	0	0	16	1
6	Résistance des Matériaux	GARI32RDM		32	16	16	64	3
7	Topographie	GARI32TOP		0	0	32	32	1
8	Thermique de Batiment	GARI31TBM		16	0	0	16	1
9	Élément technique d'architecture (TCB1)	GARI32TCB		32	0	0	32	2
10	Stage de fin I3 et Rapport	GARI41SFR						2

Total for 2nd semester I3				128	48	208	384	18
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Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Anglais	GARI41LAN		0	0	32	32	1
2	Français	GARI41LFR		0	0	32	32	1
3	Analyse des structures	GARI41ADS		16	32	0	48	2
4	Atelier d'Architecture III (Bâtiment monofonctionnel)	GARI41ATA		16	0	64	80	3
5	Béton armé	GARI41BEA		0	32	0	32	1
6	Construction métallique	GARI41COM		32	0	0	32	2
7	Electricité du bâtiment	GARI41EDB		16	0	0	16	1
8	Installation Sanitaire	GARI41INS		16	0	0	16	1
9	Système d'Information Geographique (GIS)	GARI41GIS		16	0	0	16	1
10	Technologie du batiment	GARI41TDB		16	0	0	16	1
11	Architecture du Paysage	GARI41ADP		32	0	32	64	3
Total for 1st semester I4				160	64	160	384	17

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Anglais	GARI42LAN		0	0	32	32	1
2	Français	GARI42LFR		0	0	32	32	1
3	Atelier d'Architecture IV (Projet intégré)	GARI42ATA		16	0	64	80	3
4	Décoration intéreur	GARI42DIN		16	0	32	48	2
5	Règlementation d'Urbanisme et Droit	GARI42RUD		32	0	0	32	2
6	Mécanique des Sols	GARI42MDS		32	0	0	32	2
7	Urbanisme I	GARI42URB		16	32	0	48	2
8	Voirie et reseaux divers	GARI42VRD		16	0	0	16	1
9	Dessin par Ordinateur II (BIM)	GARI42DPO		32	0	32	64	3
Total for 2nd semester I4				160	32	192	384	17

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Anglais	GARI51LAN		0	0	32	32	1
2	Module d'Insertion Professionnelle	GARI51LFR		0	0	32	32	1
3	Atelier d'Architecture V (Masterplan)	GARI51ATA		16	0	64	80	3
4	Béton Précontraint	GARI51BPR		32	0	0	32	2
5	Construction en Bois	GARI51COB		16	0	0	16	1
6	Métre	GARI51MET		16	0	0	16	1
7	Méthodologie de Recherches et Rédaction de These	GARI51MRT		16	0	0	16	1
8	Gestion de Projet	GARI51GES		16	32	0	48	2
9	Pratique Professionnel	GARI51PRA		16	32	0	48	2
10	Stabilité des Batiment de Grande Hauteur	GARI51SBG		16	0	0	16	1
11	Urbanisme II	GARI51URB		16	0	32	48	2
Total for 1st semester I5				160	64	160	384	17

Curriculum for 5th year (I5) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Stage et Soutenance de Thèse	GARI52SST						9
Total for 2nd semester I5								9

ANNEX 8

Detail of proposed modification of Engineering Program in Data Science

1. BACKGROUND

The engineering program of Data Science is a 5-year program established in 2021 and begin its operation from academic year 2021-2022. Through the Higher Education Improvement Project (HEIP), the program was evaluated by two external experts Prof. Michel Verleysen (Université catholique de Louvain, Belgium) from 3-6 February 2023 and Prof. Aida Suraya Md. Yunu (Universiti Putra Malaysia, Malaysia) on 3 March 2023. The program was evaluated as "Overall Satisfactory" from both panels. However, there are some aspects shall be improved as following:

- More practical works on data analysis should be provided to students
 - Data analysis and image processing should be introduced
 - Course content and syllabus should be improved
 - Order of some courses are needed to re-ordered
-
- **Human Resources:**
 - Recruit 4 new staffs who are graduated in the field of Data Science and Computer Science
 - Host series of up-skill training for department's staffs to effectively improve the course content and teaching method
 - **Program Marketing:** boost the visualization of the program by
 - Host annual promotional events with industry engagement
 - Develop attractive brochures and other promotion materials for both online and offline campaign
 - Work closely with all relevant stakeholders to promote internships, research collaboration, training seminar on soft skills and other practical skills.

2. PROPOSE MODIFICATION OF CURRICULUM OF ENGINEERING PROGRAM IN DATA SCIENCE

For the upcoming academic year, the Engineering program in Data Science requested to modify 16 courses in total, in which, 5 courses are deleted, 4 courses are newly added, and 7 courses are modified name and reorder.

Table 8.1: Summary of propose modification of 11 courses:

Gr	No.	Name of course	Current Situation				New proposal			
			C	TD	TP	Credit	C	TD	TP	Credit
I3AMS-S2	1	Numerical Analysis	32	16	16	3	Delete			
	2	Advance Probability	48	0	0	3	Delete			
	3	Topology and Differential Calculus	48	0	0	3	Delete			
	4	Introduction to Machine Learning	Move from Year 5				32	32	0	3
	5	Introduction to Data Science	New				32	32	0	3
I4AMS-S1	1	Artificial Intelligent	New				32	0	32	3
	2	Ethics and Data Privacy	New				32	0	32	3
	3	Graph Theory	Modify name and move from I4 semester 2				32	0	32	3
	4	Stochastic Processes	32	0	32	3	Delete			
	5	Operation Research	32	32	0	3	Delete			
I4AMS-S2	1	Time Series Analysis and Forecasting	32	16	16	3	Move to year 5			
	2	Economics for Engineers	Move from semester 1				32	0	0	2
	3	Data Visualization	New				32	0	32	3
I5AMS-S1	1	Project Management	Modify name from IT Project Management				32	0	0	2
	2	IT Project Management	32	0	0	2	Modify name to Project Management			
	3	Time Series Analysis and Forecasting	Move from year 4				32	16	16	3

3. CURRICULUM OF THE PROPOSED PROGRAM

This curriculum is designed for an engineering degree that illustrates the whole three years program in the Engineering Program in Data Science, Faculty of Electrical Engineering from the 3rd year to 5th year.

The curriculum of the Engineering Program in Data Science in the academic year 2023-2024 is shown below:

Table 8.2: Curriculum of Data Science

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Statistics	AMSI31STA		16	32	0	48	2
2	Object-Oriented Programming	AMSI31OOP		32	0	32	64	3
3	Mathematical Modeling	AMSI31MAM		32	16	0	48	2
4	Advanced Computer Architecture	AMSI31ACO		32	0	0	32	2
5	Discrete Mathematics	AMSI31DIS		32	0	0	32	2
6	Optimization	AMSI31OPT		32	32	0	64	3
7	French	AMSI31FRA		0	0	64	64	2
8	English	AMSI31ANG		0	0	32	32	1
Total for 1st semester I3				176	80	128	384	17

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Introduction to Data Science	AMSI32PRO		32	0	32	64	3
2	Introduction to Machine Learning	AMSI32TDC		32	0	32	64	3
3	Database	AMSI32DAT		16	16	16	48	2
4	Computer Programming in Data Science	AMSI32PDS		16	0	32	48	2
5	Introduction to Networks	AMSI32INN		32	0	0	32	2
6	Minor project	AMSI32MPR		0	0	32	32	1
7	French	AMSI32FRA		0	0	32	32	1
8	English	AMSI32ANG		0	0	64	64	2
Total for 2nd semester I3				128	16	240	384	16

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Graph Theory	AMSI42GRT		16	0	16	32	2
2	Artificial Intelligent	AMSI41AIN		32	0	32	64	3
3	Statistical Models/Regression Analysis	AMSI41STM		32	0	32	64	3
4	Ethics and Data Privacy	AMSI41EDP		32	0	32	64	3
5	Operating Systems	AMSI41OSY		32	16	16	64	3
6	French	AMSI41FRA		0	0	32	32	1
7	English	AMSI41ANG		0	0	32	32	1
Total for 1st semester I4				128	16	240	384	16

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Economics for Engineers	AMSI42GRT		32	0	0	32	2
2	Introduction to Parallel and Distributed Programming	AMSI42IPD		32	0	32	64	3
3	Probabilistic Graphical Models	AMSI42PGM		32	16	16	64	3
4	Data Visualization	AMSI52DVI		32	0	32	64	3
5	Large-scale Distributed System (Cloud Computing)	AMSI42LDS		32	0	16	48	2.5
6	Database Design and Administration	AMSI42DDA		32	0	16	48	2.5
7	Major Project (or Internship)	AMSI42INT		0	0	0	0	3
8	French	AMSI42FRA		0	0	32	32	1
9	English	AMSI42ANG		0	0	32	32	1
Total for 2nd semester I4				192	16	176	384	21

Curriculum for 5th year (I5) semester 1:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Project Management	AMSI51IPM		32	0	0	32	2
2	Programming for Data Science	AMSI51PDS		32	0	32	64	3
3	Information Retrieval Web Analytics	AMSI51IRW		32	0	32	64	3
4	Exploratory Data Analysis and Unsupervised Learning	AMSI51EDA		16	16	16	48	2
5	Time Series Analysis and Forecasting	AMSI42TSA		32	16	16	64	3
6	Natural Language Processing	AMSI51NLP		48	0	0	48	3
7	French	AMSI51FRA		0	0	32	32	1
8	English	AMSI51ANG		0	0	32	32	1
Total for 1st semester I5				192	32	160	384	18

Curriculum for 5th year (I5) semester 2:

No.	Name of subject	Code	Instructor	Course	TD	TP	Total	Credit
1	Final Year Internship	AMSI52FYI						9
Total for 2nd semester I5								9

ANNEX 9

Detail of establishment of international program “Bachelor of Software Engineering” – 4 Years Program under department GIC

1. BACKGROUND

Bachelor of Software Engineering will be established with accordance to the improvement trend of industry in Cambodia. In conjunction with fourth phase of rectangular strategy and industrial development policy 2015-2025 of Cambodian government, human resources in Software Engineering are being one of important factors. Software Engineering is the priorities science and technology domains stated in the Science, Technology and Innovation Roadmap 2030 (The STI Roadmap 2030).

The research study is conducted by CDRI in collaboration with CADT to assess current and future demand for and supply of digital and ICT skills. The quantitative analysis of the study relied on two surveys: firms (formally registered with MPTC or Ministry of Commerce, or both) and students/graduates. 202 owners/managers over 300 sample firms were interviewed. 1022 students and graduates from higher education and technical vocational education and training (TVET) respondents were interviewed.

The following finding were observed:

- Business in ICT and the employment opportunities are thriving, particularly in the last decade. The top five services or product ICT firms have offered include: (1) retail sales and maintenance of ICT devices, (2) software, application and ICT system, (3) graphic and multimedia design, (4) network, telecommunication, and internet, and (5) digital marketing. Other emerging services and products include: cloud services, data management system, and financial technology (fintech).
- Almost all sample firms are optimistic that their demand for ICT-related skills and occupations will increase in the next two years at an average rate of 30 percent per annum. ICT firms are more positive in their future hiring of ICT positions at an average rate of 40 percent between 2021 and 2022, compared to 20 percent for non- ICT firms. Occupations that the interviewed employers expected to hire for in the future include ICT sales professionals, software and application developers, e-marketing professionals, and web developers and programmers.
- ICT graduates have higher employment opportunities with relatively higher wage premiums to those of non-ICT graduates with similar levels of education, experience, and other socio-economic characteristics, at least in the short term. The average wage premium of graduates with ICT majors is estimated at around 10 percent, with a 95 percent confidence interval.

In the finding, it is clearly state the thriving of ICT business. And software and application development is the second service or product after the technical sale (which also required ICT skills), thus the high occupation opportunities and premium wage compare to other non-ICT occupation.

Based on the potential, the Department of Information and Communication would like to establish the International Program for Bachelor's Degree of Software Engineering. The program aims at promoting the software engineering field in Cambodia on the international stage and increasing job and research opportunities for local and international students. The university partner supporting the program is Curtin University in Australia and Malaysia. Therefore, the Bachelor's Degree in Civil and Construction Engineering from the Internal Program is recognized by Australia and Malaysia.

2. BACHELOR OF SOFTWARE ENGINEERING

2.1. Program Structure

The bachelor of Software Engineering is designed to be flexible with total four years (1 year of Pre-degree foundation + 3 years of degree program).

➤ Pre-degree Foundation Program

The Pre-degree Foundation Program is kind of applied curriculum of Curtin University in 1year at ITC. This one-year international foundation studies includes two semester courses in Foundation Engineering and Science

The Foundation of Engineering and Science prepares students for undergraduate study in Engineering and Science and Information Technology. In addition to several units that are common to all foundation courses, students study units in Engineering Mathematics, Physics and Chemistry and Programming in C++. The courses are aimed at developing academic diligence, critical analysis, and a raft of generic skills in students. They provide a solid foundation for the students to adapt to university education more confidently, both in terms of level and style of education.

There are two (2) streams for the Foundation of Engineering and Science program:

- Engineering stream (+3years)
- Science stream (+4years)

Students who obtain satisfactory results are eligible for either admission to a range of undergraduate courses offered in the Faculty of Engineering/Science at any Curtin campus (Malaysia, Perth-Australia, Singapore, etc) or admission to other international program at ITC (see Figure 9.1).

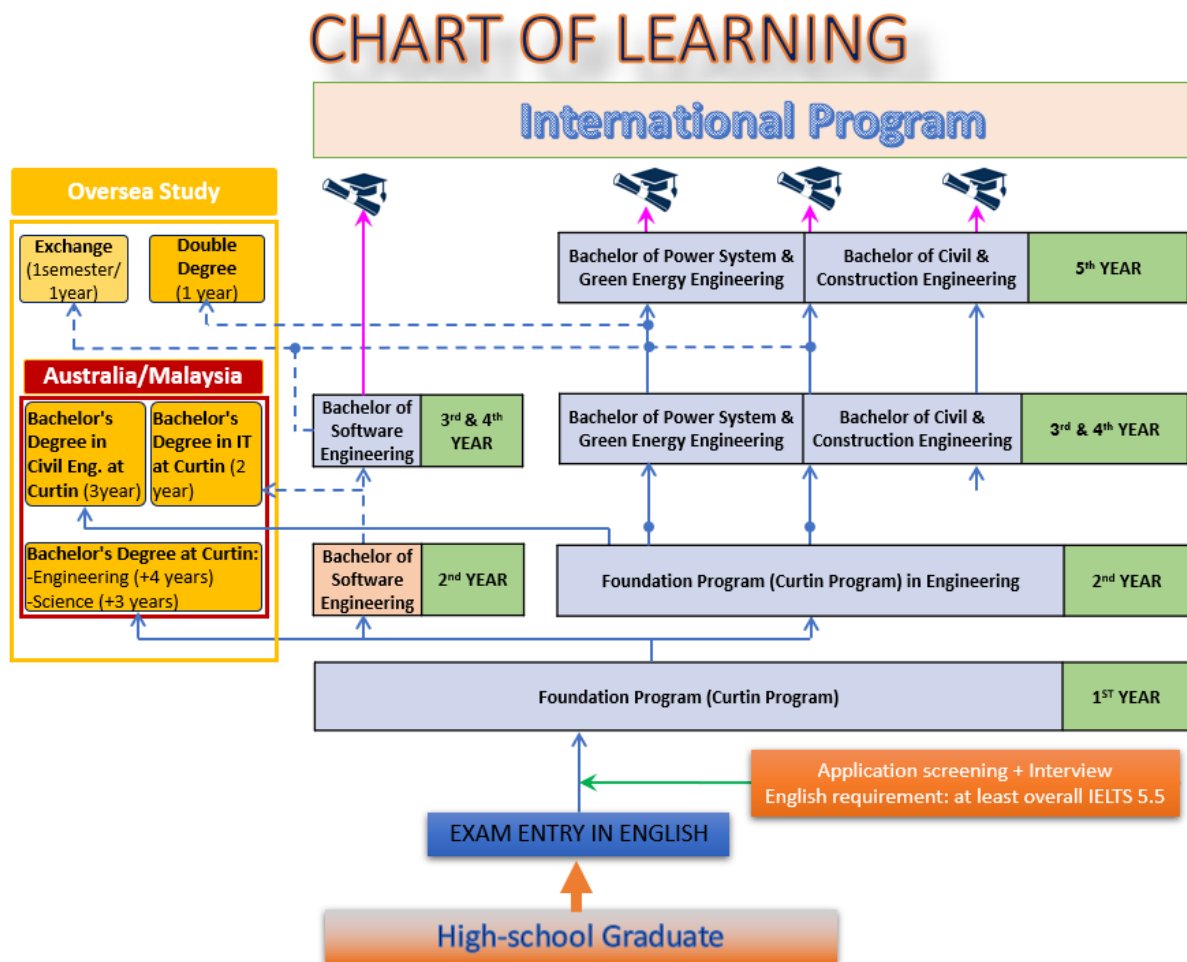


Figure 9.1: Learning chart of Pre-degree Foundation Program and all international programs at ITC

The course structure of 1year Pre-degree Foundation in both Engineering and Science stream is showing in tables below. Student who successfully completed the Pre-degree Foundation Program in 1 year at ITC are eligible to pursue undergraduate study offered in any Curtin campus (see in Table 9.1) and other international program at ITC.

Admission process for pre-degree foundation program:

To gain admission to the Curtin Foundation Program, students must have:

For National-High School Graduate:

- Take the entrance exam at ITC
- Meet the English requirement of at least IELTS 5.5
- Application Screening and Interview through the Committee

For International-High School Graduate:

- Take the entrance exam in English at ITC
- Application Screening and Interview through the committee

Table 9.1: Course structure of pre-degree foundation program

Engineering Stream		Science Stream	
Unit Offered		Unit Offered	
Semester 1	Semester 2	Semester 1	Semester 2
Effective Communication Skills	Chemistry	Effective Communication Skills	Chemistry
Engineering Mathematic I	Engineering Mathematic I	Engineering Mathematic I	Engineering Mathematic I
Physic I	Physic II	Physic I	Business Information Technology
Programming C++	Writing and Research Skills	Programming C++	Introduction to Business Studies
Pathway to degree at Curtin	Bac. of Chemical Engineering	Pathway to degree at Curtin	Bac. of Technology (Computer System & Networking)
	Bac. of Civil and Construction Engineering		Bac. of Applied Science (Construction Management)
	Bac. of Chemical Engineering		Bac. of Science (Applied Geology)
	Bac. of Electrical and Electronic Engineering	Pathway to degree at ITC	Bac. of Software Engineering
	Bac. of Mechanical Engineering		Bac. of Civil and Construction Engineering
	Bac. of Mechatronic Engineering		Bac. of Electrical System and Green Energy Engineering
	Bac. of Petroleum Engineering		
	Bac. of Environmental Engineering		

➤ Degree Structure of Bachelor of Software Engineering

The high-school graduates must take the entrance exam and meet the English requirement (at least IELTS 5.5) before entering in Year 1 (Pre-degree foundation program). Students need to spend four (4) years to complete their International Program for Bachelor of Software Engineering. After completing Year 1, students could have a choice to pursue their study in Curtin University in Australia or Malaysia. Those students do not want to continue their study in abroad so they could also continue their bachelor in software engineering at ITC. Students need to spend three (3) years to complete their Bachelor's Degree in Information Technology at Curtin Campus or at ITC. In Year 4 at ITC, students could have the opportunities to do an exchange program within one (1) semester per year in other university partners of ITC such as Curtin Malaysia, University of Grenoble Alpes, University of Toulouse, and University of La Rochelle (See Figure 9.2).

2.2. Program Education Objectives (PEOs)

The Software Engineering program under the department of Information and Communication at Institute of Technology of Cambodia prepares students for lifetime careers as productive and innovative engineers adaptive to new situation and emerging programs with utmost awareness of ethical, social and environmental concerns so that, within 4 years after graduation, they will:

- PEO1:** Graduates apply their fundamental knowledge, principles, and comprehensive technical skill sets in software engineering to solve real world challenges with innovative technological solutions.
- PEO2:** Graduates demonstrate effective communication, conflict resolution, interpersonal skills, critical thinking, and leadership to collaboratively work as members and/or leaders of their diverse teams or organizations.

PEO3: Graduates adapt to rapidly evolving technological changes by maintaining continuous learning in their professional pathway of software engineering field and/or be able to pursue an advanced degree in the field.

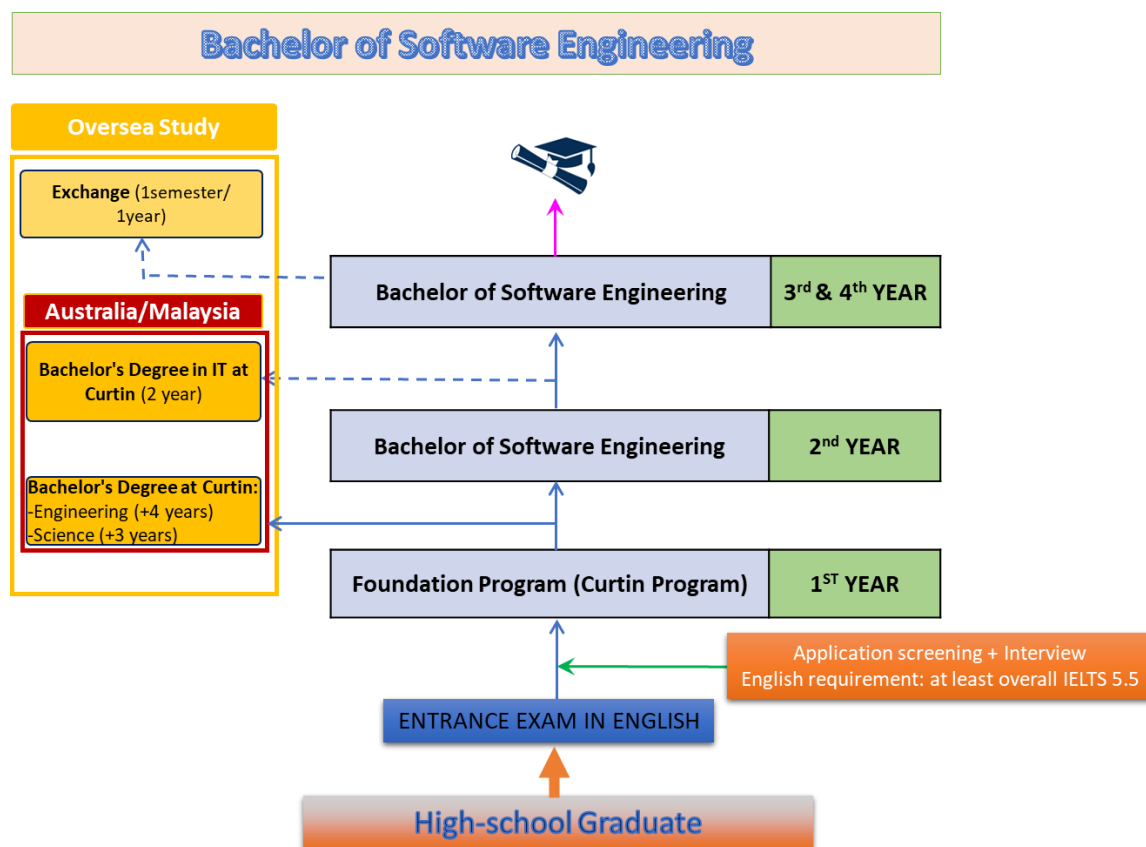


Figure 9.2: Learning Chart of Bachelor of Software Engineering

2.3. Program Learning Outcomes (PLOs)

Bachelor of Software Engineering under Department of Information and Communication at ITC aims to instill in our graduates the following attributes:

A – KNOWLEDGE

PLO1: Demonstrate a comprehensive understanding of the fundamental knowledge, principles, techniques and skills in software engineering and other relevant disciplines and use them to discuss, identify and solve complex computing problems.

B – COGNITIVE SKILLS

PLO2: Apply the principles, and techniques in software engineering and domain knowledge to analyse, evaluate, and design both functional and non-functional software requirements that meet the needs of software consumers.

- PLO3: Propose innovative technological solutions using the knowledge and principles of software engineering and other relevant disciplines.
- PLO4: Implement a variety of scalable and flexible software systems that satisfy the defined software requirements.
- PLO5: Effectively operate and maintain the developed system and software application to achieve the satisfaction of software consumers.

C – INTERPERSONAL SKILLS AND RESPONSIBILITY

- PLO6: Resolve problems and conflicts taking into account professional code of ethics and morals of multi cultures.
- PLO7: Efficiently perform the collaborative tasks as team members as well as leaders to deliver high quality software.
- PLO8: Communicate effectively with diverse people in professional and non-professional audiences appropriately and be able to properly provide satisfied explanations over complexities surrounding the technical problems.

D – NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION

- PLO9: Utilize the latest and existing Information and Communication Technology for various ways of communication and comprehend their beneficial functionalities and constraints.
- PLO10: Apply novice-level of data analysis and statistical thinking in software and application development

E – PSYCHOMOTOR SKILLS

- PLO11: Design, reproduce and adapt to specific needs and delivering innovative software.

2.4. Course hours and credits

For each semester from 2nd year to 4th year, students will take about 7 to 8 courses, to fulfill about 15 to 20 credits in equivalent to 384 hours. Total credits for the program are required about 123 credits (including final year project which is 40) equivalent to 2113 class hours in total.

The credit to be equivalent with teaching hour as follow:

- 16 hours of teaching course (C) = 1 credit
- 32 hours of tutorial (TD) = 1 credit
- 32 hours of laboratory practice (TP) = 1 credit

2.5. Curriculum of the program

This curriculum is designed for engineering degree which illustrate the whole four years (1 year of Pre-degree foundation + 3 year of degree program) Bachelor of Software Engineering in Department of Information and Communication from 1st year to 4th year. Below is the curriculum of international program of software engineering followed by the need analysis that we have discussed in the previous section. Within the first year many international programs need to follow the common pre-degree foundation year, starting from year 2 students who choose the international program in software engineering will follow our specialty curriculum. Curriculum of Bachelor of Software Engineering in academic year 2023-2024:

Table 9.2: Curriculum for 1st -4th year:

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T HR	CREDIT
Year 1 SEMESTER 1 (FOUNDATION)							
1	FP-059	Effective Communication Skills	60	0	0	60	4
2	FP-040	Engineering Mathematic I				75	3.5
3	FP-060	Programming C++				75	3.5
4	FP-050	Physic for Engineering I				90	4
5	INSE011	Introduction to Software Engineering	32	0	32	64	3
6	ICCN004	Introduction to Computer Communication and Network	16	0	16	32	1.5
TOTAL Y1S1			16	0	16	396	19.5
Year 1 SEMESTER 2 (FOUNDATION)							
6	FP-041	Engineering Mathematic II				113	5
7	FP-058	Writing and Research Skills				60	3
8	FP-061	Business Information Technology				60	3

9	FP-029	Introduction to Business Studies				60	3
10	DSAL009	Data Structures and Algorithms	32	0	32	64	3
11	INDA010	Introduction to Database	48	0	32	80	4
TOTAL Y1S2			80	0	64	437	21
Year 2 SEMESTER 1							
12	OPSY012	Operating Systems	32	0	32	64	3
13	SEMD013	Software Engineering Modeling and Design	32	0	32	64	3
14	ADDA014	Advanced Database	32	0	16	48	2.5
15	COAR015	Computer Architecture	32	0	16	48	2.5
16	OOPR019	Object Oriented Programming	32	0	32	64	3
TOTAL Y2S1			128	0	96	288	11
Year 2 SEMESTER 2							
17	INPO017	Internet Programming	64	0	64	128	6
18	MADO018	Mobile Application Development	96	0	64	160	8
19	HCIN016	Human Computer Interaction	32	0	0	32	2
20	OOSE021	Object Oriented Software Engineering	32	0	32	64	3
21	ASTE022	Automated Software Testing	32	0	32	64	3
TOTAL Y2S2			256	0	192	448	22
Year 3 SEMESTER 1							
22	SECO024	Software Engineering Concepts	32	0	32	64	3
23	DISY025	Distributed Systems	32	0	16	48	2.5

24	ENTR026	Entrepreneurship	32	0	32	64	3
25	ITPM027	IT Project Management	32	0	32	64	3
26	CCPO028	Capstone Computing Project 1	32	0	64	96	4
TOTAL Y3S1			160	0	176	336	15.5
Year 3 SEMESTER 2							
26	DAOA029	Design and Analysis of Algorithms	16	0	16	32	1.5
27	SSAR030	Software System Architecture	32	0	32	64	3
28	MALE031	Machine Learning	32	0	32	64	3
29	FCDS032	Fundamental Concepts of Data Security	16	0	16	32	1
30	REME033	Research Methodology	32	0	0	32	2.5
TOTAL Y3S2			128	0	96	224	11
Year 4 SEMESTER 1							
31	CCPT034	Capstone Computing Project 2	32	0	64	96	4
32	SOEN035	Software Engineering	32	0	32	64	3
33	SYAD036	System Administration	16	0	32	48	2
34	DPDP037	Data Privacy and Data Protection	32	0	32	64	3
				0		0	
TOTAL Y4S1			112	0	160	272	12
Year 4 SEMESTER 2							
		Internship 1 (end of year 3)					2
		Internship 2 (year 4 semester 2)					9

TOTAL Y4S2			0	0	0	0	11
		TOTAL	752	0	704	2113	112

2.6. Human Resources

The Institute of Technology of Cambodia has many human resources who got Master degrees and PhD degrees from abroad which are talented in their specific skills that could ensure the quality of teaching. Moreover, we have many staff and students who are still pursuing higher degrees overseas which could be the future potential staff.

Below is the name list of lectures in the international program in software engineering.

Table 9.3. Number of staffs in internal program in software engineering 2022-2023

Degree	2022-2023
PhD	4
Master	8
Total	12

Table 9.4. List of staff in internal program in software engineering 2022-2023

No.	Name	Degree	Graduated University	Year
1	VALY Dona	PhD	Université catholique de Louvain (Belgium)	2020
2	KONG PhutPhalla	PhD	Université de Mons (Belgium)	2021
3	SOK Kimheng	Master	INSA de Rennes (France)	2008
4	BOU Channa	Master	Sirindhorn International Institute of Technology (Thailand)	2018
5	CHUN Thavorac	Master	University Toulouse III-Paul sabatier(France)	2012
6	HENG Rathpisey	Master	Gadjah Mada University (Indonesia)	2020
7	HOK Tin	Master	Chungbuk National University (Korea)	2021
8	TAL Tongsreng	Master	Institute of Technology of Cambodia (Cambodia)	2018

9	YOU Vanndy	Master	Mahatma Gandhi University (India)	2016
10	TANN Chantara	Master	Royal University of Phnom Penh (Cambodia)	2010
11	MUTH Boravy	PhD	Sejong University (Korea)	2021
12	PHAUK Sökkhey	PhD	University of the Ryukyus (Japan)	2021

2.7. Laboratory Facilities

Infrastructure and facility

The Institute of Technology of Cambodia provides a comfortable study room and laboratory which enables teaching and learning. Moreover, ITC has one small conference hall that could handle 300 people, one big conference hall that could handle 2012 people, and two big tutorial rooms. At the same time, we have a STEM library that contains more than 12000 books, 14 computers, 30 laptops, a self-study room, two symposiums containing 10 small discussion rooms, a showroom and a startup incubation room.

Laboratory

The Institute of Technology of Cambodia provides practical knowledge which is why there are many practical laboratories to support implementation and practical works for teaching and learning.

Table 9.5. Laboratory in internal program in software engineering

No.	Type of Laboratory	Devices in the laboratory	Qty	Status
1	Networking	Server machine	13	Functioning
2	Computer room	30 computers	3	New setup
3	Smart room	Smart screen	2	Functioning
4	Laboratory room	Office spaces and equipment	2	Functioning

ANNEX 10

Detail of establishment of international program “Bachelor of Construction Management and Infrastructure” – 4 Years Program under in faculty GCI

1. BACKGROUND

Institute of Technology of Cambodia (ITC) has played an important role in contributing science and technology knowledge and practice to Cambodian society since 1964. In the current context of globalization and fast transformations of new technologies, the goal is to provide students with a high quality education in the fields of engineering sciences and technologies. Students are provided with technical know-how and skills of analysis which allows integration and evolution in the labor market. To achieve this, academic and international scientific research requires development. Besides the academic activities, ITC contributes to maintain sustainable development and decrease the inequalities within our society through its internal functioning and opening-up to foreign countries and the way their students get admitted. The current development of ITC owes a lot to the support of the national community and the great efforts made by staff and students from generation to generation. In 1993, Cambodian and French governments agreed to renovate ITC with a view to improve performance of the administration and financial services along with the educational system of the institution and the human resources. ITC enjoys numerous cooperative agreements with European, regional, and local universities. These agreements help improve the quality of the educational program, create new degrees, and enable collaboration in new research projects and mobility of teachers and students. ITC also enjoys privileged relations with a great number of Cambodian companies and multinationals which have branches throughout Cambodia. Beyond regular exchanges, ITC has developed a Continuing Education programs and a large laboratory services proposal. Nowadays, ITC is at the crossroads in South Eastern Asia region where several partners meet:

- French Cooperation,
- Agence Universitaire de la Francophonie (AUF),
- La communauté Française de Belgique (CUD),
- ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net)
- Greater Mekong Subregion Academic and Research Network (GMSARN)
- School of Internet network

Construction sector in Cambodia has been gradually developed and contributed to the economic growth of the country. While this sector has been attracting investments from both national and international investors, human resources in the field of civil engineering are in high demand. The Faculty of Civil Engineering Department of the Institute of Technology of Cambodia is working to produce highly competent human resources to contribute to developing the country. Civil engineering majors remain popular among young STEM (Science,

Technology, Engineering, and Mathematics) generations, a potential force for the growth of the country. The graduated students are fully qualified. Some are employed and some pursue Master's and Doctoral Degrees, especially in the partner universities in France, Belgium, Japan, and others.

Based on the potential, the Faculty of Civil Engineering would like to establish the International Program for Bachelor's Degree in Civil and Construction Engineering. The program aims at promoting the civil engineering field in Cambodia on the international stage and increasing job and research opportunities for local and international students. The university partner supporting the program is Curtin University in Australia and Malaysia. Therefore, the Bachelor's Degree in Civil and Construction Engineering from the Internal Program is recognized by Australia and Malaysia.

2. FACULTY OF CIVIL ENGINEERING

The Department of Civil Engineering (GCI) (now it is Faculty of Civil Engineering) was founded in 1964, is one of the oldest departments of the Institute of Technology of Cambodia. The curriculum is reviewed regularly, and the faculty collaborates with international partner universities around the world as well as industries to provide students an excellent education. The mission, vision, value, faculty organization structure, and faculty staff are as follows:

Mission

The faculty missions are as follows:

- Produce highly competent engineers and technicians in the field of civil engineering in contributing to STEM education in Cambodia and to fulfill a high demand of human resources for developing our country.
- Promote the quality of sciences and technology education in the field of civil engineering to the regional and international level.
- Develop research and publication to contribute in the development of sciences and technology in Cambodia.

Visions

The faculty visions are as follows:

- Build a strong cooperation with industries and public sector in civil engineering fields as well as other stakeholders.
- continue cooperating with universities in the region and internationally to provide students an excellent education and more opportunities in pursuing Master and PhD degrees.
- build highly competent human resources.

Values

The faculty focus on the values as follows:

- Quality, Excellence and Development
- Integrity and Respect
- Communication
- Contributing to society

2.1 Organization Structure

The Faculty of Civil Engineering is managed and led by Dr. HAN Virak. There are three (3) departments in the faculty: (1) Department of Civil Engineering, (2) Department of Architectural Engineering, and (3) Department of Infrastructure and Transportation. The organization structure of the faculty is presented in Figure 10.1.

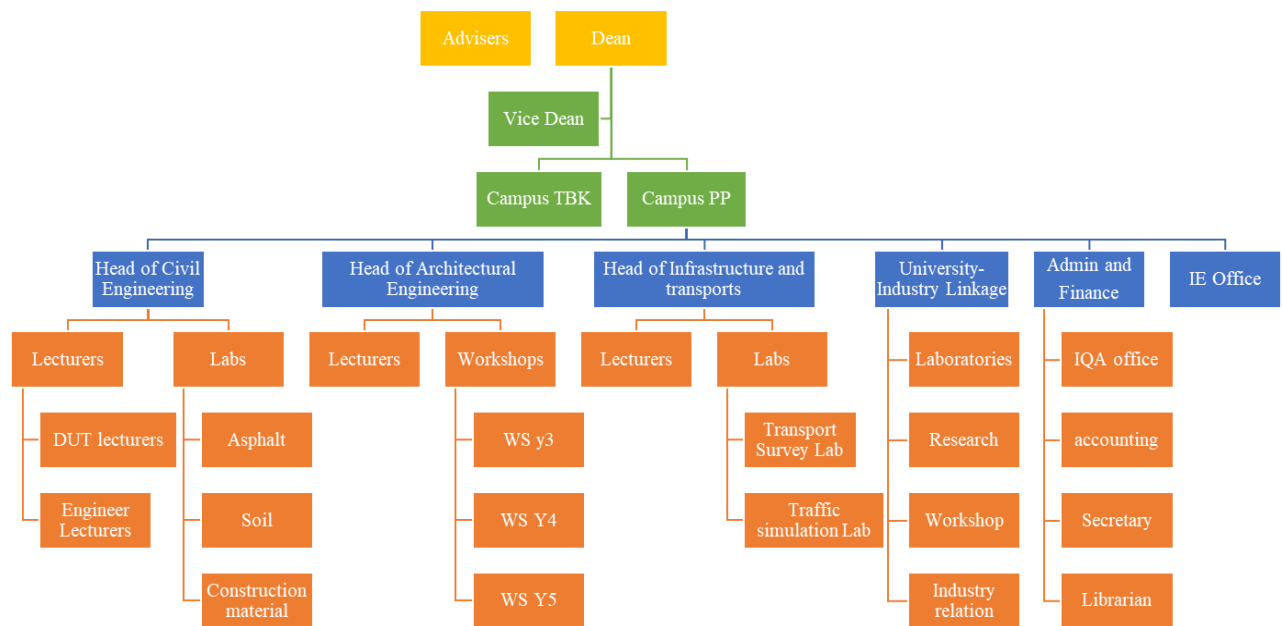


Figure 10.1: Organization structure of Faculty of Civil Engineering, ITC

2.2 International Program Structure

The international program is designed to be flexible for students to choose. The International Program at the Faculty of Civil Engineering, ITC should be completed within five (5) years. The high-school graduates from international institutions are allowed to take the entrance exam in English before entering in Year 1. On other hand, the high-school graduates from the national school in Cambodia are allowed to have the entrance exam. Two (2) more steps are required such as the application screening process and interview and the total score of IELTS 5.5. Both students need to spend five (5) years to complete their International Program for Bachelor's Degree in Civil and Construction Engineering. After completing Year 1, students could have a choice to pursue their study in Curtin University in Australia or Malaysia. Students

need to spend four (4) years to complete their Bachelor's Degree in Civil Engineering. In Year 5 at the Faculty of Civil Engineering, ITC, students could have the opportunities to do an exchange program within one (1) semester per year in other university partners of ITC such as King Mongkut's University of Technology Thonburi (KMUTT), Sirindhorn International Institute of Technology (SIIT), University of Bergen (UIB), Institut National des Sciences Appliquées (INSA) and more in Annex 3. The detailed diagram of the program structure is presented in Figure 10.2.

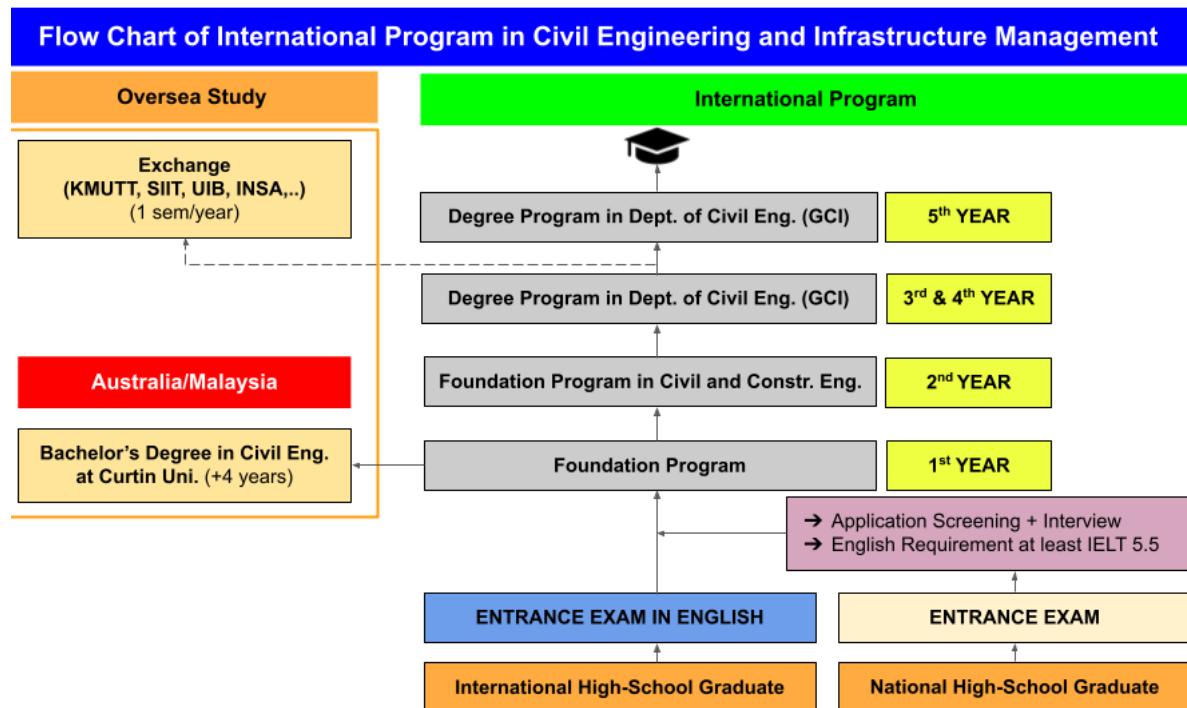


Figure 10.2: Diagram of the International Program structure

2.3 Program Education Objectives (PEOs)

The bachelor of construction management and infrastructure under faculty of Civil Engineering at Institute of Technology of Cambodia prepares students for lifetime careers as productive and innovative engineers adaptive to new situation and emerging programs with utmost awareness of ethical, social and environmental concerns so that, within five years after graduation, they will be able:

- PEO1:** Apply knowledge of science, mathematics, civil, engineering principles, and other relevant fields of studies to solve complex engineering problems.
- PEO2:** Solve complex problems based on investigation or research using the integration of knowledge and the consequent responsibilities relevant to professional practice.
- PEO3:** Ability in engineering, management, and finance principles in managing projects

- PEO4:** Function effectively as an individual or in a team to achieve common goals in diverse teams and in multi-disciplinary settings
- PEO5:** Understand the impact of engineering decisions and apply professional ethics for sustainable development.

2.4 Outcome Standards and Program Learning Outcomes

The International Program in Civil and Construction Engineering in the Faculty of Civil Engineering, ITC aims at grooming future engineers with capability based on the Outcome Standards and Program Learning Outcomes. The Outcome Standards (OC) include the knowledge, cognitive skills, interpersonal and responsibility, numerical skills, information technology and communication, and psychomotor skills. Table 10.1 summarizes the Outcome Standards. The Program Learning Outcomes (PLO) consist of ten (10) elements presented in Table 10.2.

Table 10.1: Outcome Standards for International Program

Outcome Standard	Outcome Title	Program Learning Outcomes (PLO)
OC1	Knowledge	PLO1, PLO3, PLO4
OC2	Cognitive Skills	PLO3, PLO4
OC3	Interpersonal and Responsibility	PLO6, PLO7, PLO8, PLO9, PLO10
OC4	Numerical Skills, Information Technology and Communication	PLO1, PLO2, PLO5
OC5	Psychomotor Skills	PLO2, PLO4

Table 10.2: Program Learning Outcomes for International Program

Program Learning Outcomes (PLO)	Title	Description
PLO1	Scientific and engineering knowledge	Ability to apply knowledge of science, mathematics, civil, engineering principles

		and other relevant fields of study to solve complex engineering problems.
PLO2	Analysis and Tools	Ability to analyze and use appropriate techniques, resources and modern tools to solve complex engineering problems and activities.
PLO3	Design	Ability to design solutions for complex problems and design components, systems, or processes that comply specific requirement with appropriate consideration of other requirements.
PLO4	Problem solving & Research	Ability to resolve complex problems based on investigation or research using integration of knowledge and the consequent responsibilities relevant to professional practice.
PLO5	Communication skills	Ability to communicate effectively and with confidence including complex engineering activities.
PLO6	Managing project	Ability to engineering, management and finance principles in managing projects.
PLO7	Teamwork skills	Ability to function effectively as an individual or in a team to achieve common goals in diverse teams and in multi-disciplinary settings.
PLO8	Lifelong learning	Ability to perpetually seek and acquire contemporary technological changes.
PLO9	Leadership & Entrepreneurial	Ability to demonstrate entrepreneurial skills, lead and manage a team effectively in multidisciplinary environment with self-assurance.
PLO10	Ethics and Social responsibility	Ability to understand the impact of engineering decisions and apply professional ethics for sustainable development.

2.3. Course hours and credits

The curriculum of the International Program is prepared for students graduating within five (5) years. The total credits for completing the International Program for Bachelor's Degree in Civil and Construction Engineering are at least 149. There are 45 courses that students have to enroll within 5 years (1 year of pre-degree foundation+4 years of degree program). 1 year of pre-degree foundation program is following the Curtin program (See in Annex 12). Each course includes the total hour for study (T. HR) per semester for coursework (C), tutorial (T), and practice (P).

The credit to be equivalent with teaching hour as follow:

- 16 hours of teaching course (C) = 1 credit
- 32 hours of tutorial (TD) = 1 credit
- 32 hours of laboratory practice (TP) = 1 credit

2.4. Curriculum of the International Program

This details curriculum is designed for bachelor of construction management and infrastructure for the whole five years in Faculty of Civil Engineering.

Table 10.3: Total course and credit for International Program

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T. HR	CREDIT
YEAR 1 SEMESTER 1 (FOUNDATION)							
1	FP-059	Effective Communication Skills	56			56	3.5
2	FP-040	Engineering Mathematic I	32	32		64	3
3	FP-060	Programming C++	32		48	80	3.5
4	FP-050	Physic for Engineering I	32	32	32	96	4
Total Y1S1			152	64	80	296	14
YEAR 1 SEMESTER 2 (FOUNDATION)							
5	FP-041	Engineering Mathematic II	48	48		96	4.5
6	FP-028	Chemistry for Engineering	32	32	32	96	4
7	FP-051	Physic for Engineering II	32	48		80	3.5

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T. HR	CREDIT
8	FP-058	Basic Writing and Research Skills	32	32		64	3
Total Y1S2			144	160	32	336	15
YEAR 2 SEMESTER 1							
9	MATH1020	Calculus for Engineers	32	32		64	3
10	MCEN1000	Engineering Mechanics	32	32		64	3
11	COMP1005	Fundamentals of Programming	32		48	80	3.5
12	ELEN1000	Electrical Systems	32	32		64	3
Total Y2S1			128	96	48	272	12.5
YEAR 2 SEMESTER 2							
13	INDE1001	Engineering Foundations: Principles, Design and Communication	32	32	32	96	4
14	PRRE1003	Resource, Process and Materials Engineering	32	32		64	3
15	ENVI1000	Environmental Engineering	48			48	3
16	TEDW1000	Engineering Drawing and Computer Aided Design	32		48	80	3.5
Total Y2S2			144	64	80	288	13.5
YEAR 3 SEMESTER 1							
17	STEN2002	Civil Engineering Materials	32	32	32	96	4
18	CVEN2000	Civil Engineering Drawing	32	32		64	3

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T. HR	CREDIT
19	STEN2005	Structural Analysis of Determinate Structures	32	32		64	3
20	ENGR2000	Fluid Mechanics	32	32	32	96	4
21	GARI32TOP	Engineering Survey	32		32	64	3
Total Y3S1			160	128	96	384	17
YEAR 3 SEMESTER 2							
22	WSEN2000	Water Quality and Resources Engineering	32	32		64	3
23	ENEN2000	Engineering Sustainable Development	16	32		48	2
24	GEOT2000	Principles of Geomechanics	32	32	32	96	4
25	STEN2006	Structural Analysis of Indeterminate Structures	32	32		64	3
26	STEN2004	Structural Mechanics	32	32		64	3
27	GARI31STA	Statistics	16	32		48	2
Total Y3S2			160	192	32	384	17
YEAR 4 SEMESTER 1							
28	STEN3003	Advanced Structural Analysis	32	32		64	3
29	TREN3001	Transportation Engineering and Earthworks	32			32	2
30	GEOT3002	Geotechnical Engineering Analysis	32	64		96	4
31	STEN3004	Structural Actions and Steel Design	32	64		96	4

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T. HR	CREDIT
32	GARI41INS	Plumbing System and Sanitary Equipment	32			32	2
33	GCI13IFEM	Finite Element Method	32	32		64	3
Total Y4S1			192	192		384	18
YEAR 4 SEMESTER 2							
34	GEOT3003	Geotechnical Engineering for Foundations	32	32	32	96	4
35	CSEN3000	Civil Engineering Project and Cost Management	32	64		96	4
36	CVEN3002	Hydraulics and Hydrology	32	32	32	96	4
37	STEN3005	Reinforced Concrete Design	32	64		96	4
Total Y4S2			128	192	64	384	16
YEAR 5 SEMESTER 1							
38	CVEN4003	Civil Engineering Research Project 1	32			32	2
39	CSEN4003	Civil Engineering Practices, Quality and Legislation	16	64		80	3
40	STEN4003	Integrated Structural Design	32	32	32	96	4
41	TREN4002	Traffic and Road Pavement Engineering	32	32		64	3
42	STEN4005	Advanced Concrete Design and Construction	16	32		48	2
43	STEN4006	Structural Dynamics	32	32		64	3
Total Y5S1			160	192	32	384	17

No.	UNIT CODE	COURSE STRUCTURE	C	T	P	T. HR	CREDIT
YEAR 5 SEMESTER 2							
44	CVEN4004	Civil Engineering Research Project 2 (Final Year Internship)			405	405	9
Total Y5S2					405	405	9
TOTAL FOR GRADUATION						3517	149

2.5. Human Resources

There are forty-five (46) academic staff, five (5) laboratorians, and two (2) secretaries in the faculty. They are from various fields such as structural engineering, steel engineering, architecture, construction materials, civil engineering, transportation engineering, soil mechanics, geotechnical engineering, foundation engineering, structural dynamics, and water resources engineering (Table 10.4)

Table 10.4. Human resources of Bachelor of Construction Management and Infrastructure

No.	Name	Gender	Degree	University	Specialty
1	HAN Virak	M	PhD	Kochi university of Technology (Japan)	Construction materials/Structural engineering
2	LY Hav	M	Master	Univisité Liber de Bruxelles (Belgium)	Steel structure/Structural engineering
3	LIM Sovanvichet	M	PhD	INSA DE RENNES (France)	Structural Engineering
4	Dr. MAY Raksmeay	M	PhD	Kyushu University (Japan)	Urban and Environmental Engineering/Hydrogeological Engineering /GIS/Numerical Simulation
6	Mr. CHHOUK Chhay Horng	M	Master	INSA DE RENNES (France)	Timber Engineering
7	Mr. CHREA Rada	M	Master	Univisité Liber de Bruxelles (Belgium)	Soil Mechanics
8	Dr. PROK Narith	M	PhD	Kochi University of Technology (Japan)	Structure Dynamics/Construction Materials

9	Dr. RATH Sovann Sathya	M	PhD	Kochi university of Technology (Japan)	Construction Materials
10	Dr. KAING Sao Serey	M	PhD	INSA DE RENNES (France)	Bridge Engineering
11	Dr. VONG Seng	M	PhD	Kochi university of Technology (Japan)	Structural Analysis
12	Dr. CHEA Savuth	M	PhD	INSA DE RENNES (France)	Road Engineering
13	Dr. BUN Polyka	F	PhD	ITC (Cambodia)	Civil Engineering
14	Mr. MAO Khunthea	M	Master	Jean Moulin Lyon 3 (France)	Computer Aids Drawing
15	Dr. SENG Sochan	M	PhD	Hokkaido university (France)	Soil Mechanics
16	Dr. KAN Kuchvichea	M	PhD	Université Libre de Bruxelles (Belgium)	Soil Mechanics/Construction Materials
17	Dr. HENG Sokbil	M	PhD	Tokyo institute of Technology (Japan)	Soil Mechanics
18	Dr. HENG Sounean	F	PhD	INSA de Rennes (France)	Mechanics of materials and structures
19	Dr. HIN Raveth	M	PhD	Université de Rennes 1 (France)	Mechanics of Materials and Structures/Glass Structures
20	Dr. DOUNG Piseth	M	PhD	Tokyo institute of Technology (Japan)	Steel structures/Tall steel/concrete building systems/Earthquake engineering and structural dynamics/Bridge Engineering
21	Dr. CHHANG Sophy	M	PhD	INSA DE RENNES/KTH (France)	Steel structures/Earthquake engineering and structural dynamics
22	Mr. HASH Chanly	M	Master	Toyohashi University of Technology (Japan)	Urban Planning
23	Dr. KY Sambath	M	PhD	INSA DE RENNES (France)	Soil Mechanics
24	Mr. MOEUNG Sothy	M	BA	ITC (Cambodia)	
25	Dr. POUV Keang Se	M	PhD	Université de Caen Basse-Normandie (France)	
26	Mr. MEY Dina	M	BA	NU (Cambodia)	
27	Dr. LENG Khundadino	M	PhD	INSA DE RENNES (France)	
28	MEAS Kim Seng	M	Master	RUFA (Cambodia)	
29	HENG Chanthirith	M	Master	RUFA (Cambodia)	
30	HENG Sokrithy	M	Master	RUFA (Cambodia)	

31	HEANG Souhan	M	Master	Rostov State of Civil Engineering (Russia)	
32	SOK Sophal	M	Master	University of Architecture, Ho Chi Minh (Vietnam)	
33	KONG Dara	M	Master	NU (Cambodia)	
34	LIM Iden		Master	RUFA (Cambodia)	
35	CHET Seila	F	BA	RUFA (Cambodia)	Architecture
36	THAI Srun	M	BA	(Cambodia)	Architecture
37	PEL Dararith	M	BA		
38	TAN Vanno	M	BA		
39	KETH Kannary	F	Master	Université de Liège (Belgium)	
40	TAING Kimnenh	F	Master	Université de Liège (Belgium)	
41	LONG Makara	M	Master	Université de Liège (Belgium)	
42	PHUN Vengkheang	M	PhD	Tokyo institute of Technology (Japan)	Traffic Engineering
43	YANG Panha	F	Master	ITC (Cambodia)	Transportation Economics
44	CHHIEV Vanda	M	Master	ITC (Cambodia)	Fundamental of Logistics
45	CHHENG Ratha	M	Master	ITC (Cambodia)	Traffic Management and Modeling
45	PANG Chhaya	M	Master	ITC (Cambodia)	Road and Transboundary Transportation
46	SREY Vireak	M	Master	Kochi University of Technology (KUT) (Japan)	Management of Supply Chain and Transportation Systems

2.6. Laboratory Facilities

3 main laboratories are for supporting the research and practical class work. The details information on those 3 laboratories are following:

➤ Construction Materials Laboratory

GCI-Lab is an institute's testing laboratory, mainly opened for ITC's students for understanding the practical experiment test in the research and civil engineering fields. On the other hand, the laboratory accepts industrial samples to make close cooperation between ITC and private companies in ensuring the quality of materials used at the construction sites. GCI-Lab delivers superior value to all its customers by leveraging its expertise in material testing services,

inspection, consulting, research and training. The main purpose of the Construction Materials Laboratory is to develop awareness in public by using the technology in fields of Civil Engineering for the benefit and comfort of life. The laboratory is government owned. Lab's equipment was aided by CIUF (Coopération Universitaire Institutionnelle Universités Francophones de Belgique), CF (Coopération Française) and the ministry of education and work. The equipment is approved in accordance with the relevant international and municipality standards and specifications. GCI-Lab is empowered with young, skillful and experienced professionals to deliver quality services through provision of precise, reliable and timely results. All tests are based on internationally accepted standards, procedures and specifications (ASTM, AASHTO, BS, EN, NF). The Construction Materials Laboratory is led by Mr. KHEM Ratha (Annex 1). The major equipment is listed in Annex 2.

The core values of the laboratory are as follow:

- Trust & Transparency
- Work Towards 'Excellence'
- Team Work
- Create Lasting Relationship

The Construction Materials Laboratory provides testing and analysis on:

- Steel: UTS, Yield strength, 0.2% proof stress, % Elongation tests
- Cement: Standard Consistency, Setting Time (Initial and Final), Compressive Strength, Density tests
- Coarse Aggregate: Strength class, Sieve Analysis (Gradation), Bulk Density (Fine), Crushing Value, Water Absorption, Specific gravity (Coarse / Fine), Flakiness & Elongation Index, soundness (Sodium Sulfate), Clay lumps, Los Angeles Abrasion
- Fine Aggregate: Sieve Analysis (Gradation), Bulk Density (Fine), Water Absorption, Specific gravity (Coarse / Fine), Clay lumps, soundness (Sodium Sulfate), Sand's property, Finer than 0.075mm by Washing Test
- Concrete (Cube/Cylinder): Compressive Strength, density, water absorption, tensile strength (Fendage Method)
- Solid Block, AAC Block, CLC Block: Compressive strength, water absorption
- Paving block: Water absorption, Compressive strength
- Concrete core: Compressive strength
- Concrete beam: Flexural test
- Concrete mixed design: Conventional method
- Ceramic Tiles: Dimensional analysis, water absorption, modulus of rupture, Compressive strength
- Brick Masonry and Masonry Prism: Compressive Strength, Water absorption test

- Polyethylene Pipe: Tensile Strength test
- Timber: Shear, Flexion, Compressive, Tensile strength test
- Calibration: Compression Testing Machine, Tension Testing Machine, Concrete hammer calibration
- NDT tests: Rebound hammer test

➤ **Soil Mechanics Laboratory**

GCI-Lab has been providing various services towards Geotechnical Surveying, Hydrogeology Survey and other surveying services for some of the major companies towards their infrastructure and construction requirements. With its skilled manpower & advanced machinery at its disposal, GCI-Lab is one of the leading players providing in-situ tests and other geotechnical tests to a varied clients from various sectors including Infrastructure, Construction, Government Institutions, Industrial, etc. The Soil Mechanics Laboratory is managed and led by Dr. KY Sambath (Annex 1). The major equipment is listed in Annex 2. The laboratory provides the following services to students and industries.

- Physical property: Moisture content, Specific Gravity, Grain size analysis, LL & PL, Classification of soil, FDT- by sand replacement (Sand Cone Method), core cutter method, MDD, OMC
- Mechanical property: Direct shear, triaxial shear, uniaxial consolidation, UCS, CBR (soaked & unsoaked), Field CBR
- Soil mix: Estimate the Soil-Lime Proportion, CBR, UCS

➤ **Road Materials Laboratory**

The Soil Mechanics Laboratory is managed and led by Dr. KAN Kuchvichea (Annex 1). The major equipment is listed in Annex 2. The laboratory provides the following services to students and industries. The laboratory provides the following services to students and industries.

- Bitumen tests: softening point, penetration test, specific gravity, ductility test, viscosity and extraction.
- Bituminous mixes: testing of materials, job mixed formula, preparation of Marshall specimen, density, stability & flow value tests, determination of air voids, void filled with bitumen in the mix.
- Core test: cored specimens are collected from pavement surfaces then the test is conducted for its density, gradation & bitumen content.

ANNEX 11

Detail of establishment of international program “Bachelor of Electronics and Smart Automation System” – 4 Years Program under in department GEE

1. BACKGROUND

Department of electrical and energy engineering, namely GEE, is one of the oldest departments at ITC. In HEIP project, GEE has updated an electronics and automation program to meet current and future market need as well as response to vision and mission of 10 years strategy of ITC. GEE department also plans to develop a new international program namely “Bachelor of Electronics and Smart Automation System” with partnerships from European partners such as INP-Toulouse (France), university of Pavia (Italy). New program is a four-year program with possible to obtain double degree from partner university.

The new curriculum was developed by using Outcome-Based Education (OBE). The figure below shows Program Learning Objectives (PEOs) must integrate from all stakeholders, such as feedback from market, the department's mission and vision, school alumni, etc. The objectives of the educational program are evaluated by the institutional board and the results of the program (Program Learning Outcomes - PLOs). The expected outcomes of the programs are assessed by the program level and supported by Course Learning Outcomes (CLOs). Therefore, the evaluation of per subject standards is crucial to achieve the effective objectives of the programs (PEOs).

2. BACHELOR OF ELECTRONICS AND AUTOMATION SYSTEM

The international program is designed to be flexible for students to choose. The International Program at the department of Electrical and Energy, ITC should be completed within five (5) years. The high-school graduates from international institutions are allowed to take the entrance exam in English before entering in Year 1 (Pre-degree foundation program, see Annex 11). On other hand, the high-school graduates from the national school in Cambodia are allowed to have the entrance exam. Two (2) more steps are required such as the application screening process and interview and the total score of IELTS 5.5. Both students need to spend five (5) years to complete their International Program for Bachelor of Electronics and Smart Automation System. After completing Year 1, students could have a choice to pursue their study in Curtin University in Australia or Malaysia. Students need to spend four (4) years to complete their Bachelor of Electronics and Smart Automation System at ITC. In Year 5, students will have the opportunities to do a double degree program with partner universities in France, Italy and Thailand. The detailed diagram of the program structure is presented in Figure 11.1.

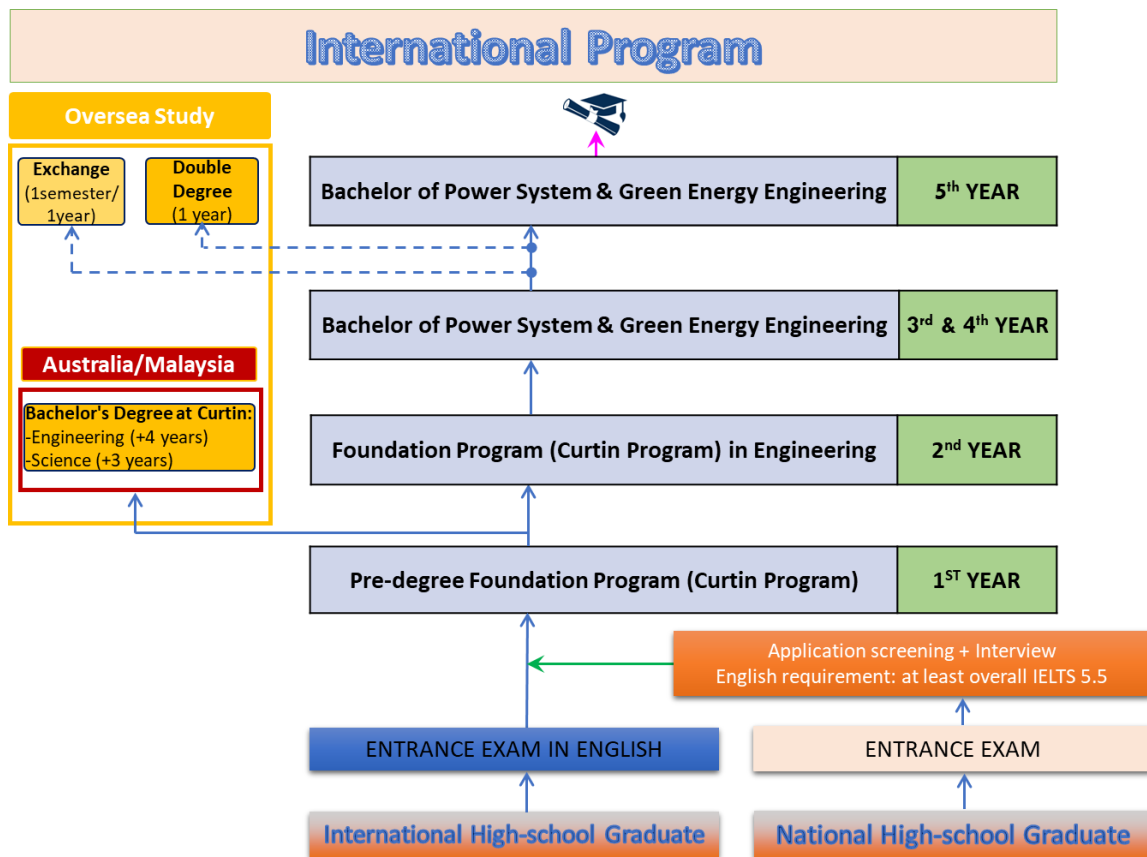


Figure 11.1 : Diagram of the program structure

2.1. Program Education Objectives (PEOs)

In response to the market and the Institutional need, the Program Educational Objectives (PEOs) are listed as follow:

- **PEO1:** Graduated students will become qualified engineers in the electronics (electronics design and fabrication) and automation (production line, applied IoT/AI in automation, automation in smart grid/building) field to meet current and future market needs nationally and internationally.
- **PEO2:** Graduated students capable of pursuing higher education (Master degree and Doctoral degree) which will increase the number of qualified managers/researchers' level in the electronics and automation field.
- **PEO3:** Graduated students can become an entrepreneur in the field of electronics and automation or other sectors.

2.2. Program Learning Outcomes (PLOs)

To support the above three main PEOs, 6 Program Learning Outcomes (PLOs) have been developed in accordance with the Cambodia Qualifications Framework (CQF) and KSA:

A – KNOWLEDGE

- PLO1: Ability to apply the knowledge modern tools of mathematics, science, engineering, and technology to the solution of complex engineering problem in the fields of ESAS.
- PLO2: Ability to apply research-based knowledge (research method including design of experiment, analysis and interpretation of data, develop business plan, and synthesis of the information) to provide valid conclusion.

B – SKILLS (COGNITIVE SKILLS + PSYCHOMOTOR SKILLS)

- PLO3: Ability to design systems, components, or processes meeting specified need for broadly-defined engineering problems appropriate to ESAS.
- PLO4: Ability to conduct standard test, measurements, experiments, analyze and interpret the results to improve process in electronics design and smart automation system set-up/config.

C – ATTITUDE (INTERPERSONAL SKILLS AND RESPONSIBILITY + NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION)

- PLO5: Ability to apply written, oral, and graphical communication with appropriate usage of technical literature in broadly-defined technical and non-technical environments.
- PLO6: Ability to obtain effective leadership skills through teamwork, industry interaction, and join real project with partner industries.

2.3. Course hours and credits

For each semester from 1st year to 4th year, students will take about 7 to 8 courses, including languages (French and English), to fulfill about 15.5 to 19.5 credits in equivalent to 384 hours.

- 16 hours of teaching course (C) = 1 credit
- 32 hours of tutorial (TD) = 1 credit
- 32 hours of laboratory practice (TP) = 1 credit

2.4. Curriculum of the program

This curriculum is designed for bachelor of engineering degree which illustrate the whole four years Bachelor of Electronics and Smart Automation System in Department of Electrical and Energy Engineering from 1st year to 4th year.

Table 11.1: Curriculum for 1st year

No	Course code	YEAR 1	Semester I			Semester II			Nb. Credit
			L	T	P	L	T	P	
1	FP-059	Effective Communication Skills	56						3.5
2	FP-040	Engineering Mathematic I	32	32					3
3	FP-060	Programming C++	32		48				3.5
4	FP-050	Physic for Engineering I	32	32	32				4
5	FP-041	Engineering Mathematic II				48	48		4.5
6	FP-028	Chemistry for Engineering				32	32	32	4
7	FP-051	Physic for Engineering II				32	48		3.5
8	FP-058	Basic Writing and Research Skills				32	32		3

		Subtotal	152	64	80	144	160	32	29
		Ratio CM/TD/TP	51.4 %	21.6 %	27.0 %	48.6 %	54.1 %	10.8 %	
		Total by semester	296			336			
		Total by year	632						

Table 11.2: Curriculum for 2nd year

No	Course code	YEAR 2	Semester I			Semester II			Nb. Credit
			L	T	P	CM	TD	TP	
1	CPEA02	Computer Programming	24		32				2.5
2	SSEA02	Signals and System	32	32	32				4
3	ECEA02	Electrical Circuit	32		48				3.5
4	EFEA02	Electronics Analog and Filter	32	32					3
5	EEEA02	Engineering Innovation and Ethics	32		32				3
6	FCEA02	Feedback Control System				16	32	32	3
7	DMEA02	Digital Electronics and Microprocessors				16	16	32	2.5
8	EMEA02	Electrical Machine				16	16	32	2.5
9	SPEA02	Student Project Part 1						32	1
10	EIEA02	Communication and Interpersonal Relation				48			3
11	NOEA02	Numerical Method and Optimization				16	16	16	2
		Subtotal	152	64	144	112	80	144	30
		Ratio CM/TD/TP	42.2 %	17.8 %	40.0 %	31.1 %	22.2 %	40.0 %	
		Total by semester	360			336			
		Total by year	696						

Table 11.3: Curriculum for 3rd year

No	Course code	YEAR 3	Semester I			Semester II			Nb. Credit
			L	T	P	L	T	P	
1	EDEA03	Electric Drive	16	32	32				3
2	MSEA03	Modern Control System	16	32	32				3
3	PEEA03	Power Electronics	32	32	32				4
4	RMEA03	Research Methodology	32	0	0				2
5	IPEA03	Industrial Network Protocol	16		32				2

6	SPEA03	Student Project Part 2						32	1
7	SAEA03	Sensors and Actuators				16	32	32	3
8	PCEA03	Programmable Logic Controller				32	32	32	4
9	RSEA03	Real-Time Embedded Systems				32		32	3
10	EMEA03	Electronics Circuit Design and Manufacturing				16		32	2
11	IWEA03	International languages for work				32			2
12	SPEA03-2	Student Project Part 3						32	1
		Subtotal	112	96	128	128	64	192	30
		Ratio CM/TD/TP	33.3 %	28.6 %	38.1 %	33.3 %	16.7 %	50.0 %	
		Total by semester	336			384			
		Total by year	720						

Table 11.4: Curriculum for 4th year

No	Course code	YEAR 4	Semester I			Semester II			Nb. Credit
			L	T	P	L	T	P	
1	EEEE04	Embedded Electronics	32	32	32				4
2	EMEA04	Environmental and Process Risk Managements	32		32				3
3	SSEA04	Smart Grid and Storage	32	32	32				4
4	PDEA04	Project Development	32		32				3
5	IAEA04	Industrial Automation	32		32				3
6	EPEA04	Entrepreneurship	48						3
7	SPEA04	Student Project Part 4			32				1
8	FTEA04	Final Year Thesis				At least 3 months			9
		Subtotal	208	64	192	0	0	0	30
		Ratio CM/TD/TP	44.8%	13.8%	41.4%	0.0%	0.0%	0.0%	
		Total by semester	464			0			
		Total by year	464						

2.5. Human Resources

Description of Academic Staff Quantity and Quality

Table 11.5: Teacher – Student ration for Academic 2021-2022

No	Description	N. of students	Remark
1	Technician students (T1)	131	TP: 25 students/group

2	Technician students (T2)	69	TD: 50 students/group
3	Engineering students (year 3)	129	
4	Engineering students (year 4: EE)	76	
5	Engineering students (year 4: EA)	65	
6	Engineering students (year 4: EE)	56	
7	Engineering students (year 4: EA)	55	
Total		581	
8	Number of Teacher	34	
Teacher/student ratio		1/17	

As reported in Teacher-student ratio, department have currently 35 staff to support a teaching for 581 students. In those 34 staff, we have 7 PhD. holders (20.5%), 20 Master degree holders (59%), and 7 Engineer's degree holders (20.5%).

Table 11.6: List of GEE staff

No	Name	Degree	Year of completion	University
1	Dr. CHRIN Phok	PhD	2016	INP, Toulouse, France
2	Dr. AM Sok Chea	PhD	2016	UGA, Grenoble, France
3	Dr. BUN Long	PhD	2012	INPG, Grenoble, France
4	Dr. NGET Rithea	PhD	2020	TIT, Tokyo, Japan
5	Dr. PEC Rothna	PhD	2017	ChungAng, Korea
6	Dr. VAI Vannak	PhD	2017	UGA, Grenoble, France
7	Dr. KIM Bunthern	PhD	2017	INP, Toulouse, France
8	Mr. SEAN Piseth	Master	2009	AIT, Thailand
9	Mr. KHUN Chanthea	Master	2007	KMITL, Thailand
10	Mr. CHAN Tola	Master	2014	INP, France
11	Mr. KHON Kimsronn	Master	2016	INP, France

12	Mrs. ENG Samphors	Master	2019	ITB, Indonesia
13	Mr. CHHLONH Chhith	Master	2019	ITB, Indonesia
14	Mr. CHHORN Sopheaktra	Master	2018	CU, Thailand
15	Mr. CHHENG Monyvathna	Master	2015	UPD, Phillipine
16	Mr. CHOU Koksai	Master	2019	SIIT, Thailand
17	Mr. BUN Menghorng	Master	2020	SIIT, Thailand
18	Mr. ETH Oudaya	Master	2014	CU, Thailand
19	Mr. HEL Chanthan	Master	2014	CU, Thailand
20	Mr. CHIN Chandaraly	Master	2016	CU, Thailand
21	Mr. CHUM Pharino	Master	2013	ChungAng, Korea
22	Mr. TEP Sovichea	Master	2018	INP, France
23	Mr. CHEA Kimsraing	Master	2020	UPD, Phillipine
24	Mr. VENG Mengkorng	Master	2014	INP, France
25	Mr. ROEUNG Youngan	Master	2019	Russia
26	Mr. DONG Kong	Master	2000	AIT, Thailand
27	Mrs. HANG Vichothy	Master	2009	NUM, Cambodia
28	Mr. IT Chivorn	Eng.	2018	ITC, Cambodia
29	Mr. CHY Cheapok	Eng.	1991	ITC, Cambodia
30	Mr. BUN Seang	Eng.	1995	ITC, Cambodia
31	Miss. CHHITH Chunny	Eng.	1991	ITC, Cambodia
32	Mr. CHAP Lythoeun	Eng.	1986	Vietnam
33	Miss. SENG Dararaksmeay	Eng.	2021	ITC, Cambodia
34	Mr. CHEA Rothvichea	Eng.	2021	ITC, Cambodia

In the next academic year, number of students are expected to be increased from 581 to 630 because of a new program technician in mechatronics will be launched. As a result, department need to recruit more lecturers. In academic year 2019-2020 and 2020-2021, department have sent 7 students for Master degree in Thailand, Indonesia, and France. They are all will be important staff for our department in the new academic.

Table 11.7: Scholarship students in academic 2019-2020 and 2020-2021

No	Name	University	Expected date of return
1	Mr. LIM Phing	CU, Thailand	December, 2022
2	Mr. LORM Rathna	SIIT university, Thailand	November, 2023
3	Mr. SENG Ou	ITB, Indonesia	November, 2023
4	Mr. SENG Theara	UGA, France	September, 2022
5	Miss. TAING Liv	CU, Thailand	December, 2022
6	Mr. VANN Veasna	Taiwan University	December 2023
7	Mr. SUK Sievlong	ITB, Indonesia	November, 2023

In academic 2021-2022, department have sent 3 students to master degree in France (one year program). They will join department in the academic 2023-2024.

Table 11.8: Scholarship students in academic 2021-2022

No	Name	University	Expected date of return
1	Miss SOUN Dalin	IMT, France	September, 2023
2	Mr. CHEA Rothvichea	IMT, France	September, 2023
3	Mr. SOR Hokly	INP, France	September, 2023

Thus, for academic 2022-2023, we can have 41 staff for operation. And 44 staff for academic 2023-2024.

Since department plan to implement new vital projects as well as upgrading their teaching and researching capacity/expert on electronics and control for smart grid power system, hence department registered 3 staff to PhD. degree in the related filed with the financial support from HEIP project and technical support from INP partner.

Table 11.9: PhD students under HEIP Project

No	Name	University	Expected date of defense
1	Mr. KEAN Jeudy	INP, France	December 2022
2	Mr. TEP Sovichea	INP, France	December, 2023
3	Mr. BUN Menghorng	INP, France	December, 2024

2.6. Laboratory Facilities

Table 11.10: Lab descriptions

No	Rooms	Description	Lab. Head
1	B312	This Lab is used for: <ul style="list-style-type: none"> - Electrical Circuit - Electric Drive/Analog Electronics 	Mr. ETH Oudaya
2	B313	This Lab is used for: <ul style="list-style-type: none"> - Electrical Machine - Power Electronics/Electric Drive 	Mrs. ENG Samphors
3	B316	This Lab is used for: <ul style="list-style-type: none"> - PLC, Control System/Automation Lab - Computer Lab 	Mr. CHOU Koksai
4	B311	This Lab is used for: <ul style="list-style-type: none"> - Computer Lab - Design Lab 	Mr. SORN Darong
5	H202	This Lab is used for: <ul style="list-style-type: none"> - Power Electronics Lab/Control Lab - Device Fabrication Lab - Feedback control system Lab 	Dr. KIM Bunthern (Upgrade facility with financial support from HEIP-SGA#1 research project)
6	H201	This Lab is used for: <ul style="list-style-type: none"> - Renewable Energy Lab - Power System Lab 	Dr. VAI Vannak (Upgrade facility with financial support from HEIP-SGA#7 research project)
7	H102	This is workshop for student to prototype: <ul style="list-style-type: none"> - Electronics board/ Device Fabrication Lab - Robotic/CNC/3D printer 	Dr. CHRIN Phok

ANNEX 12

Detail of establishment of international program “Bachelor Degree of Engineering and Sustainable Business (BESB)” – 4 Years Program under faculty of HWR

1. BACKGROUND

The Institute of Technology of Cambodia has identified the need to improve its educational system and human resource capacity to ensure the sustainable socio-economic development of the country and to meet the increasing demand for qualified engineering professionals in both governmental institutions and the private sector. However, there is a mismatch between the expectations of the industry and the skills acquired by engineering graduates. To bridge this gap, the Institute has developed a multidisciplinary bachelor's degree program called "Engineering and Sustainable Business (ESB)". This program offers a flexible curriculum that equips students with a strong foundation in engineering principles and an entrepreneurial mindset. Students will also acquire administrative and professional skillsets such as technical management, critical thinking abilities, communication, and project coordination. The program also offers academic-industry cooperation through internships or cooperative engineering programs, to provide students with practical experience in real-world industries. Graduates from this program will have diverse job opportunities in government or non-governmental institutions, particularly in environmental engineering, including water treatment, municipal sewage treatment, solid waste management, environmental and social auditing, and water production.

1.1 Introduction

In the face of globalization and rapidly technological transformations, the main focuses of the Institute of Technology of Cambodia are to play an efficient role in Cambodia and to be at the cutting edge of development to improve its educational system and human resource capacity in order to contribute to the nation building and to ensure the resilient and sustainable socio-economic development of the country. Meanwhile, demand for qualified engineering professionals in both governmental institutions and private sectors in Cambodia is projected to grow significantly, thereby requiring educational institutions to produce graduates with personality traits and skillsets necessary to be successful in careers.

It is important to narrow down the mismatch between the expectation of the industry and the skillset acquired by engineering graduates. For instance, a static academic curriculum taught in educational institutions to students might not well prepare students to meet a complex nature and dynamism in labor requirements in industrial units and sophisticated production processes which involved with both technical and organizational terms. To fill the gap, it is compulsory to invest more in the educational sector. Thus, a multidisciplinary study programme and a flexible curriculum specially designed to equip students with a strong foundation in engineering principles and entrepreneurship mindset (e.g., integrating traditional business courses with scientific and technical coursework), and with administrative and professional skillsets (e.g., scientific base and technical know-how, technical management, critical thinking abilities, communication, and project coordination) required to manage

complicated projects, as well as with a professional expertise focusing on a holistic approach to problem solving will contribute significantly to ensuring success (employability and workability) and expanding job prospects of the graduates. Some industries might also prefer to hire graduates with practical experience, and thus academia-industry cooperation (e.g., internships or cooperative engineering programs), which allows students to get exposed to the real-world industries, should be of significantly important value for students to leverage their professional network as well as meet the manpower need of the labor market.

1.2 Program Objective

The Faculty of Hydrology and Water Resources Engineering offers a unique program in collaboration with Griffith University in Australia that combines and integrates high-end expertise in science, engineering, and business. This program aims to prepare professional engineers, equipping them with a solid foundation in engineering principles alongside the administrative skills required to manage complicated projects.

Through this program, students will gain knowledge and abilities in the Engineering major, focusing on advanced environmental engineering concepts. Additionally, they will acquire fundamental business competencies such as organizational behavior, communication, economics, and quality control. This combination of technical and business skills will enable graduates to address complex challenges in the water resources management sector.

The program emphasizes industry-linkage experience, where students can develop practical skills by engaging in research collaborations or industry-linked projects with leading companies. This experience will improve students' skills and prepare them for admission into the job market.

Graduates from this program will be equipped with the necessary knowledge and competencies to tackle complex engineering projects and manage the business aspects of environmental management projects effectively. They will be prepared to make significant contributions to their field, with the potential to become leaders in the industry.

2. BACHELOR OF ENGINEERING AND SUSTAINABLE BUSINESS

2.1. Program Education Objectives (PEOs)

The objective of "The engineering and Sustainable Business program is to provide the graduates with the necessary skills and knowledge to succeed in a rapidly changing world. The program aims to provide graduates with the following Program Educational Objectives (PEOs):

- **PEO1:** The program will provide graduates with a strong foundation in both scientific and technical knowledge as well as business knowledge competence. Graduates will be equipped with the knowledge and skills necessary to handle professional work in the engineering and sustainable business fields. Graduates will be able to critically analyze existing problems, generate innovative and sustainable solutions, and communicate effectively within an organization.
- **PEO2:** Graduates will be equipped with the hard skills necessary to support invention and innovation in the future. These skills will include a deep understanding of new and innovative technologies, knowledge and competencies in software development, and the ability to utilize data and analytics to drive decision making.

- **PEO3:** Graduates will develop core leadership, entrepreneurship, and interpersonal skills necessary to succeed in today's rapidly changing global environment. They will operate with high ethical standards and values, and remain committed to fulfilling their social responsibilities in their professional lives. Graduates will also understand the importance of teamwork, adaptability, and engagement with diverse cultures and communities.

2.2. Program Learning Outcomes (PLOs)

Program Learning Outcomes (PLOs) for the Bachelor Engineering and Sustainable Business program may include the following::

A – KNOWLEDGE

- PLO1: Demonstrate design solutions for engineering projects that are technically feasible, economically viable, and socially acceptable.
- PLO2: Demonstrate an understanding of key business concepts and principles, including finance, accounting, marketing, and management,

B – COGNITIVE SKILLS

- PLO3: Develop an entrepreneurial mindset, and identify opportunities for innovation and growth in various sectors of the economy.
- PLO4: Develop initiative and planning skills to create successful businesses. That students able to identify and assess potential risks and develop plans to mitigate them.
- PLO5: Demonstrate knowledge of legal and ethical aspects of business operations, including social responsibility and sustainability.

C – INTERPERSONAL SKILLS AND RESPONSIBILITY

- PLO6: Develop the ability to utilize skills for programming, operating machinery, and performing maintenance tasks, while student can learn these skills through laboratory experiments, internships, and co-programs
- PLO7: Develop the ability to visualize concepts in three dimensions and the ability to use design software to create detailed schematics.

D – NUMERICAL SKILLS, INFORMATION TECHNOLOGY AND COMMUNICATION

- PLO8: Develop effective Managerial Skill, Entrepreneurship Skill, teamwork and leadership skills in the context of engineering business.
- PLO9: Demonstrate knowledge of legal and ethical aspects of business operations, including social responsibility and sustainability.

E – PSYCHOMOTOR SKILLS

- PLO10: Conduct experiments and analyze data using modern engineering tools and techniques. And with the ability to translate science to the public.
- PLO11: Capacity to response to challenge of today society, the necessary mathematical and statistical techniques to analyses business problems and work out optimal solutions.

2.3. Course hours and credits

For each semester from 1st year to 4th year, students will take about 5 to 6 courses, to fulfill about 15 to 20 credits in equivalent to 300 hours.

Total credits for the program are required about 140 credits (including final year project which is 12 credits) equivalent to 2,671 hours in total.

The credit to be equivalent with teaching hour as follow:

- 15 hours of teaching course (C) = 1 credit
- 30 hours of tutorial (TD) = 1 credit
- 30 hours of laboratory practice (TP) = 1 credit

2.4. Curriculum of the program

This curriculum is designed for bachelor's degree which illustrate the whole four years **Engineering and Sustainable Business program** in Faculty of Hydrology and Water Resources Engineering From 1st year to 4th year. Curriculum of Engineering and Sustainable Business program in academic year 2024-2025:

Table 12.1: Curriculum of the Engineering and Sustainable Business program

Curriculum for 1st year (I1) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Effective communication skills			4	0	0	60	4
2	Engineering Mathematic I (Linear Algebra)			2	1.5	0	75	3.5
3	Programming C++			2	1.5	0	75	3.5
4	Physic for Engineering I			2	1	1	90	4
5	History			2	0	0	90	2
Total for 1st semester I1							330	17

Curriculum for 1st year (I1) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Engineering Mathematic II (Calculus)			3	2	0	113	5
2	Chemistry for Engineering			2	1	1	90	4
3	Physic for Engineering II			3	2	0	113	5
4	Writing and Research skills			2	1	0	60	3
5	Hydrology			3	0	0	45	3
Total for 2nd semester I1							421	20

Curriculum for 2nd year (I2) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Business Engineering			3	0	0	45	3
2	Fundamentals of Engineering			2	1		60	3
3	Numerical and Computing Skills			2	2		90	4
4	The business of changing the world			3	0	0	45	3
5	Statistic			2	2	0	90	4
Total for 1st semester I2							330	17

Curriculum for 2nd year (I2) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Engineering mechanic			2	1	1	90	4
2	Ethical and Philosophical Reflection			2			30	2
3	Heat and mass transfer engineering			2	1	1	90	4
4	Economics for business engineering			2	1		60	3
5	Environmental microbiology and ecology			2	1	1	90	4
6	Green marketing for sustainable SME			2			90	2
Total for 2nd semester I2							450	19

Curriculum for 3rd year (I3) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Commercializing Science and Technology			2	0	0	30	2
2	Experimentation in science and engineering			3			45	3
3	Global sustainable business			2			30	2
4	Water treatment			2	1	1	90	4

5	Resources recovery			2	1		60	3
6	Creating ethical and sustainable business			3			45	3
Total for 1st semester I3							300	17

Curriculum for 3rd year (I3) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Material Engineering			2	1	1	90	4
2	Wastewater treatment			2	1	1	90	4
3	Process and product engineering			2	1	1	60	4
4	Technology management			3			45	3
5	Community internship and partnership for SDGs			2			30	2
Total for 2nd semester I3							315	17

Curriculum for 4th year (I4) semester 1:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Civil engineering design project			2	0	1	60	3
2	Circular Economic Project			2	0	1	60	3
3	Project management principle			3	0		45	3

4	The politic of environment and sustainability			3	0		45	3
5	Leading and managing organization			3			45	3
6	Civil engineering design project							
Total for 2nd semester I4							250	15

Curriculum for 4th year (I4) semester 2:

No.	Name of subject	Code	Instructor	Cour	TD	TP	Total	Credit
1	Procurement and Supply Management			3			45	3
2	Market research project			3			45	3
3	Thesis Research Project			12			180	12
Total for 2nd semester I4							270	18

Note: students are compulsory to conduct internship at least 4 weeks. 2 modes of internship: i) full time at company/industry/government institution and ii) full time at ITC. Internship report is required.

2.5. Human Resources

The new international program of Engineering and Sustainable Business requires a range of human resources with expertise in engineering principles and business skills. Table 5.1. list the team of faculty members may include lecturers with experience in environmental engineering, hydrology, water resources, sustainable business practices, finance, marketing, and management. Additionally, the program may require the support of administrative staff and student advisors to ensure smooth program operations and student success. The program may also include industry experts as guest lecturers or mentors, providing students with industry insights and real-world experiences. Furthermore, the program may offer opportunities for hands-on experience through research collaborations or industry-linked projects with leading companies, requiring partnerships with businesses and organizations in the relevant fields. Overall, the program requires a team of dedicated and experienced human

resources with a commitment to providing high-quality education and preparing graduates for the challenges of the industry.

Number of human resources at Faculty of Hydrology and Water Resources Engineering (HRE) is shown in table below:

Table 12.2: Number of human resources for the engineering aspect

Degree\Year	2023	2024	2025
Doctor	18	19	19
Master	16	16	16
Total	34	35	35

Table 12.3: Human resources of Program Engineering and Sustainable Business

No.	Title	Name	Sex	Degree	Specialization	Year of Graduation	University	Country
001	Dr.	BUN Saret	M	Docteur	Environmental Engineering	2019	Chulalongkorn University	Thailand
002	Dr.	CHAN Rathborey	M	Docteur	Environmental Engineering	2020	Kasetsart University	Thailand
003	Mr.	CHAN Ratboren	M	Master	Environmental Engineering	2020	Kasetsart University	Thailand
004	Dr.	CHHUON Kong	M	Docteur	Hydrology	2016	University of the Philippines Diliman	Philippines
005	Dr.	DOUNG Ratha	M	Docteur	Groundwater and Environment	2015	University of the Philippines Diliman	Philippines
006	Dr.	EANG Khy Eam	M	Docteur	Groundwater Geochemistry	2018	Hokkaido University	Japan
007	Mrs	HANG Leakhéna	F	Master	Environmental Engineering	2009	University of the Philippine Dilman	Philippines
008	Dr.	HEU Rina	F	Docteur	Civil and Environmental Engineering	2020	Tokyo Institute of Technology	Japan
009	Mr.	HONG Penghour	M	Master	Environmental Engineering	2018	Chulalongkorn University	Thailand
010	Mrs.	PHOEURN Chan Arun	F	Master	Environmental Engineering	2012	University of the Philippines	Philippines
011	Ms.	SANG Davin	F	Master	Environnment	2018	Kasetsart University	Thailand

012	Mr.	VENG Huor	M	Master	Fluid mecaniques	2001	Faculté Universitaire des Sciences Agronomiques de Gembloux, Belgique	Belgium
013	Dr.	ANN Vannak	M	Docteur	Ecology and Environment	2015	Universitat de Girona, Espagne	Spain
014	Mr.	HAM Phaly	M	Master	Environmental Engineering	2018	Chulalongkorn University	Thailand
015	Mr.	HENG Salpisey	M	Master	Geological Engineering	2010	Gadjah Mada University	Indonesia
016	Dr.	HENG Sokchhay	M	Docteur	Water Resources	2014	University of Yamanashi	Japan
017	Mr.	HUN Ketya	M	Master	Structural Engineering	2013	Chung Ang University	South Korea
018	Ms.	KET Pinnara	F	Docteur	Irrigation	2019	Université de Liège - Gembloux Agro- Bio Tech, Belgique	Belgium
019	Mr.	KIM Lengthong	M	Master	Water and Environmental Engineering	2018	University of Peradeniya a	Sri Langka
020	Dr.	LIM Samreth	M	Docteur	Public Administration	2020	ROYAL ACADEMY OF CAMBODIA (RAC)	Cambodia
021	Mrs.	LON Sokanya	F	Master	Structural Engineer (BIM)	2018	Chung-Ang University	South Korea
022	Dr.	LONG Borith	M	Docteur	Transportation Engineering	2014	Hokkaido university	Japan
023	Mr.	LUN Sambo	M	Master	Groundwater and Environment	2010	Gadjah Mada University	Indonesia
024	Ms.	MUON Ratha	F	Master	Water Resources Engineering	2018	University of Peradeniya	Sri Langka
025	Dr.	OUCH Rithy	M	Docteur	Civil Engineering	2016	Chulalongkorn University	Thailand
026	Dr.	PEN Sytharith	M	Docteur	Hydrology	2018	Hokaido University	Japan
027	M.	SOK Khom	M	Master	Structural Engineering	1996	Asian Institute of Technology	Thailand
028	Dr.	SOK Ty	M	Docteur	Functional Ecology	2021	National Polytechnic Institute of Toulouse	France

029	Dr.	SONG LAYHEANG	M	Docteur	Hydrology and Soil Erosion	2021	Université Toulouse III - Paul Sabatier	France
030	Mr.	SOU Senrong	M	Master	Hydraulics	2015	Chungnam National University	South Korea
031	Dr.	THENG Vouchlay	F	Docteur	Civil and Environmental Engineering	2022	Tokyo Institute of Technology	Japan
032	Mr.	YOANG Sothoan	M	Master	Geotechnical Engineering	2016	Chulalongkorn University	Thailand
033	Dr.	CHHORN Chamroeun	M	Docteur	Pavement Engineering	2017	Gangneung-Wonju National University	Korea
034	Dr.	UK Sovannara	M	Docteur	Civil and Environmental Engineering	2022	Tokyo Institute of Technology	Japan

2.6. Double Degree Program with Griffith University in Australia

Through the existing collaboration between ITC and **Griffith University in Australia** (MOU signed in January 2022), we agreed to extend on the academic program in which we agree to offers a unique double degree program designed to prepare professional engineers with a solid foundation in engineering principles and administrative skills. After finishing 2nd year of the program at ITC, the student can to continue study abroad at Griffith University in Australia. This gives them the opportunity to expand the knowledge of other cultures and practices. They will get double degree which is one from ITC and another one from Griffith University. The summary of pathway from high school to graduation is shown by the learning chart below.

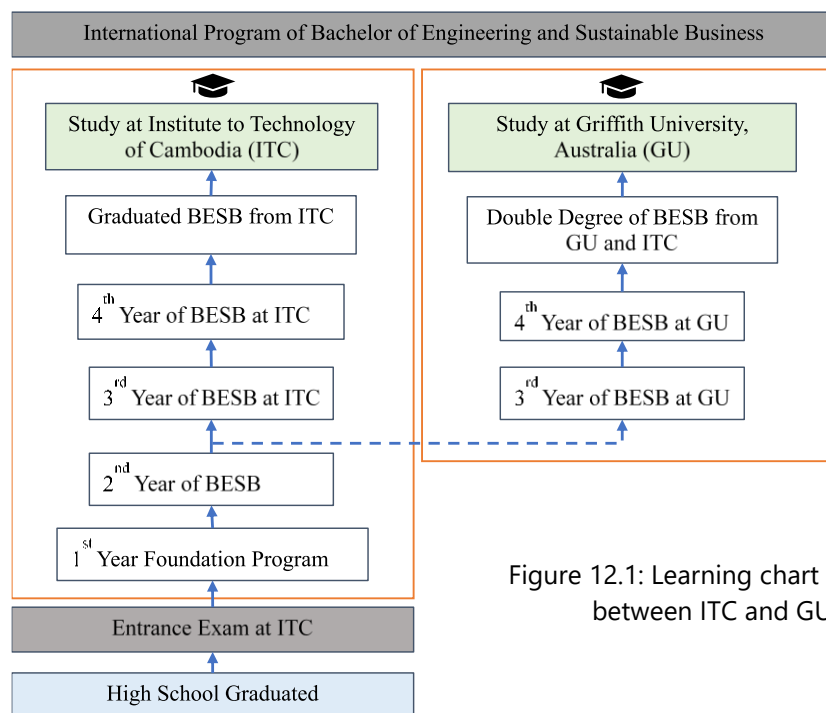


Figure 12.1: Learning chart of BESB between ITC and GU

2.7. Laboratory Facilities

Facility for supporting to the program under the Faculty of Hydrology and Water Resources Engineering is shown in table below.

Table 12.4: Facility supporting to the program

No.	Item	Unite (2023)
1	Class room with Aircon and Projector	1
2	Desktop (PC) in laboratory	25
3	Laptop for lecturers use in class	2
4	Printer	2
5	Laboratory support to the program	11

Several laboratory facilities that could support the program of Engineering and Sustainable Business as listed in Table 12.5.

Table 12.5: Laboratory facilities and function for Engineering and Sustainable Business

Nº	Name of Laboratory in English	Location	Remark
1	HydroMet and Disaster Management Lab.	D-101	Research Lab
2	Topography Lab.	D-103	TP Lab
3	Soil Lab.	D-104	TP Lab
4	Water Quality Lab.	D-105	TP Lab
5	Water Environment Lab.	D-105	Research Lab
6	Hydrology and Hydraulics Lab.	D-106	TP Lab
7	Coastal & Wetland Environmental Lab.	B-107	Research Lab
8	GIS and Remote Sensing Lab.	I-306	TP Lab and it can be an experimental lab in the future
9	Irrigation experimental station	Greenhouse	Experiment site
10	The KHmer Earth OBServation (KHEOBS) Laboratory	B-209	Research Lab
11	Water Supply Laboratory	D-108	TP Lab

ANNEX 13

List of research projects are implementing in 2023-2024

➤ Number of research projects implementing in 2022-2023

The first 21 research projects are new projects, whereas other 59 projects are continuing from previous year.

No.	Name of PI	Sex	Title	Period	Budget
1	Dr. TAN Reasmey	F	Removal of diclofenac and caffeine from different water sources using activated carbons made from different wastes	2022-2023	EU/AFD
2	Dr. SROY Sengly	F	Assessment on nutritional profiles, storage stability and sensory evaluation of dried fish powder made by low-value small fish species	2022-2023	LBE-JICA
3	Ms. SIENG Sreyvich	F	Development of alternative salt process to manufacture refined table salt from coarse salt	2022-2023	AFD
4	Dr. MITH Hasika	M	Development of high nutritional value farmed fish and safe processed products (smoked and fermented fish) in Cambodia	2022-2027	ARES
5	Dr. VALY Dona	M	Plagiarism Detection System for Khmer Language	2022-2023	LBE JICA
6	Mr. CHHORN Sopheaktra	M	Controller system for smart greenhouse	2022-2023	HEIP + YG
7	Mr. CHHORN Sopheaktra	M	SOLAGEO's Internet of Energy	2022-2023	HEIP + Trade without Border
8	Ms. OUM Sotheara	F	Development of omnidirectional semi-autonomous mobile robots for robot competition	2022-2023	AI Farm
9	Mr. LY Leangchheng	M	Design a boat for SUV car	2022-2023	
10	Dr. NGET Rithea	M	Design and Implementation of Health Data Collection Communication Protocol Using Physical-Layer Network Coding	2022-2023	LBE JICA
11	Mr. CHIN Chan Daraly	M	The vehicle as an intelligent thing	2022-2025	
12	Dr. CHRIN Phok	M	Smart farming for qualified vegetable using mechatronics techniques	2022-2023	LBE JICA

13	Dr. Doung Piseth	M	Evaluation of Mechanical Behavior of Post-Installed Bundled Reinforcement Used for Concrete Connections	2022-2023	LBE/JICA
14	Dr. Seang Sirisokha	F	Geological, Geochemical Characteristics and Genesis of Gold Mineralization, Gemstone and Rare Earth Element in Ratanakiri, Kampot, and Pailin province, Cambodia	2022-2023	LBE/JICA
15	Dr. Yos Phanny	M	Physical Properties and Mineralogy of Ancient Brick from Temples at Sambor Prei Kuk area, Kampong Thom, Cambodia	2022-2023	LBE/JICA
16	Dr. Kan Kuchvichea	M	Designing and Implementing a Pilot to Promote Waste Circularity in Phnom Penh	2022-2023	UNDP
17	Dr. BUN Saret	M	Occurrence and Distribution Analysis of Microplastics in Different Environmental Mediums of Cambodia	2022-2023	EU/AFD
18	Dr. HEU Rina	F	Investigation of the Effects of Algal Bloom in TSL Source Water on Water Supply Treatment Efficiency	2022-2023	EU/AFD
19	Dr. THENG Voulay	F	Preventing zoonotic diseases emergence	2022-2027	AFD-RD
20	Ms. DOEURN Seyha	F	Antimicrobial Resistance Circulation along the Mekong and its Delta (ARCIMED)	2022-2023	FSPI (French Government)
21	Dr. PEN Sytharith	M	Ecosystem-base Adaptations for Sustainable Groundwater Resources Management in the Transboundary Cambodia-Vietnam Mekong Delta Aquifer, Lower Mekong Region (GEBA)	2022-2023	Stockholm Environment Institute (SEI)
22	Dr. Or Chanmoly	M	Applied geophysics for investigating hydrocarbon potential and depositional environment of sediments at onshore prospect, southern Cambodia	2021-2023	HEIP
23	Dr. Vai Vannak	M	Development of a Virtual Cambodian Power System-Towards an Innovation Micro-Grid in Cambodia	2020-2024	HEIP
24	Dr. Kret Kakda	M	Integration of Landsat-8, ASTER, and Sentinel-2 for mapping of mineral prospective, hydrothermal alteration and geological structures for porphyry copper and epithermal gold deposits in the north Cambodia.	2021-2023	JICA-LBE
25	Dr. Kret Kakda	M	Investigation the production potential of the Cambodian offshore reservoir considering	2021-2023	HEIP

			effects of phase behavior and rock-fluid interaction		
26	Dr. Vai Vannak	M	Planning and Operation of Active Distribution Systems	2021-2023	JICA-LBE
27	Dr. Eng Chandoeun	M	Quality Assurance of Concrete Pile Integrity Soil Properties Investigation in Phnom Penh City using Seismic and Electrical Resistivity Tomography Approaches	2021-2023	HEIP
28	Dr. Vongchanh Kinnaeth	F	Study on impact of heat stress to human productivity and economic in Cambodia	2020-2023	CCCA3
29	Mr. Chhlonh Chhith	M	Optimal Fault Location, Isolation, and Restoration Procedure for LV Microgrids	2021-2024	BGF
30	Dr. SUONG Malyna	F	Biotechnology for Integrated Pest Management towards pesticide reduction in Cambodia	2019-2023	HEIP
31	Dr. IN Sokneang	F	Valorization of high-value dry food products (agricultural products including herbal and spices) and other by-products in Cambodia	2019-2023	HEIP
32	Dr. MITH Hasika	M	Improvement and development of rice-based products toward the growth of SMEs/Industries in Cambodia	2019-2023	HEIP
33	Dr. TAN Reasmey	F	Development of Cambodian Soy Sauce by Fermentation Method	2019-2023	HEIP
34	M. KONG Sela	M	Development of Cooking Oil Processes for Commercialization	2021-2023	HEIP
35	Dr. PENG Chanthol	F	Improvement and development of fish and meat products for better preservation using innovative technology	2021-2023	HEIP
36	Dr. HOUNG Peany	F	Valorization of agricultural by-products in Cambodia through extractions and formulations of essential oils and bioactive compounds	2021-2023	HEIP
37	Dr. SUONG Malyna	F	Sustainable Rice Production within an Agroecology Framework (HEALTHYRICE)	2019-2022	IRD

38	Dr. PO Kimtho	M	FOODI (MSc course in Food Processing and Innovation)	2019-2022	Erasmus+ KA2
39	Dr. IN Sokneang	F	Training a new generation of entrepreneurs in sustainable agriculture and food engineering (FoodSTEM)	2019-2022	Erasmus+
40	Dr. HOUNG Peany	F	Agroecology and Safe Food System Transitions (ASSET)	2020-2025	EU/AFD and GRET
41	Dr. PENG Chanthol	F	Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement	2020-2024	USAID
42	Dr. TAN Reasmey	F	Development of Cambodian Fermented Cucumbers by using Freeze-Dried Lactic Acid Bacteria with their Potential Use as Aromatic and Bacteriocin-producing Starters	2021-2023	LBE-JICA
43	Dr. YOEU Sereyvath	M	ASEAN Network for Green Entrepreneurship and Leadership/ ANGEL	2021-2024	Erasmus+
44	Ms. CHIN Lyda	F	Impact of initial composition and processing techniques on aromatic quality of mango	2021-2024	BGF & MoEYS, Tonle sap project
45	Dr. SRANG Sarot	M	Development of Nanosatellite for Demo	2021-2024	MoEYS
46	Dr. THOURN Kosorl	M	Initiative Towards Electrical and Electronic Product Testing and Certification by EMC Laboratory	2019-2023	HEIP
47	Dr. VALY Dona	M	Ancient Manuscript Digitization and Indexation	2020-2023	HEIP
48	M. KEO Chivorn	M	Flight controller and structural design for fixed-wing unmanned aerial vehicle (UAV)	2022-2024	AOARD
49	Dr. KIM Bunthern	M	Applied Control and Automation for Agriculture in Cambodia (ACAAC)	2019-2023	HEIP
50	M. HEL Chanthan	M	Toward Production Innovation via FabLab-ITC	2019-2023	HEIP
51	Mr. KUY Movsun	M	Investigation of configuration issues related to SDN/NFV deployments	2020-2024	ARES

52	Mr. PICH Reatrey	M	DNS Tunneling Detection Based on DNS over HTTPS Data Analysis	2021-2025	ARES
53	M. BAN Sam	M	Developing Countries' Transportation Enhancement through the Application of Physical Internet Paradigms	2019-2022	Government of Cambodia + ARES-CCD
54	AUN Srean	F	Air Pollution Monitoring in Phnom Penh	2019-2023	LBE-JICA
55	BUN Polyka	F	Development and optimization of ceramic tile using Cambodian clays incorporating with industrial wastes	2020-2023	LBE-JICA
56	KETH Kannary	F	Managing the interdisciplinary collaboration in construction 4.0: ITC's workshop case	2021-2024	IRD
57	YOS Phanny	M	Cambodian natural rubber/different minerals composites for floor mat shock absorbing application	2020-2023	Kanazawa University
58	YOS Phanny	M	Polyethylene (PE) Waste Recycling for Asphalt Concrete Pavement Application	2021-2022	HEIP
59	DOUNG Piseth	M	Initiative on the development of wind load for design of building structures in Cambodia	2020-2023	HEIP
60	DOUNG Piseth	M	Energy-based design for buildings and Steel ring damper for seismic application	2020-2024	HEIP
61	HIN Raveth	M	Chemical Strengthening of Large-scale glass Pieces for Construction and Other Engineering Applications	2020-2024	HEIP
62	TAING Kimnenh	F	Green BIM - Analysis of BIM approach for designing a bioclimatic building	2020-2024	HEIP
63	LONG Makara	M	Sustainable building designs integrated life-cycle assessment (LCA), for best strategies to design the green residential building in Phnom Penh, Cambodia	2021-2025	HEIP
64	Dr. OR Chanmoly	M	SATREPS: Establishment of Risk Management Platform for Air Pollution in Cambodia	2022-2027	ITC and BGF
65	Dr. BUN Saret	M	Addressing Water Scarcity in a Rural Community of Cambodia through Groundwater Use	2020-2022	ITC and BGF

66	Dr. CHAN Rathborey	M	Influence of Locally Made Effective Microorganism (EM on the Treatment of Domestic Wastewater using the Conventional Septic Tank	2021-2022	ITC and BGF
67	Dr. DOUNG Ratha	M	Water Evolution and Vulnerability Under Global Changes in Coastal Catchments of Cambodia	2019-2022	French Embassy
68	Ms. AUN Srean	F	Air pollution in Phnom Penh/East Asia-Nanoparticle monitoring network (EA-Nanonet)	2011-Present	LBE-JICA
69	Dr. HANG Leakhena	F	Development of a bio-filter system model to control air pollution toward industrial application	2021-2023	LBE-JICA
70	Dr. HEU Rina	F	Improving Sustainable Water Supply and Sanitation in Cambodia: Case of Tonle Sap Lake's Floating Villages	2021-2023	HEIP
71	Dr. KET Pinnara	F	Integrated approach of precise irrigation and sustainable soil management to improve crop water productivity in Cambodia through ITC soil laboratory development: the focus on rice farming	2021-2023	HEIP
72	Dr. BUN Saret	M	Development of Eco-Friendly and Low-Cost Wastewater Treatment System as an On-Site Product	2021-2023	JICA-LBE
73	Dr. SONG Layheang	M	Development of Climate Data Information System for Cambodia	2021-2023	HEIP
74	Dr. OEURNG Chantha	M	Strengthening Flood and Drought Risk Management and Early Warning System in Lower Mekong Basin of Cambodia	2021-2023	JICA-LBE
75	Ms. MOUN Ratha	F	Termite bioturbation in Cambodia-From Characterization to Application (PhD project)	2019-2022	HEIP
76	Dr. SONG Layheang	M	Impact of Land Use Change and Climate Change on Surface Runoff and Suspended Sediment in the Mekong Basin (PhD project)	2019-2022	CCCA3
77	Dr. SOK Ty	M	Dynamic Transport of the Sediment and Nutrient in the Mekong River Basin and the Role of the Tonle Sap: Assessment Coupling	2019-2022	BGF

			Data and Modelling Approaches (PhD project).		
78	Dr. PENG Chanthol	F	Aquaculture in Cambodia: Sustainability and Risk Prevention (AquaCam)	2020-2022	HEIP
79	Dr. CHAN Rathborey	M	Development of Electrocoagulation Reactor Integrated Sedimentation for Turbidity and Color Removal from Industrial Wastewater	2021-2023	HEIP
80	Dr. KET Pinnara	F	Prototype of Low-cost and Smart In-vessel Composter for converting Spent Mushroom Substrates to Bio-Organic Fertilizer	2021-2022	HEIP

➤ **Number of Projects/Proposals submitted 2022-2023**

No.	Title of Project	Speciality	Partner	Funding agency (Erasmus KA1, Erasmus KA1, AUN- SEED/Net, AUF, AFD, ADB, WB etc.,)	Funding Amount (USD)
1	Improving fresh-water fish powder production for versatile use in Cambodian diets	FTN	DCF Danish Care Foods Co., Ltd	UNIDO-Capfish	30,000 USD
2	Shelf life improvement and development of fish Jerky products	FTN	Unica entreprise	UNIDO-Capfish	30,000 USD
3	Improvement of Dried Fish Quality through Drying Technology Development	FTN	- Harvest The Sun Co., Ltd - Samnang Sothea Handicraft	UNIDO-Capfish	29,940 USD
4	Development of Instant Fish Soups for Commercialization	FTN	Heng Channy Angkor Meas	UNIDO-Capfish	30,000 USD
5	Development of Cambodian Traditional Fish Based-Product: Fish Amok and Khmer Fish Noodle Soup	FTN	- Embassy Restaurant Enterprise - CT FOODS	UNIDO-Capfish	29,561 USD
6	Development of nutrient-dense waffle rolls for children by incorporating Cambodian freshwater fish powder	FTN	DCF Danish Care Foods Co., Ltd.	UNIDO-Capfish	28,000 USD
7	Stability of dried fish quality by using green synthesis of metallic nanoparticles as a preservative	FTN	- Narith Sokleng Dried Fish Handicraft - NISTI	UNIDO-Capfish	29,985 USD

8	Development of monitoring and controlling of IoT-based aquaponics system using green energy Acronym: Smart Aquaponic Project	MIT & WAE	Tokyo Polytechnic University, Oita University, Kagawa University, University of Fukui, Tokyo Institute of Technology	LBE JICA	15,000 USD
9	Integrated Decision Support System for Non-Communicable Ocular Diseases using Machine IntelligenceMachine Intelligence	MIT (as member)	Universiti Kebangsaan Malaysia, Malaysia; Institute of Technology Bandung, Indonesia	ASEAN IVO	22,016 USD
10	Concrete made of 100% recycled materials	MSS	Lmdc	BGF-ITC	8,100 USD
11	Effect of The Addition of Natural Fibers on Shrinkage, Cracking Risk and Healing Capacity of Cementitious Materials	MSS	INSA Rennes	BGF-ITC	N/A
12	Development of Starch-Based Film for Biodegradable Packaging Using Cambodian Cassava as Starch Source	MSS	N/A	Takahashi	4,961 USD
13	Characterization and Fabrication of Ceramic Brick for Sambor Prei Kuk Temple Rehabilitation	MSS	Chulalongkorn University and Nagaoka University of Technology	LBE/JICA	14,800 USD