

## **PROGRAM OF STUDY**

**Type: Vocational and professional education**

**Faculty: Faculty of Hydrology and Water Resources Engineering**

**Specialty: Water Resources Engineering and Rural Infrastructures**

**Level: 6 ( Engineer's Degree ) for 5 years program**

### **1. Objective of the Program**

The program of Water Resources Engineering and Rural Infrastructures will provide students with knowledge and skills related to water resources engineering, irrigation and drainage, construction, dams, hydropower, infrastructure, roads, geographic information systems and remote sensing. Students will also gain knowledge on disaster management, climate change and water and land use management in order to promote sustainable development. The program also aims to provide the students with the fundamentals of responsibility and ethics for their professional life.

### **2. Job Opportunity after Graduation**

After obtaining a degree in Water Resources Engineering and Rural Infrastructures, students can get the following job opportunities:

- Become an engineer of Irrigation and engineer of road and infrastructure construction
- Public Institution: MoE, MPWT, MOWRAM, MIST, TSA, CNMC, APSARA Authority,
- Private Institutions: Engineering Company, Surveying company, construction company, consultant company, Bank, Insurance company,
- University and research center, Institutions
- NGOs/DP: Conservation International (CI), World Wildlife Fund (WWF), Borda, Mekong River Commission (MRC), Flora and Fauna International (FFI), International Union Conservation of Nature (IUCN), Asian Development Bank (ADB), World Bank (WB), World Health Organization (WHO), AFD and etc

### **3. Program Learning Outcomes: PLO**

After graduating with a degree in Water Resources Engineering and Rural Infrastructures, students will be able to:

#### **A. Knowledge**

PLO1. Gain new knowledge and practices in line with national qualification by using effective learning methods.

PLO2. Demonstrate an in-depth understanding of theories of soil science, meteorology, hydrology, and knowledge on geology and strength of materials and structure.

PLO3. Explain the principles of integrated water resources management and reliable engineering processes.

### **B. Cognitive Skills**

PLO4. Analyze and interpret data of soil, meteorology, hydrology, hydro-geology and use engineering judgments to draw conclusions.

PLO5. Measure land, create accurate plans of the site for water resources study projects and other constructions.

PLO6. Develop and conduct appropriate simulations on construction materials for irrigation and other infrastructures.

PLO7. Assess water and land resources for related development and for the management of water and land resources systems under the current situation and scenarios of climate change, land cover change and other impact.

PLO8. Prepare the projects with engineering design and construction of irrigation structures as well as rural roads, including dams, canals, dams, water distribution structures, pumping stations to meet economic, social and environmental needs.

PLO9. Flood forecast for disasters manage caused by water

PLO10. Study on the feasibility of building a hydropower dam as a renewable energy

### **C. Interpersonal Skills and Responsibility**

PLO11. Work and collaborate effectively with different professionals

PLO12. Present scientific references on the ideas of other authors that students support in their work and demonstrate professional and social ethics.

PLO13. Participate in critical thinking and pursue lifelong learning for skills development.

#### **D. Numerical Skills, Information Technology and Communication**

PLO14. Identify and be able to use mathematical tools and techniques commonly used in system analysis.

PLO15. Identify, create, and solve complex engineering problems by applying engineering, scientific, and mathematical principles.

#### **E. Psychomotor Skills**

PLO16. Able to use topographic equipment, soil testing equipment, construction equipment testing equipment and be able to teach and implement training programs to others effectively.

### **4. Admission Condition**

The applicant must have complied any condition as listed below<sup>§</sup>

- High school certificate (Bac II) or equivalent certificate and pass entrance exam to the first year at ITC or
- Certificate of foundation year from other universities then pass the qualified exam to enter second year at ITC or
- Certificate of associate degree of engineer or any equivalent certificate then pass the qualified exam to enter third year at ITC or
- Certificate of Bachelor of science or any equivalent certificate then pass the qualified exam to enter third year at ITC.

### **5. Number of Credits and Number Hours**

In order to get this engineer's degree of Water Resources Engineering and Rural Infrastructures, the student need to study 5 years with the total number of credits is 158 credits. 1 credit is equal to 16 hours of lecture (lesson); or 1 credit is equal 32 hours of tutorial or practical work in the lab.

### **6. Subjects in the program**

Basic Major Course	Core Major Course	Course for General Education
1. MATLAB 2. Statistics	1. Surveying	1. Geometry 2. Calculus

<ul style="list-style-type: none"> <li>3. Fluid Mechanics</li> <li>4. Soil Science</li> <li>5. Strength of Materials</li> <li>6. Meteorology</li> <li>7. Hydrometeorology</li> <li>8. Geology and Hydrogeology</li> <li>9. Computer-aided Design (AutoCAD)</li> <li>10. Introduction to IWRM</li> <li>11. Vibration and Wave</li> <li>12. Introduction to Environmental Engineering</li> <li>13. Hydrology</li> <li>14. Hydraulics</li> </ul>	<ul style="list-style-type: none"> <li>2. Soil Mechanics and Foundations</li> <li>3. Earth Dam Design &amp; Construction</li> <li>4. GIS and Remote Sensing</li> <li>5. Construction Materials</li> <li>6. Structural Analysis</li> <li>7. Water-induced Disaster Risk Assessment</li> <li>8. Road Engineering and Construction</li> <li>9. Groundwater Exploration</li> <li>10. Irrigation and Drainage Systems</li> <li>11. Reinforced Concrete Design</li> <li>12. Hydropower Development and Pumping Station</li> <li>13. Land Management</li> <li>14. Climate Change Impacts and Adaptation</li> <li>15. Hydraulic Structures</li> <li>16. Water Resources Economics</li> <li>17. Cost Estimating and Contracting</li> <li>18. Project Management</li> <li>19. Multi-Disciplinary Design Project</li> </ul>	<ul style="list-style-type: none"> <li>3. Linear Algebra</li> <li>4. Probability</li> <li>5. Differential equations</li> <li>6. Mechanics</li> <li>7. Thermodynamics</li> <li>8. Electricity</li> <li>9. Chemistry</li> <li>10. Technical drawing</li> <li>11. Environment</li> <li>12. Management and Finance</li> <li>13. Marketing</li> <li>14. Philosophy</li> <li>15. Historical study</li> <li>16. ICT</li> <li>17. Work Safety</li> <li>18. English</li> <li>19. French</li> </ul>
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## 7. Course Structure of the Program

📌 Year 1, Semester 1

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French			96	96	3
2	ធរណីមាត្រ	Geometry	16	32		48	2
3	មេកានិកក្រុម	Mechanics I	32	24	8	64	3
4	គ្រប់គ្រងនិងគណនេយ្យ	Management and Accounting	48			48	3
5	ទស្សនវិជ្ជា	Philosophy	32			32	2
6	បរិស្ថាន	Environment	32			32	2
<b>Total in Semester 1</b>			<b>160</b>	<b>56</b>	<b>104</b>	<b>320</b>	<b>15</b>

Note: Lecture: 1 credit = 16 hours, Tutorial or Practical: 1 credit= 32 hours

📌 Year1, Semester 2

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French			96	96	3
2	គណិតគណនាវគ្គ១	Calculus 1	32	32		64	3
3	ថែម៉ូឌីណាមិក	Thermodynamic	32	24	8	64	3
4	គំនូរបច្ចេកទេស	Technical Drawing	16		32	48	2
5	ទីផ្សារ	Marketing	32			32	2
6	ព័ត៌មានវិទ្យា	Informatic	16		32	48	2
7	ប្រវត្តិវិទ្យា	History	32			32	2
<b>Total in Semester 2</b>			<b>160</b>	<b>56</b>	<b>168</b>	<b>384</b>	<b>17</b>

📌 Year 2, Semester 1

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French			96	96	3
2	អង់គ្លេស	English			64	64	2
3	គណិតគណនាវគ្គ២	Calculus 2	32	32		64	3
4	មេកានិកវគ្គ២	Mechanics II	32	32		64	3
5	អគ្គិសនី	Electricity	32	24	8	64	3
6	គីមីវិទ្យា	Chemistry	32	32		64	3
<b>Total in Semester 1</b>			<b>128</b>	<b>120</b>	<b>168</b>	<b>416</b>	<b>17</b>

🏠 Year 2, Semester 2

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French			64	64	2
2	អង់គ្លេស	English			96	96	3
3	ប្រូបាប៊ីលីតេ	Probability	32	32		64	3
4	សមីការឌីផេរ៉ង់ស្យែល	Differential Equations	32	32		64	3
5	រំញ័រនិងរលក	Vibration and Wave	32	24	8	64	3
<b>Total in Semester 2</b>			<b>96</b>	<b>88</b>	<b>168</b>	<b>352</b>	<b>14</b>

🏠 Year 3, Semester 1

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French		64		64	2
2	ភាសាអង់គ្លេស	English		32		32	1
3	ស្ថិតិវិទ្យា	Statistics	16	32		48	2
4	មេកានិកនៃសន្ទនីយ៍វត្ថុរាវ	Fluid Mechanics	32	16	16	64	3
5	វិទ្យាសាស្ត្រដី	Soil Science	16	16	16	48	2
6	ភាពធន់នៃសំភារៈ	Strength of Materials	16	32		48	2
7	ឧតុនិយម	Meteorology	16			16	1
8	រាវឧតុនិយម	Hydrometeorology	16	16		32	1.5
9	ភូគព្ភសាស្ត្រ និង រាវភូគព្ភសាស្ត្រ	Geology and Hydrogeology	16	16		32	1.5
<b>Total in Semester 1</b>			<b>128</b>	<b>224</b>	<b>32</b>	<b>384</b>	<b>16</b>

🏠 Year 3, Semester 2

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង	French		32		32	1
2	ភាសាអង់គ្លេស	English		64		64	2
3	គំនូសបច្ចេកទេសដោយកុំព្យូទ័រ	Computer-aided Design (AutoCAD)			32	32	1
4	ជលវិទ្យា	Hydrology	32	16	16	64	3
5	មេកានិចដី និង គ្រឹះ	Soil Mechanics and Foundations	32	16	16	64	3

6	មន្ទីរពិសោធន៍កុំព្យូទ័រម៉ាត្រិក	MATLAB	16		16	32	1.5
7	ឋានលេខា	Surveying	16	16	48	80	3
8	សេចក្តីផ្តើមនៃវិស្វកម្មបរិស្ថាន	Introduction to Environmental Engineering	16			16	1
<b>Total in Semester 2</b>			<b>112</b>	<b>144</b>	<b>128</b>	<b>384</b>	<b>15.5</b>


**✚ Year 4, Semester 1**

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង I	French I		32		32	1
2	ភាសាអង់គ្លេស I	English I		32		32	1
3	សំណង់ទំនប់ដី	Earth Dam Design & Construction	16	16	16	48	2
4	ប្រព័ន្ធព័ត៌មានភូមិសាស្ត្រ និងទូរអង្កេតវិទ្យា	GIS and Remote Sensing	16		64	80	3
5	ការវិភាគគ្រឿងបង្ហាញ	Structural Analysis	32	32		64	3
6	ការវាយតម្លៃហានិភ័យគ្រោះមហន្តរាយដោយសារបញ្ហាទឹក	Water-induced Disaster Risk Assessment	32			32	2
7	សម្ភារៈសំណង់	Construction Materials	16		32	48	2
8	ជលគតិ	Hydraulics	16	16	16	48	2
<b>Total in Semester 1</b>			<b>128</b>	<b>128</b>	<b>128</b>	<b>384</b>	<b>16</b>

**✚ Year 4, Semester 2**

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial-TD	Practical-TP		
1	ភាសាបារាំង II	French II		32		32	1
2	ភាសាអង់គ្លេស II	English II		32		32	1
3	សំណង់ផ្លូវជនបទ	Construction of Rural Roads	32	16	16	64	3

4	ការរុករកទឹកក្រោមដី	Groundwater Exploration	32			32	2
5	ការស្រោចស្រព និងប្រព័ន្ធបង្ហូរចេញ	Irrigation and Drainage Systems	32	32		64	3
6	សុវត្ថិភាពការងារក្នុងការដ្ឋាន	On-site Safety Management	16			16	1
7	សេចក្តីផ្តើមនៃការគ្រប់គ្រងធនធានទឹកចម្រុះ	Introduction to Integrated Water Resources Management	16			16	1
8	ការអភិវឌ្ឍស្ថានីយ៍វារីអគ្គិសនី និងម៉ាស៊ីនបូមទឹក	Hydropower Development and Pumping Station	32	16	16	64	3
9	សំណង់បំពង់	Reinforced Concrete Design	32	32		64	3
<b>Total in Semester 2</b>			<b>192</b>	<b>160</b>	<b>32</b>	<b>384</b>	<b>18</b>

 Year 5, Semester 1

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial- TD	Practical -TP		
1	ភាសាបារាំងសម្រាប់វិជ្ជាជីវៈ	Module d'Insertion Professionnelle (MIP)		32		32	1
2	ភាសាអង់គ្លេសសម្រាប់ការងារនិងអាជីព	English for Work and Career: Engineering Skills		32		32	1
3	ការរៀបចំដែនដី	Land Management	16	32		48	2
4	វិបាកនៃបម្រែបម្រួលអាកាសធាតុនិងការបន្ស៊ាំ	Climate Change Impacts and Adaptation	32			32	2
5	សំណង់ធារាសាស្ត្រ	Hydraulic Structures	32	32	32	96	4



6	សេដ្ឋកិច្ចធនធាន ទឹក	Water Resources Economics	32			32	2
7	ការប៉ាន់តម្លៃ និង កិច្ចសន្យា	Cost Estimating and Contracting	16			16	1
8	ការគ្រប់គ្រង គម្រោង	Project Management	32			32	2
9	ការសិក្សាគម្រោង ពហុវិស័យ	Multi-Disciplinary Design Project	32	32		64	3
10	កម្មសិក្សាឆ្នាំទី៤	Internship I4					2
<b>Total in Semester 1</b>			<b>192</b>	<b>160</b>	<b>32</b>	<b>384</b>	<b>20</b>

**✚ Year 5, Semester 2**

No.	Course name in Khmer	Course name in English	Number of hours			Total number of hours	Number of Credit
			Lecture - Course	Tutorial- TD	Practical- TP		
1	កម្មសិក្សាបញ្ចប់ឆ្នាំ សិក្សា	Final Year Internship				384	9
<b>Total in Semester 2</b>				<b>32</b>		<b>384</b>	<b>9</b>

**Note:** Foundation year covers year 1 and year 2 which under coordination by department of foundation year. From year 3 to year 5, the program is under faculty of Hydrology and Water Resources Engineering.

Number of credit and hours for each year:

Engineer 's Degree of Water Resources Engineering and Rural Infrastructure					
Year	Number of Credit	Number of hours	Lecture (hr)	Tutorials (hr)	Practical work (hr)
I1	32	704	320	112	272
I2	31	768	224	208	336
I3	31.5	768	240	368	160
I4	34	768	320	288	160
I5	27	768	192	160	416
Total	155.5	3776	1296	1136	1344

The total number of credits from year 1 to year 5 is 155.5 credits which equals to 3776 hours (lecture 1296 hours, Tutorials 1136 hours and practical work in laboratory 1344 hours).

### **8. Condition to Get the Certificate**

In order to successfully complete the program and receive the certificate of Water and Environmental Engineering, the student have to :

- Complete and pass all subjects in the program successfully
- Pass all semester exams
- Complete internship 1 month in year 4 and complete final year internship for at least 3 months in year 5.
- Writing the final project from internship and defense successfully Infront of a committee