



# DOCTOR OF PHILOSOPHY PROGRAM IN RENEWABLE ENERGY

- SCHOOL OF RENEWABLE ENERGY TECHNOLOGY (SERT)

## DOCTOR OF PHILOSOPHY PROGRAM IN RENEWABLE ENERGY

This is the first and outstanding program of its kind in Thailand in graduate studies. Highlighting sustainable energy, our school designed a permanent display of an energy park. The authentic sustainable energy at work is the first showcase in Asia. All the systems and tools are set up to facilitate instruction and research endeavors.

Our school is the one and only entity where a solar electrical generation system is the mainstay of research, enabling knowledge and technology dissemination in (1) a solar thermal parabolic power plant and (2) a 120 KW-PV micro grid system.

At present, all electrical needs of the School are produced for consumption by our own sustainable energy.



## Objectives

The purpose of the Ph.D. program in Renewable Energy is to empower and enable students to develop advanced knowledge and skills in order to become leaders and managers in the energy sector. Desirable characteristics are as follows:

- Keen in knowledge, skills, and experiences in advanced renewable energy and able to integrate all personal assets for the benefits of the nation
- Competent in renewable energy research in a systematic way to create innovations and new knowledge in the field
- Equipped with an inquiry mind and professional ethics.

## Admission

In accordance with the Graduate School Rules and Regulations. The program committee reserves the rights to require more qualifications as deemed appropriate.

## Medium of Instruction

Thai and English

## Research Focus

- Solar Thermal Energy
- DV System
- Biomass
- Community Energy
- Hydrogen, Fuel Cell
- Energy Economic Policy

## Requirement for Graduation

In accordance with the Graduate School Rules and Regulations.



# Doctor of Philosophy Program in Renewable Energy

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## Structure of the Program

### 1. Credit Requirements. \*

Requirements	Option 1.1	Option 2.1
Coursework	-	12
Core Courses	-	6
Electives	-	6
Required Non-credit Courses	3	3
Dissertation	48	36
<b>Total</b>	<b>48</b>	<b>48</b>

\* Minimum credits required.

### 2. Core Courses

Requirements	Option 1.1		Option 2.1	
	Course No.	Credits	Course No.	Credits
Mathematic for Energy Technology	-	-	852601	3
Simulation and Computer Aided Design of Energy System	-	-	852602	3
<b>Total</b>	-	-	<b>2</b>	<b>6</b>

### 3. Electives

Requirements	Option 1.1		Option 2.1	
	Course No.	Credits	Course No.	Credits
Downdraft Gasifier for Engine	-	-	852611	-
Photovoltaic Power Plant	-	-	852621	-
Solar Thermal Application for Industry	-	-	852622	-
Solar Thermal Power Plant	-	-	852623	-
Smart Grid	-	-	852624	-
Life Cycle Assessment and Carbon Footprint for Renewable Energy System			852631	
Green Building	-	-	852632	-
High Thermal Energy Storage System Technology	-	-	852641	-
Energy System for Vehicle	-	-	852642	-
<b>Total</b>	-	-	<b>11</b>	<b>≥6</b>

### 4. Required Non-credit Courses.

Requirements	Option 1.1		Option 2.1	
	Course No.	Credits	Course No.	Credits
Seminar 1	852603	1	852603	1
Seminar 2	852604	1	852604	1
Seminar 3	852605	1	852605	1
<b>Total</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

### 5. Dissertation Credit Requirements.

Requirements	Option 1.1		Option 2.1	
	Course No.	Credits	Course No.	Credits
Dissertation 1	852681	8	852691	3
Dissertation 2	852682	8	852692	6
Dissertation 3	852683	8	852693	6
Dissertation 4	852684	8	852694	6
Dissertation 5	852685	8	852695	6
Dissertation 6	852686	8	852696	9
<b>Total</b>	<b>6</b>	<b>48</b>	<b>6</b>	<b>36</b>

## Course Descriptions

### 852601 Mathematics for Energy Technology 3(3-0-6)

A study of ordinary differential equations and partial differential equations, numerical modeling, solution approaches, and energy system modeling. Simulation methods embracing steady lumped systems, dynamic simulation of lumped systems, and numerical computer programming.

### 852602 Simulation and Computer Aided Design of Energy Systems 3(2-3-5)

A study of computer aided design for energy systems with simulation techniques, numerical methods and approximation into computational programming and simulation, energy equipment simulation, optimisation and visualisation techniques.

### 852603 Seminar 1 1(0-2-1)

Emphasis on encouraging students to learn how to search for information and critically examine and assess articles and published papers. Oral presentation practice of selected topics relative to student's current research or thesis progress in renewable energy.

### 852604 Seminar 2 1(0-2-1)

Presentation and discussion of current research topics pertinent to renewable energy.

### 852605 Seminar 3 1(0-2-1)

Presentation and discussion of current research topics pertinent to renewable energy.

**852611 Downdraft Gasifier for Engines****3(2-3-5)**

An examination of the following topics: fuel for gasifiers, gasification reaction, downdraft gasifier design, producer gas cleaning and cooling, producer gas engines, and biomass gasification applications. Health and environmental evaluation of producer gas use and producer gas economics.

**852621 Photovoltaic Power Plants****3(2-3-5)**

A study of photovoltaic power plant design, construction operation, control systems and maintenance. Evaluation of power plant performance and economics, and power plant safety standards and their implementation.

**852622 Solar Thermal Energy Application for Industry****3(2-3-5)**

Solar thermal technology, devices and components, and their application in an industrial environment. The design of solar thermal applications using mathematical modeling together with the installation, operation, and maintenance of solar thermal technology.

**852623 Solar Thermal Power Plants****3(2-3-5)**

A study of solar thermal power plant design and simulation techniques. Construction and commissioning of solar thermal power plants and their subsequent operation and maintenance.

**852624 Smart Power Grids****3(2-3-5)**

An examination of the latest technology and techniques used to facilitate “smart grid” management to optimize power generation, transmission, and distribution to consumers including small scale energy systems that involve energy storage, metering, and home design and building to conserve and utilize energy efficiently.



### 852631 Life Cycle Assessment and Carbon Foot Printing of Renewable Energy Systems 3(3-0-6)

A holistic approach to the economic and environmental impacts of renewable energy systems over their total life cycle comparing the systems and processes in current use in Thailand and other countries from an energy analysis and socio-economic impact perspective.

### 852632 Green Buildings 3(2-3-5)

Modern building architectural design, operation, and maintenance focusing on conservation and optimal use of water, power, and other forms of energy. Examination of these aspects and also attitudes and approaches to energy management and the equipment and methods used to measure and monitor impacts on indoor and outdoor environments.

### 852641 High Thermal Energy Storage System Technology 3(2-3-5)

A study of thermal energy storage systems which involve: heat transfer, high thermal energy storage systems for solar power, thermal energy storage equations and mathematical modeling, thermal energy charging and discharging systems, and energy loss and the technology and efficiency factors of thermal energy storage.

### 852642 Vehicle Energy Systems 3(2-3-5)

A study on vehicle energy sources focusing on various types of batteries, fuel cells, and super capacitors. Electric vehicle design, safety, performance, economic evaluation, and electronic charging and battery energy management systems in vehicles.

**852681 Dissertation 1, Option 1.1****8 Credits**

Conducting an extensive, detailed and critical literature search and review related to their research topic and preparing a draft research proposal for submission to their dissertation advisors which includes a statement of the research problem, justification for the research topic, research objectives, and procedures stated in brief.

**852682 Dissertation2, Option 1.1****8 Credits**

Conducting an extensive, detailed and critical literature search and review of the concepts, theories, and journal articles related to their research topic; submitting a completed research proposal comprising full details of the research components, preparing to defend their dissertation, and submitting a progress report to their dissertation advisor.

**852683 Dissertation 3, Option 1.1****8 Credits**

Designing and conducting research experiments, collecting and analysing the data, and submitting a progress report to their dissertation advisors.

**852684 Dissertation 4, Option 1.1****8 Credits**

Designing and conducting research experiments, collecting and analysing additional data, submitting a progress report to their dissertation advisors, and writing a research article based on their dissertation which is suitable for publication in international academic journals.

**852685 Dissertation 5, Option 1.1****8 Credits**

Completing experiments, finalising the collection and analysis of the data, and preparing and submitting a final progress report to their dissertation advisors.

**852686 Dissertation 6, Option 1.1****8 Credits**

Conducting research, writing a dissertation following the dissertation format guidelines, and presenting it to the examination committee. Defending the dissertation before the committee and making any necessary rectifications or adjustments before submitting the final corrected dissertation to the Graduate School.

**852691 Dissertation 1, Option 2.1****3 Credits**

Conduct an extensive, detailed and critical literature search and review related to their research topic, and preparing a draft research proposal for submission to their dissertation advisors which includes a statement of the research problem, justification for the research topic, research objectives, and procedures stated in brief.

**852692 Dissertation 2, Option 2.1****6 Credits**

Completing a research proposal comprising details of the research components for submission to the dissertation advisors.

**852693 Dissertation 3, Option 2.1****6 Credits**

Completing a research proposal comprising details of the research components and taking a dissertation defense.

**852694 Dissertation 4, Option 2.1****6 Credits**

Designing and conducting research experiments, collecting and analysing additional data, submitting a progress report to their dissertation advisors, and writing a research article based on their dissertation which is suitable for publication in international academic journals.

**852695 Dissertation 5, Option 2.1****6 Credits**

Collecting and undertaking a final analysis of the data and writing a dissertation following the format of the dissertation guidelines for submission to the dissertation advisors.

**852696 Dissertation 6, Option 2.1****9 Credits**

Conducting research, completing a dissertation following the dissertation format guidelines and presenting it to the examination committee. Defending the dissertation before the committee and making any necessary rectifications or adjustments before submitting the final corrected dissertation to the Graduate School.