# INSTITUT DE TECHNOLOGIE DU CAMBODGE

## RÉUNION DU CONSEIL D'ADMINISTRATION

### Document général et dossier pédagogique 2022-2023

**16 Juin 2022**

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# PARTIE I : DOCUMENT GENERAL

# Introduction

Depuis sa création en 1964, l'Institut de technologie du Cambodge (ITC) a reçu une plus grande reconnaissance pour ses succès et ses réalisations au service du pays grâce au développement des ressources humaines, au renforcement des capacités institutionnelles et au travail intensif sur le développement économique et des infrastructures du Cambodge. L'ITC, depuis plus de quatre décennies, a établi un lien entre les réseaux francophones et anglophones de la région et du monde. Avec ses nombreux collaborateurs, administrateurs, étudiants, professeurs et anciens étudiants, cette institution offre un contexte multilatéral unique pour un échange de vues avec les ministères, les autorités locales, les ONG, le secteur privé et les institutions partenaires.

L'ITC a pour mission de former des étudiants ayant une formation de haute qualité dans les domaines de l'ingénierie, des sciences et des technologies et de développer des transferts de technologies innovants. Les étudiants disposent d'une base scientifique solide ainsi que d'un savoir-faire et de compétences techniques qui permettent leur intégration et leur évolution sur le marché du travail. Sur la base de la décision de la réunion annuelle du conseil d'administration, l'orientation future de l'ITC est d'élargir le domaine de la formation des ingénieurs et de développer des plateformes de recherche afin de soutenir le développement du pays. Cela nécessite de renforcer les connaissances scientifiques de base, de développer des programmes de recherche en relation avec le secteur privé et les parties prenantes nationales et internationales, de soutenir les communautés, de favoriser le développement économique grâce à des programmes d'entrepreneuriat et d'aider nos étudiants diplômés à intégrer l'économie mondiale. En fin de compte, il est important pour l'ITC de conserver sa propre identité d'institution multilingue, de maintenir et d'étendre un réseau avec des universités francophones et anglophones, de fournir une éducation qui motive le personnel enseignant et les étudiants, stimule la créativité et inspire les ambitions futures, et de développer une recherche reconnue internationalement en adéquation avec les besoins de la société.

# Perspectives and Stratégies

## 2.1 Perspectives

**Pour devenir une institution en premier plan avec efficacité et excellence offrant le transfert universitaire, de recherche, de science, de technologie, d'innovation et d'ingénierie à la communauté.**

L'ITC a développé le plan stratégique (2021-2030) basé sur la stratégie rectangulaire (phase IV) du gouvernement ainsi que le plan national de développement stratégique (2019-2023). Ce plan stratégique fournira des orientations pour la mise en œuvre efficace des plans d'action et abordera les défis afin d'améliorer la qualité de la formation des ingénieurs dans un environnement compétitif.

Deux objectifs principaux devront être atteints d'ici 2030 comme suit :

1- Former 17200 étudiants qualifiés vers la vision du Cambodge 2030
2- Mettre en place 175 projets qui transfèrent la technologie et Start-Ups pour l'harmonisation et le développement vers la vision du Cambodge 2030

## 2.2 Stratégie

L'ITC a développé 5 stratégies pour atteindre les objectifs :

1. Établir et appliquer un programme académique répondant aux besoins du marché avec une reconnaissance nationale et internationale
2. Développer les ressources humaines et moderniser la technologie pour la bonne gouvernance, la gestion et les affaires financières
3. Développer les infrastructures physiques et moderniser les laboratoires
4. Établir les projets d'investissement et les projets de recherche appliquée ciblant le démarrage et le transfert de technologie
5. Moderniser le système d'information sur les données pour la diffusion des activités et des résultats à la communauté

## 2.3 Cadre de Résultats

Le cadre de résultats pour 10 ans : 2021 à 2030 - Niveau institutionnel est présenté dans le tableau 1.

Tableau 1: Le cadre de résultats pour 10 ans : 2021 à 2030 - Niveau institutionnel

| **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 | | 62 | 83 | 93 | 103 | 108 | 114 | 121 | 129 | 137 | 145 | 153 | 153 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| with development | | | | | | | | | | | | | |
| 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. Stratégie/Perspectives pour 2022-2023

## 3.1 Base des donnés et projeté

Le nombre d'étudiants (Technicien, Ingénieur, Master et Doctorant), du Staff (doctorat et Master) et de laboratoires pour la période de référence 2021-2022 et les projections pour 2022-2023 est indiqué dans le tableau 2.

Tableau 2: Base des donnés pour 2021-2022 et projeté pour 2022-2023

| Faculty | Department/ Option | Baseline Academic year 2021-2022 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Technician Student | No. Eng. Student | No. Master Student | No. PhD Student | No. Master staffs | No. PhD staffs | No. Support Staff | No. Lab (Teaching) | No. Lab (Research) |
| | Tronc Commun | | 2823 | | | 12 | 1 | 2 | 3 | |
| Faculty of Civil Engineering | GCI | 170 | 180 | | | 6 | 14 | 2 | 3 | |
| | Arch | | 60 | | | 11 | 1 | 0 | 1 | |
| | Transport | | 0 | | | 0 | 3 | 0 | | |
| Faculty of Electrical Engineering | GEE | 64 | 386 | | | 12 | 5 | 6 | 4 | 4 |
| | GTR | | 165 | | | 5 | 5 | 7 | 2 | 3 |
| | GIM | 32 | 323 | | | 20 | 8 | 4 | 10 | 4 |
| | GIC | | 214 | | | 10 | 3 | 11 | 7 | 2 |
| Faculty of Chemical & Food Engineering | Food | 80 | 320 | | | 13 | 9 | 1 | 12 | Use teaching lab |
| | Chemical | | 129 | | | 10 | 5 | 0 | Use Food lab | Use teaching lab |
| Faculty of Hydrology and Water Resources Engineering | WRI | | 304 | | | 10 | 8 | 9 | 5 | 4 |
| | WEE | | 155 | | | 6 | 7 | 9 | 5 | 4 |
| Faculty of Geo-Resources and Geotechnical Engineering | GGG | | 157 | | | 10 | 11 | 2 | 6 | 1 |
| Graduate School | | | | 122 | 55 | 1 | 9 | 1 | | |
| **Total** | | **346** | **5216** | **122** | **55** | **126** | **89** | **54** | **58** | **22** |

| Faculty | Department/ Option | Planned Academic year 2022-2023 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Technician Student | No. Eng. Student | No. Master Student | No. PhD Student | No. Master staffs | No. PhD staffs | No. Support Staff | No. Lab (Teaching) | No. Lab (Research) |
| | Tronc Commun | | 3000 | | | 13 | 1 | 2 | 3 | |
| Faculty of Civil Engineering | GCI | 170 | 180 | | | 6 | 16 | 2 | 2 | |
| | Arch | | 80 | | | 11 | 1 | 0 | 1 | |
| | Transport | | 30 | | | 2 | 3 | 0 | | |
| Faculty of Electrical Engineering | GEE | 200 | 450 | | | 15 | 8 | 8 | 7 | 4 |
| | GTR | 60 | 200 | | | 6 | 5 | 7 | 3 | 3 |
| | GIM | 35 | 110 | | | 21 | 9 | 7 | 10 | 4 |
| | GIC | 0 | 240 | | | 10 | 4 | 11 | 7 | 2 |
| Faculty of Chemical & Food Engineering | Food | 100 | 320 | | | 14 | 10 | 1 | 13 | 0 |
| | Chemical | 0 | 150 | | | 11 | 5 | 0 | 2 | 0 |
| Faculty of Hydrology and Water Resources Engineering | WRI | 5 | 365 | | | 10 | 9 | 9 | | 4 |
| | WEE | 5 | 172 | | | 7 | 8 | 9 | 6 | 4 |
| Faculty of Geo-Resources and Geotechnical Engineering | GGG | 0 | 180 | | | 11 | 13 | 3 | 6 | 2 |
| Graduate School | GS | 0 | 0 | 136 | 62 | 1 | 10 | 2 | None | None |
| **Total** | | **575** | **5477** | **136** | **62** | **138** | **102** | **61** | **60** | **23** |

### 3.2 Amélioration du Programme d'enseignement

Actuellement, le nombre de staff avec le diplôme de doctorat à l'ITC est de 89. Malgré ce nombre important, il est encore nécessaire de réaliser le plan stratégique de l'ITC 10 (2021-2030) pour promouvoir la qualité de l'enseignement de l'ingénierie, la recherche et le développement de l'innovation à l'ITC. Trois activités principales seront prises en compte :

- Améliorer la qualité standard minimale pour tous les programmes d'ingénierie
- Établir des programmes internationaux
- Moderniser et créer de nouveaux laboratoires grâce à la mise en œuvre du projet d'éducation basée sur les laboratoires (LBE) et du projet d'amélioration de l'enseignement supérieur (HEIP)

Tableau 3: Plan d'action pour atteindre la norme de qualité minimale basée sur le système IQA

| Faculty/Department | Name of Program | Scoring (IQA Assessment 2021) | | Completion Plan |
|---|---|---|---|---|
| | | Quantitative (QN) | Qualitative (QL) | |
| Hydrology and Water Resources Engineering | Water and Environmental Engineering (WEE) | 33 | 22 | Jan 2022 |
| Electrical and Energy Engineering - GEE | Electronics and Automation - EA | 37 | 27 | May 2022 |
| Electrical and Energy Engineering - GEE | Electrical Energy | 36 | 27 | May 2022 |
| Faculty of Geo-resources and Geotechnical Engineering | Geo-resources and Geotechnical Engineering | 33 | 22 | Jan 2023 |
| Chemical and Food Engineering | Chemical Engineering | 34 | 22 | Jan 2023 |
| | Food Engineering | 34 | 22 | Jan 2023 |
| Civil Engineering | Civil Engineering | 36 | 26 | Jan 2022 |
| | Architectural Engineering | 31 | 27 | Jan 2023 |
| Information and Communication Engineering | Information and Communication Engineering | 40 | 25 | Jan 2023 |
| Industrial and Mechanical Engineering | Industrial Engineering | 33 | 24 | Jan 2023 |
| | Mechanical Engineering | 33 | 26 | Jan 2023 |
| Telecommunication and Network (GTR) | Telecommunication and Network Engineering | 35 | 29 | Jan 2023 |

### 3.3 Modification et amélioration du curriculum

La modification et l'amélioration du curriculum proposé par les différents départements sont données dans le tableau 4.

Tableau 4: Modification et l'amélioration du curriculum

| Engineering program | Current situation | | Proposed modification | | Remarks |
|---|---|---|---|---|---|
| | Name of course | Duration | Name of course | Duration | |
| I3GGG | 1. Ore Microscopy | 16h (TP) | Remove this course | - | This course will be combined with the course No.2: Petrology and Mineralogy |
| | 2. Petrology and Mineralogy | 48h (Course +TP) | Petrology and Mineralogy | - Course: 16h<br>- TP: 48h | This subject is mainly practical work. The number of is increased by combination of Ore Microscopy. |
| I4-GGG | 1. Geophysics (Course) | 48h | Geophysics (Course + Practical lab) | 64h<br>- Course: 32h<br>- TP: 32h | There are many geophysical methods, Gravity, magnetic, seismic, electrical methods etc., thus students need to do practical work to improve their understanding. Currently, faculty has magnetic equipment and DUG Insight software for analysis and interpretation geophysical data. In late 2022, Faculty is going to have seismic, electrical resistivity, IP, NMR equipment and Petrel Software. Therefore, faculty needs to |

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| | | | | | update this subject. |
| | | | | | |
| | 2. Rock blasting techniques | 16h | Rock blasting techniques | 32h<br>- Course: 16h<br>TD: 16h | This course is needed for blasting design and calculation |
| | 3. Basic geological mapping | 32h | Basic geological mapping | 32h<br>- Course: 16h<br>- TD: 16h | This course is needed the practical work for mapping |
| | 4. Mineral exploration | 48h | Mineral exploration | 48h<br>- Course: 32h<br>- TD: 16h | Currently, faculty has enough lab facility for practical work |
| | 5. Mineral characterization | 32h | Remove this course | - | This course will be added to Mineral exploration |

| Engineering program | Current situation | | Proposed modification | | Remarks |
|---|---|---|---|---|---|
| | Name of course | Duration | Name of course | Duration | |
| I3GIC<br>Semester 1 | Algorithms and programming | 80h | Algorithm and Programming | 32h | Review (Complete in year 2) |
| | Combinational and sequential logics | 32h | Combinational and sequential logics | 48h | |
| | Computer architecture | 16h | Computer architecture | 0h | (Complete in year 2) |
| | Discrete mathematics | 32h | Discrete mathematics | 32h | |
| | Electronics | 16h | Electronics | 16h | |
| | Information systems analysis and design | 32h | Information systems analysis and design | 48h | |
| | Introduction to computer systems and networks | 32h | Introduction to computer systems and networks | 32h | |
| | Probability and statistics | 48h | Probability and statistics | 48h | |
| | English | 32h | English | 32h | |
| | French | 64h | French | 64h | |
| | Soft skills | 0h | Soft skills | 16h | New course |

| | | | | | |
|---|---|---|---|---|---|
| I3GIC<br>Semester 2 | Algorithms and programming | 64h | Algorithms and programming | 0h | (Complete in year 2) |
| | Automata theory | 32h | Automata theory | 32h | |
| | Combinational and sequential logics | 32h | Combinational and sequential logics | 0h | Include in semester 1 |
| | Computer architecture | 48h | Computer architecture | 0h | (Complete in year 2) |
| | Database | 48h | Database | 48h | |
| | Theoretical computer science | 32h | Theoretical computer science | 32h | |
| | Informatique (MATLAB) | 32h | Informatique (MATLAB) | 32h | |
| | English | 64h | English | 64h | |
| | French | 32h | French | 32h | |
| | Web design | 0h | Web design | 48h | Move from year 4 – Internet Programming |
| | Object-Oriented Programming (OOP) | 0h | Object-Oriented Programming (OOP) | 64h | Move from year 4 |
| | Introduction to programming environment | 0h | Introduction to programming environment | 16h | New course |
| | Research methodology | 0h | Research methodology | 32h | Move from year 5 |
| I4GIC semester 1 | Advanced computer architecture | 32h | Advanced computer architecture | 32h | |
| | Human computer interaction | 32h | Human computer interaction | 32h | |
| | Internet programming I | 48h | Internet programming I | 48h | |
| | Networks I | 32h | Networks I | 32h | |
| | Operating systems | 48h | Operating systems | 64h | |
| | Software engineering | 64h | Software engineering | 64h | |
| | Telecommunication | 48h | Telecommunication | 32h | |
| | English | 32h | English | 32h | |
| | French | 32h | French | 32h | |
| | Compilation | 0h | Compilation | 32h | Move from semester 2 |
| I4GIC semester 2 | Advanced database and database management systems | 48h | Advanced database and database management systems | 48h | |
| | Compilation | 48h | Compilation | 0h | Move to semester 1 |
| | Distributed Systems | 48h | Distributed Systems | 48h | |

| | | | | | |
|---|---|---|---|---|---|
| | Internet programming II | 48h | Internet programming II | 48h | |
| | Networks II | 32h | Networks II | 32h | |
| | Operating systems | 16h | Operating systems | 0h | Move to semester 1 |
| | Software engineering | 48h | Software engineering | 0h | Include in semester 1 |
| | Systems and networks administration | 48h | Systems and networks administration | 48h | |
| | English | 32h | English | 32h | |
| | French | 32h | French | 32h | |
| | DevOps | 0h | DevOps | 48h | New course |
| | Network design | 0h | Network design | 16h | New course |
| | Introduction to mobile app development | 0h | Introduction to mobile app development | 32h | New course |
| | Year 4 Internship | | | | 2 credits |
| I5GIC semester 1 | Artificial intelligence | 32h | Artificial intelligence | 32h | |
| | Image processing | 48h | Image processing | 48h | |
| | IT project management | 32h | IT project management | 32h | |
| | Modelling and simulation | 32h | Modelling and simulation | 0h | Remove |
| | Network security | 48h | Network security | 48h | |
| | Cloud computing | 48h | Cloud Computing | 48h | |
| | Natural Language Processing (NLP) | 48h | Natural Language Processing | 48h | |
| | Research methodology | 32h | Research Methodology | 0h | Move to year 3 |
| | English | 32h | English | 32h | |
| | French | 32h | French | 32h | |
| | Data mining | 0h | Data mining | 16h | New course |
| | Information security | 0h | Information security | 32h | New course |
| I5GIC semester 2 | Final year internship | | | | 9 credits |
| GRU Water Resources Engineering and Rural Infrastructure | Construction of Rural Roads | 64hr | Road Engineering and Construction | 64hr | At the recent year, may student have interested in road construction for their internship and job as this sector is growing job market covering |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | all kind of road construction. Seeing this skill need at faculty under the program of Water Resources Engineering and Rural Infrastructure, we would like to improve our course syllabus to cover all type of road construction. |
| I4-Méca | Constructions mécaniques | 40h | Introduction to Robotics | 40h | |
| I4-Indu | Systèmes asservis | 48h | Control Theory 1 | 48h | |
| I3GTR Semester 1 | Data Structure and Algorithm | 48h | Operating System | 48h | The subject Data Structure and Algorithm (48 hours) which exists in the new curriculum of year 2 is replaced by Operating System (48 hours) from semester 2 |
| I3GTR Semester 2 | Computer Architecture | 48h | Microcontroller and Sensors | 48h | The subject Computer Architecture (48 hours) which exists in the new curriculum of year 2 is replaced by a new subject Microcontroller and Sensors (48 hours) |
| | Operating System | | Object Oriented Programming | 48h | the subject Operating System (48 hours) which is moved to semester 1 is replaced by Object-Oriented |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | Programming (48 hours) |
| I4GTR semester 1 | Object Oriented Programming | 48h | Mobile Application | 32h | The subject Object-Oriented Programming (48 hours) which is moved to year 3 semester 2 is replaced by Mobile Application (32 hours) |
| I4GTR semester 2 | Mobile Application | 32h | Introduction to Cloud Computing | 48h | The subject Mobile Application (32 hours) which is moved to semester 1 is replaced by a new subject Introduction to Cloud Computing (48 hours) |

## 3.4 Création d'un Programme de la Fondation Pré-Diplôme par le Curriculum Appliqué de l'Université Curtin

### 3.4.1 Contexte

Les besoins de l'industrie contemporaine nécessitent une réduction de l'écart entre les compétences enseignées dans le cadre de l'éducation traditionnelle et celles réellement requises pour des lieux de travail efficaces. En particulier, la demande de main-d'œuvre qualifiée a augmenté au cours des dernières années alors que le Cambodge passe progressivement de l'agriculture aux secteurs industriels et manufacturiers. Pour répondre à ces demandes, des efforts et un engagement considérable sont nécessaires pour renforcer le système éducatif, qui souffre depuis longtemps d'un manque de ressources. Améliorer l'enseignement des STIM est donc essentiel pour soutenir la croissance économique et rester compétitif à l'échelle internationale au cours des prochaines décennies. De plus, la vision 2030 de l'enseignement supérieur au Cambodge et la feuille de route de l'enseignement supérieur 2017-2030 indiquent l'importance des STIM dans la stratégie de développement des ressources humaines. L'Institut de Technologie du Cambodge est impatient de jouer un rôle important pour répondre à cette demande.

L'Institut de Technologie du Cambodge (ITC) est un établissement public d'enseignement supérieur et l'un des principaux instituts d'ingénierie au Cambodge qui propose une formation en ingénierie dans cinq facultés d'ingénierie. Actuellement, l'ITC est en train de moderniser et d'améliorer son système d'enseignement-apprentissage et de recherche pour répondre aux normes régionales et internationales.

Pour réaliser cette vision, l'ITC prévoit de lancer un Programme International de la Fondation Pré-diplôme de Curtin en 1 an à l'ITC et les étudiants pourraient poursuivre leurs études de

premier cycle en ingénierie et en sciences sur n'importe quel campus de Curtin à l'issue de ce programme de base.

### 3.4.2 Création d'un Programme de la Fondation Pré-diplôme

Le Programme de la Fondation Pré-diplôme est une sorte du curriculum appliqué de l'Université Curtin en 1 an à l'ITC. Ces études de la fondation internationales d'un an comprennent deux cours semestriels en fondation d'ingénierie et de sciences.

La Fondation de l'Ingénierie et des Sciences prépare les étudiants aux études de premier cycle en Ingénierie et en Sciences et en Informatique. En plus de plusieurs unités d'enseignement communes à tous les cours de la fondation, les étudiants étudient des unités en Mathématiques pour l'ingénieur, Physique-Chimie et Programmation en C++. Les cours visent à développer la diligence académique, l'analyse critique et une série de compétences génériques chez les étudiants. Ils fournissent une base solide pour que les étudiants s'adaptent avec plus de confiance à l'enseignement universitaire, tant en termes de niveau que de style d'éducation.

Il existe deux (2) filières pour le programme de la Fondation de Génie et de Science :

- Filière d'ingénierie Engineering stream (+3ans)
- Filière de science (+4ans)

Les étudiants qui obtiennent des résultats satisfaisants sont éligibles pour être admis à une gamme de cours de premier cycle offerts à la Faculté de Génie et des Sciences de n'importe quel campus de Curtin (Malaisie, Perth-Australie, Singapour, etc.)

Les étudiants ayant des résultats satisfaisants dans les Études de la Fondation – filière de l'ingénierie peuvent s'inscrire aux programmes de diplôme ci-dessous :

- Baccalauréat en ingénierie (Hons.) (Chimie, Civil et Construction, Électrique et Électronique, Environnement, Mécanique, Pétrole)
- Baccalauréat en sciences appliquées (Gestion de la Construction)

Les étudiants ayant des résultats satisfaisants dans les Études de la Fondation - filière des sciences peuvent s'inscrire aux programmes de diplôme ci-dessous :

- Baccalauréat en Technologie (Système Informatique et Réseaux)
- Baccalauréat en Sciences Appliquées (Gestion de la Construction)
- Baccalauréat en Science (Hons.) (Géologie appliquée, Génie Logiciel, Cybersécurité)

### 3.4.3 Objectifs pédagogiques du programme (OPPs)

1 an d'études de la Fondation Pré-Diplôme comprend deux cours semestriels en fondation d'ingénierie et de sciences. Les cours visent à développer la diligence académique, l'analyse critique et une série de compétences génériques chez les étudiants. Une base solide est fournie pour que l'étudiant s'adapte à un niveau et à un style d'éducation élevés.

Les étudiants du programme de la Fondation Pré-diplôme en Génie et en Sciences sont capables de :

- **Connaissance : A**ppliquer les connaissances en Mathématiques, en Sciences et en Informatique pour résoudre des problèmes d'ingénierie.
- **Résolution de problèmes :** Identifier, analyser et résoudre des problèmes en utilisant les principes des Mathématiques, des Sciences et d'Informatique.

- **Utilisation de la Technologie :** Sélectionner et appliquer les techniques et ressources appropriées à diverses sciences et informatique.
- **Communication :** Communiquer efficacement par le biais de travaux écrits et de tâches orales.
- **Travail d'équipe :** Travailler efficacement en tant que membre ou leader dans un groupe multidisciplinaire et diversifié.
- **Apprentissage continu :** S'engager dans l'apprentissage continu et acquérir les compétences essentielles pour poursuivre des études supérieures.

### 3.4.4 Attribut diplômé

- **Appliquer les connaissances de la discipline :** comprendre ses fondements théoriques et ses modes de pensée ; étendre les frontières de la connaissance par la recherche.
- **Compétences de réflexion :** appliquer des processus logiques et rationnels pour analyser les composantes d'un problème ; penser de manière créative pour générer des solutions innovantes.
- **Compétences informationnelles :** Décidez quelles informations sont nécessaires et où elles pourraient être trouvées en utilisant les technologies appropriées ; porter des jugements valables et synthétiser des informations provenant de diverses sources.
- **Compétences en communication :** Communiquer de manière appropriée à la discipline, au public et à l'objectif.
- **Compétences technologiques** – Utiliser les technologies appropriées en reconnaissant leurs avantages et leurs limites.
- **Apprendre à apprendre** – Utiliser une gamme de stratégies d'apprentissage ; assumer la responsabilité de son propre apprentissage et développement ; entretenir la curiosité intellectuelle ; savoir comment continuer à apprendre en tant que diplômé.
- **Perspective internationale** – Penser à l'échelle mondiale et considérer les problèmes sous divers angles ; appliquer les normes et pratiques internationales dans une discipline ou un domaine professionnel.
- **Compréhension culturelle** – Respecter les droits humains individuels ; reconnaître l'importance de la diversité culturelle, en particulier du point de vue des Australiens indigènes ; valoriser la diversité de la langue.
- **Compétences professionnelles** – Travailler de façon autonome et en équipe ; faire preuve de leadership, de comportement professionnel et de pratiques éthiques.

### 3.4.5 Structure du Cours

La structure du cours d'1 an d'études de la Fondation Pré-diplôme dans les filières d'Ingénierie et de Sciences est indiquée dans le **Tableau 3** et le **Tableau 4**. Les étudiants qui ont terminé avec succès le Programme de la Fondation Pré-diplôme en 1 an à l'ITC sont éligibles pour poursuivre des études de premier cycle proposées dans n'importe quel campus de Curtin.

Tableau 5 : Structure du Cours de la Fondation Pré-diplôme dans le Filière d'Ingénierie

| **Filière de l'Ingénieurie** | | | |
|---|---|---|---|
| **Semestre 1** | **Crédit** | **Semestre 2** | **Crédit** |
| Compétences en communication efficacies | | Chimie | |

| | | | |
|---|---|---|---|
| Mathématiques de l'ingénieur I | | Mathématiques de l'ingénieur II | |
| Physique 1 | | Physique II | |
| Programmation en C++ | | Compétences rédactionnelles et de recherche | |
| **Total** | | **Total** | |

Tableau 6 : Structure du Cours de la Fondation Pré-diplôme dans le Filière de Science

| **Filière des Sciences** | | | |
|---|---|---|---|
| **Semestre 1** | **Crédit** | **Semestre 2** | **Crédit** |
| Compétences en communication efficacies | | Compétences rédactionnelles et de recherche | |
| Mathématiques de l'ingénieur I | | Mathématique de l'ingénieur II | |
| Physique 1 | | Technologie de l'information commerciale | |
| Programmation en C++ | | Introduction aux études commerciales | |
| **Total** | | **Total** | |

The detailed curriculum of pre-degree foundation program is attached in **Annex-A**.
The course description of pre-degree foundation program is shown in **Annex-B.**
The admission requirement of pre-degree foundation program is shown in **Annex-C.**
The human resources of ITC for pre-degree foundation program is listed in **Annex-D**.
The laboratories and facilities for pre-degree foundation program is detailed in **Annex-E.**

### 3.4.6 **Projet de support et Programme de partenariat**

The pre-degree foundation program was established by technical assistant from both Curtin Perth, Australia and Curtin Malaysia under Higher Education Partnership Program of HEIP. The Establishment of Pre-degree Foundation Program in Eng. and Science will meet the Curtin's undergraduate entry requirement at any Curtin campus.

Curtin will assist in pre-degree foundation program as following:

- To provide all relevant materials for the Foundation courses to ITC including Course structures, course unit content, syllabus, curriculum map, assessment (structure, map and design) with training and coaching
- To build up the capacity of ITC staff on some courses specific for pre-degree foundation program at ITC:
  - Foundation class/teaching observations

- Co-plan of units and give feedback
- Develop teaching materials, possible amendments to syllabus, assessment, rubrics
- Moderation meetings
- Internal quality assurance
- Student results and appeals

### 3.5 Renforcement des capacités du personnel enseignant

Le renforcement des capacités du personnel est l'une des principales priorités de l'ITC en envoyant du personnel enseignant à l'étranger pour améliorer / partager des expériences dans l'enseignement, la recherche scientifique et le développement des compétences générales par le biais de partenariats universitaires, de programmes d'échange, etc., et vice versa. Les entrées et sorties du renforcement des capacités du personnel sont détaillées dans les tableaux 7 et 8.

Tableau 7: Inbound staff for capacity building 2021-2022

| Name | Skill/Department | Partners | Financial support | Others |
|---|---|---|---|---|
| Dr. Eng Chandoeun | Geophysics | Total Energies Cambodia | Total Energies Cambodia | |
| Dr. Kret Kakda | Geophysics | | | |
| Ms. Heng Muoy Yi | Geophysics | | | |
| Ms. Pech Sopheap | Method of Teaching | Curtin University | HEIP | |
| Ms. Sio Sreymean | Method of Teaching | Curtin University | HEIP | |
| Dr. Boeut Sophea | Method of Teaching | Curtin University | HEIP | |
| Dr. Bun Kim Ngun | IQA | MoEYs | | |
| Dr. Eng Chandoeun | IQA | MoEYs | | |
| Dr. Yos Phanny | IQA | MoEYs | | |
| Dr. Boeut Sophea | IQA | MoEYs | | |
| Ms. Pech Sopheap | IQA | MoEYs | | |
| Vai Vannak | Electrical Energy | INP-Grenoble | Erusmus | |
| Kim Bunthern | Electronics and Automation | INP-Grenoble | Erusmus | |
| CHOU Koksal | Electronics and Automation | INP-Grenoble | Erusmus | |
| Jérémy Olivier | Wastewater | École Nationale Supérieure en Génie des Technologies Industrielles (ENSGTI)_PAU | AFD | |
| Pierre Le Cloirec | Distribution system | École nationale supérieure de chimie de Rennes (ensc-rennes) | AFD | |
| Marc Descloitres | Hydrogeophysical survey | IRD | HGP Mekong | |
| Sunil Herat | Waste Management and Circular Economy | Griffith University | Griffith University | |

Tableau 8: Outbound staff for capacity building 2021-2022

| Name | Skill/Department | Partners | Financial support | Others |
|---|---|---|---|---|
| Ms. Heng Muoy Yi | Geophysics | University of Liege | Impulse Program | |
| Dr. Eng Chandoeun | Geophysics | University of Liege | HEIP Project | |
| Dr. Kret Kakda | Remote Sensing | Kyushu University | LBE-JICA | |

| | | | | |
|---|---|---|---|---|
| Dr. Eng Chandoeun | X-Ray Fluorescence | Kyushu University | LBE-JICA | |
| Dr. TITH Dara | Information Security / GIC | University of Namur | ARES | |
| HEU Rina | Water supply | PAU | AFD | |
| BUN Saret | Wastewater | PAU | AFD | |
| KET Pinnara | Water Resources | CHULA | HIEP | |
| Chan Rathboren | Urbanization | Université de Liège | KA2 | |
| ANN Vannak | Education/pedagogy | University of Girona - UdG | Erasmus+ InowAsia | |
| EANG Khy Eam | Education/pedagogy | University of Girona - UdG | Erasmus+ InowAsia | |
| CHHUON Kong | Education/pedagogy | University of Girona - UdG | Erasmus+ InowAsia | |

### 3.6 Pédagogie

- Implémenter Fab-lab (via le projet HEIP)
- Mettre en œuvre une formation en laboratoire (Lab based education projet JICA)
- Accroître la pratique en laboratoire et sur le terrain
- Introduire des cours en ligne (encourager le personnel à développer davantage de cours en ligne)
- Réforme linguistique pour 2022-2023

### 3.7 Qualité d'Assurance

En ce qui concerne l'assurance de qualité interne, nous avons visés les points suivants :

- Renforcer le système interne d'assurance de qualité
- Renforcer la capacité du responsable interne de l'assurance de qualité
- Créer un mécanisme d'évaluation interne pour surveiller et évaluer la qualité de l'éducation
- Fournir aux étudiants d'évaluer la qualification du personnel enseignant par une feuille d'évaluation (deux fois par an)
- Se concentrer sur l'information, l'analyse des données concernant le programme d'apprentissage, d'enseignement et académique afin de découvrir les forces et les faiblesses et de formuler des recommandations pour faire une réforme
- Faire un rapport d'auto-évaluation interne
- Fournir l'évaluation dans la demande de formation éducative à partir d'un cercle externe comme de l'ACC ainsi que du Département général de l'enseignement supérieur (MoEYS)
- Exiger une réunion régulière du personnel pour discuter des défis et trouver une solution / amélioration appropriée
- Exiger une réunion régulière pour soulever et résoudre les problèmes d'enseignement et d'apprentissage
- Il est conseillé à tous les professeurs de vérifier régulièrement les performances des étudiants en ayant des quiz, des évaluations, des présentations, un examen à mi-parcours et un examen final

- Participer à une formation avec l'ACC, la DGHE et les EES pertinents pour développer l'AQI
- Participez à toutes les réunions et activités liées à l'AQI à l'ITC
- Améliorer l'outil d'évaluation et le mécanisme d'évaluation pour une bonne AQI
- Élaborer un plan d'action pour élaborer des lignes directrices sur l'AQI, y compris des actions pour renforcer et développer les capacités du personnel de l'ITC
- Gérer les séminaires / ateliers liés à l'AQ, à l'apprentissage et à l'enseignement.

### 3.8 Vers la mise en place d'un programme international en génie civil

#### 3.8.1 Objectif

Le génie civil se changera en un programme international ayant le curriculum qui est enseigné en anglais avec des professeurs nationaux et internationaux. Les étudiants doivent faire au moins un semestre d'échange dans une autre université partenaire.

#### 3.8.2 Programme d'études et infrastructure

**A- Curriculum et requises**

Le département de génie civil applique le programme d'études qui a été amélioré de temps en temps depuis 1993, au moment où l'ITC ayant la coopération avec des agences d'universités francophones. L'examen régulier par l'AC et le Consortium a rendu le programme d'études en génie civil plus fort afin de former des ingénieurs avec des capacités de s'adapter aux marchés actuels et futurs du Cambodge. Ces dernières années, l'ITC a planifié des missions pour un développement à long terme dans le but d'améliorer la qualité de l'enseignement supérieur et la prospérité de la population. La réforme du programme est l'une des tâches clés les plus importantes pour atteindre les objectifs proposés. Les conseils à faire sont au-dessous :

i. Le programme d'études doit être révisé et mis à jour en anglais pour être facilement accessible et compris par nos partenaires.
ii. 10% des cours devraient être fait étudier par des enseignants étrangers qui sont recrutés dans différents domaines spécialisés
iii. Les services aux étudiants et aux enseignants sont rapides et améliorés avec des dates bien définies et administrées.
iv. Chaque étudiant doit au moins avoir des expériences pendant un semestre dans une université partenaire pour des cours ou des travaux de fin d'études.
v. Le diplôme est le diplôme d'ingénieur.

**B- Ressources humaines**

À la faculté, nous avons 47 enseignants spécialisés dans différentes formations. Il y a 18 doctorats, 22 des masters et les autres enseignants et employeurs qui sont titulaires d'un diplôme d'ingénieur. Nous avons été informés par l'enquête sur le programme international, 20 enseignants sont prêts à enseigner en anglais et à s'adapter aux exigences du programme international. Le nombre d'enseignants peut être augmenté si nous recrutons plus des nouveaux enseignants avec des capacités.

Tableau 9: List des ressources humaines

| | **Bachelor** | **Master** | **Ph.D** | **Sous-total** | |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| GCI | 2 | 6 | 14 | 22 | |
| GAR | 3 | 11 | 1 | 15 | |
| GTI | 0 | 0 | 3 | 3 | |
| Lab | 0 | 5 | 0 | 5 | |
| Sec | 2 | 0 | 0 | 2 | |
| **Total** | **7** | **22** | **18** | **47** | |

**C- Classes et laboratoires**

Au total, la faculté de génie civil possède 3 laboratoires pour eux, d'un atelier pour le génie architectural et d'un petit laboratoire pour le génie des transports. Nous avons des classes et des laboratoires bien conçus pour l'enseignement des ingénieurs avec 60 étudiants au maximum. L'augmentation de l'objectif à l'avenir nécessitera que la faculté doublé le nombre de laboratoires.

**D-MOU avec les universités partenaires**

MOU avec des universités partenaires d'accueillir et l'envoi d'étudiants en tant qu'échanges internationaux qui devrait être très important et nous prévoyons d'avoir au moins 8 universités avant de commencer des programmes internationaux. Selon ce que nous prévoyons d'échanger 4 étudiants avec une université. Maintenant, nous avons MOU avec

①.INSA de Rennes
②.INSA de Toulouse
③.SIIT
④.KMUTT

**E-Soutien du bureau**

Afin d'affiner le bon fonctionnement d'un programme international, les travaux et les tâches vont augmenter. Des immigrations, le logement, l'assurance, les soins de santé sont tous importants qu'une université d'accueil doit assurer et gérer pour les étudiants en échange. J'ai trouvé que nous devrions au moins avoir quelques bureaux suggérés comme ci-dessous :

①.Bureau des étudiants étrangers (logement, assurance, soins de santé, manuel de l'étudiant, plan du campus, ....)
②.Bureau d'échange (communication pour trouver des places en échange, planification de voyage,...pour les étudiants et les enseignants,....)
③.Bureau de l'enseignement (travaux des enseignants nationaux et internationaux, emploi du temps, contrats, échanges,...)

Les bureaux et tâches ci-dessus doivent être créés et gérés efficacement dans l'objectif de former les ingénieurs de manière internationale.

### 3.8.3 Progrès

**Planification des programme international**

Ingénieur civil

| No | Description | Progès | Heure du mois | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Année 2022 | | | | | | | | | | | | Année 2023 | | | | | | | | | | | | Année 2024 | | | | | | | | | | | | | |
| | | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | |
| 1 | Enseignants nationaux | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Programme en anglais | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Université partenaires (MOU) | 40% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Pilot course | en démarche | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Programme des cours en anglais | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Pilot d'échanges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Étudiants étranger | en démarche | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Soutien du bureau et employeurs | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Programmes commercial | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Lancement du program | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

### 3.8.4 Appel au soutien et à la coopération internationale

Nous avons vraiment besoin du soutien et de la coopération par des universités partenaires afin de donner des conseils techniques et des lieux d'échange pour d'étudiants échangés. Le campus de l'ITC est également ouvert à l'accueil de vos étudiants pour un échange afin de leur apporter des connaissances techniques et surtout la diversité des échanges culturels au Cambodge.

## 3.9 Vers la création du Centre de Recherche Côtière Cambodgien

Récemment, la zone côtière du Cambodge a connu un développement urbain rapide dû en partie à la croissance économique globale soutenue du pays. Le gouvernement cambodgien développe et transforme la province de Sihanoukville en une zone économique spéciale polyvalente. La préoccupation environnementale sur les zones côtières qui recherchent et surveillent l'état de l'environnement pour assurer le développement durable, comme soutenir le besoin de sources d'eau pour l'approvisionnement de la province. Cela nécessite une compréhension plus approfondie du processus environnemental et de la réponse à un nouveau niveau de développement, puis recherche des stratégies innovantes pour faire face aux défis attendus. De plus, les études d'impact sur les ressources en eau et le changement climatique dans les zones côtières du Cambodge sont très limitées en raison du défi de la disponibilité des données, alors qu'il existe de nombreuses études et rapports pour les bassins versants situés à l'intérieur du bassin du Mékong en raison de la disponibilité des données de sources nationales et internationales. La zone côtière cambodgienne a une forte demande pour la prévision des inondations, la surveillance et la gestion des ressources en eau en raison du processus rapide d'industrialisation et d'urbanisation. Ainsi, nous avons besoin de toute urgence de recherches scientifiques pour améliorer les connaissances sur l'état et les processus environnementaux côtiers, qui nécessitent une observation et une surveillance environnementales de routine.

Le ministère de l'Environnement (MoE) s'intéresse vivement à l'environnement côtier où il existe un comité national de gestion et de développement des zones côtières cambodgiennes pour travailler sur la conservation et la gestion des zones côtières. Dans le même intérêt, l'Institut de technologie du Cambodge (ITC), qui est la principale école d'ingénieurs et institut de recherche scientifique, a mené de nombreux projets de recherche scientifique et technologique en coopération au Cambodge et absorbe de plus en plus de chercheurs talentueux pour lesquels travailler. Afin d'améliorer notre recherche scientifique qui contribue directement à l'action scientifique sur le développement durable et résilient au climat dans la zone côtière, nous avons besoin de la co-création d'un Centre de recherche côtière cambodgienne (CCRC)

dans la zone côtière cambodgienne pour faciliter l'engagement de la recherche scientifique côtière. La co-création dépendra de l'intérêt du MoE à avoir un impact durable sur notre développement côtier, y compris la sauvegarde de l'environnement offshore et onshore. La vision du CCRC est de devenir le centre national d'excellence pour aider directement le gouvernement à résoudre le problème environnemental et possède les connaissances et l'expertise dédiées à la collaboration de recherche scientifique sur la gestion côtière. Les objectifs de la création du CCRC sont de renforcer la collaboration nationale de recherche scientifique entre les institutions nationales et la collaboration internationale pour trouver la solution aux problèmes environnementaux régionaux et mondiaux en se concentrant sur la zone côtière. Ce centre de recherche se veut également le centre de formation du personnel gouvernemental, des chercheurs nationaux et internationaux et d'autres parties prenantes concernées par la surveillance et la gestion de l'environnement afin de répondre aux besoins futurs en ressources humaines dans ce domaine.

Le centre travaillera sur les domaines de recherche suivants : la surveillance et la modélisation des processus côtiers ; la prévision des crues et des sécheresses pour les bassins versants de la zone côtière ; l'eau de surface et l'aquifère d'eau souterraine ; la biodiversité côtière et marine ; l'érosion côtière ; l'impact du changement climatique et l'adaptation ; l'élévation du niveau de la mer ; le courant de surface de la mer ; l'Infrastructure et la technologie. Pour couvrir tous ces domaines de recherche scientifique, le CCRC devra disposer d'un terrain et d'un bâtiment comprenant une salle de laboratoires, une salle de démonstration et une salle de conférence.

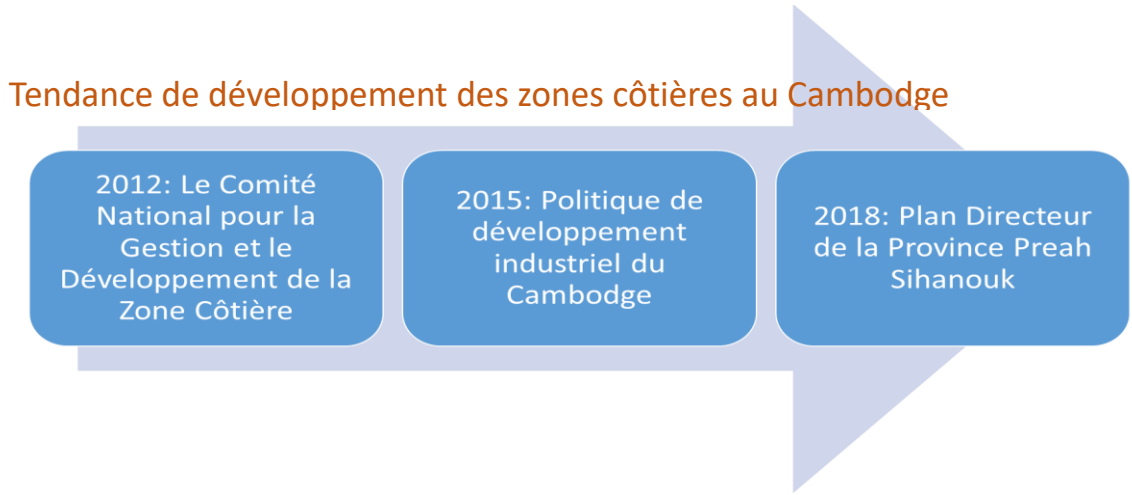


Figure 1: Tendance de développement des zones côtières au Cambodge

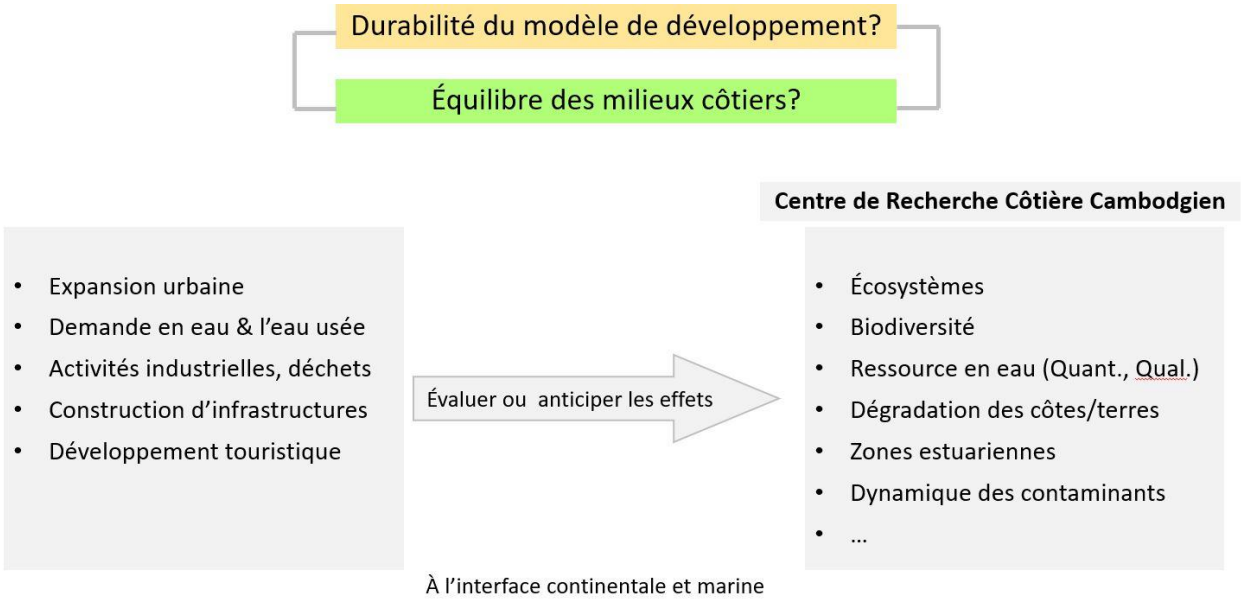


Figure 2: Le besoin du Centre de Recherche Côtière Cambodgien

**Objectif du Centre de Recherche Côtière Cambodgien**

- Coordination et collaboration
- Harmoniser et lier les actions des différents organismes
- Lien avec les communautés côtières
- Collaboration avec d'autres institutions au niveau local et international (approches, transpositions, liens)
- Continuité
- Partenariat avec le gouvernement, la réglementation et les décisions
- Obtenir la visibilité et des financements
- Planification à long terme
- Formation
- Identifier les étudiants et les chercheurs, développer les échanges
- Clé pour créer la collaboration et développer l'expertise et la continuité

**Collaborations potentielles**

Nationales

- MLMUPC, MoE, MAFF, MoT, MOWRAM, RUA, ITC, MCC …

Internationales

- USTH, UPD, CHU, GGGI, IRD …

### 3.10 Vers l'établissement de Centre de Transfer de Technologie

Cette proposition vise à améliorer les compétences d'entraînement en type d'innovation et de recherche pour le start up et le transfert de technologie. Le principal résultat de cette proposition de projet est d'offrir des diplômés hautement qualifiés et des compétences en type d'innovation afin de répondre aux besoins du marché cambodgien.

Quatre résultats sont attendus afin de faire marcher les résultats du projet, à savoir,

- Le centre de recherche et de transfert de technologie est construit à l'ITC.
- Un laboratoire de R&D, un espace d'incubation, un espace d'entraînement et de co travail pour les étudiants entrepreneurs, une école d'usine sont établis et équipés.
- Un écosystème pour l'éducation des entrepreneurs est développé et mis en œuvre.
- L'entreprises de start up est développée

Cette proposition comporte deux composantes :

(1) Composante 1 : amélioration des compétences d'innovation des diplômés de l'ITC ;

(2) Composante 2 : amélioration de la recherche pour promouvoir start up et le transfert de technologies.

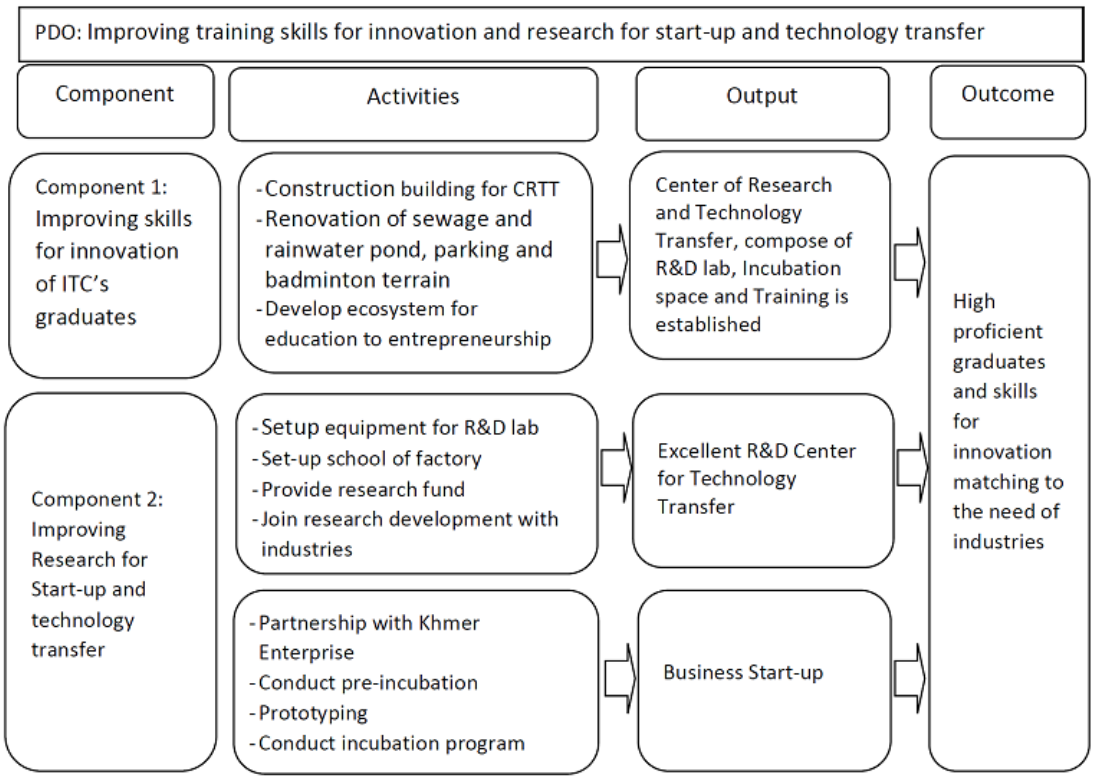


Figure 3: Framework of Center of Research and Technology Transfer (CRTT)

## 3.11 Mise en œuvre et soumission du projet

### 3.11.1 Établissement d'une plateforme de gestion des risques de la pollution de l'air au Cambodge

**Introduction**

Le Cambodge est un pays en voie de développement qui a une croissance économique en PIB de 7% ces dernières années. En même temps, les transports, industries, logements et touristes ont sensiblement augmenté en Asie du Sud-Est. Les infrastructures sociales sont souvent manquantes dans ces pays, la pollution environnementale les rend plus graves et également le sanitaire devenu si mauvais. En plus, le stress environnemental, tel que l'augmentation de

l'embouteillage qui est si noté, dépassant la limite de l'infrastructure, et endommageant la pollution environnementale et cause des problèmes sanitaires.
Plusieurs infrastructures sociales considérées en tant qu'un excellent système d'accès en eau, ont été construites au Cambodge. À cause de l'urbanisation en plein essor à Phnom Penh, menace l'argumentation des défis environnementaux comme les bruits, déchets et la pollution de l'air. La pollution de l'air est globalement et localement l'un des défis à faute de l'urbanisation, industriel et des régions agricoles auprès d'autre sources tels que l'embouteillage, les constructions, la combustion des carburants, la région agricole et incendie de forêt. Faux de la pollution polluée sans cesse, cela concerne aussi au défi mondial. La transmission aéroportée du virus COVID-19, met l'accent sur l'importance de la gestion de la pollution de l'air intérieur. Cependant, cela est la situation actuelle n'ayant pas encore été étudiée pour le moment.
La proposition a été acceptée le 20 mai 2021 avec un budget de 4,5 millions de dollars. La période de prévision de mise en œuvre est du 1er juillet 2022 au 31 juin 2027.

**But et objectif du projet**

Objectif général : Contribuer à la création et à l'établissement de la sécurité et confort de vie des résidents et touristes par la perception de la pollution de l'air, ce qui amène à une croissance économique soutenue du Cambodge.

- Établir la structure/le système afin d'évaluer la situation actuelle et les caractéristiques de la pollution de l'air au Cambodge.
- Créer le monitoring de site avec un système de gestion des données.
- Établir la structure/le système d'évaluation des risques environnementaux.
- Développer les ressources humaines étant nécessaires dans le but d'opérer la platform de la gestion des risques de la pollution de l'air

**Participant à la recherche :**

Homologues japonais :

- Université de Kanazawa
- Université de Nagasaki
- Université d'Osaka Ohtani
- Partical Plus Co., Ltd.

Homologues cambodgiens :

- Institut de technologie du Cambodge
- Université des sciences de la santé
- Université nationale de gestion
- Ministère de l'environnement
- Ministère de l'éducation, de la jeunesse et des sports

**Activité à mettre en œuvre :**

Les 4 groupes de travail sont :

- Groupe 1 : Gestion globale
- Groupe 2 : Échantillonnage des données et s'installer le monitoring.
- Groupe 3 : Évaluation des risques environnementaux
- Groupe 4 : Mise en œuvre sociale

**Activités prévues au plan de travail dans cinq ans**

1. La structure/le système pour but d'évaluer la situation actuelle et les caractéristiques de la pollution de l'air au Cambodge

- Comprendre la situation et les caractéristiques de la pollution de l'air au Cambodge.
- Comprendre la pollution de l'air sur les transfrontaliers.
- Noter les sources d'émission et préparer l'inventaire des émissions.

- Visualiser les sources d'émission.
- Développer une technologie de monitoring des PM et peu coûteuse, étant capable de donner des informations en avance

2. Le monitoring réseau en ligne avec système de gestion des données
   - Les informations fondamentales de la construction du réseau en ligne sont examinées et résumées.
   - Un test préliminaire du monitoring réseau en ligne est fait
   - Monitoring réseau en ligne est construit et commencé
   - Gestion de monitoring et des données environnementaux
3. La structure/le système d'évaluation des risques environnementaux
   - Extraire les facteurs de risques potentiels macroscopiques de la santé
   - Extraire les facteurs microscopiques de risque potentiels de la santé.
   - Examiner des scénarios pour l'atténuation des risque potentiel de la santé.
   - Préparer une base de données sur les risques de la pollution de l'air
4. Les ressources humaines étant nécessaires au fonctionnement de la plateforme de gestion des risques de la pollution d'air.
   - Déterminer la politique de gestion de la plateforme et les rôles de chaque organisation participante.
   - Proposer au plan de travail d'activité pour la plateforme de gestion des risques de la pollution d'air.
   - Proposer des mesures pour atténuer les risques sanitaires potentiels causés par la pollution de l'air.
   - Mener des recherches avancées dans le cadre de la collaboration internationale et élargir les réseaux humains entre les chercheurs du monde entier.

Pour 2022-2023, 80 projets sont acceptés et en cours de mise en œuvre grâce au financement de HEIP Banque mondiale, LBE-JICA, AFD/EU, IRD, CCCA3, Erasmus+KA2, USAID, JASTIP et SATREPS/Japon. Les projets à mettre en œuvre en 2022-2023 sont présentés dans le tableau 10 et les projets qui ont été proposés sont indiqués dans le tableau 11.

### *3.11.2* Projets à mettre en œuvre pour 2022-2023

L'unité de recherche ETM, FTN, MIT, MSS et WAE comptes respectivement 10, 19, 14, 17 et 19 projets. En outre, MTE a un projet de LBE. Il y a donc au total 80 projets à mettre en œuvre en 2022-2023.

Tableau 10: Projets à mettre en œuvre pour 2021-2022

| No | Title of Project | Objectives of the project | Speciality (WAE, MSS, etc…..) | Partner | Funding agency (Erasmus KA1, Erasmus KA1, AUN-SEED/Net, AUF, AFD, ADB, WB etc.,) | Funding Amount (USD) |
|---|---|---|---|---|---|---|
| 1 | Applied Geophysics for | 1. To Investigate subsurface geological | ETM | EnerCam Co., Ltd | HEIP | 800,000 |

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| | Investigating Hydrocarbon Potential and Depositional Environment of Sediments at Onshore Prospect of Tonle Sap Lake, Cambodia | structures and stratigraphy<br>2. To characterize the petroleum system including source, reservoir, migration pathway and seal.<br>3. To characterize the shallow hydrocarbon reservoir and its related geological condition.<br>4. To evaluate the quality of source rocks<br>5. To Study sedimentology and depositional environment of the sediments<br>6. To correlate the depositional environment from sedimentary facies and geochemical analysis | | | | |
| 2 | Geological and geophysical studies of hydrocarbon potential in Tonle Sap Basin, Onshore Cambodia | To investigate the characteristics of reservoir outcrop, onshore, Cambodia | ETM | N/A | LBE/JICA | 29,971 |
| 3 | Design and Installation of Off-Grid PV System for Clean Water and Electricity Supply in Ta Mat Primary School, Cambodia | 1. To design and simulate off-grid PV systems<br>2. To install the selected off-grid PV system in a rural village<br>3. To analyze the quality of life based on the PV system utilization. | ETM | N/A | JASTIP | 1,300 |
| 4 | Development of a Virtual Cambodian Power System-Towards an Innovation | 1. To develop algorithms for planning tool of MV distribution grid architectures<br>2. To develop algorithms for | ETM | ORBIT P.A Co., Ltd, Electricité du Cambodge (EDC) | HEIP | 390,800 |

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| | Micro-Grid in Cambodia | planning tools of LV distribution topologies and hybrid micro-grid system architectures<br>3. To set up an educational virtual power distribution grid laboratory | | | | |
| 5 | 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. | To define surface hydrothermal alterations of ore deposits by applying band ratios analysis for ASTER and Landsat-8 | ETM | 1. IMECS (Cambodia),<br>2. Angkor Resource Corp., 3. Ministry of Mine and Energy, Cambodia,<br>4. Samnang Angkor Development Co Ltd | LBE/JICA | 30,000 |
| 6 | Investigation the production potential of the Cambodian offshore reservoir considering effects of phase behaviour and rock-fluid interaction | To attain the reservoir characteristics, include phase behavior and quality of crude oil, reservoir rock-fluids interaction for the production potentials of the Cambodian offshore reservoir | ETM | KrisEnergy Co., Ltd | HEIP | 277,529 |
| 7 | Planning and Operation of Active Distribution Systems | 1. To improve the algorithms of optimal LV system, reconfiguration, and restoration<br>2. To develop algorithms for improving the unbalanced distribution systems<br>3. To develop algorithms for fault location and isolation<br>4. To develop a GUI and a prototype | ETM | N/A | LBE/JICA | 30,000 |

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| 8 | Pushing Energy Efficiency in Cambodia | 1. The creation of a self-sustaining, multi-year building Energy Efficiency contest to help EE adaptation in Cambodia,<br>2. Development of awareness and capacity on climate change mitigation and adaptation amongst the youth and<br>3. A policy advocacy work. | ETM | Sevea, EnergyLab, IFPEB, ATS | CCCA3 | 186,912 |
| 9 | Quality Assurance of Concrete Pile Integrity and Soil Properties Investigation using Seismic and Electrical Resistivity Tomography Approaches | integrate seismic and electrical resistivity methods to qualify concrete pile integrity Progress/ status | ETM | Matlab Co., Ltd, Liege University | HEIP | 240,000 |
| 10 | Study on Impact of Heat Stress to Human Productivity and Economic in Cambodia | 1. To build human resources in the heat stress field<br>2. To investigate the impacts of heat on productivity<br>3. To build evidence on the impacts of heat stress on productivity in three selected sectors including the construction, garment, and education sectors.<br>4. To develop an economic model and investigate a work/study rest schedule to be presented to the ministries for policy planning | ETM | NUS, PolyU | CCCA3 | 200,000 |
| 11 | Biotechnology for Integrated Pest Management towards Pesticide | To rescue all Cambodian crops from pest and diseases by integrating biotechnology into IPM approach | FTN | - Ministry of Agriculture, Forestry and Fisheries (MAFF)<br>- Research Institute for | HEIP | 106,600 |

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| | Reduction in Cambodia | | | Development (IRD), France<br>- The Agricultural Research for Development (CIRAD), France<br>- ORKIN Cambodia | | |
| 12 | Valorization of High-value Dry Food Products (Agricultural Products including Herbal and Spices) and Other By-products in Cambodia | To set up the drying excellence center (the pilot scale of drying processing center) of agricultural products, by-products, to develop the capacity building of human resource on drying technology (including technology transfer and industrial collaboration) for agricultural products in Cambodia | FTN | - SupAgro Monpelier, France<br>- AgroSup Dijon, France<br>- University Libre Brussel, Belgium<br>- Kasesart University, Thailand<br>- Rosemoric Company<br>- Ly Ly Food industry | HEIP | 658,324 |
| 13 | Improvement and Development of Rice-based Products toward the Growth of SMEs/Industries in Cambodia | To set up a rice-based product development platform, improving the quality of rice-based products locally produced and available in markets and to diversify rice-based products, human resource development, and enhancing collaborative research between university and SMEs | FTN | - University of Liege, Belgium<br>- Kasesart University, Thailand<br>- Indochina Rice Mill Limited | HEIP | 800,527 |
| 14 | Development of Fermentation Process for Cambodian Soy Sauce | To produce Cambodian soy sauce by fermentation method with good quality and transfer the developed technology of soy sauce to the private sector | FTN | - Kasetsart University, Thailand<br>- Tokyo Institute of Technology, Japan<br>- AgroSup Dijion, France<br>- Eche Ngov Heng Food Production of Kampot Co., Ltd | HEIP | 90,000 |
| 15 | Development of Cooking Oil Processes for | To develop cooking oil processes in order to produce cooking | FTN | - UPM, Malaysia | HEIP | 200,000 |

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| | Commercializati on | oils with good quality, to transfer the technology to private sectors for commercialization, to develop cooking oil research platform and to develop human resource in cooking oil processing | | - Dara Khmer Sacha Inchi | | |
| 16 | Improvement and Development of Fish and Meat Products for Better Preservation using Innovative Technology | To improve the quality, and add-value to the existing fish and meat products which are available on Cambodian market by applying different preservation technique | FTN | - Nantes-Atlantic National College of Veterinary Medicine, Food Science and Engineering, France<br>- KC Food | HEIP | 210,660 |
| 17 | Valorization of Agricultural By-products in Cambodia through Extractions and Formulations of Essential Oils and Bioactive Compounds | To identify and screen essential oils/bioactive compounds in extracts obtained from varieties of Cambodia agricultural food products and wastes; then evaluate its applicability to be used as aromatherapy, food preservatives and active ingredients and to promote institutional Chemical Engineering Field, through university-SME technology transfers and strengthen university-university research collaborations | FTN | - Tokyo Institute of Technology (TIT), Japan<br>- VIE International Co., Ltd | HEIP | 199,960 |
| 18 | HEALTHYRICE | To identify diversified agricultural rice systems allowing an increase in soil and plant health, and a decrease in pesticide use and their occurrence as residues in consumption products | FTN | IRD, CIRAD, RUA, UBB | IRD | 55,293.51 |
| 19 | FOODI (MSc course in Food Processing and Innovation) | To educate aspiring food entrepreneurs, healthcare professionals, | FTN | University of the Aegean, University College Dublin, University | Erasmus+ KA2 | 54,055 EUR |

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| | | government officials, and food industry professionals in the end-to-end value chain of food processing: from understanding the elements of food, to starting a new venture for disrupting and enriching the food processing industry in Asia | | of Salerno, Research Innovation and Development Lab PC, Metropolitan college SA, AIT, PSU, Universit Kuala Kampur, University of Malaya, Universiti Teknologi Mara, UTM, UBB, Svay Rieng University, University of Heng Samrin Thbongkhmum, MoEYS | | |
| 20 | Training a new generation of entrepreneurs in sustainable agriculture and food engineering (FoodSTEM) | To build the partnership between Cambodian and European universities, and to create a favourable condition in the 4 partners universities for the emergence of student entrepreneurship and micro or small enterprises | FTN | NPT-ENSAT, Institut Agro/SupAgro Montpelleir,Liege University, UBB, RUA, and RULE | Erasmus+ | 330,307 EUR |
| 21 | Agroecology and Safe Food System Transitions (ASSET) | To make food and agricultural systems in Southeast Asia more sustainable, safer and inclusive, through harnessing the potential of agroecology to transform them | FTN | APPARI, ILRI, CIRAD, SEI, GDA/MAFF, VAAS, GRET, Swisscontact, University of Florence, University of Hohenheim, Mediaseeds, NUOL, DALAM, NAFRI | EU/AFD and GRET | 231,000 EUR |
| 22 | Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement | To reduce the prevalence and incidence of foodborne pathogen contamination of vegetables produced and sold in Cambodia | FTN | Royal University of Agriculture; Institut Pasteur du Cambodge; World Vegetable Center; Purdue University; Penn State University; Kansas State University | USAID | 130,000 |

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| 23 | Development of Cambodian Fermented Cucumbers by using Freeze-Dried Lactic Acid Bacteria with their Potential Use as Aromatic and Bacteriocin-producing Starters | To develop fermented cucumbers by using freeze-dried LAB that are useful for taste and preservation | FTN | Tokyo Institute of Technology, AgroSup Dijon | JICA/JICA | 30,000 |
| 24 | ASEAN Network for Green Entrepreneurship and Leadership/ ANGEL | To build the capacity necessary in eleven ASEAN Universities for balancing the high potential economic growth and innovation in the partner countries with their lack of capacities in green entrepreneurship as well as resolving entrenched issues and challenges of poverty, low quality jobs in the informal sector, digital divide and leadership gaps | FTN | - Universiti Teknologi Malaysia (UTM)<br>- Universiti Malaysia Kelantan (UMK)<br>- Universiti Tun Hussein Onn (UTHM)<br>- Universitas Gadjah Mada (UGM)<br>- Universitas Islam Indonesia (UII)<br>- University of South-East Asia (USEA)<br>- Royal University of Phnom Penh (RUPP)<br>- Savannakhet University (SKU)<br>- Champasack University (CU)<br>- Can Tho University (CTU)<br>- Hanoi University of Mining and Geology (HUMG)<br>- Research Innovation and Development Lab (ReadLab)<br>- Hellenic Open University (HOU)<br>- European University of Cyprus (EUC)<br>- Centre for Social Innovation (CSI) | Eramus + | 60,000 |

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| 25 | Impact of Initial Composition and Processing Techniques on Aromatic Quality of Mango | To identify the biochemical composition (volatile compounds and aroma precursors) of three contrasted cultivars at three ripening stages before and after each processing (drying, puree, and vacuum frying) | FTN | UMR-Qualisud, CIRAD | BGF & MoEYS | 20,000 |
| 26 | Assessment on Nutritional Profiles, Storage Stability and Sensory Evaluation of Dried Fish Powder Made by Low-Value Small Fish Species | To assess the nutritional profile of low-value small fish species and develop low-cost nutrient fish powder by following the sensory and nutritional profile along storage. | FTN | Institut Agro (Montpellier), National University of Battambang, Vissot Enterprise | LBE/JICA | 15,175 |
| 27 | Removal of Diclofenac and Caffeine from Different Water Sources using Activated Carbons made from Different Wastes | To remove the diclofenac and caffeine as micropollutants from different water sources using activated carbons made from different wastes. | FTN | National Institute of Applied Sciences (INSA), Toulouse | AFD/EU | 13,000 |
| 28 | Development of Alternative Salt Process to Manufacture Refined Table Salt from Coarse Salt | To develop an alternative coarse salt refining process with affordable cost of production and acceptable quality on physical and chemical criteria in term of maintaining the original characteristics of salt for GI application | FTN | GRET ARTE-FACT CIRAD IRAM CERTIPAQ REDD | AFD | 45,000 |
| 29 | Development of High Nutritional Value Farmed Fish and Safe Processed Products (Smoked and Fermented Fish) in Cambodia (CAMBOFISH) | The global objective of CAMBOFISH is to stimulate sustainable fish farming in Cambodia in order to 1) to create jobs and reduce poverty, and 2) to improve the safety of fish-derived products and their nutritional quality | FTN | ULIège, UCLouvain, RUA | ARES | 500,000 EUR |

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| 30 | Toward Production Innovation via Fablab-ITC | 1. Install Measurement lab, workshop lab, PCB fabrication and assembly lab.<br>2. Develop management, control, and data collection system for smart agriculture | MIT | MAUSO, INP-Toulouse | HEIP | 409,313 |
| 31 | Initiative towards electrical and electronic products testing and certification by EMC Laboratory | 1. To set up an anechoic chamber at ITC. This chamber will be used for conducting research and development (R&D) on related EMC issues.<br>2. To analyze and design electromagnetic wave absorber using time domain techniques. 3) To study a new topology of reverberation chamber by using meta-material to improve spectral richness, reduce size and control direction of arrival. | MIT | INP-Toulouse | HEIP | 793,450 |
| 32 | Flight Controller and Structural Design for Small Unmanned Aerial Vehicle. | 1. Design of aircraft body and autopilot simulation.<br>2. Design and implement autonomous flight controller and equip surveillance sensors. | MIT | Tokyo Tech | AOARD, US Air Force | 69,800 |
| 33 | Development of Nanosatellite | 1. To conduct background research and formulate mission objective<br>2. To create concept design of the satellite and create a report<br>3. To submit the CubeSat mission application form to KiboCube program | MIT | U-Tokyo | MoEYS | 62,500 |

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| 34 | Indoor mobile robot localization using multisensor data fusion | 1. Implement and evaluate robot's localization and planned trajectory 2. Focus on multiple sensor scenarios 3. Established methods relying on sensor fusion | MIT | N/A | Takahashi | 5,000 |
| 35 | Investigation of configuration issues related to SDN/NFV deployments (New topic) | 1. Design NFV testbed with cluster of Raspberry Pi.<br>2. Benchmarking the testbed.<br>3. Investigate the various deployment issues. | MIT | U-Namure | ARES-CCD | 80,000 |
| 36 | Building trustable and privacy aware IoT systems using blockchain and smart contracts | To focus on security, privacy and inter-operability of the IoT network, which could take into account the architecture model, authentication, authorization, access control, policy and data protection. | MIT | U-Namure | ARES-CCD | 90,000 |
| 37 | Building Blood bank eco-system using blockchain technology | To apply blockchain technology for decentralized system to store those data and proposed using existing secure technique. | MIT | Tokyo Tech | Tokyo Tech | 20,000 |
| 38 | Ancient Manuscript Digitization and Indexation | 1. Standardized manuscript digitization and dataset construction<br>2. Improvement of existing content analysis approaches 3. Design of an interactive search engine - Knowledge transfer to potential institutions and users | MIT | National Museum | HEIP | 61,535 |
| 39 | Applied Control and Automation for Agriculture in Cambodia | 1. Simulation study of electric drive using BLDC/PMSM motor.<br>2. Study of new technique of | MIT | INP-Toulouse | HEIP | 37,6500 |

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| | | sensorless vector control for BLDC/PMSM motor. | | | | |
| 40 | ASEAN Factori 4.0 | 1. To improve capacity building for PLC<br>2. To set-up PLC excellence center at ITC | ETM & MIT | Universituy of Claude Bernard Lyon1, University of Ruse (UR), Grenoble Alpes University (UGA) | Erasmus + | 70,733 EURO |
| 41 | Design and Implementation of Health Data Collection Communication Protocol using<br>Physical-Layer Network Coding | To implement a healthcare platform that allows users can monitor the patient's condition and to propose a data collection communication protocol. | MIT | N/A | LBE/JICA | 14,980 |
| 42 | Plagiarism Detection System for Khmer Language | To develop a plagiarism detection framework to find duplicated texts and similarities of an input text in a document (document to be analyzed) compared to existing referenced documents. | MIT | National University of Battambang (NUBB) | LBE/JICA | 14,380 |
| 43 | Smart Farming for Qualified Vegetable using Mechatronics Techniques | 1.To do comprehensive literature review as well as to perform site surveys in order to collect necessary information and data related to Cambodia vegetable farming style and behavior and the necessity for technological adoption.<br>2.To conceptualize and perform the detailed analysis of an appropriate automation system integrated with a smart system.<br>3.To develop and design a prototyping system which will be later installed for testing and validation. | MIT | Chitose Institute of Science and Technology, Tokyo Polytechnic University, Oita University, Kagawa University, University of Fukui, Tokyo Institute of Technology | LBE/JICA | 14,990 |

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| 44 | Green BIM - Analysis of BIM approach for designing a bioclimatic building | 1. Find bioclimatic design to achieve thermal comfort in building specific in tropical region by using BIM as instrument<br>2. BIM to facilitate at the early stage of this design process to avoid certain conflicts between architect and engineer<br>3. Perspective of application of BIM and Bioclimatic design in AEC sector in Cambodia | MSS | University of Liege | ARES | 94,568 |
| 45 | The managing collaboration between architecture, structure, and MEP in service of construction 4.0: workshop at ITC case | 1. To identify the effective strategies for interdisciplinary collaboration in BIM<br>2. To integrate the interdisciplinary collaboration in BIM for construction in Cambodia context<br>3. To integrate the interdisciplinary collaboration in BIM for the architectural engineer, which is aligned with construction in Cambodia context | MSS | University of Liege | ARES | 94,568 |
| 46 | Development and optimization of ceramic tile using Cambodian clays incorporating with industrial wastes | To characterize the physical, chemical, mineralogical properties of the raw materials – clays and rock dusts | MSS | N/A | HEIP | 256,520 |
| 47 | Cambodian natural rubber/different minerals composites for floor mat shock absorbing application | - To optimize mechanical and physical properties of Cambodian natural rubber composites by varying common clay mineral and limestone fillers content for shock absorbing | MSS | CRRI, USM | HEIP | 416,669 |

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| | | applications such as floor tile | | | | |
| 48 | Initiative on the development of wind load for design of building structures in Cambodia | 1. To evaluate the wind load<br>2. To develop wind load calculation for design of buildings in Cambodia<br>3. To collaborate with construction industries and professionals<br>4. To promote research activities in civil engineering at ITC for both undergraduate and graduate levels | MSS | KMUTT | HEIP | 50,200 |
| 49 | Managing the Interdisciplinary Collaboration in Construction 4.0: ITC's Workshop Case | 1.To integrate the evolution of technology into the field of CSCW and construction 4.0 in the international context<br>2.To introduce a BIM-AR collaborative method in the construction phase | MSS | Liege University, Belgium | ARES-Cambodia | 94,567 |
| 50 | Steel Ring Damper for Seismic Application - Collaboration with King Mongkut's University of Technology Thonburi | 1. To develop a novel steel ring damper<br>2. To apply to a system called 'knee-brace frame' for seismic resistance | MSS | King Mongkut's University of Technology Thonburi | KMUTT | 16,000 |
| 51 | Durability of Concrete Beam Strengthening with GFRP | To study the durability of concrete beam strengthening with GFRP and GFRP laminate under different conditions and durations. | MSS | Fyfe Asia Pte Ltd | Fyfe Asia Pte Ltd | 3,500 |
| 52 | Effectiveness of Tyfo® Fibr Anchors with the Tyfo Fibrwrap Systems | To evaluate the performance of Tyfo® Fibr Anchors embedded using chemical epoxy in low compressive strength concrete cylinder specimens and the | MSS | Fyfe Asia Pte Ltd | Fyfe Asia Pte Ltd | 8,000 |

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| | | effectiveness of Tyfo® Fibr Anchors inserting to concrete cylinder confined by glass fiber reinforcing polymer | | | | |
| 53 | Air Pollution Monitoring in Phnom Penh | Monitor air quality in Phnom Penh | MSS | Kanazawa University | N/A | In-kind |
| 54 | Polyethylene (PE) Waste Recycling for Asphalt Concrete Pavement Application | Polyethylene (PE) will be added into asphalt concrete with varying PE percentage for pavement application | MSS | MoE | MoE | 50,000 |
| 55 | Chemical strengthening of large-scale glass pieces for construction and engineering | To study on a glass strengthening process, which is chemical tempering and its applications | MSS | N/A | HEIP | 329,140 |
| 56 | Sustainable building design integrated life-cycle assessment (LCA), for best strategies to design the green residential building in Phnom Penh, Cambodia | 1. To analyze LCA toward the green building design<br>2. To propose design strategies and guidelines to reduce the overall environmental footprint of buildings<br>3. To study on the green building life cycle and be aware of standards, methods, tools on LCA<br>4. To study and investigate the situation of residential building design in Phnom Penh | MSS | Liege University, Belgium | ARES-Cambodia | 181,360 |
| 57 | Subsurface Mapping of Soil Bearing Capacity in Phnom Penh Area, Cambodia | To create 3D modeling of subsurface soil bearing capacity in Phnom<br>Penh Area up to the depth of 50 meters underground based on secondary and new date logs. | MSS | Hokkaido University, Research and Development Enterprise, Ministry of Land Management, Urban Planning and Construction | LBE/JICA | 14996.08 |

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| 58 | Evaluation of Mechanical Behavior of Post-Installed Bundled Reinforcement Used for Concrete Connections | To evaluate the mechanical behavior of post-installed bundled reinforcement | MSS | Tokyo Institute of Technology, King Mongkut's University of Technology Thonburi | LBE/JICA | 14,900 |
| 59 | Physical Properties and Mineralogy of Ancient Brick from Temples at Sambor Prei Kuk area, Kampong Thom, Cambodia | To characterize and determine the physical and chemical properties of ancient brick, sandstone, laterite rocks from the Sambo Prei Kuk area. | MSS | National Authority of Sambor Prei Kuk | LBE/JICA | 14,970 |
| 60 | Geological, Geochemical Characteristics and Genesis of Gold Mineralization, Gemstone and Rare Earth Element in Ratanakiri, Kampot, and Pailin province, Cambodia | To focus on geological conditions and geochemical characteristics to provide guideline for further gold, copper, and rare earth element exploration in those areas. | MSS | Ministry of Mines and Energy, Yangon University of Mine and Energy | LBE/JICA | 14,998.08 |
| 61 | Understanding and Managing the Cambodian Floodplains, The Preks of Kandal Province | To understand and manage the floodplains in Kandal province | WAE | Institut de recherche pour le développement | IRD | 100,000 |
| 62 | Water Evolution and Vulnerability Under Global Changes in Coastal Catchments of Cambodia | To assess surface water resource and groundwater resource in the coastal area;<br><br>Groundwater salinity monitoring and mapping | WAE | Institut de recherche pour le développement | IRD | 50,000 |
| 63 | Development of Climate Data Information System for Cambodia | 1. To construct gridded climate data from the historical point observation data over Cambodia.<br>2. To provide reliable climate data and downscaling climate data in Cambodia to | WAE | Kyoto University Institute of Technology of Bandung | HEIP | 12,250 |

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| | | users by using bias-correction method and climate downscaling method, respectively. 3. To share climate data and software developed in the sub-project with relevant governmental agencies and partner institutions by launching training workshops and supporting on utilizing the output herein for policy | | | | |
| 64 | Improving Sustainable Water Supply and Sanitation in Cambodia: Case of Tonle Sap Lake's Floating Villages | The objective of this research to provide a sustainable water supply and sanitation that are adapted to the socio-economic and environmental contexts of TSL by using pilot scale of advanced water treatment technologies. | WAE | Tokyo Institute of Technology | HEIP | 200,000 |
| 65 | Strengthening Flood and Drought Risk Management and Early Warning System in Lower Mekong Basin of Cambodia. | The main goal of the project is to improve flood risk management through integration of technical and institutional linkage into policy, and reducing vulnerability of local community livelihoods. | WAE | N/A | HEIP | 200,000 |
| 66 | Development of a Biofilter System Model to Control of Air Pollution toward Industrial Application | 1. Characterization of air pollutant 2. Development of biofiltration system 3. Efficiency testing 4. Technology transferring to industries/SMEs | WAE | Kanazawa University | HEIP | 212,710 |
| 67 | Aquaculture Cambodia: Sustainability and Risk Prevention | To contribute to Cambodia's public policies for the development of sustainable aquaculture, through adapted methodological tools | WAE | Institut de recherche pour le développement | IRD/French Embassy | 30,000 |

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| | | shared between main stakeholders of the sector. | | | | |
| 68 | Water and Health Risk in Cambodia (WatHealth) | To determine how changes in river flood regimes affect the distribution of pollutants and lead to change in the biodiversity of water related pathogens and disease vectors, with ultimate effects on health, agricultural production and the environment. | WAE &FTN | Institut de recherche pour le développement | IRD | 10,000 |
| 69 | Improving Capacity on Integrated Coastal Management with Low Impact Development Considering Environmental Sustainability and Climate Change in Coastal Area of Cambodia (CLID) | To support the integration of best practices in LID with urban planning process through scenario evaluation platforms, workshops, and instruction materials that involve the participation of city planners, policymakers, practitioners, and citizens. | WAE | Institut de recherche pour le développement Kyoto University | CCCA3 | 149,990 |
| 70 | Integrated Approach of Precise Irrigation and Sustainable Laboratory Development: the Focus on Rice Farming | Develop advanced technology on irrigation system for rice farming | WAE | University of Liège | HEIP | 200,000 |
| 71 | Termite Bioturbation in Cambodia-From Characterization to Application (PhD project) | 1. To identify the abundance of termite mounds<br>2. To analysis soil physico-chemical properties of termite mound soil<br>3. To study the impact of Termite mound soil on vegetable growth | WAE | N/A | ITC, BGF, and IRD | N/A |
| 72 | Prototype of Low-cost and Smart In-vessel Composter for converting Spent | 1. To calibrate and validate mathematic modelling of compost process of spent mushroom substrates | WAE | Center of Excellence on Sustainable Agriculture and Nutrition, Royal | LBE/JICA | 30,000 USD |

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| | Mushroom Substrates to Bio-Organic Fertilizer | (SMS); To prototype an automatic composter for rapid fermentation of SMS;<br>2. To implement the prototype composter at mushroom production farm to evaluate the quality of the SMC produced | | Unviersity of Agriculture (RUA) | | |
| 73 | SATREPS: Establishment of Risk Management Platform for Air Pollution in Cambodia | 1. To understand the overall picture and status of air pollution and their health risk for tourists and residents in Cambodia (provincial areas) by examining the characteristics of aerosols based on three different aspects and their inter-correlations: 1) Management of air quality monitoring, 2) IoT and data management, and 3) Environmental risk assessment.<br>2. To develop a better understanding of the air quality standard for aerosols using indices reasonably describing health risks, which are evaluated by using state of the art technology and knowledge based on the molecular microbial ecology.<br>3. To identify factors that cause health risks for tourists based on analyses of the activity of various sectors by mapping the sources of aerosol pollution in Cambodia, by obtaining the | WAE | Cambodian side: ITC, UHS, NUM, MOE<br>Japanese side: Kanazawa university, Osaka Otani university, Nagasaki university | JST and JICA | 5 million |
| 74 | Kinetic and Influence of Iron Co-Presence on Arsenic Removal | To study a relative effect of ferrous iron co-presence on arsenic removal in | WAE | Chulalongkorn University, Tokyo Institute of Technology, B2G | LBE/JICA | 15,000 |

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| | from Groundwater | batch experiment and continuous mode system. | | Engineering Co., Ltd | | |
| 75 | Influence of Locally Made Effective Microorganisms (EM) on the Treatment of Domestic Wastewater using Conventional Septic Tank | To devise a method for producing effective microorganisms in Cambodia utilizing raw materials or organic waste. | WAE | B2G Engineering Co., Ltd | LBE/JICA | 15,000 |
| 76 | Investigating the Effects of Algae Bloom in Tonle Sap Lake Source Water on Water Supply Treatment Efficiency | To investigate the characteristics of algae for enhancing algae removal in water treatment | WAE | Kompong Kou water supply (KKWS) | AFD/EU | 13,000 |
| 77 | Occurrence and distribution analysis of Microplastics in different environment mediums of Cambodia. | To study the assessment of MP particles in three different conditions including freshwater, marine, and salt (made by sea water) in order to understand its occurrence and distribution in both rainy and dry seasons | WAE | Chulalongkorn Universit ,<br>B2G Engineering Co., Ltd | AFD/EU | 13,000 |
| 78 | Water Use Behavior in peri-urban communities of Southeast Aisan Countries: case study in Phnom Penh City, Cambodia | 1. To assess and evaluate water usage and sanitation practices of households in Dangkao district, Phnom Penh city<br>2. To analyze the quality of water, particularly drinking water, in this selected community<br>3. To compare these results with other communities of other countries (i.e. Vietnam, Thailand, Indonesia) | WAE | Kyoto University | Grant-in-Aid for Scientific Research (A) No. 14301 & GSGES, Kyoto University, Japan | 15,000 |

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| 79 | Antimicrobial Resistance Circulation along the Mekong and its Delta (ARCIMED) | To enumerate and identify the antibiotic-resistant bacteria | WAE | N/A | French Government | 25,000 |
| 80 | How the Poor Commute in Cambodian Cities and Their Intention towards Public Transport | 1. Examine how low-income people commute in urban areas (identify opportunities/challenges for commuters and public transport systems)<br>2. Develop an accessibility index to/from urban public transport system.<br>3. Feasible solutions to maximize the use of urban public transport systems via low-income citizens (policy discussion and formulation) | N/A | Svay Rieng University | LBE/JICA | 14,350 |

### 3.11.3 Projets soumis en 2021-2022

Au total, 8 projets ont été soumis en 2021-2022 comme indiqué dans le tableau 11.

Tableau 11: Projets soumis en 2021-2022

| No | Title of Project | Objectives of the project | Speciality (WAE, MSS, etc…..) | Partner | Funding agency (Erasmus KA1, Erasmus KA1, AUN-SEED/Net, AUF, AFD, ADB, WB etc.,) | Funding Amount (USD) |
|---|---|---|---|---|---|---|
| 1 | Sustainable Utilization of Residual Sources for Energy Supply (SURSES) | 1. Establishing a solid information basis about the availability of residuals for sustainable utilization in Cambodia and the Philippines<br>2. Strengthening of research methods and promoting young researchers<br>3. Deriving applicable research results to | ETM & FTN | Reiner Lemoine Institut gGmbH (RLI), Off-Grid Research Group,<br>TU Berlin (TUB), FG Bioverfahrenstechnik, University of the Diliman (UP), Research Group Sustainable Production and | Federal Ministry of Education and Research (BMBF) | 199,613.7 EUR |

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| | | enhance the sustainable utilization of residues for<br>energy supply in Southeast Asia<br>4. Strengthening of institutional capacities of Southeast Asian partners for sustainable energy research and decision support to policy makers and private sectors | | Responsible Consumption | | |
| 2 | Decrypting Recruitment and Biocontrol Activities Against Plant-parasitic Nematodes from Suppressive Soil Microbiota | The project aims at decrypting the diversity, ecology and functions of the Root-Knot Nematode suppressive soil microbiota towards reduced *Meloidogyne graminicola* parasitism with specific objectives:<br>1. Determining the suppressive capacity of natural microbiota assemblages,<br>2. Identification of sub-microbiota and kinetics of the establishment of the gallobiome,<br>3. Understanding the function of bacterial communities isolated from suppressive soil. | FTN | IRD, CIRAD, MAFF | European Union | 556,000 EUR |
| 3 | Monitoring and Combating Root Knot Nematodes for European and Global Rice Farmers | The projects' objectives:<br>1. Develop the first dynamic range modelling tool for plant pathogens and use it to assess the current and future scale of the threat caused to EU crop production by the recent arrival of the root-knot nematode Meloidogyne graminicola in Italy,<br>2. Integrate EU research on M. | FTN | Cambodia (ITC), Vietnam (NLU), Banglades (BRRI), China (CAAS, SAAS, HAU), France (IRD, CFR), UK (UNIABDN, JHI), Belgium (UGent, FYTO), Spain (Kimitec), Italy (UPO, CREA, RETIONE PIEMONTE, | European Commission | 180, 000 EUR |

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| | | graminicola with that in Asia to produce common solutions, 3. Develop resistant rice varieties and novel products (seed, leaf or soil treatment) that will mitigate the problem in currently affected areas as well as those at risk from spread of the disease, 4. Disseminate policy advice and integrated pest management tools for threat mitigation at the farm, regional and global level. | | SA.PI.SE), Portugal (INIAV). | | |
| 4 | Electrochemical Aptasensor for Point-of-Care Detection of Tropical Schistosoma-REDEEM | The project aims on the development of electrochemical aptamer-based biosensor device for sensitive, rapid and cost-effective screening of tropical schistosoma, neglected parasitic tropical disease causing high morbidity and mortality in humans worldwide | FTN | Fraunhofer IKTS (Germany) Riphah International University Islamabad (Pakistan) | Federal Ministry of Education and Research (BMBF) | 200,000 EUR |
| 5 | Impacts of Climate Change on Animal and Plant Pathogens in Relation to Food Security and Human Health | The overall ambition of the project, hence, is to characterize the relationships between and/or impact of climate change (temperature, humidity, rainfall) on the distribution of animal and plant pathogens, with their ultimate effects on health, agricultural production and the environment. | FTN | CDRI | IDRC | 547,400 |
| 6 | Efficiency of Disinfectant on the Model Strains of Bacteria and Virus using Different Spraying | To evaluate the efficiency of disinfectant on the model strains of bacteria and virus | WAE | N/A | Takahashi Foundation | TBC |

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| | Equipment on Surfaces | | | | | |
| 7 | Assessment of Water Availability in Natural Reservoirs for Piped-water Supply in Cambodia based on Satellite Images Analysis | To assess the water availability in natural reservoirs for piped-water supply | WAE | N/A | AFD/EU | 13,000 |
| 8 | Optimization of Rapid Molecular Detection Method for Waterborne Pathogens: Case Study in Mekong River | To optimize the rapid molecular detection method for waterborne pathogens | WAE | N/A | AFD/EU | 13,000 |

## 3.12 Promotion des études master et doctorale

- Maintenir et étendre les partenariats avec les institutions partenaires (universités, ONG, agences gouvernementales, secteurs privés, etc.).
- Continuer à améliorer et à revoir les programmes par thématiques (inter-départements)
- Rechercher des fonds / bourses pour soutenir les étudiants.
- Augmenter les activités promotionnelles auprès des étudiants potentiels.
- Mener une enquête sur l'emploi des diplômés auprès des diplômés de maîtrise et de doctorat.
- Internationaliser les programmes grâce à nos partenariats régionaux et internationaux.
- Accroître la communication entre la communauté universitaire, le personnel enseignant et les étudiants potentiels.
- Mettre pleinement en œuvre les programmes de partenariat du Projet d'amélioration de l'enseignement supérieur (HEIP).
- Augmenter la visibilité de la réponse des sujets de recherche aux sociétés nécessaires grâce au soutien d'institutions de fonds de recherche telles que les ministères, le projet LBE, le projet WB.

Tableau 12: Perspective pour 2022-2023

| **Nº** | **Objectif** | **Référence 2021-2022** | **Cible 2022-2023** | **Stratégies/Actions** | **Défis** |
|---|---|---|---|---|---|
| 1 | Augmenter le nombre d'inscrits en Master | 122 (Inscrits) | 136 (Inscrits) | Rechercher davantage de fonds/bourses pour soutenir les étudiants<br>Augmenter les activités promotionnelles auprès des étudiants potentiels | - Covid-19<br>- Disponibilité du personnel<br>- Sources limitées de soutien financiers |

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| | | | | Améliorer les outils de communication et les contenus du site web de la « Graduate School » de l'ITC | |
| | | | | Faire la promotion des programmes centrés sur la recherche | |
| | | | | Faire la promotion de LBE et de la recherche dans le projet HEIP | |
| | | | | Nouer des partenariats et collaborer avec des universités locales/régionales, des institutions publiques, des entreprises et des ONG | |
| 2 | Augmenter le nombre de diplômés de Master | 277 | 340 | Orienter les activités de recherche et de stages, et informer sur les plannings et conditions nécessaires | - Covid-19<br>- Arrivée tardive des équipements d'expérimentation |
| | | | | Réunir régulièrement les étudiants et leurs responsables | |
| | | | | Faire un suivi hebdomadaire et mensuel des progrès des projets de recherche et des stages | |
| 3 | Viser des Masters internationaux en 2023 | 0 (Programme) | 1 (Programme) | Collaborer avec des universités partenaires | - Covid-19<br>- Disponibilité du personnel |
| | | | | Mettre pleinement en œuvre les programmes de partenariat du Projet d'amélioration de l'enseignement supérieur (HEIP) | |
| | | | | Promouvoir l'anglais comme langue de communication, d'enseignement et d'apprentissage | |
| | | | | Inviter des professeurs/experts d'institutions partenaires pour donner des enseignements et des conférences | |
| 4 | Viser l'accréditation des programmes en 2023 | 0 (Programme) | 2 (Programmes) | Former le personnel des facultés aux attendus et à la préparation de la demande d'accréditation | - Covid-19<br>- Disponibilité du personnel |
| | | | | Conduire des auto-évaluations des programmes de formation | |
| | | | | Consulter des experts de l'accréditation | |
| | | | | Préparer les documents et moyens nécessaires pour remplir les conditions exigées par le corps d'accréditation | |

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| 5 | Lancer la révision des contenus des Masters | 1 | 5 | Proposer au Consortium un programme d'enseignement révisé par l'équipe, pour commentaires et discussions | |
| 6 | Lancer un nouveau Master | 0 | 1 | Lanver un master de science des données avec le soutien de l'HEIP et des partenaires français | |
| 7 | Augmenter le nombre d'inscrits en thèse | 55 (Inscrits) | 62 (Inscrits) | Rechercher davantage de fonds/bourses pour soutenir les étudiants<br>Augmenter les activités promotionnelles auprès des étudiants potentiels<br>Améliorer les outils de communication et les contenus du site Internet de l'école de 3e cycle<br>Faire la promotion des programmes centrés sur la recherche<br>Faire la promotion de LBE et de la recherche dans les projets HEIP<br>Nouer des partenariats et collaborer avec des universités locales/régionales, des institutions publiques, des entreprises et des ONG<br>Développer plus de programmes de double-diplôme, de cotutelles et de programmes sandwichs avec les universités partenaires | - Covid-19<br>- Disponibilité du personnel<br>- Soutien financier limité |
| 8 | Augmenter le nombre de docteurs | 4 | 15 | Orienter les activités de recherche et de stages, et informer sur les plannings et conditions nécessaires<br>Réunir régulièrement les étudiants et leurs responsables<br>Faire un suivi hebdomadaire, mensuel et semestriel des progrès des projets de recherche et des stages | - Covid-19<br>- Arrivée tardive des équipements d'expérimentation<br>- Soutiens financiers<br>- Peu d'expérience d'encadrement de thèse pour certains directeurs de thèse |
| 9 | Améliorer le management du département de 3e cycle | | | Renforcement des capacités en leadership/management/S&E du personnel de l'école<br>Renforcement des capacités de "Encadrement efficace des doctorants"<br>Développer des recommandations pour les étudiants et le personnel de la faculté | - Disponibilité du personnel possiblement contrainte<br>- Difficulté à rassembler les inputs en raison de la Covid-19 |

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|---|---|---|---|---|---|
| 10 | Augmenter l'assurance de qualité | | | Élaborer et mener des enquêtes sur l'emploi des diplômés du département de 3e cycle | - Risque de participation faible aux questionnaires |
| | | | | Mener un sondage sur le programme de formation par les étudiants | |
| | | | | Mener un sondage sur les acquis et les enseignements par les étudiants | |
| | | | | Faire une étude de marché pour évaluer les compétences recherchées | |
| | | | | Analyser les données des enquêtes et rapports pour réviser ou développer les contenus d'enseignements | |

### 3.12.1 Master Programs

***A. <u>Master Program of Computer Science</u>.***

Curriculum of the Master Program of Computer Science was revised last year and has been implemented successfully. The revised curriculum aims at providing skills and advanced knowledge to fit the current and future job market trends (skills related to Big Data) and embrace research and development in order to support the research study projects in the fields of Computer Science, Machine Learning and Deep Learning at ITC or elsewhere. With the practice of the new curriculum proposed last year, some practical issue is found and there is need to be slightly updated to the curriculum. To keep students involved in their research project earlier, for year-one students, an internship project is a must, and it is proposed to be added at the end of second semester. The duration of internship will be two months with the number of credits of 3. For the perspective of academic year 2022-2023, we propose to run this program in collaboration with local partners, aiming at recruiting 10 new M2 students.

***B. <u>Master Program of Materials and Structural Engineering</u>***

- For the academic year 2020-2024, we push the collaboration with Chulalongkorn University (CU) in Thailand through HEIP project. The collaboration will focus on exchanges of students, professors and developing curriculum in Materials Science and Engineering part with the Faculty of Engineering of CU. Meanwhile, we work with our partner, Université Sorbonne Paris Nord (13), to establish an Erasmus+ project the support staff's and students' mobilities.

***C. <u>Master Program of Water and Environmental Engineering</u>***

- Following our SWOT analysis, feedbacks from stakeholders and our survey, for the academic year 2021-2022, we propose to revise our current curriculum to address the current development, market needs and skill gaps, by adding

two new courses, namely, (1) Guest lecture Seminar (2 credits) and (2) M1 Internship for a period of 2 to 3 months. The detail of this proposal is put in the Annex [Perspective-M-WEE-2022-2023].

Table 1: Revision of current curriculum

| Master program | Current situation | | Proposed modification/add | | Remarks |
|---|---|---|---|---|---|
| | Name of course | Duration | Name of course | Duration | |
| M-WEE | None | None | Guest lecture Seminar | 48h | |
| | None | None | M1 Internship | 2 to 3 months | Exempted for ITC students who enroll in M2 directly |

- For the academic years 2020-2024, we push the collaboration with Chulalongkorn University (CU) in Thailand through HEIP project. The collaboration will focus on exchanges of students and professors and with Department of Environmental Engineering, Faculty of Engineering of CU. To prepare the master program to gain AUN-QA accreditation with collaboration with CU.

- To have 10 more exchange professor from France to give lecture in partnership with ITC professor for UWE program. To have exchange experts from NGOs such as GRET and Water Supply Authority to provide short courses to the Master students so that the students can know more on the real-world problems of work. This exchange is supported by EU-AFD project.

- To send master students to do internship abroad with EU-AFD projects. To have students doing research internships in the ministries and industries.

### *D. Master Program of Energy Technology and Management Engineering*

- Following our SWOT analysis, feedbacks from stakeholders and our survey, for the academic year 2021-2022, we propose to substantially revise our current curriculum to address the current development, market needs and skill gaps. The detail of this proposal is put in the Annex Perspective-[M-ETM-2022-2023].

- For the academic years 2020-2024, we push the collaboration with Institut Teknologi Bandung (ITB) in Indonesia through the HEIP project. The collaboration will focus on exchanges of students and professors.

- We also work with ECAM-Lyon to establish the link between M-ETM and ECAM international double-degree program.

***E. Master Program of Agro-industrial Engineering***

- Following our SWOT analysis, feedbacks from stakeholders and survey data, for the academic year 2021-2022, we propose to substantially revise our current curriculum to address the current development, market needs and skill gaps. The detail of this proposal is put in the Annex [Perspective-M-AIE-2022-2023].

- To develop and strengthen the training and research programs in the field of Agro-industry to account for regional context, collaborating with prestigious universities in the region is essential. For the academic years 2020-2024, we push the collaboration with Kasetsart University (KU) in Thailand through the HEIP project. The collaboration will focus on exchanges of students and professors and establishing dual degree program.

***F. Master Program of Mechatronics, Information and Communication Engineering***

- Following our SWOT analysis, feedbacks from stakeholders and our survey, for the academic year 2021-2022, we propose to substantially revise our current curriculum to address the current development, market needs and skill gaps. The detail of this proposal is put in the Annex [Perspective-M-MIC-2022-2023].

- For the academic years 2020-2024, we push the collaboration with, through the HIEP project, with Institut Mines Télécom (IMT) and IMT Mines Alès in France. The collaboration will focus on exchanges of students and professors and improving curriculum.

- We also work with ECAM-Lyon to study the possibility of having international double-degree program.

***G. Master Program of Data Science***

- For the academic years 2020-2024, we propose to launch Master's Degree in Data Science, by collaborating with our French partners IMT-TSP and ENSIIE, under the Partnership Program established under the HIEP project. The collaboration will focus on human resource development, exchanges of students and professors and improving curriculum.

Overall, in the coming academic year 2022-2023 we propose to run the following master programs:

1. Agro-industrial Engineering
2. Energy Technology and Management Engineering
3. Materials and Structural Engineering,
4. Transport Engineering
5. Computer Science
6. Water and Environmental Engineering
7. Mechatronics, Information and Communication Engineering
8. Data Science

**Agenda:**

- Program Promotion to I5 Engineering students: July
- Official Announcement of the new intake: July—August
- Selection and result: September
- Start of academic year: October
- Proposed Tuition Fee: 1,200$ per year and 2400$ for the double-degree international program

### 3.12.2 Doctoral Program

The Doctoral Program has been launched since the academic year 2017-2018. For this academic year, there are 55 doctoral students. In the coming academic year 2022-2023, ITC plans to recruit 2 PhD students each for the five fields:

1. Water and Environment
2. Materials Science and Structures
3. Energy Technology and Management
4. Food Technology and Nutrition
5. Mechatronics and Information Technology.

The PhD students will engage actively in the research projects defined under the HEIP project. We prioritize ITC faculty staffs who are potential (lecturer-researchers or pure researchers) but have difficulty to mobilize far from home (especially, female staff with children). Co-supervision and cotutelle programs with partner universities are highly considered.

**Agenda:**

- Announcement of the new intake: April—July

- Selection and result: August—September
- Start of academic year: October
- Proposed Tuition Fee: 1,900$ per year.

## 3.13 Promotion de la recherche et de l'innovation

**a) Promouvoir des activités de recherche**

- Encourager les chercheurs à proposer et à mener des projets de recherche avec des partenaires nationaux et internationaux
- Échanger les résultats de la recherche avec des chercheurs locaux et internationaux par le biais de conférences, de procédures, d'ateliers, etc.

**b) Amélioration continue pour les chercheurs de haute qualité**

- Encourager le personnel enseignant pour des études doctorales ou post-doctorales
- Envoyer des chercheurs pour avoir des expériences en laboratoire de partenaires nationaux et internationaux
- Développer les capacités des chercheurs pour la rédaction de propositions de recherche et la rédaction de propositions de subventions
- Développer les compétences des chercheurs en planification, gestion de projet et rédaction de rapports

**c) Moderniser les installations de laboratoire**

Avec le soutien du gouvernement, le gouvernement français, le gouvernement belge, le gouvernement japonais, l'AUF, AUN-Seed-Net et d'autres partenaires de développement, l'ITC s'est doté de bons équipements. Cependant, il y a encore des limites en termes de facilité de recherche. Par conséquent, l'ITC continue de renforcer et de moderniser les installations de laboratoire en élargissant sa collaboration avec ses partenaires. Les stratégies suivantes doivent être mises en œuvre pour atteindre l'objectif ci-dessus :

- Développer un laboratoire avec un domaine spécifique pour répondre au développement des connaissances scientifiques et à l'amélioration économique
- Équiper des installations modernes de recherche et développement grâce au soutien du gouvernement et des partenaires internes
- Continuer de renforcer et d'élargir la collaboration avec des partenaires de développement tels que la France, la Belgique, le Japon, la Corée et d'autres partenaires de développement

**d) Renforcement et expansion du réseau de chercheurs**

Sur ce, l'ITC dispose d'un réseau de chercheurs au niveau local et international tels que MOEYS, RUPP, RUFA, ministère de l'industrie et de l'artisanat, et ministère des ressources en eau et de la météorologie, etc. avec l'ambassade de France, AUF, Ares-CCD, AUN / Seed- Net, Banque mondiale. Ces agences locales et internes fournissent un soutien technique et financier à l'ITC. Pour atteindre cet objectif, l'ITC procédera comme suit :

- Continuer de proposer une proposition de projet de recherche avec les partenaires existants

- Participez à des conférences et événements scientifiques pour échanger des résultats de recherche
- Inviter un conférencier principal scientifique pour les événements organisés par l'ITC

**e) Renforcement et expansion de la collaboration avec le secteur privé**

- Continuer de proposer un projet de recherche pour le développement de technologies de fabrication
- Continuer à organiser des événements scientifiques pour partager des expériences en impliquant les secteurs universitaire et privé
- Continuer à fournir des services aux secteurs privés tels que la formation, l'analyse des matières premières et des produits finaux, et la consultation -etc.

## 3.14 Promotion des relations avec les industries (Industry-University-Linkage)

Les stratégies à accomplir sont proposées comme suit :

- Organiser la réunion avec le secteur privé et le salon des carrières en génie en décembre 2021
- Renforcer la capacité du personnel de liaison entre l'industrie universitaire et le représentant de liaison de l'industrie universitaire des ministères sur les compétences en entrepreneuriat et les compétences en évaluation technique.
- Mener une étude de marché (besoins du marché) pour garantir une forte compétence technique et non technique pour un marché à haute employabilité et un meilleur programme pour une bonne qualité d'enseignement.
- Renforcer l'activité de recherche de chaque département vers les industries partenaires dans le but d'attirer leur intérêt pour la coopération.
- Promouvoir la recherche appliquée dans chaque département pour répondre aux besoins de la société.
- Promouvoir le programme Techno-Innovation et Entrepreneuriat auprès des étudiants de l'ITC
- Promouvoir le programme de concours de démarrage du projet ITC C-NEUF et du projet ERASMU
- Renforcer la coopération avec les partenaires industriels existants et élargir la coopération avec les autres industries.
- Augmenter le nombre de programmes de formation technique pour les industries et les PME.
- Augmenter le nombre de coopérations de recherche avec les industries.
- Visiter les industries pour rechercher la collaboration et encourager l'entreprise à participer au forum sur les carrières organisées par l'ITC

## 3.15 Promotion d'Incubation et Start-Up

Les domaines couverts par le Centre d'Incubation d'Entreprises sont reliés aux 5 Unités de Recherche du Centre de Recherche et d'Innovation, à savoir : Eau et Environnement (WAE),

Technologie Alimentaire et Nutrition (FTN), Science et Structure des Matériaux (MSS), Mécatronique et Technologies de l'Information (MIT) et Technologie et Gestion de l'Énergie (ETM).

Cependant, 2 domaines d'innovations ont été prioritaires :

- Innovations avec les Hautes Technologies, y compris l'utilisation de la Robotique, AI (Intelligence Artificielle), Mécatronique, Big Data, Cloud Computing, IoTs, Cybersécurité, Automatisation.

  Les hautes technologies peuvent être appliquées à l'agriculture (agriculture intelligente), à l'énergie (production et utilisation intelligentes d'énergie), à l'environnement (prévisions météorologiques, prévisions du changement climatique) et bien sûr à l'industrie 4.0 (prototypage, conception de produits, contrôle de la qualité dans la fabrication, gestion de l'énergie et de l'environnement)

- Innovation dans la transformation des aliments et la sécurité alimentaire. Bien que les technologies impliquées puissent sembler moins sophistiquées que dans le domaine précédent, les questions de développement d'aliments abordables, sûrs, attrayants et durables "Made in Cambodia" impliquent de nombreux domaines scientifiques tels que l'agronomie, la science des aliments, la valorisation des déchets et des sous-produits, la conception des procédés alimentaires, les procédés biotechnologiques, la microbiologie, la biochimie, la chimie analytique, …

Les Stratégies et les activités pour 2022-2023 :

- Collaborer avec des entités externes pour renforcer les capacités des étudiants afin d'apprendre l'entrepreneuriat plus efficacement.
- Participez au cours sur le développement de l'esprit d'entreprise avec le programme international (ECAM Cambodge).
- Engagez un laboratoire LBE en tant que FabLab de première étape.
- Collaborer avec les différents services de l'ITC pour fournir un soutien technique à l'équipe de démarrage (accès au laboratoire et mentorat technique).
- Organiser Techno Innovation Challenges Cambodia 2021 (TICC 2021) pour sélectionner les meilleures idées/projets innovants et les équipes les plus engagées (6-8).
- Organiser une formation de 10 semaines sur l'élaboration d'un plan d'entreprise pour aider les équipes de jeunes pousses (les équipes start-up) à établir complètement leur plan d'entreprise et à améliorer leur prototype de produit/service.
- Fournir un soutien technique, commercial et financier à trois meilleurs projets de démarrage (start-up) pour commercialiser / tester leur produit sur le marché.
- Organiser une soirée Showcase et Networking pour présenter et connecter les trois meilleures équipes de start-up avec des investisseurs (en partenariat avec Khmer Enterprises).
- Promouvoir le résultat du programme de démarrage (start-up) (par le biais d'un séminaire) aux universités partenaires d'ITC.

## 3.16 Promotion de la bibliothèque, de la Cyberuniversité et du centre multimédia

Bibliothèque

- acheter de nouveaux livres
- améliorer des services de bibliothèque
- améliorer les salles de discussion
- mettre à jour les médias sociaux
- mettre à jour le système PMB
- mettre en place un programme de formation sur la méthodologie de recherche sur l'information scientifique

Tableau 13: Activités pour le bibliothèque 2021-2022

| No | Activités | Description |
|---|---|---|
| 1 | Upgrade library equipment | - Replace some broken equipment with the new one<br>- Decoration library space (such as Map stick the wall)<br>- Replace all computer tables look like the same style<br>- Replace all bookshelves look like the same style |
| 2 | Build partnerships and cooperation with the regional and global library for development | - One (01) partnerships in country or one (01) for international partnerships |
| 3 | Improve and update library resources and services | - Purchase new books with solution manual and instructor resources (pdf, Lecturer slides, Chapter Figures, Photos and Tables and Lab Account login) as an engineering collection<br>- Purchase new electronic power extension to support patrons need<br>- Develop library web portal for accessing the digital resource and databases<br>- Update learning technology to support learning environment as such: comfortable tables and chairs, fast Wi-Fi connection, new high-speed computer for engineering requirement, Internet Security and Firewall protection. |
| 4 | Update or Improve the Library Management System | - Update PMB system on GUI and report |
| 5 | Provide more trainings/workshops to students and researchers | - Research methodology on scientific information for students, researchers and young scholars<br>- Orientation workshop to promote and use library resources and services<br>- Staff management<br>- Join local and international events/workshops for library development |
| 6 | Capacity building on library management and service operation | - Structure of human resources and provide standard management and operation in the ITC library:<br>o Qualified executive officer<br>o Qualified service operation staffs |

| | | |
|---|---|---|
| 7 | Improve library service security | Install camera security on<br>- library space<br>- self-study and e-learning space<br>- discussion room space(symposium I&II) |

Cyber université and Centre multimédia

- Développer plus de cours en ligne
- Accroître le nombre de membres universitaires
- Augmenter le nombre d'utilisateurs de cours en ligne
- Améliorer le fonctionnement du cours
- Développer un cours en ligne Khmer (Khmer MOOC)
- Mettre à jour les installations du réseau pour soutenir les activités d'apprentissage et de recherche
- Fournir une formation externe (à l'étranger) avec nos partenaires et une formation locale au e-Learning Center de l'ITC pour augmenter le nombre de personnes qualifiées
- La communication directe avec les dirigeants universitaires ou les décideurs se joint au Réseau cambodgien de recherche et d'enseignement (CamREN)
- Développer un modèle de MOOC khmer à piloter avec certains partenaires au Cambodge

### 3.17 Promotion des compétences transversales

Les compétences transversales sont un cours essentiel qui favorise les attributions personnelles qui se situent en dehors des qualifications professionnelles et de l'expérience de travail. Les compétences générales seront intégrées dans le programme de technicien et d'ingénieur de l'ITC pour renforcer les capacités générales des étudiants. Parmi les autres compétences, le travail d'équipe est l'une des principales compétences à considérer. 2 formations sur le travail d'équipe seront dispensées chaque année aux étudiants de l'ITC.

Le travail d'équipe implique d'établir des relations et de travailler avec d'autres personnes en utilisant un certain nombre de compétences et d'habitudes importantes :

- Gestion d’équipe
- Contribuer à des groupes avec des idées, des suggestions et des efforts
- Communication (à la fois donner et recevoir)
- Sens de responsabilité
- Respect sain des différentes opinions, coutumes et préférences individuelles
- Capacité à participer à la prise de décision en groupe

## 4 Défis

- Le programme de mobilité peut être soumis à des changements en raison du COVID19. La plupart des programmes de mobilité et de renforcement des capacités ont été modifiés pour se dérouler en ligne.

- La gestion des projets de renforcement des capacités et des projets collaboratifs nécessite plus de temps et d'efforts, ce qui nécessite un personnel administratif plus compétent pour aider.
- Espace étroit de certains laboratoires et atelier pour les TP (ex: Conception mécanique, Fluide mécanique, métrologie, TIC,…) (GIM)
- La promotion du domaine des géo-ressources et de l'ingénierie géotechnique à l'ITC n'est pas atteinte aux lycéens pour en savoir plus sur cette spécialité (GGG)
- Équipement de laboratoire limité pour la pratique (Option Environnement) (GRU)
- Le nombre de personnel avec le doctorat est limité pour le programme de master et encadrer la recherche des étudiants (GIC)
- Manque de ressources humaines dans le département de génie Architect (GCI)
- Les équipements pour les travaux pratique est limité et les équipements existants sont plus anciens (GCI, GIM)

## 5 Capacité d'accueil de l'ITC

Pour l'année universitaire 2022-2023, nous prévoyons de recruter environ 1300 étudiants ingénieurs, et environ 1000 étudiants techniciens selon le besoin des ressources humaines du marché de travail en respectant l'évolution de la capacité d'accueil de l'institut et le renforcement de l'effectif d'enseignants. Le tableau ci-dessous indique la capacité d'accueil actuelle de l'ITC.

| ***Type de salle*** | **Quantité** | **Capacité** |
|---|---|---|
| Grande salle de conférence | 1 | 2000 |
| Salle de conférence | 1 | 350 |
| Amphithéâtre (Bâtiment A) | 2 | 200 |
| Amphithéâtre (Bâtiment F) | 2 | 380 |
| Salle de cours ou de TD | 6 | 100 |
| | 43 | 50 |
| Salle d'apprentissage de la langue | 11 | 25 |
| Salle de TP spécialisé | 57 | 25 |
| Salle informatique (25 pc) | 5 | 25 |
| Deux bâtiments du projet S4C seront mis en place avant la rentrée 2022-23 :<br>– 23 laboratoires<br>– 10 salles de cours<br>– 5 salles d'ordinateur<br>– 4 centres de formation<br>– 3 ateliers<br>– 2 amphithéâtres<br>– Etc. | | |

Pour les travaux pratiques, les salles ou les laboratoires de TP sont directement sous la responsabilité de chaque département. Le tableau ci-dessous indique le nombre des salles de TP dans chaque département.

| Département | Nombre de salles de TP | Capacité |
|---|---|---|
| GCA | 6 | 25 |
| GCI | 4 | 25 |
| GEE | 8 | 25 |
| GGG | 7 | 25 |
| GIC | 8 | 25 |
| GIM | 11 | 25 |
| GRU | 7 | 25 |
| GTR | 3 | 25 |
| TC | 3 | 25 |
| **Total** | **57** | |

Actuellement, le nombre maximum d'étudiants dans une séance de cours, de TD et de TP est fixé par le bureau des études (Tableau ci-dessous).

| Département | Cours | TD | TP | Langue |
|---|---|---|---|---|
| TC | 180 | 50 | 25 | 25 |
| Spécialité | 180 | 50 | 25 | 25 |

A la rentrée 2022-2023, l'estimation de l'effectif d'étudiants est d'environ **6800.** Selon la répartition en groupe, nous pouvons estimer les besoins en termes de nombre de séances par semaine et la capacité de salle de cours, de TD et de TP de la façon suivante :

| | Cours (180 étudiants) | Cours spécialité et TD (50 étudiants) | TP (25 étudiants) | Cours de langue | Informatique |
|---|---|---|---|---|---|
| Nombre de séances pour technicien | | 475 | 346 | | 120 |
| Nombre de séances pour Ingénieur | 149 | 1154 | 593 | 1456 | 104 |
| **Nombre de séances réel (Besoin)** | **149** | **1629** | **939** | **1456** | **224** |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Nombre de Salles à l'ITC** | 4 | 43 | 57 | 11 | 5 |
| **Nombre de séances possibles sur 4,5 jours** (36 séances/semaine) | 144 | 1548 | 2052 | 396 | 180 |
| **Nombre de séances possibles sur 5 jours** (40 séances/semaine) | 160 | 1720 | 2280 | 440 | 200 |

Ce tableau montre qu'au niveau de l'infrastructure d'accueil, nous avons la capacité d'accueillir le nombre d'étudiants proposé. Ce tableau ne tient pas compte du bâtiment en construction sous le projet S4C.

# PARTIE II : DOSSIER PEDAGOGIQUE

# 6 Préparation pour la rentrée 2022-2023

## 6.1 Calendrier universitaire 2022-2023

Le calendrier de l'année universitaire 2022-2023 est présenté à l'annexe F.

## 6.2 Recrutement des étudiants en 2022-2023

### a) Cycle de technicien

Le recrutement des étudiants du cycle de technicien est basé sur dossiers du candidat (Passé ou échoué l'examen national de baccalauréat). Les étudiants choisissent le département préféré pendant l'inscription. La sélection de ce choix est basée sur leurs dossiers.

Seuls les candidats (passé le baccalauréat) avec la mention du Bac II de A à E peuvent continuer leurs études au cycle d'ingénieur.

### b) Cycle d'ingénieur

Tous les candidats (mention générale du baccalauréat de A à E) doivent déposer leur dossier pour un concours d'entrée. Deux options ont été envisagées pour le recrutement des étudiants ingénieurs selon la situation de la pandémie de Covid-19.

- Option 1 : Le concours d'entrée sur place sera organisé pour les matières suivantes : mathématiques, physique-chimie et logique.
- Option 2 : Le concours d'entrée en ligne sera organisé pour les matières suivantes : mathématiques, physique-chimie et logique.

## 6.3 Proposition de droits de scolarité en 2022-2023

Les droits de scolarité seront proposés selon le tableau ci-dessous.

| *Cycle d'ingénieurs* | *Cycle de techniciens* |
|---|---|
| 600$ pour les garçons<br>450$ pour les filles | 300$ pour les garçons<br>200$ pour les filles |

## 6.4 Exonération

Comme chaque année, des bourses d'études ont été octroyées aux étudiants de 1ère année :

- 80 étudiants inscrits en 1ère année d'ingénieur à l'ITC de Phnom Pneh seront exonérés de droits de scolarité.
- 120 étudiants inscrits en 1ère année d'ingénieur à l'ITC de Tbong Khmum seront exonérés de droits de scolarité.
- 15% des étudiants inscrits en 1ère année de technicien seront exonérés de droits de scolarité.

Pour être conforme aux critères du Ministère de l'Education, de la Jeunesse et des Sports, les exonérations seront réparties selon les catégories suivantes :

- Mérite (meilleurs du concours) : proposition 60%
- Inscrits en difficultés financières : proposition 20%
- Inscrits des provinces éloignées de Phnom Penh : proposition 5%
- Inscrits filles : proposition 15%

## 6.5 Proposition de places ouvertes en 2022-2023

### i. Entrée directe en 1ère année

Le nombre prévu d'étudiants à recruter en 2022-2023 est présenté ci-dessous :

| | ITC-Phnom Penh | ITC-Tbong Khmum |
|---|---|---|
| I1 | 1300 | 120 |
| T1 | 1000 | - |

### ii. Entrée normale en 3ème année d'Ingénieur

Le tableau suivant montre le nombre de places ouvertes en 3ème année (I3) dans chaque département pour l'année 2022-2023.

Tableau des places ouvertes I2 pour I3

| **Faculté/département** | **Places ouvertes I2 en I3** |
|---|---|
| GCA | 190 |
| GCI | 190 |
| GAR | 90 |
| GEE | 190 |
| GGG | 100 |
| GIC | 90 |
| GIM | 150 |
| GRU | 150 |
| GTR | 80 |
| GTI | 80 |
| AMS | 80 |
| **Total** | **1390** |

### iii. Possibilité de passer en I3 après le technicien supérieur

Pour l'année scolaire 2022-2023, 15% des étudiants de T2 peuvent passer en I3 s'ils réussissent un test des trois matières (mathématiques, physique et langue étrangère) qui sont conformes au programme d'ingénieur de 2ème année (I2) et un entretien par département concerné.

Pour s'assurer que les étudiants finissant le programme de technicien supérieur de 2 ans seront capables de poursuivre leurs études en 3ème année d'ingénieur, nous proposons un cours intensif de préparation sur les trois matières (mathématiques, physique et langue étrangère) pendant les vacances universitaires (août et septembre). Ce cours intensif est payant.

### iv. Concours externes

3 places par département pour les cambodgiens ayant un niveau BAC+2 et une connaissance suffisante de la langue étrangère ou une licence de science, et qui auront passé avec succès les épreuves d'un concours spécifique (épreuves écrites : mathématiques et physique et entretien par le département concerné) en septembre.

### v. Places ouvertes pour les I3 en 2022-2023

Le tableau suivant récapitule, pour chaque département, le nombre total de places ouvertes aux étudiants I3 en 2022-2023.

| **Département** | **Place ouverte I2 en I3** | **Place ouverte T2 en I3** | **Place ouverte Concours externe** | **TOTAL** |
|---|---|---|---|---|
| GCA | 190 | 7 | 3 | **200** |
| GCI | 190 | 9 | 3 | **202** |
| GAR | 90 | - | - | **90** |
| GEE | 190 | 10 | 3 | **203** |
| GGG | 100 | - | - | **100** |
| GIC | 90 | - | 3 | **93** |
| GIM | 150 | 4 | 3 | **157** |
| GRU | 150 | - | - | **150** |
| GTR | 80 | - | - | **80** |
| GTI | 80 | - | - | **80** |
| AMS | 80 | - | - | **80** |
| **TOTAL** | **1390** | **30** | **15** | **1435** |

# 7 Nomination de l’équipe de Direction pour l’année 2022-2023

Le 30ème Conseil d’Administration propose de nommer l’équipe de Direction suivante pour l’année 2022-2023:

# Annexes

## Annex A

### Pre-degree Foundation Program with Curtin

Level: International Pre-degree Foundation Program for Engineering and Science

Duration: 1 Year at ITC

Semester:2 Semesters

Maximum of hours per semester: 375

Lecture (L): 1L=15 hours

Tutorial (T): 1T=30 hours

Practice (P): 1P=30 hours

**Table 2**. Pre-degree Foundation Program for Engineering Stream

| Year | Semester | Course Code | Subject | Credit | L | T | P | Hours |
|---|---|---|---|---|---|---|---|---|
| Y1 | S1 | FP-059 | Effective Communication Skills | 4 | 4 | 0 | 0 | 60 |
| | | FP-040 | Engineering Mathematic I | 3.5 | 2 | 1.5 | 0 | 75 |
| | | FP-060 | Programming C++ | 3.5 | 2 | 1.5 | 0 | 75 |
| | | FP-050 | Physic for Engineering I | 4 | 2 | 1 | 1 | 90 |
| | | FP-022 | History | 2 | 2 | 0 | 0 | 30 |
| | | Total | | 17 | 12 | 4 | 1 | 330 |
| | S2 | FP-041 | Engineering Mathematic II | 5 | 3 | 2 | 0 | 113 |
| | | FP-028 | Chemistry for Engineering | 4 | 2 | 1 | 1 | 90 |
| | | FP-051 | Physic for Engineering II | 5 | 3 | 2 | 0 | 113 |
| | | FP-058 | Writing and Research Skills | 3 | 2 | 1 | 0 | 60 |
| Total | | | | 17 | 10 | 6 | 1 | 375 |

**Table 3**. Pre-degree Foundation Program for Science Stream

| Year | Semester | Course Code | Subject | Credit | L | T | P | Hours |
|---|---|---|---|---|---|---|---|---|
| Y1 | S1 | FP-059 | Effective Communication Skills | 4 | 4 | 0 | 0 | 60 |
| | | FP-040 | Engineering Mathematic I | 3.5 | 2 | 1.5 | 0 | 75 |
| | | FP-060 | Programming C++ | 3.5 | 2 | 1.5 | 0 | 75 |
| | | FP-050 | Physic for Engineering I | 4 | 2 | 1 | 1 | 90 |
| | | FP-022 | History | 2 | 2 | 0 | 0 | 30 |
| | | **Total** | | **17** | **12** | **4** | **1** | **330** |
| | S2 | FP-041 | Engineering Mathematic II | 5 | 3 | 2 | 0 | 113 |
| | | FP-058 | Writing and Research Skills | 3 | 2 | 1 | 0 | 60 |
| | | FP-061 | Business Information Technology | 3 | 2 | 1 | 0 | 60 |
| | | FP-029 | Introduction to Business Studies | 3 | 2 | 1 | 0 | 60 |
| **Total** | | | | **14** | **9** | **5** | **0** | **292.5** |

## Annex B

### Courses Description for Pre-degree Foundation Program with Curtin

| No. | Code | Course Unit | Credit | Description |
|---|---|---|---|---|
| 1 | FP-040 | Engineering Mathematic I | 3.5 | Basic Algebra includes solving absolute value of linear equations, and absolute value of linear and quadratic inequalities. Rational functions and its asymptotes, odd & even functions as well as piecewise defined functions are also introduced.<br><br>Linear Algebra includes matrices and their determinants, and determining inverse matrices by the Gauss-Jordan method, as well as vectors and their applications in solving relative velocity, collision and shortest distance problems.<br><br>Probability and its Distribution introduces basic probability principles and rules, as well as probability of discrete and continuous random variables.<br>Analysis of Data consists of analysing the univariate and bivariate data through measure of central tendency, measure of dispersion, measure of association and linear regression line as well as introduction to statistical inference.<br>Basic Trigonometry includes all trigonometric ratios, graphs, equations and identities. |
| 2 | FP-041 | Engineering Mathematic II | 5 | The pre-requisite for this unit is Engineering Mathematics 061.<br>Algebra consists of series and sequences as well as determining roots of equations by using factor theorem and remainder theorem.<br><br>Trigonometry includes trigonometric identities involving compound and double angles, solving trigonometric equations and expressing trigonometric functions in harmonic form.<br><br>Complex numbers cover different forms of complex numbers, loci of complex number on the Argand diagram, and the roots of complex numbers by De Moivre's Theorem.<br><br>Calculus introduces first principle of derivatives, differentiation rules, numerical differentiation by Newton-Raphson's method, techniques of integration and numerical integration by Trapezium and Simpson's rules. |
| 3 | FP-060 | Programming C++ | 3.5 | This unit introduces students to C++ programming, and includes the topics of Computer fundamentals, Algorithms, Programming fundamentals & compiler basics, Flow control structures, Arrays, Modular programming, User-defined data types and Data storage types.<br><br>It then introduces students to the basics of Object-oriented programming in C++ by including the topics of Class concept, Constructors, Inheritance & File processing. |
| 4 | FP-050 | Physic for Engineering I | 4 | Physics 061 introduces students to the basics of physics, basic mechanics and thermal physics, basic electricity and basic optics. Basics of Physics includes SI units, measurement and error analysis. |

| | | | | |
|---|---|---|---|---|
| | | | | Basic Mechanics includes motion in one or two dimensions, dynamics, circular motion, rotational motion, work and energy, linear momentum, body in equilibrium, vibrations and waves.<br><br>Thermal Physics includes heat, temperature and ideal gases. Basic Electricity includes Electric Currents and Direct Current Circuits. Basic Optics includes lenses and mirrors. |
| 5 | FP-051 | Physic for Engineering II | 5 | The pre-requisite for this unit is Physics for Engineers 061. The syllabus as follows:<br>Mechanics and thermodynamics will cover rotational motion, fluids and First Law of thermodynamics.<br>Electricity and Magnetism will cover electrostatic, capacitors, magnetism, electromagnetic induction and introduction to alternating current.<br><br>Oscillation and Modern Physics includes oscillatory motion (simple harmonic motion) and early quantum theory. |
| 6 | FP-028 | Chemistry for Engineering | 4 | This unit is intended for the engineering foundation program of Curtin University Malaysia. It introduces students to Chemistry Foundations, Basic understanding of matter, Fundamental Physical and Organic Chemistry.<br>• ***Chemistry Foundations*** including a brief review of basic concepts, atomic structure, electron configuration and periodic table, mole concepts, chemical equations and stoichiometry, solution and volumetric analysis, with a strong problem-solving orientation in addition to experimental approach.<br>• ***Basic Understanding of Matter*** including chemical bonding, shapes and polarity of molecules, states of matter and intermolecular forces in order to support a systematic, logical approach to explain important phenomena of matter.<br>• ***Physical Chemistry*** encompassed thermochemistry, chemical equilibria and chemical kinetics in order to account for the related natural phenomena, to carry out relevant calculations, and to facilitate chemical reactions for optimum performance in industry.<br>• ***Basic organic chemistry*** includes systematic nomenclature for common organic functional group compounds, organic reactions and practical aspects of application in the daily life. |
| 7 | FP-058 | Writing and Research Skills | 3 | This unit is primarily designed to introduce and develop capabilities and proficiency in the English language essential for tertiary education and for academic purposes, and to reinforce as well as extend existing skills and proficiency in the language.<br><br>It specifically provides students with appropriate learning experiences to comprehend and interpret a variety of academic texts. It also develops further students' academic writing skills needed in tertiary education, so that students are able to research and write on contemporary topics that require discussion and development within an analytical report of 2000 words. |

| | | | | |
|---|---|---|---|---|
| 8 | FP-059 | Effective Communication Skills | 3 | This course is primarily designed to introduce students to the theories and practices of effective communication skills. Within this framework, students will develop an understanding of effective communication skills theories that are reinforced through individual and group activities. |
| 9 | FP-022 | History | 2 | History is one of the most important social science subjects in the world. This course aims to significant contributes to the development of the basic knowledge and encourages student to understand their national identity through history.<br>In addition, it also introduces student the historical development of the countries in the region and outside the world in terms of economic and trade activities, political trends, society, culture of Khmer people and other nations. |
| 10 | FP-029 | Introduction to Business Studies | 3 | The fundamental concepts of business will be introduced at the beginning of the course followed by the management roles; functions and skills; and organization structures.<br>This unit will familiarize students with the basic concepts and theories in business operations and in managing business organization. In addition, the unit will provide exposure to the functional areas of business such as management, operation, marketing, human resources and finance. There will be opportunity throughout the course to discuss current events in business as they apply to the topic being covered. |

**Annex C**

**Admission Requirement for Pre-degree Foundation Program with Curtin**

To gain admission to the Curtin Foundation Program, students must have an overall IELTS score of 5.5 with no skill below 5 (or equivalent score in another recognized examination or having scored a C or better in the IGCSE/GCSE/O-Level, AS Level, A Level English exam) as outlined in **Table 1** and must meet the applicable academic requirement outlined in **Table 2** below:

**Table 4**. English Proficiency Requirement

| **English Language proficiency test requirements** | **Foundation Program (Science, Engineering, Business stream)** |
|---|---|
| **IELTS Academic** | |
| Writing and Speaking | 5.0 |
| Reading and Listening | 5.0 |
| Overall | **5.5** |
| **TOEFL iBT** | |
| Reading | 12 |
| Listening | 11 |
| Speaking | 17 |
| Writing | 20 |
| Overall | **54** |
| **PTE Academic** | |
| Listening and Reading | 40 |
| Speaking and Writing | 40 |
| Overall Score | **42** |
| IGCSE/GCSE/GCE 'O' Level, AS Level, A Level English exam | C or better |

**Table 5.** Academic Qualification and Minimum Entry Requirement

| **Academic Qualification and Minimum Entry Requirements** | |
|---|---|
| GCE 'O' Level | Minimum of 5Cs including English or 5Cs and English competency, or equivalent as determined by Curtin. |

**Annex D**

## List of Human Resources at ITC for Pre-degree Foundation Program with Curtin

| No. | ITC | Gender | Department | Degree | Specialist | Unit in Charge |
|---|---|---|---|---|---|---|
| 1 | LIN Mongkolsery | M | TC, RIC | Doctor | Functional Analysis, Analysis and Differential Equations | Engineering Mathematic 061/062 |
| 2 | SIM Tepmony | M | GS, TC | Doctor | Applied Mathematics and Statistics | |
| 3 | PHAUK Sokkhey | M | TC | Doctor | Data Science | |
| 4 | LONG Sovann | M | TC | Master | Physic | Physic 061/062 |
| 5 | HOUNG Peany | F | GCA | Doctor | Chemical Science and Engineering | Chemistry 063 |
| 6 | KONG Phutphalla | M | GIC | Doctor | Computer vision and engineering | Programming C++ 063 |
| 7 | Heng Rathpisey | M | GIC | Master | Natural Language Processing | |
| 8 | SIEN BROSS | M | ES | Master | Arts in teaching English | Effective Communication Skills 061 |
| 9 | CHAT Koem Hong | M | ES | Master | Arts in English Education | Writing and Research Skills 062 |
| 10 | HIN Raveth | M | GS, GCI | Doctor | Mechanics of materials | |
| 11 | Hiring Plan/Curtin Staff | N/A | N/A | N/A | N/A | Business Information Technology 061 |
| 12 | Hiring Plan/Curtin Staff | N/A | N/A | N/A | N/A | Introduction to Business Studies 061 |

**Annex E**

**Laboratories and Facilities for Pre-degree Foundation Program with Curtin**

**Table 1.** Laboratory for Pre-degree Foundation Program

| No. | Room number | Laboratory |
|---|---|---|
| 1 | F304-305 | Physic Lab |
| 2 | F306-309-310 | Computer Lab |
| 3 | Under construction | Data analytic lab |

**Table 2.** Existing Facilities for Pre-degree Foundation Program

| No. | Room number | Laboratory |
|---|---|---|
| 1 | A109 | Class room |
| 2 | B221 | E-learning studio |
| 3 | B220 | E-learning content development |

# Urban Water and Sanitation Engineering (USE)

## MASTER OF WATER AND ENVIRONMETAL ENGINEERING (MWEE)

# Master of Water and Environmental Engineering
# Specializing in
# Urban Water and Sanitation Engineering (USE)

# Introduction

## 1- Report of the consortium committee consultation

In the consultation of the consortium committee, Director of Graduate School and Head of the master program MWEE has discussed the proposal with Prof Adele MARTIAL, Representative of IRD in Cambodia on 29 April 2022, Dr. Sylvain Massuel, research scientist from IRD on 23 May 2022. In general, the committee agreed with the proposal to include the courses of guest lecture and internship in the current curriculum. They had constructive comments as below.

- **Course of Guest Lecture.** It should have Professional lecture. Prof. Martial agreed with this proposal and she recommended to improve its name as Professional lecture. The course can be provided by professional guest lecturers
- Prof. Martial proposed to formulize the **committee of the curriculum to review the program.** There should be a consultation meeting of the Master Program of the curriculum committee composing of industries, international scientists, experts of the areas, current students, governments to enrich ideas to improve the program.
- Prof. Martial mentioned there should be a **link project with industries**. The course should be enhanced by joining the industries companies by having the project topics proposed by the industries. That is the way to make the network for the students, it can be the project with foreigners' students from companies, partnership program and with the spirit of teamwork. And there should have the assessment of the projects including the **soft skills** such as leadership, communications…
- Prof. Martial proposed to have the course of **Environmental Law aspect**. It is important to let the students understand about the aspect of the environmental law for their future career. Dr. Ket mentioned that we have the course of Water Policy but it is not available.
- There should have indication of the **norm and standard** measurement in the courses of the water quality assessment both waste water and drinking water.
- Dr. Sylvain concerned about the soft skill of the students as mostly they did not perform the active learning by not asking question during the class and less interact with the lecturers. The skill should be enhanced to equip them with the critical thinking, active learning. The new 21th century skills should be introduced to the students.

The minutes meetings are attached in the Annex.

## 2- Modification of the curriculum proposal after the consortium consultation

After the swot analysis and the consultation meeting, we propose to add 2 courses, Professional lecture and internship courses to the existing curriculum of master of water and environmental engineering specializing in urban water and sanitation to enrich the program and answer to the market need. The importance and description of the course are provided as below.

**Professional Lecture course**

This course is a series of guest lectures. Using guest lectures can provide graduate students with the great opportunity to link theories with practice in the real world and networking. A

wide variety of guest lecturers from different industries and organizations will be invited to give lecture once per week. The guest lecturers can share their knowledge, expertise and especially an important professional experience for students based on their real-world life experiences that can reinforce the teachings of the instructor and the students' capacity. Students benefit greatly from being exposed to new pedagogies to get quality education. They can have the opportunity to meet passionate, committed and critical people and to learn from them in various ways. Guest lecturers can act as role models and bring an authentic, vivid picture of the real world to students, thereby enabling transdisciplinary learning. Experiences and perspectives from local actors and entrepreneurs inspire students in their own (entrepreneurial) projects, creating motivation and an action-orientation. They bring in special expertise and experiences that teachers cannot provide.

The students present an opportunity to utilize alternative technologies and teaching techniques into the course (flexibility). They increase the access to the experts. The experts can be from local and international agencies. They get to see the insight and perspective of the guest lecturers' specific field. The format can enable students to interact and engage with professionals to ask questions during and after class. Through discussions, interpersonal competence and communicative skills are fostered. Guest lecturers can contribute to have a single lecture, a lecture series over a specific topics and period.

**Internship program**

A three-credit internship program is designed to enrich the students with career-related work experiences to gain confidence and skills to become more mature professionally in any private company, government agency, or non-profit organization.

Students who successfully complete an internship will be able to i) Apply knowledge obtained from class to real-world challenges in an internship place, ii) improved skills and maturity in performing within professional work environments, iii) achieved specific learning objectives agreed upon between the student, academic adviser, and hosting internship place.

### 7.1 MWEE in Urban water and Sanitation Engineering

### Program Objective

In Cambodia, there is urgent need of water and sanitation engineering specialist to address the problems of providing adequate water supplies, and design and management of urban drainage with water and wastewater treatment facilities. The Master Program of Urban water and Sanitation Engineering aims to produce highly capable human resources to operate and manage water supply and wastewater treatment and sewage system. The program will provide students with an in-depth knowledge of how to deliver effective modern water supply and sanitation engineering. The students will learn to deal with technical aspects of drinking water treatment and distribution, as well as sewage collection and treatment (on- and off-site), in an integrated way, design the treatment plant and pay attention to the choice of technologies and services. They will be able to manage the utility function of a supply and treatment plant. The program will also train the practitioners, technical persons and decision makers who have limited capacity to become experts with strong management and responsible leadership of a development project. Once students have successfully completed this program, they will obtain a position in the wider social, economic and environmental contexts of urbanization and municipal water and infrastructure services provision. This program aims also to provide students with the tools and knowledge to contribute to the development of innovative

approaches to the provision of sustainable and equitable municipal water, sanitation, environmental and infrastructure services in developing and transition countries.

## Career Opportunity after Graduation

After graduation the student will become civil water supply and sanitary engineers working in water supply and waste-water companies, municipal assemblies, government ministries and consulting companies dealing with water supply, sanitation and municipal infrastructure.

## Courses

### Urban Water and Sanitation Engineering (UWE)

| Core Courses | Elective Courses | Specialized Courses | Research-oriented Courses |
|---|---|---|---|
| 1. Applied Statistics<br>2. Chemical Kinetics<br>3. GIS and Remote Sensing for WEE<br>4. Entrepreneurship<br>5. Project Management | 1. Hydrology<br>2. Water Chemistry<br>3. Sustainable Solid Waste and Hazardous Management (not available)<br>4. Environmental Monitoring and Modelling<br>5. Water Policy and Planning (not available)<br>6. Water Induced Disaster Risk Assessment<br>7. Sustainable Energy Management and Conservation (not available)<br>8. Urban Pollution Control<br>9. Environmental Impact Assessment<br>10. Climate Change Impacts and Adaptation<br>11. Environmental Law (New) | 1. IWRM and Watershed Management<br>2. Water Quality Assessment and Management<br>3. Processes Engineering<br>4. Micro-biology and Toxicology<br>5. Water Treatment and Distribution System Design<br>6. Urban Drainage and Sewerage System Design<br>7. Wastewater and Sludge Treatment Process<br>8. Management of Water Supply and Sanitation | 1. Research Methodology<br>2. Seminar on Water and Environmental Engineering<br>3. Professional Lecture (New, 2 credits)<br>4. Water and Environmental Laboratory<br>5. Mini-Project<br>6. Internship (New, 3 credits) |

## Programme structure

**First Year**

| Semester 1 | | Semester 2 | |
|---|---|---|---|
| **Course** | **Credit** | **Course** | **Credit** |
| Chemical Kinetics | 2 | IWRM and Watershed Management | 2 |
| Project Management | 2 | Processes Engineering | 2 |
| GIS and Remote Sensing for WEE | 3 | Micro-biology and Toxicology | 2 |
| Research Methodology | 2 | Water Quality Assessment and Management | 2 |
| Seminar on Water and Environmental Engineering | 1 | Elective Course | 4 |

| | | | |
|---|---|---|---|
| Water and Environmental Laboratory | 2 | Internship (New) | 3 |
| Elective Course | 2 | | |
| **Second Year** | | | |
| Entrepreneurship | 2 | Professional Lecture (New) | 2 |
| Applied Statistics | 2 | Research Proposal | 3 |
| Water Treatment and Distribution System Design | 2 | Scientific conference with presentation | 3 |
| Urban Drainage and Sewerage System Design | 3 | Master Thesis and Defense | 6 |
| Wastewater and Sludge Treatment Process | 3 | | |
| Management of Water Supply and Sanitation | 2 | | |
| Mini-project | 2 | | |
| Elective Course | 2 | | |

## SWOT analysis

Master of urban water and sanitation engineering has launched through the support of AFD/EU program since 2018. In order to improve and sustain the program, we do the SWOT analysis through a survey discussion with alumni and relevant stakeholders in 2021. The following table shows the SWOT analysis of the master program.

| **Strength** | |
|---|---|
| Financial support | • Financial support from AFD and HIEP project until 2023 for the master program of Urban and Sanitation Engineering. |
| Leadership | • Leadership team with great motivation to lead the program toward the international reputation. |
| Reputation | • The reputation of the ITC school is strong in the local and international context. One Myanmar and French students have graduated from the master program and many other foreigner students from Indonesia, Laos, Vietnam, Africa contacted us for scholarship study. |
| Flexible curriculum | • Flexible curriculum allows students to engage in different pathway program such as course and research-based program and research-based program. From 2021-2022 academic year, the program has launched the research-based pathway. This has great attraction for many students of ITC to join this. There are 7 students join this academic year of 2020-2021. And one from the owner of a water supply company. That is a good sign of the program among the private industries. |
| Lecturers | • Highly qualified and dynamic teaching staffs. They provide sound scientific and technological knowledge for professional life to the master students. They have had grant to support students for research thesis. |
| Expertise | • The program is known as the leading academic and research experts in the field of water and environmental engineering. |
| Market need | • High market needs in the field of WASH sector both public and private sectors. |
| Graduation rate | • Successful 4-year graduation rates since 2018-2021. |

| Weakness | |
|---|---|
| Scholarship/Project grant | • Financial limitations and support. The current course-research based program depends heavily on the scholarship sponsor from AFD that will be end by 2023. |
| Instructors | • Some instructors' expertise is not fit to the courses designed. |
| Laboratory | • The laboratory activities of each course are still limited. |
| Study duration | • One-year system that request one semester for course and one semester for research is very limited the research period for course-research based study. |
| Research thesis qualification | • The research scope for qualified graduate is required to strengthen for ensuring the graduated student quality. |
| A mandatory internship or a field-implemented project | • A mandatory internship or a field-implemented project where students can demonstrate the knowledge, they are learning in the classroom would make their candidacy stronger. (Comments from companies and intentional organization) |
| Marketing | • Lack of awareness of the master program in the private sectors and public institutions. (Some provincial departments did not know about the program until we met them to show the program.).<br>• Marketing strategy and skills are still limited to produce video for promoting the master program. |
| Teaching and learning methods | • It is heavily on lecturer-center study methods. The student center method should be enhanced. |
| Job Market | • Some master graduates commented having difficulty to find a job to match the field in a short time period. Limited industry linkage cooperation for being ready for the students to catch the job. No event/workshop to recruit the position of the fresh graduates.<br>• Some lecturers advise also that to connect with market network, **industry internship** is important to let the students, lecturers and industry work together. |
| Competency | • Competency should be well defined for each course and align with the competency of the program. |
| Professional Management Skills | • Because the lecturers have less experience in the industries, therefore there are lacking on management part in their courses. Therefore, **Guest lectures/seminars** are important for the students to understand the experience from experts from potential industry. It will be more attractive for their future professionalism and job market network with industry. |
| Study space | • Limited study space for research-based students |
| Research sources | • Poor access to scientific literature |
| Quality assessment | • Internal quality assessments are not yet totally implemented. |
| **Opportunities** | |
| Partnerships and Grants | • There are great opportunities to extend more collaboration and partnerships both international and local stakeholders in the field of water and environmental engineering. GIZ, JICA, ADB are the |

| | |
|---|---|
| | potential partnerships for the further collaboration. Opportunities to collaborate with other donor stakeholders such as IRD. |
| Internship and industry linkage | • There should have an active collaborating with companies and public entities, namely through Projects/Internships as team work. This will create new opportunities for students, promoting multidisciplinary and multicultural teamwork. |
| Competency based pathway | • Competency or module-based pathway can be another study pathway that opens to different needs of the market need. |
| Solid waste management | • Solid waste management should be enhanced in the master program.<br>• After a survey, the organizations mentioned in looking for expertise in the following area, e.g., fecal sludge management (on-site waste treatment) and solid waste management (trash disposal, recycling, and reuse)<br>• They emphasized on other desired skills including computational analysis, critical thinking, ingenuity, presentation and writing skills, etc. |
| **Threat** | |
| Tuition fee | • Will we need to raise tuition or fees to support our growth after 2023 after reforming the program? |
| Pandemic impact | • Covid-19 continuity would limit the opportunities for many students |

# Annex G [Perspective-M-ETM-2022-2023]

## CURRICULUM DEVELOPMENT PROPOSAL

**Program Level:** International Master's Degree

**Major:** Energy Technology and Management Engineering (ETM)

### I. Background and rationales

While the Master program had been established initially by mainly focusing on electrical energy system, it has been expanded to be multidisciplinary program accessible to students from 4 departments of ITC (GEE, GIM, GCA, GCI). However, the program objectives still need more evaluation and improvement so that it can provide what the industry and market need. By reflexing on the current market trending, other aspect such as Energy Technology and Energy Management are vital for future energy industries in Cambodia. Thus, the ETM research unit under ITC had decided to extend the former electrical energy master curriculum to Energy, Technology and Management or ETM master. The objective is to modify the program in order to reply to the current and future market.

The proposed new ETM curriculum is created based on the joint efforts of qualified lecturers, researchers and teaching staff from relevant departments such as GEE, GIM, GGG, etc. The team is working on the data analysis from the primary result of the survey that has been implemented recently. Surely, we can finalize the final curriculum within this year and ready for the new academic.

Also, the program is backed by international partners such as ITB in Indonesia (under WB project), La-reunion University, Toulouse INP and Grenoble INP. This cooperation enables student exchange for course and internship at highly qualified establishments.

Another main aspect of the ETM master program is the availability of high-quality laboratories from the relevant departments and from the partner universities.

The first draft of the curriculum for Master ETM has been developed following the meeting, discussion and consultation involving stakeholders which clearly defined the Program Education Objectives (PEOs) as well as Program Learning Outcomes (PLOs).

### II. Proposition to Update current curriculum

#### 1. Description of updated program

Master of ETM is a minimum 54-credit (more than requirement from CQF) multi-disciplinary degree program, intended for students who have completed undergraduate degree in science and engineering, specialized in energy, electrical, mechanical, and other energy-related engineering fields. ETM master program is designed for the need of preparing graduates to solve real-world problems and become expert in the field of energy, energy technology, policy, management and audit. It is also inspired by the need for solutions to tackle the challenges the world will be facing in realizing a sustainable energy system, i.e. environmentally friendly, economically viable, and resilient in the face of natural risks. The master program will also provide necessary skills for future researchers who wish to use their abilities and capabilities to take part in the exciting challenge of solving energy-related issues.

#### 2. Program educational objectives (PEOs)

Graduates of the Master of ETM Engineering will be able to:

PEO-1. Be a leader or influencing engineer in the various fields of Energy Management and Technology for the context of Cambodia as well as region.

PEO-2. Demonstrate an ability to apply advanced engineering methods to the solutions of complex energy-related engineering problems.

PEO-3. Become an entrepreneur equipped with basic technical knowledge, leadership, management and understanding of financial management.

PEO-4. Pursue advance degree in local or international universities.

**3. Program learning objectives (PLOs)**

The ETM master program aims to provide students a set of knowledge and technical skills in engineering that can be applied in a variety of disciplines. Upon successful completion of this major, graduates will:

*Knowledge*

PLO-1. Obtain knowledge of Energy Management

PLO-2. Obtain knowledge to use cutting-edge technology for problem-solving in the field of energy management and technology.

PLO-3. Obtain knowledge to prepare/develop an effective energy planning/regulation/policy in the framework of complex energy-related problems.

*Cognitive skills*

PLO-4. Be able to analyze the problem of energy management and technology for industrial /public sector.

PLO-5. Be able to create the Energy management platform for context of Cambodia.

PLO-6. Be able to predict the energy problem projection and propose solutions.

PLO-7. Be able to invent the tool or system to solve the energy management problem with cutting-edge technology.

*Psychomotor skills*

PLO-8. Use digital technologies and appropriate software competently to enhance study and practice.

*Interpersonal skills and responsibilities*

PLO-9. Be able to demonstrate leadership, autonomy and responsibility in managing resources.

PLO-10. Be able to demonstrate effective collaboration with stakeholders professionally.

PLO-11. Be able to engage self-advancement through continuous learning or professional development.

*Communication, Information technology and numerical skills*

PLO-12. Be able to demonstrate entrepreneurial skills with relevant knowledge and expertise.

PLO-13. Be able to evaluate numerical and graphical data critically using quantitative or qualitative tools in solving problems.

PLO-14. Be able to communicate effectively the knowledge, skills and ideas using appropriate methods to peers, experts and communities.

## 4. Program's Structure and Requirement

### 4.1. Program's Structure

In principle, students need to follow a 2 years course (M1 and M2). For qualified students who are graduated from ITC engineering program, they can follow only 1 year program (M2). The total credit is 54 credits. Students may take no longer than 3 years to obtain the required number of credits for graduation.

The program has 2 options:

- Course and Research Pathway:
  - 33 credits in course work
  - 12 credits in research project.
- Research-Based Pathway:
  - 12 credits of course work
  - 33 credits of research activities.
  - An article publication

Course-Research pathway:

<table>
<tr><th>Semester I (M1)</th><th>Semester II (M1)</th><th>Semester III (M2)</th><th>Semester IV (M2)</th></tr>
<tr><td>Specialized and Core Courses (12 credits)</td><td>Specialized and Core Courses (8 credits)</td><td>Specialized and Core Courses (12 credits)</td><td rowspan="3">Thesis: Research Proposal Defend, Presentation in Seminar or Conference, Report and Defend<br>(12 credits)</td></tr>
<tr><td>Elective course<br>(2 credits)</td><td>Elective course<br>(2 credits)</td><td>Elective course<br>(2 credits)</td></tr>
<tr><td></td><td>Project (3 credits)</td><td></td></tr>
</table>

Master ETM

| No | Code | M1 | Semester I | | | Semester II | | | Nb. Credit | Comment from Maurice Fadel | Correction checklist |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CM | TD | TP | CM | TD | TP | | | |
| 1 | | Energy Sustainability, Regulation, and Audit | 16 | 32 | | | | | 2 | | |
| 2 | | Electrical Energy and Smart-Power System | 16 | | 32 | | | | 2 | | |
| 3 | | Energy Conversion System (Power Electronics II) | | | | 32 | 16 | 16 | 3 | More TD and TP | Done |
| 4 | | Energy Efficiency | 32 | 32 | | | | | 3 | More TD and TP | |
| 5 | | Energy life-cycle and emission analysis | 32 | | | | | | 2 | | |
| 6 | | Engineering Optimization tool | 16 | | 32 | | | | 2 | | |
| 7 | | Energy Research Project 1 (Research Methodology) | | | 32 | | | | 1 | | |
| 8 | | Thermal Energy Management | | | | 32 | 16 | 16 | 3 | More TD and TP | Done |
| 9 | | Thermal Energy Technology | | | | 32 | 16 | 16 | 3 | More TD and TP | Done |
| 10 | | Communication and interpersonal relation | | | | | | 32 | 1 | | |
| 11 | | Energy Research Project 2 | | | | | | 32 | 1 | | |
| 12 | | Advance Control for Renewable Energy Integration | 32 | | 16 | | | | 2 | More TD and TP | Done |
| 13 | | Energy Business Modeling | | | | 16 | 16 | | 2 | | |
| 14 | | Work Life and social psychology | | | | 32 | | | 2 | | |
| | | Subtotal | 144 | 64 | 112 | 144 | 64 | 112 | 29 | | |
| | | Ratio CM/TD/TP | 45.0% | 20.0% | 35.0% | 45.0% | 20.0% | 35.0% | | | |
| | | Total by semester | 320 | | | 320 | | | | | |
| | | Total by year | 640 | | | | | | | | |

| No | | M2 | Semester I | | | Semester II | | | Nb. Credit | Comment from Maurice Fadel | Correction checklist |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CM | TD | TP | CM | TD | TP | | | |
| 1 | | Energy Management and Planning | 32 | 16 | 16 | | | | 3 | | |
| 2 | | Renewable Energy Integration into Power System | 16 | | 16 | | | | 2 | French teachers, in particular from the INPT, may be solicited. | Done |
| 3 | | Long project | | | 32 | | | | 2 | Include project or BE (Bureau d'études) or BEI (Bureau d'Etudes Industriels) | Done |
| 4 | | Project Management | 32 | | | | | | 2 | | |
| 5 | | Techno-entrepreneurship | 32 | | | | | | 2 | | |
| 6 | | Research Proposal | | | 64 | | | | 2 | | |
| 7 | | Final Year Internship | | | | | | | 12 | | |
| | | Subtotal | 112 | 16 | 128 | 0 | 0 | 0 | 25 | | |
| | | Ratio CM/TD/TP | 35.0% | 5.0% | 40.0% | 0.0% | 0.0% | 0.0% | | | |
| | | Total by semester | 256 | | | 0 | | | | | |
| | | Total by year | 256 | | | | | | | | |
| | | | | | | | | Total Credit | 54 | | |

Remark: text in red is a modification according to France Prof.

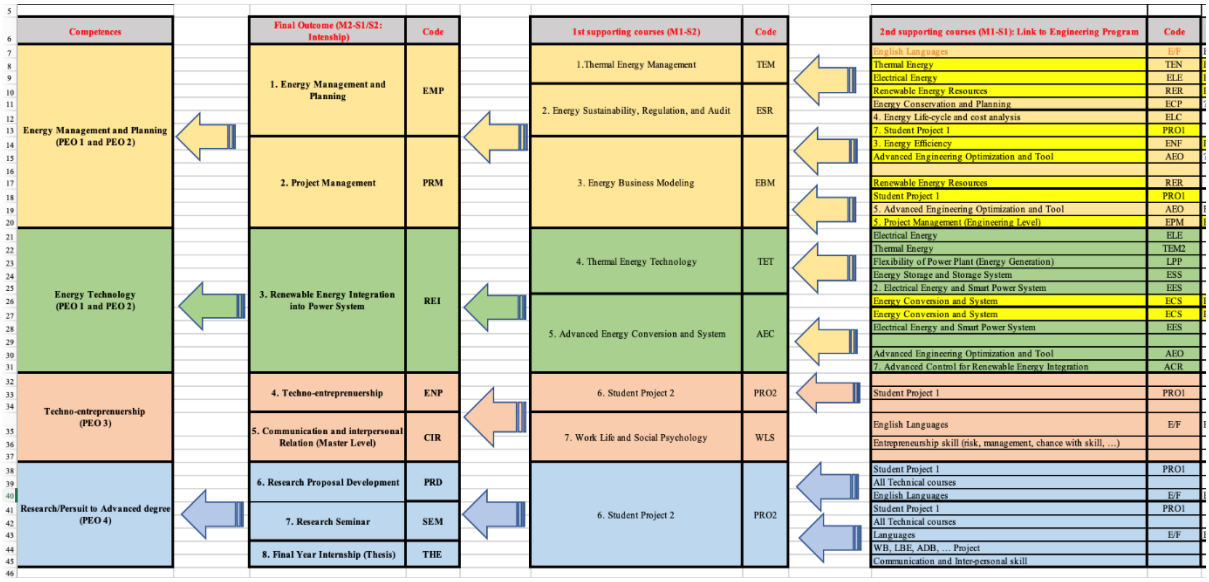
Research-based pathway:

| Semester I (M1) | Semester II (M1) | Semester III (M2) | Semester IV (M2) |
|---|---|---|---|
| Choose courses based on topic: Core Courses, Elective Courses, Specialized Course (6 credits) | Primary research report and defense (9 credits) | Research-oriented courses (4 credits) | Publication in national or international journal (6 credits) |
| Research-oriented courses (2 credits) | Graduate Seminar (1 credits) | Detailed research proposal and defense (2 credits) | Thesis and defense (18 credits) |
| | | Graduate Seminar (2 credits) | |
| | | Presentation in scientific conference (3 credits) | |

## Course list and description

| No | Courses | Descriptions |
|---|---|---|
| 1 | **Energy Efficiency and Audit** | This course will provide the knowledge and skills to conduct energy efficiency audit and provide the customers with solutions to their increasing energy costs. It teaches students to evaluate the energy efficiency, health, and safety of a home and to use diagnostic equipment to identify areas for energy savings. |
| 2 | **Electrical Energy and Smart-Power System** | This course presents the basics of electrical system and smart grids. The smart grid of the future is a complex electrical power system. Its study, design, and management requires the integration of knowledge from various disciplines including sustainability, technology and mathematics. |
| 3 | **Energy Conversion System (Power Electronics II)** | This course provides a basic background in static and electromechanical energy conversion devices; intended for students with interests in the control of electrical and electromechanical systems with applications to electric energy systems. |
| 4 | **Energy life-cycle and emission analysis** | This course will provide basic introduction to LCA and its relation with environmental decision support.LCA is a methodology used in environmentally-conscious manufacturing and supports the analysis of environmental burden accumulated during the product life cycle, with the intention of driving improvement programmes. This course is targeted at individuals who are aspiring to become product engineers, manufacturing engineers, industrial designers, etc., or any technology or engineering-related field. |
| 5 | **Engineering Optimization tool** | This course provides basic introduction to optimization methods for engineering students. Students should have basic computer programming skills using a language such as C, C++, MATLAB, or Python. |
| 6 | **Thermal Energy Management** | This course involves the application of the fundamentals of thermodynamics in internal and external energy gains, heating and cooling, duct and piping design, and overall thermal design specifications and system component design and selection. |
| 7 | **Thermal Energy Technology** | This course will provide basic and conceptual understanding about various thermal energy technologies. |
| 8 | **Communication and interpersonal relation** | This course presents concepts essential to understanding the complex dynamics that go into constructing and maintaining our relationships, offering a multitude of research-based insights that will help students better understand themselves, their relationship partners, and relationship dynamics. |
| 9 | **Advance Control for Renewable Energy Integration** | This course will enable students to develop an understanding of sustainability issues and renewable energy systems, to examine the role of microprocessor control in industry, and to design and build a control system for power conversion using static converters. |
| 10 | **Energy Business Modeling** | The course is designed to help students who wish to perform Energy Modelling of Building. It gives hand on practice to create the building, to apply energy efficiency measure and to predict the building performance before it is made. It is a consolidated course to understand Energy Modelling from scratch and to be expert in the same. All modules have explanation videos about What is energy modelling followed by details of eQuest software. |
| 11 | **Work Life and social psychology** | The pressure of an increasingly demanding work culture is one of the biggest challenges to society's mental health. This course offers some answers based on the latest research from social psychology. This course provides a brief introduction to classic and contemporary social psychology, covering topics such as decision making, persuasion, group behavior, personal attraction, and factors that promote health and well-being. |
| 12 | **Energy Management and Planning** | This course presents about the basic of energy management systems standard and how it can be applied to various cases. Students will also learn about the possible relevant financial benefits related to government energy and tax/funding policy. |
| 13 | **Renewable Energy Integration into Power System** | Renewable Energy Integration is essential in modern day electrical grid systems. This course focuses on how to incorporate renewable energy, distributed generation, energy storage, thermally activated technologies, and demand response into the electric distribution and transmission system. The solar power and wind turbines approaches are being used to conduct integration development and demonstrations to address technical, economic, regulatory, and institutional barriers for using renewable and distributed systems. |
| 14 | **Techno-entrepreneurship** | The courset provides students with technological knowledge about entrepreneurship as well as the skills to turn such knowledge into practice. The teaching and learning activities include case study and field work with the aim to inculcate entrepreneurship values and entrepreneurship acculturation with a view to successfully launch and subsequently manage their enterprises. Students will be exposed to the support systems available or government agencies in starting new ventures, including the tactics commonly employed by entrepreneurs starting a business. |

## Courses and Competencies Mapping




## 4.2. Program's Requirements

2.1. Admission Requirement

Students can register for the program if they can fulfill the required conditions. Students who are graduated with a bachelor degree in the field of electrical, mechanical engineering, and some other related engineering fields are accepted for this program. However, graduated students from ITC can directly register for M2 program after evaluation from technical committee (passing certain qualification). Graduate students from other institution have to start and to register for M1 program (they need 2 years to complete program) after evaluation from technical committee.

2.2. Graduate Requirement

In order to graduate, students are required to obtain a minimum number of credits and fulfill certain condition depending on the pathways or other conditions as defined by graduate school.

- Course and Research Pathway:
  - 33 credits in course work
  - 12 credits in research project.
- Research-Based Pathway:
  - 12 credits of course work
  - 33 credits of research activities.
  - An article publication

## 4.3. Methodology

The students have to follow a 2 years course to obtain the required number credits. For M1, students follow mostly course work. In M2, they follow additional courses in the first Semester. In the second semester, they need to do internship with private sector or industry or in the research laboratories.

Students learned through course-based, project-based research activities and internship at industries. For research-based pathway, students can do their research through projects linked with research labs at ITC. For course-research pathway, students can apply for joint project with industries in order to experience real practical problem solving.

## III. Resources

### 1. Human Resources and Planning

Backing this program is a curriculum development committee that has been formed to help in developing the needed improved program curriculum. Qualified lecturers and teaching staffs are already available from relevant departments such as GEE, GIM, GCI, GCA and GGG.

Nevertheless, there are few newly proposed courses which will require additional staff upgrading and new recruiting.

### 2. Facilities and Laboratories

All facilities and laboratories that are ready for this ETM master program includes:

- Thermal lab: coordinated by Dr. VONGCHANH Kinnaleth.
- Power System lab: coordinated by Dr. VAI Vannak.
- Renewable energy lab: coordinated by Dr. VAI Vannak.
- Control system and automation lab: managed by Dr. KIM Bunthern
- Biomass lab.
- Petroleum lab.
- Environmental Microbiology lab.

### 3. Planning

Under the Higher Education Improvement Project (HEIP), a certain number of staffs are expected to follow higher degree program for staff upgrading. For instance, a PhD degree with partner university under joint project is granted to Mr. CHHENG Monyvathna under the partnership program with ITB. with the research grants, more laboratories will be set-up and upgraded. A new Fab-Lab in new building (under ADB grant) is also established to support the program.

## IV. Partnership and Supports

### 1. Partnership

The ETM master program have engaged and cooperated with a number of international institutions and universities. These include ITB (Indonesia), Toulouse INP, Grenoble INP, La-reunion University, and ECAM LaSalle. With the partnership program under HEIP project, ITB are cooperating with ETM program in developing its curriculum, proposing joint research activities, upgrading staffs and training ETM staffs.

For industry, one partner of the master ETM is the French Company Sirea. Sirea is implementing a training factory and a design office in ITC for capacity building in renewable energy electrical energy systems. Under the ETM research unit, cooperation with Energy Consultant company such as Sevea has already been established.

The ETM program is also seeking to create more connection with more institutions including EDC, and the Ministry of Energy and Mines. It will also develop specific partnerships with companies in Cambodia for seminars and technical visits with different teaching units and collaboration within specific projects and master thesis work.

### 2. Development Projects

Currently, the ETM program is being developed and improve with the partnership program under HEIP project with ITB, a highly rated university in Indonesia. ETM is cooperating with ITB to improve its curriculum, propose joint research activities, upgrade staff's qualification and train ETM staffs.

**Annex H : Perspective-M-AIE-2022-2023]**

**CURRICULUM UPDATE PROPOSAL**

**Program Level:** Master's Degree

**Major:** Agro-industrial Engineering (International program)

## I. Background and rationales

In 2017, ITC launched the master program of Agro-industrial and Environment which was under department of food science and technology (now become Faculty of Chemical and Food Engineering). Since then, about 30 students have enrolled to pursue their master's degree with this program and now some of them are working for their research thesis. Recently, the graduate program in ITC is modified to comply with the five-research thematic (Research unit). Among those five thematic, Food Technology and Nutrition unit is one of the main research field in ITC. As the previous program was too broad which it was combined two research units together (WAE and FTN), so to avoid the duplication of the field, graduate school has modified the previous master program which is called Master of Agro-Industrial and Environment to the specific name as Agro-industrial Engineering (M-AIE) in 2019 by eliminated the environment part while ITC has also established Master of Water and Environment in 2019 as well. Even though, graduate school has narrowed down and specialized the M-AIE program, but this program is still not inclusive enough and well structure. We have done the SWOT analysis to find the strength and weakness of the program and propose to modified this program base on the analysis.

### 1. **SWOT analysis of the current program**

| Master of Agro-industrial Engineering of Institute of Technology of Cambodia | |
|---|---|
| **SWOT ANALYSIS** | |
| **STRENGTH** | **WEAKNESS** |
| Have strong collaborations with universities both local, region and in the world | The old program is not inclusive enough and well structured |
| Have research structure to support research students | The old program's curriculum is more relavent to environment courses almost 40% which isnot fit with its own shmeme |
| Most of the courses can be adapted to and conducted in English | The curriculm of course base and research base are not well structure and not yet standardize |
| Have adequate ICT facilities to support teaching and learning | The old program isnot atractive enough to get attention from students inside and outside ITC |
| More than 70% of faculty/staff have terminal degrees. | The programs lack addressing the market needs as more than 50% of graduates earn less than expected standard income |
| Have strong support from bachelor program (faculty of chemical and food engineering) | Lack of competitive scholarships to attract outstanding students |
| | Lack of supports and colaboration from industrial/SME in research activities for graduate students |
| | The only local program and certificate is not so favorable and atrractive to students while they prefer more international program and certificate |
| | Teaching capacity is yet to be ameliorated to meet standard requirement |
| | Lack of research fund/grant to support student research activities |
| | Currently used technology and equipements are far behind the industrial needs |
| | Poor connections with local industries and SMEs |
| | |
| **OPPORTUNITY** | **THREAT** |
| Growing demands in STEM skills in Agro-food industry | Outstanding students seek for scholarships abroad |
| Growing demands in international programs regarding food science | Decreasing number of students enrolling (no willing to pay by themselve) |
| Growing new startup and incubation center regarding agri-food chain development | Cambodia readiness in preparing new skills to challenge international market is slow |
| Agri-food product development /Agro-insudtry is one of the main target in SDG of Camboian government to improve and increase GDP | Society undervalues local degree |
| Growing demands in technological innovatoin in food product development skill | Sttaffs of SMEs/Industries/Mistries donnot get full support to pursure and extended their knowledges at university from their firms. |
| Growing demand in skillset for food industrial-revolution market | Industries are isolate from university in research colaboration and innovation |
| Increase the demand of standardize on agri-food products for exportation both local and international | Very few SMEs have willing to colaborate with University while the rest ignore |
| | |
| **Needs for improvement to address the weakness** | **Priorty** |
| Improving the old curriculum to be standandized and internation acceptance | Develop the new curriculum that answer to the competency of job market needs |
| Offering dual degree (local+internation) program to atract more students | Colaboration with famous rigional university in the field of Ago-industry to establish the dual program |
| Need sustainable fund/grant for research activities for graduate students | To seek for fund/grant for research activities, from national/international partners including universities, public/private institutions, NGOs, industries, and other possible donors. |
| Increase number of staff to be equipemnt with solid one skill per person | Gather sufficient human resources |
| Upgrade staffs' capacity in terms of skills set and new technology adoption | |
| Improving the connection with industries and SMEs | |
| Need a better straitergy or detail planing to attract SMEs/Industiries involving in staff buiding capacity through gratuate research | |

## 1. Analysis on the demand of skills and competencies

The survey for skill needed and competency is conducting with SMEs in Cambodia for primary data analysis and collecting secondary data from Cambodia Industrial Development Policy 2015-2025, Cambodian's science technology innovation roadmap 2030, and other government related policies, FoodSTEM, and Foodi programs to support some integrated courses in the revised curriculum.

## II. Proposition to update current curriculum

### 1. Description of updated program

The Master of Agro-industrial Engineering (M-AIE) is a 54- credit multidisciplinary degree program, intended for students who have completed undergraduate degree in science and engineering, specialized in food science and technology, chemical engineering, and agriculture. M-AIE is modified its program to be more internationally and competency by develop its curriculum up to date and standardized base on the requirement of the skill needs from current job market competency in the field of agro-food industry by locally, regionally and globally. This modification program also established a double degree program with Kasetsart University of Thailand which the modification will be 100% approve and parallels with Kasetsart university's program. The program has two pathways, research base and course research base program. The course requirement is categorized into Core Course, Elective Course, Specialized Course and Research Oriented Course. The program is designed to train the master students learn not only technical skills but also management capacities with critical thinking following the requirement of educational quality framework of Cambodia for higher education in science and engineering. The students will learn some courses of soft skills including entrepreneurship, and project management. To maintain our good educational quality and professionalization, the students will be required to conduct a professional internship at public or private institution which is working on their related field. On the other hand, instead of internship at public or private institution, the student can choose to do research work with their adviser at ITC/Kasetsart (for double degree) if needed. To graduate, for course research base program, the students are required to pass research proposal and then write the thesis and pass the thesis defense which will be evaluated by thesis evaluation committee and get approval from all juries. The topic of thesis must be composed based on the works for professional internship or research at ITC and it needs to be specific and agreed by adviser. Other course requirement needs to be completed for graduation. For research base program, the students are required to complete some requirement credit from course works, pass primary research report defense, pass the detailed research proposal defense, participate by presenting research work in scientific conference, publishing their research work in national or international journal, and then write the thesis and pass the thesis defense. For dual degree program, the student has to fulfill the requirement of graduate requirement of Kasetsart university and ITC graduate requirement.

### 2. Program educational objectives (PEOs)

The M-AIE program aims to equip the students with knowledge and skills in the agro-industrial field to promote their creativity, capability and problem-solving skills through advanced knowledge and various experiences including agro-product processing design and modeling, research methods in the agro-industry, product innovation and entrepreneurship. The two pathways. (1) Course-research, and (2) Research based pathway, provide the options for any individual in the agro-industrial related area to advance their knowledge and skills either in research and development, or seeking high-skilled employment, or starting their own business in the agro-industry.

After successfully graduating in Master Program of Agro-industrial Engineering at ITC, the graduates shall be able to:

**Program educational objectives (PEOs)**

**PEO-1.** Be a professional engineer in the multidisciplinary fields of Agro-product processing and management.

**PEO-2.** Gain the intellectual ability and advance technology to engage in critical thinking, problem solving, and research and innovation in the Agro-industry.

**PEO-3.** Become an entrepreneur equipped with soft skills, management, and cost analysis in the field of Agro-industry.

**PEO-4.** Engage in independent and life-long learning for professional, ethical, and social skills.

**Knowledge**

**PLO-1.** Deeply understand all relevant problems through theoretically and practically regarding Agro-product processing.

**PLO-2.** Use the problem solving, critical and innovative skills to develop and initiate ideas regarding Agro-product processing.

**Cognitive skills**

**PLO-3.** Critically analyze the complex problems related to agro-product processing and be able to interpret or demonstrate the results from the data in scientific way and in simplified way to the public.

**PLO-4.** Develop process toward solutions and prototypes to tackle the problems in agro-industry by using advanced technical skills and knowledge.

**PLO-5.** Evaluate any possible risk in the agro-product processing to provide safety solutions in the factory or industry in practices.

**PLO-6.** Predict the work process by using simulation analysis and be able to improve and develop the process in agro-product processing.

**Psychomotor skills**

**PLO-7.** Use analytical instruments for evaluating agro-product qualities and agro-product developments.

**Interpersonal skills and responsibilities**

**PLO-8.** Show desire to learn through individual and group project-based and research activities, project implementation, supervision guiding by supervisor/mentor, and work independently as a responsible entrepreneur/scientist.

**PLO-9.** Demonstrate strong leadership and negotiation skills.

**PLO-10.** Collaborate effectively, entrepreneurially, professionally, responsibly, and integrally with team members and others.

**Communication, Information technology and numerical skills**

**PLO-11.** Effectively use the ICT software, statistical and numerical methods to generate and analyze data.

**PLO-12.** Demonstrate effective presentation skills on experimental results and conclusions using scientific and simplified methods.

| PLO\PEO | PEO1 | PEO2 | PEO3 | PEO4 |
|---|---|---|---|---|
| PLO1 | **F** | **F** | | |
| PLO2 | **F** | **F** | | |
| PLO3 | **F** | **F** | | |
| PLO4 | **F** | **F** | | |
| PLO5 | **F** | **F** | | |
| PLO6 | **F** | **F** | | |
| PLO7 | **F** | **F** | | |
| PLO8 | | | | **F** |
| PLO9 | | | **F** | |
| PLO10 | | | **F** | **P** |
| PLO11 | **P** | **P** | | |
| PLO12 | **P** | **P** | | |

-P: Partially fulfill

-M: Moderately fulfill

-F: Fully fulfill

**4. Job opportunities**

After graduation from Master of Engineering of Agro-industrial Engineering, students can have job opportunities as below:

- Private sector such as laboratory manager; production manager, technical consultant in agro-product processing, or entrepreneur in an agro-processing company

- Governmental institutions such Ministry of Education, Youths and Sports, Ministry of Industry, Science, Technology and Innovation, Ministry of Commerce – Department of Cam Control, Ministry of Health, Ministry of Agriculture, Forestry and Fisheries, Ministry of Environment,

- Non-governmental organizations working the agro-industry related fields.

- Pursuing research or Ph.D. programs in the agro-industry related fields.

## 5. Program's Structure and Requirement

### 5.1. Program's Structure

Based on the educational qualification framework of Cambodia, for master degree program of engineering, the students are required to pass 45 to 57 credits. The credit requirement for the program needs to be complied with the qualification framework of ministry of education youth and sport. The structure of the program consists of core course, elective course, specialized course and research oriented course. Number of credits requirement in each course categories is different between Plan A (Course-Research Based) and Plan B (Research-Based). However, the total minimum requirement for the number of credit is set to be 54 credits which is the same for both Plan A and Plan B.

This master's degree will accept the applicant from two categories which are ITC students and non-ITC students. ITC students referring to those who graduated Bachelor of Engineering degree from ITC with Faculty of Chemical and Food Engineering or Faculty of Geo-resources and Geotechnical Engineering. Non-ITC student refers to those who graduated bachelor's degree from other university/institute aside from ITC but their background must be in the field of science and engineering related to food science and technology, chemical engineering, agriculture engineering, and chemistry and biological Science and engineering.

In order to strengthen the research activity particular in the research unit Food Technology and Nutrition and encourage the student to involve with research as young researcher initiative, the program needs to divide into Plan A and Plan B. Plan A is referred to "Course-Research Based pathway" while plan B is referred to "Research-Based pathway". The requirement of academic plans is described as the following:

**A. Plan A (Course-Research Based Pathway)**

❖

- The total credit requirement is 54 credits. It includes 42 credits of coursework (minimum requirement based on qualification framework is 33 credits) and 12 credits of research thesis.
- Professional Internship at a professional institution or at ITC with advisor.
- 1 year for ITC student with his/her minimum grade-point average (GPA) greater than 2.5 (C+) on a 4.0 scale, and 2 years for non-ITC students or ITC students with his/her GPA between 2.5 and 2.0.

- For double degree with Kasetsart University, both ITC and non-ITC students have to enroll at least 2 years in which 1 year in Cambodia (for course-research work) and 1 year at Kasetsart university (only research work). The eligibility to enroll in the program unless her/his minimum grade-point average (GPA) greater than 3.0 on a 4.0 scale.
- Summary of credits
    - Core courses 8 credits
    - Specialized courses 16 credits
    - Elective courses 8 credits
    - Research oriented courses 10 credits
    - Research activities
        - Presentation in scientific conference Required (No credits)
        - Research thesis 12 credits

**B. Plan B (Research-Based Pathway)**

- The total credits requirement is 54 credits. It includes 12 credits of course work (minimum requirement based on qualification framework is 12 credits) and 42 credits for research.
- 1 year for ITC student with his/her minimum grade-point average (GPA) greater than 2.5 (C+) on a 4.0 scale and 2 years for Non-ITC students and ITC students with his/her GPA less than 2.5
- Full-time research student at ITC/ KU (for double degree)
- For double degree with Kasetsart University, both ITC and non-ITC students have to enroll at least 2 years which 1 year in Cambodia and 1 year at Kasetsart university. The eligibility to enroll in the program, unless her/his minimum grade-point average (GPA) greater than1 3.0 on a 4.0 scale.
- Summary of credits
    - Specialized courses 6 credits
    - Elective courses 2 credits
    - Research oriented courses 4 credits
    - Research activities
        - Primary research report and defense 9 credits
        - Detailed research proposal defense 3 credits
        - Graduate seminars 3 credits
        - Presentation in scientific conference 3 credits

| | |
|---|---|
| Publication | 6 credits |
| Research thesis | 18 credits |

### 5.2. Program's Requirements

Master of Agro-industrial Engineering is a full-time graduate program developed for all nationalities from all over the world. To be eligible for the program, an applicant must hold a BSc. /BEng Degree or equivalent and also meet the requirements of the Graduate School. The applicants can be ITC student or non-ITC student which details below:

**ITC student**

The students who graduated from ITC with the faculties listed below will start at M2 if her/his GPA greater than 2.5, but will start from M1 if his/her GPA less than 2.5.

- Faculty of Chemical and Food Engineering

**Non-ITC student**

An applicant must hold a bachelor's degree or equivalent in the field of science and engineering such as field of science and engineering related to food science and technology, chemical engineering, agriculture engineering, and chemistry and biological Science and engineering. However, the applicant will be assessed case by case. The additional courses will be required for the applicant who found to be lack of basic course of this engineering field.

### 5.3. List of courses

**Table 1.** List of courses in each course category

| Core Course | Elective Course | Specialized Course | Research-oriented Course |
|---|---|---|---|
| 1. Project 1 on Agro-product processing and simulation<br>2. Agro-product processing and factory design and simulation and modeling in agro-process<br>3. Bio-refinery Process<br>4. Industrial Symbiosis<br>5. Postharvest management of agro-product | (Course from I4 and I5 of Bachelor's degree of GCA faculty) | 1. Project 2 on Product Innovation and Entrepreneurship<br>2. Product Innovation and Entrepreneurship<br>3. Agro-products quality and safety, and risk management<br>4. Bio-industry<br>5. Cold chain logistic and management<br>6. Agro-products supply chain<br>7. Agro-products laws and certification system<br>8. Agricultural-waste processing and management | 1. Research Methodology<br>2. Seminar on agro-industrial Engineering I<br>3. Seminar on agro-industrial Engineering II<br>4. Project 3 in Agro-industrial Engineering<br>5. Applied statistic in agro-processing |

**5.4. Course for Agro-industrial Engineering (AIE) for Plan A**

- ***ITC Student***

**Table 2.** Course requirement of Course-Research based for Agro-Industrial Engineering for ITC Student.

| | | ***AIE for ITC Student course-research base*** | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Sem.** | **Course Code** | **Type of Course** | **Note** | **Course** | **Credit** |
| ***M1*** | ***S1*** | | Courses taken under faculty:<br>• GCA | | | 17 |
| | ***S2*** | | Research Oriented Course | Old | Internship as requirement for Bachelor's degree of Engineering from GCA faculty | 9 |
| | | | | | **Total (M1)** | **26** |
| **M2** | **S1** | | Core Course | New | Postharvest management of agro-product | 2 |
| | | | | New | Industrial Symbiosis | 2 |
| | | | Elective Course | Old | Course to be selected from Elective Course | **2** |
| | | | Specialized Course | New | Product Innovation and Entrepreneurship | 2 |
| | | | | New | Project 2 on Product Innovation and Entrepreneurship | 2 |
| | | | | New | Agricultural-waste processing and management | 2 |
| | | | Research Oriented Course | Old | Research Methodology | 2 |
| | | | | Old | Applied statistic in agro-processing | 2 |
| | | | | | **Total (M2-S1)** | **16** |
| | ***S2*** | | Research/Internship | Old | Professional Internship, Master Thesis and Defense | **12** |
| | | | | | **Total (M2)** | **28** |
| | | | | | **Grand Total** | **54** |

| *Elective Course for ITC Student* | | | | | |
|---|---|---|---|---|---|
| **No.** | **Code** | **Course** | **Credit** | **Sem.** | **Lecturer** |
| 1 | GCA-I5 | Entrepreneurship | 2 | I | Mr. LUON Vireak |
| 2 | GCA-I5 | Computing software for chemical reaction | 2 | I | Mr. KONG Sela |
| 3 | GCA-I5 | Industrial Chemical process | 2 | I | Mr. KONG Sela |
| 4 | GCA-I5 | Chemical Plant Safety | 2 | I | Ms. SIENG Sreyvich |
| 5 | GCA-I5 | Project Management | 2 | I | Dr. YOEUN Sereyvath |
| 6 | GCA-I5 | Automation and regulation | 2 | I | Dr. KIM Bunthern |
| 7 | GCA-I5 | Seminar | 2 | I | Dr. SIEV Sokly |
| 8 | GCA-I5 | Food Processing II | 2 | I | Ms. HENG Soukim/ Ms. MOM Vattana |
| 9 | GCA-I5 | Product Development | 2 | I | Dr. MITH Hasika |
| 10 | GCA-I5 | Agro-Food industrial Management | 2 | I | Mr. LUN Vireak |
| 11 | GCA-I5 | Sensory Evaluation | 2 | I | Dr. HOR Sivmey |
| 12 | GCA-I5 | Quality Assurance | 2 | I | Mr. YIT Soukea |
| 13 | GCA-I4 | Materials Science II | 2 | II | Dr. Ms. AUN Srean |

- ***Non-ITC Student***

**Table 3.** Course requirement of Course-research base for Agro-Industrial Engineering for Non-ITC Student

| *AIE for Non-ITC Student Course-research base* | | | | | |
|---|---|---|---|---|---|
| **Year** | **Sem.** | **Type of Course** | **Code** | **Course** | **Credit** |
| ***M1*** | ***S1*** | Core Course | New | Agro-product processing and simulation | 2 |
| | | | New | Bio-refinery Processing | 2 |
| | | | New | Project 1 on Agro-product processing and simulation | 2 |
| | | Elective Course | Old | Course to be selected from Elective Course | 2 |
| | | Research Oriented Course | Old | Research Methodology | 2 |
| | | | Old | Seminar on Agro-industrial Engineering I | 2 |
| | | | New | Project 3 in Agro-industrial Engineering | 2 |
| | | | | ***Total (M1-S1)*** | ***14*** |

| | | | | | |
|---|---|---|---|---|---|
| | **S2** | Specialized Course | New | Agro-product quality and safety, and risk management | 2 |
| | | | New | Bio-industry | 2 |
| | | | New | Agro-products supply chain | 2 |
| | | | New | Agro-products laws and certification system | 2 |
| | | | New | Cold chain logistic and management | 2 |
| | | Elective Course | | Course to be selected from Elective Course | 2 |
| | | | | ***Total (M1-S2)*** | ***12*** |
| | | | | **Total (M1)** | **26** |
| **M2** | **S1** | Core Course | New | Industrial symbiosis | 2 |
| | | Elective Course | Old | Course to be selected from Elective Course | 4 |
| | | Specialized Course | New | Product Innovation and Entrepreneurship | 2 |
| | | | New | Project 2 on Product Innovation and Entrepreneurship | 2 |
| | | | New | Agricultural-waste processing and management | 2 |
| | | Research Oriented Course | Old | Seminar on agro-industrial Engineering II | 2 |
| | | | Old | Applied statistics in agro-processing | 2 |
| | | | | **Total (M2-S1)** | **16** |
| | ***S2*** | Research/Internship | | Professional Internship, Master Thesis and Defense | **12** |
| | | | | **Total (M2)** | **28** |
| | | | | **Grand Total** | **54** |

| ***Elective Course for AIE for non- ITC Student*** | | | | | |
|---|---|---|---|---|---|
| **No.** | **Code** | **Course** | **Credit** | **Sem.** | **Lecturer** |
| 1 | GCA-I5 | Entrepreneurship | 2 | I | Mr. LUON Vireak |
| 2 | GCA-I5 | Computing software for chemical reaction | 2 | I | Mr. KONG Sela |
| 3 | GCA-I5 | Industrial Chemical process | 2 | I | Mr. KONG Sela |
| 4 | GCA-I5 | Chemical Plant Safety | 2 | I | Ms. SIENG Sreyvich |
| 5 | GCA-I5 | Project Management | 2 | I | Dr. YOEUN Sereyvath |
| 6 | GCA-I5 | Automation and regulation | 2 | I | Dr. KIM Bunthern |
| 7 | GCA-I5 | Seminar | 2 | I | Dr. SIEV Sokly |

| | | | | | |
|---|---|---|---|---|---|
| 8 | GCA-I5 | Food Processing II | 2 | I | Ms. HENG Soukim/ Ms. MOM Vattana |
| 9 | GCA-I5 | Product Development | 2 | I | Dr. MITH Hasika |
| 10 | GCA-I5 | Agro-Food industrial Management | 2 | I | Mr. LUN Vireak |
| 11 | GCA-I5 | Sensory Evaluation | 2 | I | Dr. HOR Sivmey |
| 12 | GCA-I5 | Quality Assurance | 2 | I | Mr. YIT Soukea |
| 13 | GCA-I4 | Materials Science II | 2 | II | Dr. Ms. AUN Srean |

### 7.2 5.5. Course for Agro-industrial Engineering (AIE) Plan B (Research Based)

**Table 4.** Course requirement of Plan B for Agro-Industrial Engineering for ITC Student and Non-ITC Student.

| ***AIE for ITC student and Non-ITC Student Plan B*** | | | | | |
|---|---|---|---|---|---|
| **Year** | **Sem.** | **Type of Course** | **Code** | **Course** | **Credit** |
| | **S1** | Elective Course | | Course to be selected from Elective Course | 2 |
| | | Specialized Course | New | Product Innovation and Entrepreneurship | 2 |
| | | | New | Agricultural-waste processing and management | 2 |
| | | | New | Project 2 on Product Innovation and Entrepreneurship | 2 |
| | | Research Oriented Course | Old | Research Methodology | 2 |
| | | | Old | Seminar on Agro-industrial Engineering I | 1 |
| | | | Old | Applied statistics in agro-processing | 2 |
| | | | | ***Total (M1-S1)*** | ***13*** |
| | **S2** | Research | Old | Primary research proposal and defense | 9 |
| | | | | ***Total (M1-S2)*** | 9 |
| | | | | **Total (M1)** | **22** |
| | | Research | Old | Detailed research proposal and defense | 3 |
| **M2** | **S1** | Research | Old | Presentation in a scientific conference | 3 |
| | | Research | Old | Scientific publication | 6 |
| | | Research | Old | Graduate seminar II and III (Seminar on agro-industrial Engineering II) | 2 |
| | ***S2*** | Research | Old | Master Thesis and Defense | **18** |
| | | | | **Total (M2)** | **32** |
| | | | | **Grand Total** | **54** |

| *Elective Course for non-ITC and ITC Student* | | | | | |
|---|---|---|---|---|---|
| **No.** | **Code** | **Course** | **Credit** | **Sem.** | **Lecturer** |
| 1 | GCA-I5 | Entrepreneurship | 2 | I | Mr. LUON Vireak |
| 2 | GCA-I5 | Computing software for chemical reaction | 2 | I | Mr. KONG Sela |
| 3 | GCA-I5 | Industrial Chemical process | 2 | I | Mr. KONG Sela |
| 4 | GCA-I5 | Chemical Plant Safety | 2 | I | Ms. SIENG Sreyvich |
| 5 | GCA-I5 | Project Management | 2 | I | Dr. YOEUN Sereyvath |
| 6 | GCA-I5 | Automation and regulation | 2 | I | Dr. KIM Bunthern |
| 7 | GCA-I5 | Seminar | 2 | I | Dr. SIEV Sokly |
| 8 | GCA-I5 | Food Processing II | 2 | I | Ms. HENG Soukim/ Ms. MOM Vattana |
| 9 | GCA-I5 | Product Development | 2 | I | Dr. MITH Hasika |
| 10 | GCA-I5 | Agro-Food industrial Management | 2 | I | Mr. LUN Vireak |
| 11 | GCA-I5 | Sensory Evaluation | 2 | I | Dr. HOR Sivmey |
| 12 | GCA-I5 | Quality Assurance | 2 | I | Mr. YIT Soukea |
| 13 | GCA-I4 | Materials Science II | 2 | II | Dr. Ms. AUN Srean |

**5.6 Course Description and Lecturers**

**Table 5**. List of courses with descriptions and responsible lecturers

| No. | Note | Course Code | Course | Credit | Description | Lecturers |
|---|---|---|---|---|---|---|
| 1 | New | | Agro-processing design and simulation | 2 | This course is the combination of principles of process design and simulation of that process. The agro-processing design section focuses on the design principles of design agro-industrial systems/components/processes to transform agricultural raw material into the products.<br>With the conceptual design of the processes, simulation and modeling section aims to instruct students to learn how to simulate their conceptual design processes before scaling them up into pilot scale or industrial scale. A path of simulation is designed for students to get fundamental knowledge for problem-solving skill. In this course students will be able to use varieties of numerical method and algorithm to solve the problem effectively. Student will be able to use program language by converting algorithm data. | Dr. EK Pichmony and Dr. TY Boreborey |
| 2 | New | | Project 1 on Agro-processing and simulation | 2 | This project-based course is a complimentary course to the agro-processing design and simulation. In this course, students will work as a team (2-3 members) to apply their knowledge in agro-processing design and simulation in a mini-project of their choice. Instructors will supervise and evaluate their project. | Dr. EK Pichmony and Dr. TY Boreborey |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | New | | Post-harvest management of agro-products | 2 | This course introduce student in a holistic view of the systematic handling of agricultural products/commodities after harvesting. Case studies of different commodities will the focal points to instruct students specific technical aspects (biochemistry of a specific agricultural commodity and operations in handling their post-harvesting). The postharvest chain involves a series of operations starting immediately after taking a product from the field to its consumption. Agricultural commodities – fruits and vegetables, cassava, rice and cereal grains, fishes, wood, raw rubber etc… | Dr. HOR Sivmey and Dr. MORM Elen |
| 4 | New | | Agro-product supply chain | 2 | This course aims to provide the principle of agricultural supply chain which typically have three main steps: (1) from framers to intermediate warehouse, (2) from intermediate to processing plants, and (3) from processing plants to consumers. The management systems and decision makings throughout the supply chain to ensure the efficient flow from raw materials to products in consumers' household will be introduce in the course. | Dr. PHOUNG Hengsim and Dr. HOR Sivmey |
| 5 | New | | Product innovation and Entrepreneurship | 2 | This course is designed to combine the product development and innovation process with the business model in mind. The course mainly focuses into two sections – (1) new product development process from ideation into launching the products and (2) a business model creation process to launch | Dr. KHEOUN Kimleang and Dr. HOUNG Peany |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | and commercialize the new products with entrepreneurial spirit. Case studies of agro-products will be presented in the courses. | |
| 6 | New | | Project 2 in production innovation and entrepreneurship | 2 | This project-based course is a complimentary course to product innovation and entrepreneurship. In this course, students will work as a team (2-3 members) to apply their knowledge in product innovation and entrepreneurship in a mini project of their choice. Instructors will supervise and evaluate their project. Three parts have to be included in their project – (1) new product ( applying new product development process), (2) a business model of that new product (3) work flow of the team. | Dr. HOUNG Peany and Dr. KHEOUN Kimleang |
| **7** | New | | Agro-products quality, safety, and risk management | 2 | This course focuses on the holistic view and technical aspects to manage food quality, analyze risks to ensure food safety and how to tackle with risks in the agro-food industry. | Dr. IN Sokneang and Dr. PENG Chanthol |
| 8 | New | | Bio-industry | 2 | General knowledge of Bio-Industry. Logistic and management. Quality control. Innovation creativity. Case study of Bio- Industry business. Trends in Bio-Industry. | Dr. Tan Reasmey and Dr. SOUNG Malyna |
| 9 | New | | Cold chain logistic and management | 2 | 7.3 Cold chain is an important aspect in postharvest handing and product processing, especially fresh produces, meat and seafoods. The whole aspect of cold chain logistic and management will be introduced to student by case studies. | Dr. SROY Sengly and Mr. Kong Sela |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | New | | Bio-refinery Process | 2 | 7.4 This course focus on converts biomass to energy and other beneficial byproducts (such as chemicals). The course is stated on sustainable processing of biomass into a spectrum of bio-based products (food, feed, chemicals, materials) and bioenergy (biofuels, power and/or heat). The course is provided multiple chemicals by fractioning an initial raw material (biomass) into multiple intermediates (carbohydrates, proteins, triglycerides) that can be further converted into value-added products. | Dr. MITH Hasika and Ms. Heng Soukim |
| 11 | New | | Agro-product laws and certification system | 2 | 7.5 This course introduces different laws and regulations in Cambodian concerning agro-products. In addition, certification systems that are needed to integrate the products in to high-end retails or export to a specific region/country will be introduce to students. | Dr. PHAT Chanvorleak and Ms. Yin Molika |
| 12 | New | | Agricultural waste processing and management | 2 | 7.6 This course focuses on the handling and managing the agricultural waste as well as value adding of agricultural waste into value-added products. Lab practices will be included. | Dr. YOEUN Sereyvath and Ms. Sieng Sreyvich |
| 13 | Old | | Research Methodology | 2 | Research methodology is designed for students to be able to understand about how to do research, the difference between research and experiment, step to conducting a research, types of research method. Moreover, students can understand how to use and | Dr. PENG Chanthol and a visiting professor (IRD) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | analyze the previous research results, methods to create new idea, how to evaluate the research work, how to evaluate the research work, how to write a paper or an article, and understand about the copyright. | |
| 14 | Old | | Seminar on agro-industrial Engineering I | 1 | The seminar arms to make the student to understand more on the thematic of Agro-industrial engineering and make the student to feel more curious for research on the related topics. The seminar will:<br>- Discussion of special topics related to environment and water resources engineering; analysis of data and conclusion; presentation of reports<br>7.7 Invited speakers from government industry and various professionals will present these seminars. Every student is expected to present a paper on his own research interest. | Dr. TY Boreborey and Advisors |
| 15 | New | | Seminar on agro-industrial Engineering II and III | 2 | The seminar arms to make the students present their research result progress and evaluated by several committees for improving their work until their work is acceptable for master thesis defense. | Dr. TY Boreborey and committees |
| 16 | | | Project 3 in Agro-industrial Engineering | 2 | A mini project is considered as the research-oriented course which is required by educational qualification framework of Ministry of Education Youth and Sport. The course of mini-project will be managed by adviser. The | Advisors and Dr. TY Boreborey |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | students can work with their adviser on the topic should be related to their research thesis. | |
| 17 | | | Applied statistic in agro-processing: | 2 | Applied statistic in agro-processing is designed to analyzing data has become common practice in virtually all scientific and engineering discipline. This course provides a comprehensive introduction to those model and methods most likely to be encountered and used by students in their career in engineering and data analytic. The examples and exercises have been designed with scientists and engineers in mind, most of the methods covered are basic to statistical analyses in many other discipline, so that students of engineering, computer science, and data science will profit from this course. | Dr. EK Pichmony and Dr. Phauk Saukkhey |
| 18 | New | | Industrial Symbiosis | 2 | The course is designed how a network of diverse organizations can foster eco-innovation and long-term culture change, create and share mutually profitable transactions and improve business and technical processes. | Dr. MORM Elen and Ms. NAT Yukleav |

**5.7 Course-PLOs Mapping**

**Table 6.** PLOs mapping

| **Course** | **PLO1** | **PLO2** | **PLO3** | **PLO4** | **PLO5** | **PLO6** | **PLO7** | **PLO8** | **PLO9** | **PLO10** | **PLO11** | **PLO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agro-product processing and simulation | **F** | **F** | **F** | **F** | **P** | **F** | **P** | **F** | **P** | **F** | **F** | **F** |
| Project 1 on Agro-product processing and simulation | **F** | **F** | **F** | **F** | | **F** | **P** | | | **F** | **M** | **P** |
| Postharvest management of agro-products | **F** | **F** | **M** | **F** | | **P** | **P** | | | **M** | **M** | |
| Agro-products supply chain | **F** | **F** | **M** | **F** | | **P** | | | | **M** | **M** | |
| Product Innovation and Entrepreneurship | **F** | **F** | **F** | **F** | **P** | **F** | | **F** | **M** | **F** | **F** | **F** |
| Project 2 on Product Innovation and Entrepreneurship | **F** | **F** | **M** | **F** | **P** | **F** | | **P** | **F** | **M** | **M** | **P** |
| Agro-product quality and safety, and risk management | **M** | **M** | **P** | **M** | **F** | **P** | | **P** | | **M** | **M** | |
| Bio-industry | **F** | **F** | **M** | **M** | | **P** | **F** | | | | **P** | **P** |
| Cold chain logistic and management | **M** | **M** | **P** | **F** | **P** | **P** | | | | **M** | **M** | |
| Industrial Symbiosis | **F** | **F** | **M** | **M** | | **P** | | | | | **P** | **P** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agro-products laws and certification system | **M** | **F** | **P** | **P** | | | | | **M** | **P** | **P** | |
| Agricultural-waste processing and management | **F** | **F** | **F** | **F** | **P** | **P** | **F** | | | **M** | **M** | |
| Research Methodology | **M** | **F** | **F** | **P** | | | | **P** | | **F** | **F** | |
| Seminar on agro-industrial Engineering I | **F** | **F** | **F** | **P** | | **P** | | **F** | | **F** | **F** | **F** |
| Seminar on agro-industrial Engineering II | **F** | **F** | **F** | **P** | | **P** | | **F** | | **F** | **F** | **F** |
| Project 3 in Agro-industrial Engineering | **F** | **F** | **F** | **P** | **P** | **M** | **F** | **F** | **F** | **F** | **F** | **F** |
| Applied statistic in agro-processing | **F** | **F** | **F** | **F** | | **F** | | | | **F** | **F** | |
| Bio-refinery Processing | **F** | **F** | **M** | **M** | | **P** | **F** | | | | **P** | **P** |

-P: Partially fulfill

-M: Moderately fulfill

-F: Fully fulfill

**5.8. Methodology (Course syllabus)**

Describe steps and how students will acquire knowledge and skills

- Competency- and project-based…

- Modality of teaching…

## III. Resources

### 1. Human Resources and Planning

**Table 7.** List of faculty members and staffs

| No. | Name | Profile |
|---|---|---|
| 1 | Dr. CHHUN Heangthavrith | Université de Montpellier, France<br>Food and Biotechnology Engineering, |
| 2 | Dr. TY Boreborey | Philippine Diliman, Philippine<br>Hydro-geochemistry |
| 3 | Dr. IN Sokneang | AgroParisTech, France<br>Science and Processing of Food<br>and Bio-products |
| 4 | Dr. KHEOUN Kimleang | Hokkaido University, Japan<br>Sustainable Resources Engineering |
| 5 | Dr. TAN Reasmey | Tokyo Institute of Technology, Japan<br>Bio-engineering |
| 6 | Dr. SOUNG Malyna | University of Montpellier, France<br>Molecular plant pathology |
| 7 | Dr. PHAT Chanvorleak | Chung-Ang University, Korea<br>Food Chemistry |
| 8 | Dr. PENG Chanthol | Tokyo Institute of Technology, Japan<br>Life Science and Technology |
| 9 | Dr. EK Pichmony | Washington State University, USA<br>Food Extrusion and Processing |
| 10 | Dr. HOUN Peany | Tokyo Institute of Technology, Japan<br>Chemical Science and Engineering |
| 11 | Dr. HOR Sivmey | Agro/SupAgro Montpellier, France<br>Physicochemistry and Food Biochemistry |
| 12 | Dr. MITH Hasika | University of Liège, Belgium<br>Food Science |

| | | |
|---|---|---|
| 13 | Dr. YEOURN Sereyvath | Chonnam National University, Korea<br>Biotechnology |
| 14 | Dr. MORM Elen | Université libre de Bruxelles, Belgium<br>Drying technologies and models |
| 15 | Dr. SRUY Sengly | University of Montpellier, France<br>Nutrition and Food Science |
| 16 | Dr. PHOUNG Hengsim | University of Nantes, France<br>Processing Engineering |
| 17 | Ms. YIN Molika | Institute Agro/SupAgro Montpellier, France<br>Food Science and Nutrition |
| 18 | Ms. THANH Chanmony | University of Montpellier, France<br>Health and Food Science |
| 19 | Ms. MOM Vattana | Kasetsart University, Thailand<br>Food Science |
| 20 | Ms. CHANTO MonychotTepy | Kanazawa University, Japan<br>Environmental Design |
| 21 | Ms. HENG Soukim | Kasetsart University, Thailand<br>Food Science |
| 22 | Ms. SIENG Sreyvich | Gadjah Mada University, Indonesia<br>Chemical Engineering |
| 23 | Ms. PHAL Sophoan | Kasetsart University, Thailand<br>Packaging Technology |
| 24 | Mr. NGET Sovanmony | Ecole Nationale Vétérinaire Oniris, France<br>Meat Preservation |
| 25 | Ms. PHAL Sivchheng | Kanazawa University, Japan<br>Environmental Design |

**2. Facilities and Laboratories**

**Table 8.** Existing laboratory for Agro-industrial Engineering

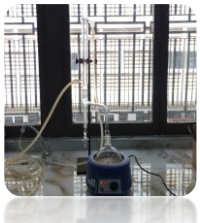
| No. | Room number | Laboratory |
|---|---|---|
| 1 | B111 | Food Processing Lab |
| 2 | B201 | Physico-chemical Lab |
| 3 | B202 | Pathogen chemical Lab |
| 4 | B203 | |
| 5 | B204 | General microbiology lab |
| 6 | B205 | Culture room |
| 7 | B210 | Biochemistry Lab |
| 8 | B301 | Molecular biotechnology Lab |
| 9 | B302 | Food Processing Lab |
| 10 | B303 | Unit operation Lab/ Analytical Chemistry Lab |
| 11 | B304 | Food Fermentation Lab |
| 12 | B306 | Biotechnology Lab |
| 13 | B307 | HPLC and GC-MS Lab |
| 14 | B310 | AAS LAb |

**Table 6**. Available existing equipment and analyzer for supporting Agro-industrial laboratory

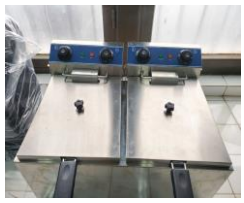
| No | Equipment/analyzer | State of Equinments/analyzer |
|---|---|---|
| 1 | Nabertherm heating furnace |  |

| | | |
|---|---|---|
| 2 | Water Activity meter |  |
| 3 | pH-meter |  |
| 4 | Moisture balance analyzer |  |
| 5 | Spectrophotometer |  |
| 6 | Refrigerated Centrifuge Machine |  |
| 7 | Microwave-assisted extraction |  |
| 8 | Soxhlet extraction |  |

| | | |
|---|---|---|
| 9 | CM-5 Spectrophotometer |  |
| 10 | Laminar Air Flow Cabinet |  |
| 11 | Microscope |  |
| 12 | Autoclave |  |
| 13 | Microscope |  |
| 14 | Laminar air flow cabinet |  |
| 15 | Freezer |  |

| | | |
|---|---|---|
| 16 | Plant growth chamber |  |
| 17 | Incubator shaker |  |
| 18 | Freezer |  |
| 19 | Hydro-distillation |  |
| 20 | Memmert incubator |  |
| 21 | Rotary Evaporator |  |
| 22 | Distilled water machine |  |

| | | |
|---|---|---|
| 23 | Nabertherm heating furnace |  |
| 24 | Ultrasonic tank |  |
| 25 | HPLC |  |
| 26 | GCMS |  |
| 27 | Capillary viscometer NVB classic |  |
| 28 | AAS |  |
| 29 | Microwave digestion system |  |

| | | |
|---|---|---|
| 30 | Freeze-dryer |  |
| 31 | Benchtop Centrifuge |  |
| 32 | Ultrasonic bath |  |
| 33 | Gas baking oven |  |
| 34 | Full Automatic Desk Boxy Cup sealer |  |
| 35 | Electric Deep Fryer Twin Tank Oil |  |
| 36 | Fruit grinder |  |

| | | |
|---|---|---|
| 37 | Mixer |  |
| 38 | Vacuum Packager |  |

## 2. Planning

### 2.1. HR development

Currently there are 5 Ph.D candidates are conducting their research in abroad and most of them have contract to help and support ITC after they graduate. And for 2021-2022, we have 4 Ph.D who just recently graduate their study abroad are joining to support our program.

Under HIPE and FOODI projects, many professional training will be offered to train our staffs (25 staffs) with their specialty courses to support Agro-industrial program and developing and revising the course contents to become standard and international contents.

### 2.2. Laboratory development

With the total budget of 342000 USD under HIEP project, ITC is planning to purchase the equipment and analyzer supporting M-AIE program for academic year of 2020-2024.

## IV. Partnership and Supports

### 1. Partnership

**Table 9.** Private and academic partners with ITC which is supporting in project development of Agro-industrial Engineering

| No. | Partner |
|---|---|
| 1 | UNIDO |
| 2 | CAVAC |
| 3 | INP-TOULOUS |

| | |
|---|---|
| 4 | ENSAT |
| 5 | Kasetsart University(KU) |
| 6 | University Technology Malaysia (UTM) |
| 7 | University of Malaya |
| 8 | Universiti Technology Mara |
| 9 | Universiti Kuala Lumpur |
| 10 | Asian Institute of Technology |
| 11 | Ministry of Education, Cambodia |
| 12 | Prince of Songkla University |
| 13 | University of the Aegean |
| 14 | University College Dublin |
| 15 | University of Salerno |
| 16 | ReadLab |
| 17 | Athens Metropolitan College |

**2. Development Projects**

**Table 10.** List down all projects that support the program

| No. | Projects |
|---|---|
| 1 | HEIP-Partnership (ITC-KU) |
| 2 | FOODI (Erasmus+ KA2 Project) (MSc course in Food Processing and Innovation) |
| 3 | FOODSTEM (Erasmus+ Project): Training a new generation of entrepreneurs in sustainable agriculture and food engineering |
| 4 | (HEIP) Biotechnology for Integrated Pest Management towards pesticide reduction in Cambodia |

| | |
|---|---|
| 5 | (HEIP) Valorization of high-value dry food products (agricultural products including herbal and spices) and other by-products in Cambodia |
| 6 | (HEIP) Improvement and development of rice-based products toward the growth of SMEs/Industries in Cambodia |
| 7 | (HEIP) Development of Cambodian Soy Sauce by Fermentation Method |
| 8 | (HEIP) Development of Cooking Oil Processes for Commercialization |
| 9 | (HEIP) Improvement and development of fish and meat products for better preservation using innovative technology |
| 10 | (HEIP) Valorization of agricultural by-products in Cambodia through extractions and formulations of essential oils and bioactive compounds |
| 11 | HEALTHYRICE (IRD) |
| 12 | Agroecology and Safe Food System Transitions (ASSET) EU/AFD and GRET |
| 13 | Nutritional profile of freshwater fish and fish powder from Tonle Sap Lake in Cambodia (BGF) |
| 14 | CAPFish-Capture: Post-harvest Fisheries Development Project (UNIDO) |

**Annex I [Perspective-M-MIC-2022-2023]**

**CURRICULUM UPDATE PROPOSAL**

**Program Level:** International Master's Degree

**Major:** Mechatronics, Information and Communication Engineering

# 8 I. Background and rationales

Master of mechatronic engineering is a multidiscipline program that integrates several fields such as mechanical, electrical, computer and software skills in order to work with smart technologies, such as robots, automated guided systems and computer-integrated manufacturing equipment. Owing to recent advancement and strong demands in communication and information processing to achieve smart and intelligent system thereby making smart mechatronics device more interactive, the existing program need to be revised and modified appropriately considering new subjects that reflects to communication and information processing.

The strength is that ITC already has engineering fields that can support this program such as GEE, GIM, GIC, and GTR. In addition, new program such as data science and ECAM program are strongly linked through a number of subjects. Our human resource is mostly educated with strong background in PhD degree in engineering. Laboratories from different departments can be exploited to support the program. The weakness is sustainable integration of all the departments and the staff mobility across various discipline. In addition, new skills need to be trained, and our staffs need capacity building to keep themselves up to date. The opportunity is that students, under this program, is able to obtain knowledge and skills in field of mechatronics engineering that meet future market trends including industry 4.0, which strongly links with ubiquitous connectivity and information processing such as artificial intelligent. ITC will also obtain new program that transform engineering-diploma students to next level equipped the skills need in the 21$^{st}$ century. This program is also implemented to provide international double degree with ECAM program. Threats include the challenge in recruiting students from different field to be matched with program since subjects are new that need fundamentals knowledge. The market sector in domain of mechatronics is still earlier birth for the context of Cambodia, which leads to lack of interest from general audiences is also a threat for attracting students to enroll in this program.

Based on the market trends, it is shown that there is strong governmental endorsement to push education sector to support the industry 4.0 in Cambodia. Government has very clear path and plan for digitalization that will penetrate in every part of the industry ranging from smart agricultures to smart manufacturing. Moreover, ITC lunched a new international program called ECAM in which the final-year student can migrate to this new program double degree in master degree of mechatronics, communication and information engineering.

# 9 II. Proposition to Update current curriculum

## 9.1 1. Description of updated program

Master of Engineering in Mechatronics, Communication, and Information (M-MIC) is 54-credit multidisciplinary degree program, which is the improved version of traditional mechatronics engineering considering new subjects and skills in the area of communication and information engineering in order to upgrade the student's capacity and ability to meet new market trends. This program will move the traditional mechatronics to be ICT-centric mechatronics. More importantly for the future of mechatronics, there is a shift from systems based around the interconnection of physical components in which transmitted data has been used to facilitate control systems in which information is at the heart of the system and serviced by smart objects. An underlying concept of such cloud based, or Internet of Things system models is treating information as a commodity whose value is determined by user or system need or context, allowing for negotiation between system components as required.

Students graduated from Master of MIC Engineering are equipped with a broad range of skills and knowledge, facilitating careers in engineering disciplines ranging from mechanical design to software engineering as well as those more purely focused on mechatronics, automation, and robotics. Graduates from this program are employed in industries ranging from mining to manufacturing, agriculture and defense.

## 9.2 2. Program educational objectives (PEOs)

Graduates of the Master of Engineering in Mechatronics, Communication and Information will:

**PEO-1**. To produce master graduate equipped with advanced multidisciplinary knowledge and technical skills to solve complex system in mechatronics integrated with information and communication technology (ICT).

**PEO-2**. To produce master graduates to become responsible entrepreneurs, leaders and managers in mechatronic engineering and ICT.

**PEO-3**. To produce master graduates who are able to conduct independent research and advanced studies in the related fields.

## 9.3 3. Program learning objectives (PLOs)

The Master of Engineering in Mechatronics, Communication and Information aims to provide students a set of knowledge and skills in engineering that can be applied in a variety of disciplines. Upon successful completion of this major, graduates will obtain the following PLOs:

### 9.3.1 Knowledge

**PLO-1**. Demonstrate interdisciplinary knowledge and technical skills used to solve complex engineering problems in mechatronics integrated with information and communication technology. (PEO1, PEO3)

**PLO-2**. Demonstrate entrepreneurial and management knowledge and expertise in the area of multidisciplinary engineering. (PEO2)

### 9.3.2 **Cognitive skills**

**PLO-3**. Develop information-centric mechatronic projects and modern mechatronic products by integrating advanced techniques in information technology and communication system into traditional mechatronic techniques. (PEO1, PEO2)

**PLO-4**. Select smart solutions to complex engineering problems encountered in industrial and other sectors by taking into account not only economic benefit, but also cultural, societal, and environmental responsibilities. (PEO1, PEO2)

### 9.3.3 **Psychomotor skills**

**PLO-5**. Show desire to learn through individual and group project-based and research activities, project implementation, supervision guiding by supervisor/mentor.

**PLO6.** Be competent in using software and hardware tools in mechatronics engineering and information and communication engineering for project analysis and implementation and mechatronic product development. (PEO1, PEO3)

### 9.3.4 **Interpersonal skills and responsibilities**

**PLO-7**. Argue appropriately and reasonably on proposed ideas and solutions with team members, supervisor /mentor, and instructors. (PEO2, PEO3)

**PLO-8**. Accept broader instruction and critical ideas and comments from team members, evaluation committee and reviewer, supervisor/mentor's guidance to improve results and productivity as well as their personal improvement. (PEO2, PEO3)

**PLO-9.** Work independently as a responsible engineer/entrepreneur/scientist.

### 9.3.5 **Communication, Information technology and numerical skills**

**PLO-10**. Explain effectively on complex engineering problem to general audience using visualization, simple diagram, and statistics. (PEO1, PEO2, PEO3)

**PLO-11**. Develop effective communication materials for presenting and communicating the results to scientific community and public audience using documentation and visualization tools. (PEO1, PEO2, PEO3)

## **9.4 4. PEO and PLO Mapping**

| PLO\PEO | PEO1 | PEO2 | PEO3 |
|---|---|---|---|
| PLO1 | F | | F |
| PLO2 | | F | |
| PLO3 | F | P | |
| PLO4 | F | P | |

| | | | |
|---|---|---|---|
| PLO5 | P | | F |
| PLO6 | F | P | |
| PLO7 | P | F | F |
| PLO8 | P | F | F |
| PLO9 | | | |
| PLO10 | P | F | P |
| PLO11 | P | F | P |

## 9.5 5. Program's Structure and Requirement

### 9.5.1 5.1. Program's Structure

The candidate that is eligible to enroll this program need to have bachelor's degree in one of the following degrees: Mechanical engineering, Electrical and Electronic Engineering, Information Technology, or Mechatronics Engineering itself. This program is a two-year program with **54 credits** distributed over four semesters, and it is applied to all candidate except the student from Institute of Technology of Cambodia (ITC) with GPA greater or equal 2.5/4.0, who can start from second year (third semester) of the program.

The course description is categorized into four group: Core Courses, Elective Courses, Specialized Courses, and Research-Oriented Course.

| **Mechatronics, Information and Communication Engineering (MIC)** | | | |
|---|---|---|---|
| Core Courses | Elective Courses | Specialized Courses | Research-Oriented Courses |
| 1. Entrepreneurship<br>2. Project Management<br>3. Modern control system<br>4. Analog and digital communication<br>5. Applied statistics | 1. Power electronics<br>2. Embedded system<br>3. Computer vision for robotics<br>4. Introduction to control theory<br>5. Numerical method and optimization<br>6. Digital electronics and microprocessor | 1. Design of machinery and robotics<br>2. Sensor and actuator<br>3. Signal processing<br>4. Advanced digital communication<br>5. Mechatronic design project<br>6. Introductory of machine learning | 1. Research methodology<br>2. Graduate seminar I<br>3. Graduate seminar II & III<br>4. MIC internship |

| | | | |
|---|---|---|---|
| | 7. Mechatronics engineering<br>8. Wireless communication<br>9. Object-oriented programming<br>10. Digital circuit design with VHDL<br>11. Mechanical Theory<br>12. Finite Element Method<br>13. Selection of Materials | 7. Neural network and deep learning<br>8. System engineering | |
| Notes: Subjects highlighted in yellow color are revised based on the comments from IMT Mine Ales | | | |

Program structure is divided into four semesters based on each pathway. There are two pathways that are implemented in this master program: Course-Research Pathway and Research-Based Pathway. In Course-Research Pathway, student need to earn at least 32 credits from through coursework participation, 10 credit through research activities with guidance from advisor and/or supervisor, and 12 credits through thesis preparation, presentation, and publication. In Research-Based Pathway, student need to earn minimum credit of 12 through course participation in which 6 credits are from major courses and 6 research-oriented courses, 30 credits through research activities led and/or supervised by his/her advisor, and 12 credits through thesis preparation, presentation, publication.

### 9.6 5.2 Course-Research Pathway

| **Year I** | | | |
|---|---|---|---|
| **Semester I** | | **Semester II** | |
| **Course** | **Credits** | **Course** | **Credits** |
| Entrepreneurship | 2 | Design of machinery and robotics | 2.5 |
| Project management | 2 | Sensor and actuators | 2 |
| Modern control system | 2.5 | Signal processing | 2 |
| Analog and digital communication<br>*Or* Applied Statistics | 2 | System Engineering | 2 |
| Elective course I.1 | 2 | Elective course II.1 | 2 |
| Elective course I.2 | 2 | Elective course II.2 | 2 |

| | | | |
|---|---|---|---|
| | | MIC internship | 3 |
| **Total** | **12.5** | **Total** | **15.5** |

| **Year II** | | | |
|---|---|---|---|
| **Semester I** | | **Semester II** | |
| **Course** | **Credits** | **Course** | **Credits** |
| Advanced digital communication | 2 | Research project<br>Thesis report and publication<br>Thesis defense | **12** |
| Mechatronic design project | 3 | | |
| Introduction to machine learning | 3 | | |
| Neural network and deep learning | 4 | | |
| Elective course III | 2 | | |
| **Total** | **14** | **Total** | **12** |

## Course-Research Pathway

| All compulsory and elective courses | Type of courses | Credit | Semester | Hours | CM | TD | TP | Remark (One semester should have 6 courses with: TP & TD: 16h (0.5credit) CM (16h = 1credits) |
|---|---|---|---|---|---|---|---|---|
| Entrepreneurship | common/core | 2 | S1 | 32 | 32 | 0 | 0 | |
| Project Management | common/core | 2 | | 32 | 32 | 0 | 0 | |
| Modern Control System | core | 2.5 | | 48 | 32 | 16 | 0 | |
| Analog and digital communication *or* Applied Statistics | core | 2 | | 48 | 16 | 16 | 16 | |
| Elective Course I.1 | elective | 2 | | | - | - | - | |
| Elective Course I.2 | elective | 2 | | | - | - | - | |
| **Minimum Credits** | | **12.5** | | | | | | |
| Design of machinery and robotics | specialized | 2.5 | S2 | 56 | 24 | 16 | 16 | |
| Sensors and Actuators | specialized | 2 | | 48 | 16 | 16 | 16 | |
| Signal Processing | specialized | 2 | | 48 | 16 | 16 | 16 | |
| System Engineering | specialized | 2 | | 40 | 24 | 16 | 0 | Revised based on comments from Mines Ales Team |
| Elective Course II.1 | elective | 2 | | - | - | - | - | |
| Elective Course II.2 | elective | 2 | | - | - | - | - | |
| MIC Internship | | 3 | | - | - | - | - | 2-month period (July to September) |
| **Minimum Credits** | | **15.5** | | | | | | |
| **Advanced Digital Communication** | **specialized** | 2 | S3 | 40 | 24 | 16 | 0 | |
| **Mechatronic Design Project** | **specialized** | 3 | | 72 | 24 | 0 | 48 | |
| **Introduction to Machine Learning** | **specialized** | 3 | | 64 | 32 | 16 | 16 | |
| **Neural Network and Deep Learning** | **specialized** | 4 | | 80 | 48 | 16 | 16 | |
| **Elective course III** | **elective** | 2 | | | - | - | - | |
| **Minimum Credits** | | **14** | | | | | | |
| Research Project | | 12 | S4 | 6-month research | | | | |
| Thesis Report | | | | One (1) Research Thesis | | | | |
| Thesis Defense | | | | One (1) Presentation | | | | |
| **Credits** | | **12** | | | | | | |
| | | | | | | | | |
| **Total credits** | | **54** | | | | | | |
| | | | | | | | | |
| **Elective Course I and III ( available in 1st semester of fiscal year)** | | | | | | | | |
| Power Electronics | elective | 2 | | 40 | 24 | 16 | 0 | |
| Embedded Electronics | elective | 2 | | 40 | 24 | 0 | 16 | |
| Computer Vision | elective | 2 | | 32 | 32 | 0 | 0 | |
| Industrial Internet of Things | elective | 2 | | 32 | 32 | 0 | 0 | |
| Mechanical Thoery | elective | 2 | | 40 | 24 | 16 | 0 | Revised based on comments from Mines Ales Team |
| IoTs and Cloud Technology | elective | 2 | | 40 | 24 | 0 | 16 | |
| **Elective Course II ( available in 2nd semester of fiscal year)** | | | | | | | | |
| Numerical Methods and Optimization | elective | 2 | | 56 | 24 | 16 | 16 | |
| Digital circuit design with VHDL | elective | 2 | | 48 | 16 | 0 | 32 | |
| Object-oriented programming | elective | 2 | | 48 | 16 | 0 | 32 | |
| Wireless communication | elective | 2 | | 40 | 24 | 0 | 16 | |
| Mechatronics engineering | elective | 2 | | 40 | 24 | 16 | 0 | |
| Finite Element Method | elective | 2 | | 40 | 24 | 16 | 0 | Revised based on comments from Mines Ales Team |
| Selection of Material | elective | 2 | | 40 | 24 | 16 | 0 | |

## 9.7 5.3 Research-Based Pathway

| Year I | |
|---|---|
| **Semester I** | **Semester II** |

| Course | Credits | Course | Credits |
|---|---|---|---|
| Graduate seminar I | 1 | Research activities | 12 |
| Specialized/Elective course I.1 | 2 | | |
| Specialized/Elective course I.2 | 2 | | |
| Specialized/Elective course I.3 | 2 | | |
| Preliminary research report and defense | 9 | | |
| **Total** | **16** | **Total** | **12** |

| **Year II** | | | |
|---|---|---|---|
| **Semester I** | | **Semester II** | |
| **Course** | **Credits** | **Course** | **Credits** |
| Graduate seminar II and III | 2 | Research activities | 18 |
| Research methodology | 2 | Detail research proposal defense | |
| Entrepreneurship | 2 | Presentation in scientific conference | |
| Project management | 2 | Journal peer review and publication | |
| | | Thesis report and defense | |
| **Total** | **8** | **Total** | **18** |

### 9.8 5.4. Program's Requirements

#### 9.8.1 Admission Requirement

The admission requires student to have bachelor's degree in the related fields such as those who has background in mechanical engineering, electrical engineering, automation engineering, information technology, and communication engineering with solid foundation in mathematics and physics.

- Students from ITC with GPA greater than or equal 2.5/4.0 can enroll in second year of the program, where some credits can be exempted from fourth year and fifth year of engineering diploma in ITC, and the period of study is one academic year consisting of two semesters.
- Except ITC student with GPA greater than or equal 2.5/4.0, the candidate needs to have at least bachelor's degree in the fields related the abovementioned or equivalent, and the period of study is two academic years consisting of four semesters.
- All the candidate needs to have certificate of English proficiency with the score of at least 5.0 for IELT or equivalent.

The important date in the process of admission includes, deadline of application form submission is 30 September, result announcement is 8 October, and registration period is from 10 October.

### 9.8.2 Graduate Requirement

In order to graduate from this program, student need to fulfill credits system as mentioned in each pathway. To obtain the credit of each subject, student need to receive GPA greater than 2.0.

### 9.9 5.5. Methodology

This program is implemented in two different pathways. In course-research pathway, student will obtain more competencies than project-based knowledge because the students focus more on coursework. Moreover, student will gain experience through short internship from the industry sector. Owing partial involvement in the research and project participation with his/her advisor, student will also receive knowledge through project-based learning. In research-based pathway, student will acquire knowledge and skills through research activities and project implementation with his/her supervisor. In addition, student will partially obtain knowledge which is fundamentals to research activity through 12-credit coursework.

The teaching methodology will follow model of higher education program in which students will works and go through themselves with proper guidance from their instructors and advisor. In each coursework, the course is divided into lecture, practice problem solving, and laboratory work. Also, student will be engaged with project implementation led by their advisor and/or instructor through short-term project or long-term project.

## 10 III. Resources

Curriculum Committee includes key person from the direct of Graduate school, head department of GEE, head department of GTR, and head of ECAM program, and other-related field lecturers.

This program borrows staffs mainly from GEE, GIM, GIC, and ECAM.

### 10.1 1. Facilities and Laboratories

There are several laboratories equipped with research and experiment facilities to support this program such as

- LBE research Lab led by GEE and GTR department
- Dynamic Lab led by Dr. Srang Sarot
- Digital Fabrication Laboratory (FabLab) led by Dr. PEC Rothna
- Control and Robotic Laboratory led by Dr. Kim Bunthean

### 10.2 2. Planning

Currently, this program has challenging human resource in the field of digital electronic and embedded system with degree of PhD or Doctoral degree. Also, we lack specialty in the field of mechatronics engineering. Due to this issue, we try to upgrade ITC's staff from bachelor's degree to master degree and master's degree to PhD degree through HEIP project.

In term of Laboratory development, it is necessary to be fully equipped with tools and facilities to allow students to work on experiment as well as project implementation. Under HEIP project, we have been establishing Fablab intended to support digital electronic, signal analysis and in-house fabrication in small scale.

## 11 IV. Partnership and Supports

### 11.1 1. Partnership

Our current partner includes:

- IMT Mine Ales working on program improvement of MIC and capacity building
- ECAM LaSalle working on student migration from ECAM to M-MIC for double degree
- JICA through LBE implementation for research supportability
- Erasmus+ to support scholarship
- Local partnership from different department such GEE, GIM, and GIC

### 11.2 2. Development Projects

Currently, we have project led by various researchers that related the program:

- Project led by Dr. Srang Sarot in the area of mechanic and control such as satellite development project, smart-system project
- Project led by Dr. Kim Bunthean in area of control system and automation such e-Tuk Tuk with collaboration with France partner.
- Project led by Dr. Pec Rothna in the area of electronics, communication, and signal processing such IoT and embedded system for smart system.

**Annexe J. Calendrier universitaire 2022-2023.**