



**Dual Degree Program Agreement
Between**



Master Degree Program in Refrigeration, Air-Conditioning and Energy Engineering

Department of Refrigeration, Air-Conditioning and Energy Engineering

National Chin-Yi University of Technology, Taiwan, R.O.C.

And

Master Degree Program in Community Energy and Environment

Asian Development College for Community Economy and Technology

Chiang Mai Rajabhat University, Thailand

1. Objective

The primary objective of this Dual Degree Program Agreement is to set up and develop a system of academic exchange of two degrees between Master degree program in Refrigeration, Air-Conditioning and Energy Engineering, Department of Refrigeration, Air Conditioning and Energy Engineering, National Chin-Yi University of Technology (NCUT) and Master degree program in Community Energy and Environment, Asian Development College for Community Economy and Technology (adiCET), Chiang Mai Rajabhat University (CMRU).

2. Degree Conferral

Upon successful completion of all program requirements of both universities, the students will be conferred an accredited Master degree from National Chin-Yi University of Technology, Taiwan, R.O.C. and an accredited Master degree from Chiang Mai Rajabhat University, Thailand.

National Chin-Yi University of Technology:

Full Title: Master of Science
(Refrigeration, Air-Conditioning and Energy Engineering)
Abbreviation: M.S. (Refrigeration, Air-Conditioning and Energy Engineering)

Chiang Mai Rajabhat University:

Full Title: Master of Science (Community Energy and Environment)
Abbreviation: M.S. (Community Energy and Environment)

3. Applications

National Chin-Yi University of Technology:

- (1) Application qualifications: Applicants must be a Master student at the Department of Refrigeration, Air Conditioning and Energy Engineering.
- (2) Application procedure: Applications should be submitted to National Chin-Yi University of Technology before the international student admission application to Chiang Mai Rajabhat University. National Chin-Yi University of Technology and Chiang Mai Rajabhat University will review applicants' qualification based on the relevant regulations.
- (3) Number of students: Refer to department regulations.

Chiang Mai Rajabhat University:

- (1) Application qualifications: Applicants must be a Master student at Asian Development College for Community Economy and Technology.
- (2) Application procedure: Applications should be submitted to Chiang Mai Rajabhat University before the student admission application to National Chin-Yi University of Technology. Chiang Mai Rajabhat University and National Chin-Yi University of Technology will review applicants' qualifications based on the relevant regulations.
- (3) Number of students: Refer to department regulations

4. Date of Application

Students should submit their application to their respective department office before the university announced deadline.

5. Student Enrollment, Registration, Course Selection, and Performance Assessment

- (1) Refer to the academic regulations of each university.
- (2) Each university is required to advise students on course selection and should provide official transcripts to the students at the end of each semester (or each semester) once grades are available.
- (3) Students of National Chin-Yi University of Technology must complete 4 elective courses to be eligible for studying in the dual degree program at Chiang Mai Rajabhat University.
- (4) Students of Chiang Mai Rajabhat University must complete at least two semesters of studies before attending the dual degree program at National Chin-Yi University of Technology.

6. Semester

National Chin-Yi University of Technology:

1st Semester: September – January

2nd Semester: February – June

Summer: July-August

Chiang Mai Rajabhat University:

1st Semester: June – October

2nd Semester: October – February

Summer: March – May

Study Plan for National Chin-Yi University of Technology Students:

| Year/Semester | Month | Host University |
|----------------------|---------------------|------------------------|
| Year 1 Semester 1 | September – January | NCUT |
| Year 1 Semester 2 | February – June | NCUT |
| Year 2 Semester 1 | October – February | CMRU |
| Year 2 Semester 2 | June – October | CMRU |

Study Plan for Chiang Mai Rajabhat University Students:

| Year/Semester | Month | Host University |
|----------------------|---------------------|------------------------|
| Year 1 Semester 1 | June – October | CMRU |
| Year 1 Semester 2 | October – February | CMRU |
| Year 2 Semester 1 | September – January | NCUT |
| Year 2 Semester 2 | February – June | NCUT |

7. Courses and Credits

National Chin-Yi University of Technology:

- (1) Master's students of National Chin-Yi University of Technology are required to complete a minimum of two semesters at National Chin-Yi University of Technology and at least two semesters at Chiang Mai Rajabhat University.
- (2) Master's students of National Chin-Yi University of Technology are exempted from the CMRU remedial courses (i.e. COM 5101 Computer for Graduate Studies and ENG 5101 English for Graduate Studies)
- (3) Master's student of National Chin-Yi University of Technology must complete all the required credits, 12 credits of elective course, the Master thesis (6 credits), and at least 30 credits at Chiang Mai Rajabhat University to be conferred with the dual degree.

Chiang Mai Rajabhat University:

- (1) Master's students of Chiang Mai Rajabhat University are required to complete a minimum of two semesters at Chiang Mai Rajabhat University and at least two semesters at National Chin-Yi University of Technology.
- (2) Master's student of Chiang Mai Rajabhat University must complete all the required 30 credits at Chiang Mai Rajabhat University, and at least 9 credits of elective courses and 6 credits of thesis at National Chin-Yi University of Technology to be conferred with the dual degree.

Refer to

- Annex 1: Program Structure
- Annex 2: Course List
- Annex 3: Proposed Dual Degree Study Plan
- Annex 4: Course Description

8. Credit Transfer Policy

Credit shall be transferred according to the regulations of each university. The transferable courses are listed in Annex 5.

9. Thesis Co-Advising and Thesis Agreement

Eligible faculty members of both universities can act as the Thesis advisors of students in the program (Refer to Annex 6). The thesis committee can be comprised of advisors from both universities or only from the students' respective university. The arrangements are upon the agreement from the department.

The thesis from the dual degree program is subjected to equal-shared copyright between National Chin-Yi University of Technology and Chiang Mai Rajabhat University.

10. Conditions for Earning the Dual Degree

Degrees awarded are based on the regulations of each university.

- (1) The M.S. degree conferred by Department of Refrigeration, Air-Conditioning and Energy Engineering must satisfy the following:
 - (a) Must complete all the required courses at National Chin-Yi University of Technology and complete 12 credits of elective courses.
 - (b) Must complete the master thesis (6 credits).
 - (c) Must complete 4 courses (12 credits) in the curriculum that are transferable at Chiang Mai Rajabhat University.
- (2) The M.S. degree conferred by Chiang Mai Rajabhat University must satisfy the following:
 - (a) Must complete 30 credits at Chiang Mai Rajabhat University.
 - (b) Must complete 15 credits in the curriculum of National Chin-Yi University of Technology that are transferable to Chiang Mai Rajabhat University.
 - (c) Must achieve GPA of 3.0 or above.

11. Fees

- (1) Students should pay credit fees in accordance with standard of the university where they have registered.
- (2) During their study in the program, National Chin-Yi University of Technology students are still required to register at National Chin-Yi University of Technology and pay tuition, miscellaneous fees, and health insurance in accordance with Article 8 of Guidelines for International Exchange Students, as well as any fees or expenses required by Chiang Mai Rajabhat University. Chiang Mai Rajabhat University students are required to register at NCUT and pay tuition at least 2 semesters and other fees in accordance with National Chin-Yi University of Technology.
- (3) Chiang Mai Rajabhat University required CMRU students to register at CMRU and pay tuition fees at least 4 semesters. National Chin-Yi University of Technology students are required to register at CMRU and pay tuition at least 2 semesters and other fees in accordance with Chiang Mai Rajabhat University.

Refer to Annex 7: Fees

12. Health or Injury Insurance Documents

Students should provide health or injury insurance documents.

13. Term, Amendment, and Termination of Agreement

- (1) This agreement will become effective for five years on the date of signing. If any party suggests changing or terminating this agreement, they should notify the opposite party six months in advance. Alteration can be made with the agreement of both parties. The agreement will terminate in five years. If there is no objection between both parties, it will be renewed automatically.
- (2) This agreement is written in English. It will be implemented after signing by both universities. For any outstanding issues not addressed in this agreement, both institutions shall make good faith efforts to resolve them through common agreement.

Annex 1: Program Structure

| | CMRU | | NCUT | |
|-----------------------------|-----------------------------------|----------------|----------------------|--------|
| | Course | Plan A Type A2 | Course | Credit |
| | | Credit | | |
| 1 | Fundamental Course | 6 | - | - |
| 2 | Required Course | 15 | Required Course | 4 |
| 3 | Elective Course (no less than) | 12 | Core/Optional Course | 24 |
| 4 | Thesis | 12 | Thesis | 6 |
| 5 | Remedial Course | no credit | | |
| Total Credits(no less than) | | 45 | | 34 |

Annex 2: Course List

CMRU

| | | |
|--------------------------------------|--|-------------------|
| 1. Fundamental Course | | 6 credits |
| CEN 5101 | Research Methodology in Science and Social Science | 3 |
| CEN 5102 | English for Community Energy and Environment | 3 |
| 2. Required Course | | 15 credits |
| CEN 5201 | Community Energy | 3 |
| CEN 5401 | Community Environmental Studies | 3 |
| CEN 5402 | Green City Planning and Configuration | 3 |
| CEN 5911 | Seminar I | 3 |
| CEN 5912 | Seminar II | 3 |
| 3. Elective Course | | |
| Plan A Type A2 (no less than) | | 12 credits |
| CEN 5202 | Solar Energy | 3 |
| CEN 5203 | Biofuel Energy | 3 |
| CEN 5204 | Wind Energy Technologies | 3 |
| CEN 5205 | Hydrogen Energy Technologies and Applications | 3 |
| CEN 5206 | Fuel Cell Theories and Applications | 3 |
| CEN 5207 | Thermodynamics and Energy Conversion | 3 |
| CEN 5208 | Photovoltaic System | 3 |
| CEN 5301 | Energy Leader and Community Knowledge Management | 3 |
| CEN 5302 | Energy Economics | 3 |
| CEN 5303 | Green Business | 3 |
| CEN 5304 | Community Studies and Development | 3 |
| CEN 5403 | Smart Grid and Energy Management | 3 |
| CEN 5404 | Landscape Development and Community Environmental Management | 3 |
| CEN 5405 | Community Ecology System and Nature Conservation | 3 |
| CEN 5406 | Community Environmental Pollution Control | 3 |
| CEN 5407 | Physical and Environmental Control of Green Building | 3 |
| CEN 5408 | Selected Topic in Community Energy and Environment | 3 |
| CEN 5409 | Internship | 3(135) |
| 4. Thesis | | 12 credits |
| CEN 5901 | Thesis | 12 (540) |
| 5. Remedial Course | | No credits |
| COM 5101 | Computer for Graduate Studies | 3 |
| ENG 5101 | English for Graduate Studies | 3 |

NCUT

| 1. Required Course | Credits |
|---------------------------|----------------|
| Seminar I | 1 |
| Seminar II | 1 |
| Seminar III | 1 |
| Seminar IV | 1 |

| 2. Core Optional Course | Credits |
|--|----------------|
| Refrigeration and Air Condition System Engineering | 3 |
| Advance Thermodynamics | 3 |
| Advanced Heat Transfer | 3 |
| Advance Fluid Mechanics | 3 |

| 3. Optional Course | Credits |
|---|----------------|
| Computational Fluid Dynamics | 3 |
| Environmental Control of Sustainable Building | 3 |
| Cleanroom HVAC System Design | 3 |
| Temperature & Humidity Control Design | 3 |
| Food Freezing and Cold Storage | 3 |
| Fuel Cell Theory and Applications | 3 |
| Vacuum Freeze Drying | 3 |
| Energy Engineering Practices | 3 |
| Control Engineering of Refrigeration and Air-Conditioning | 3 |
| Wind Power | 3 |
| Hydrogen Energy Technology and Applications | 3 |
| Design and Analysis of Heat Exchanger | 3 |
| Energy Saving Technology Approach of Air-Conditioning System | 3 |
| Electronics Cooling | 3 |
| Turbulent and the Modeling | 3 |
| Design of Special HVAC System | 3 |
| Energy Saving Technology of Indoor Planting Environment | 3 |
| Design and Analysis of Smoke Management Systems | 3 |
| Introduction to Specialty Ventilation and Air Moving Technology | 3 |
| HVAC & R Testing Standards and Procedures | 3 |
| Solar Energy Theory and Application | 3 |
| Technology English | 3 |
| Special Refrigeration Application Technologies | 3 |
| Indoor Environment Quality | 3 |
| Physical and Environmental Control of Green Building | 3 |
| Green City Planning Configuration | 3 |

| 4. Thesis | Credits |
|------------------|----------------|
| Thesis | 6 |

Annex 3: Dual Degree Study Plan

3.1 For CMRU Students

At CMRU Year 1 / Semester 2

Year 1 / Semester 1

| Code | Course | Type | Credit |
|--------------|--|--|-----------|
| CEN 5101 | Research Methodology in Science and Social Science | Fundamental Course - CMRU | 3 |
| CEN 5102 | English for Community Energy and Environment | Fundamental Course –CMRU (Transferable to NCUT: Technology English) | 3 |
| CEN 5201 | Community Energy | Required Course – CMRU (Transferable to NCUT: Energy Engineering Practices) | 3 |
| CEN 5911 | Seminar I | Required Course - CMRU (Transferable to NCUT: Seminar III) | 3 |
| CEN XXXX | Fuel Cell Theory and Applications | Elective Course – CMRU (Transferable to NCUT: Fuel Cell Theory and Applications) | 3 |
| Total | | | 15 |

| Code | Course | Type | Credit |
|--------------|---------------------------------------|--|-----------|
| CEN 5401 | Community Environmental Studies | Required Course - CMRU | 3 |
| CEN 5402 | Green City Planning and Configuration | Required Course – CMRU (Transferable to NCUT: Green City Planning and Configuration) | 3 |
| CEN 5912 | Seminar II | Required Course - CMRU (Transferable to NCUT: Seminar IV) | 3 |
| CEN 5901 | Thesis | Thesis - CMRU | 6 |
| Total | | | 15 |

At NCUT

Year 2 / Semester 1

| Code | Course | Type | Credit |
|--------------|---|---|-----------|
| XXXX | Seminar I | Required Course – NCUT | 1 |
| XXXX | Hydrogen Energy Technology and Applications | Elective Course- NCUT (Transferable to CMRU: Hydrogen Energy Technology and Applications) | 3 |
| XXXX | Solar Energy Theory and Applications | Elective Course- NCUT (Transferable to CMRU: Solar Energy) | 3 |
| XXXX | Thesis | Thesis – CMRU & NCUT (Transferable to CMRU: Thesis) | 3 |
| Total | | | 11 |

Year 2 / Semester 2

| Code | Course | Type | Credit |
|--------------|--|--|-----------|
| XXXX | Seminar II | Required Course - NCUT | 1 |
| XXXX | Physical and Environmental Control of Green Building | Elective Course- NCUT (Transferable to CMRU: Physical and Environmental Control of Green Building) | 3 |
| XXXX | Design and Analysis of Smoke Management Systems | Elective Course- NCUT | 3 |
| XXXX | Thesis | Thesis – CMRU & NCUT (Transferable to CMRU: Thesis) | 3 |
| Total | | | 11 |

3.2 For NCUT Students

At NCUT

Year 1/ Semester 1

| Code | Course | Type | Credit |
|--------------|---|---|-----------|
| XXXX | Seminar I | Required Course – NCUT | 1 |
| XXXX | Hydrogen Energy Technology and Applications | Elective Course- NCUT (Transferable to CMRU: Hydrogen Energy Technology and Applications) | 3 |
| XXXX | Solar Energy Theory and Applications | Elective Course- NCUT (Transferable to CMRU: Solar Energy) | 3 |
| XXXX | Thesis | Thesis – CMRU & NCUT (Transferable to CMRU: Thesis) | 3 |
| Total | | | 11 |

Year 1/ Semester 2

| Code | Course | Type | Credit |
|--------------|--|--|-----------|
| XXXX | Seminar II | Required Course - NCUT | 1 |
| XXXX | Physical and Environmental Control of Green Building | Elective Course- NCUT (Transferable to CMRU: Physical and Environmental Control of Green Building) | 3 |
| XXXX | Design and Analysis of Smoke Management Systems | Elective Course- NCUT | 3 |
| XXXX | Thesis | Thesis – CMRU & NCUT (Transferable to CMRU: Thesis) | 3 |
| Total | | | 11 |

At CMRU

Year 2/ Semester 1

| Code | Course | Type | Credit |
|--------------|--|--|-----------|
| CEN 5101 | Research Methodology in Science and Social Science | Fundamental Course - CMRU | 3 |
| CEN 5102 | English for Community Energy and Environment | Fundamental Course – CMRU (Transferable to NCUT: Technology English) | 3 |
| CEN 5201 | Community Energy | Required Course – CMRU (Transferable to NCUT: Energy Engineering Practices) | 3 |
| CEN 5911 | Seminar I | Required Course - CMRU (Transferable to NCUT: Seminar III) | 3 |
| CEN XXXX | Fuel Cell Theory and Applications | Elective Course – CMRU (Transferable to NCUT: Fuel Cell Theory and Applications) | 3 |
| Total | | | 15 |

Year 2 / Semester 2

| Code | Course | Type | Credit |
|--------------|---------------------------------------|--|-----------|
| CEN 5401 | Community Environmental Studies | Required Course - CMRU | 3 |
| CEN 5402 | Green City Planning and Configuration | Required Course – CMRU (Transferable to NCUT: Green City Planning and Configuration) | 3 |
| CEN 5912 | Seminar II | Required Course - CMRU (Transferable to NCUT: Seminar IV) | 3 |
| CEN 5901 | Thesis | Thesis - CMRU | 6 |
| Total | | | 15 |

Annex 4: Course Description

CMRU

1. Fundamental Course

- CEN 5101 Research Methodology in Science and Social Science 3(3-0-6)**
Research methodology in science and social science; the criteria and process formulation in scientific research; referencing; document research; planning and research design; proposal development with research statistics; conclusion and discussion; reporting; oral presentation; case study of research methodology in science and social science from researcher and successful and well accepted research
- CEN 5102 English for Community Energy and Environment 3(3-0-6)**
English skills in listening, speaking, and reading; writing publications and research reports; specific vocabularies in energy and environment

2. Required Course

- CEN 5201 Community Energy 3(3-0-6)**
Energy situation of Thailand and the world that affects the local community; basic knowledge of community power and energy technology; biofuel, green fuel, biochar, biogas, biodiesel, and ethanol; renewable energy for agriculture; agricultural product processing solar drier; and the application of energy in the community
- CEN 5401 Community Environmental Studies 3(3-0-6)**
Problem and relations of natural resources, environment and energy; management and conservation of natural resources and environment; regulations and related policies; the study and survey of community environmental issues; the effect and evaluation on communities; method of preventing and solving the environmental issues in the community and global level
- CEN 5402 Green City Planning and Configuration 3(3-0-6)**
Fundamental knowledge in the concept of green cities and the configuration; the establishment of humans and the ways of living in physical, economical, social, energy and environment; the studies of current issues in city and rural area; plans and problem solving method based on green city concept and key performance index
- CEN 5911 Seminar I 3(3-0-6)**
Current problem or aspect relating to the energy and environment; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees.

CEN 5912 Seminar II **3(3-0-6)**
Current problem or aspect relating to the energy and environment; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees.

3. Elective Course

CEN 5202 Solar Energy **3(3-0-6)**
Solar radiation; solar ray characteristics; solar radiation measurement equipment; application of solar energy as thermal and electricity; economic analysis of solar cell's application; and the marketing opportunity for solar cells

CEN 5203 Biofuel Energy **3(3-0-6)**
Biofuel energy; type of biofuel; the production of biofuel; application and transformation of biofuel through thermal, chemical and biological processing; issues of biofuel application; economic analysis; and biofuel marketing

CEN 5204 Wind Energy Technologies **3(3-0-6)**
Potential of wind energy; electricity production system; application of wind energy; the effect of using wind energy; the analysis of economics; and marketing of wind energy

CEN 5205 Hydrogen Energy Technologies and Applications **3(3-0-6)**
Basic of hydrogen energy; hydrogen generation methods; hydrogen storage techniques; hydrogen transportation; fuel cell; hydrogen applications; application of hydrogen and fuel cell

CEN 5206 Fuel Cell Theories and Applications **3(3-0-6)**
Fuel cell introduction; fuel cell thermodynamics; fuel cell reaction kinetics; fuel cell charge and transport; fuel cell types; fuel cell characteristic; fuel cell application

CEN 5207 Thermodynamics and Energy Conversion **3(3-0-6)**
Thermodynamics properties; work and heat; the first law of thermodynamics; the second law of thermodynamics; entropy; heat transfer; energy conversion; and energy efficiency

CEN 5208 Photovoltaic System **3(3-0-6)**
Solar radiation; photovoltaic cells; properties of semiconductors, types of semiconductors; photovoltaic cells fabrication; photovoltaic system design, photovoltaic cells application; photovoltaic system performance evaluation; and economic analysis of photovoltaic system

CEN 5301 Energy Leader and Community Knowledge Management 3(3-0-6)
Concept, theory, characteristics, morality and ethics of community leaders in energy; leaders' responsibility, regulations, and psychology; energy management; human resource management; learning definition and goals; community knowledge management; The integration of knowledge and theory for the application and promotion of community energy and environmental development

CEN 5302 Energy Economics 3(3-0-6)
Importance of energy to economy; effect of energy on environment; policy and planning on energy usage; energy investment; energy market; energy project analysis and evaluation

CEN 5303 Green Business 3(3-0-6)
Concept of green business; management and planning of environmental friendly community business structure; carbon credit; strategy and guidelines to socially responsible business management; the application and community product with natural resources; the development of community business; and the standardization of community products

CEN 5304 Community Studies and Development 3(3-0-6)
Definition, component and category of community; community studies; principal of development and learning with the community; quality of life, economic and social development in the community level; guideline to solve the community issues in the aspect of energy and environment for sustainability

CEN 5403 Smart Grid and Energy Management 3(3-0-6)
Smart grid system and infrastructure; distributed generations; local distribution grid; smart meter; smart home; electronic devices; electric vehicles; energy management systems; and community participation

CEN 5404 Landscape Development and Community Environmental Management 3(3-0-6)
Basic physical component in landscape development for the community; the relations between architecture and urban planning; community natural resources management; land allocations in an environmental friendly way; and the usage of natural resources in a multiple compensation approach

CEN 5405 Community Ecology System and Nature Conservation 3(3-0-6)
Changes in the ecology system; the effects on the community and the ecological agriculture; the problems in the community that relates to the ecology systems; the application of advance ecology; the development of using organism to monitor the condition and changes in the ecology system; and natural conservation in the community

CEN 5406 Community Environmental Pollution Control **3(3-0-6)**
Definition and categorization of pollution; the cause of pollution; the issues of pollution to the environment; pollution control in the community; the application of technology to control, treatment, and eliminate of each pollution category

CEN 5407 Physical and Environmental Control of Green Building **3(3-0-6)**
Physical and environmental characteristics of green building; building energy consumption analysis and technique; building climatology, urban environment and climate; indoor air/environmental control system; ventilation and air change control mode; green building heat transfer and insulation control; thermal loading of building envelope; energy saving technologies

CEN 5408 Selected Topic in Community Energy and Environment **3(3-0-6)**
This course offers opportunities to go beyond the usual curriculum in order to abreast with changes in community energy and environment. Course description and details are provided when appropriate

CEN 5409 Internship **3(135)**
Internship to achieve expertise, skills and experiences; provide report, presentation and discussion from the intern collaboratively

4. Thesis

CEN 5901 Thesis **12 (540)**
The thesis work is under the supervision of advisory committee members

5. Remedial Course

COM 5101 Computer for Graduate Studies **3 (2-2-5)**
Basic concepts of computer system and program; application of computer in various fields of study; basic concept of information technology; computer network and internet

ENG 5101 English for Graduate Studies **3(3-0-6)**
English skills in listening, speaking, reading and writing for research study; reading for main idea of academic publications abstract

Annex 5: Transferable Course

| | CMRU (Credit) | NCUT (Credit) |
|---|--|--|
| 1 | <p>CEN 5102 English for Community Energy and Environment (3)</p> <p>English skills in listening, speaking, and reading; writing publications and research reports; specific vocabularies in energy and environment</p> | <p>Technology English (3)</p> <p>The overall objectives of the course are: Develops an entrepreneurial mindset in engineering students, fosters innovation and creativity in engineering disciplines, helps the students to develop business plans for the entrepreneurial design projects, on-line training and on-site learning, how to prepare: PowerPoint & presentation, manuscript writing and PowerPoint presentation in English.</p> |
| 2 | <p>CEN 5201 Community Energy (3)</p> <p>Energy situation of Thailand and the world that affects the local community; basic knowledge of community power and energy technology; biofuel, green fuel, biochar, biogas, biodiesel, and ethanol; renewable energy for agriculture; agricultural product processing solar drier; and the application of energy in the community</p> | <p>Energy Engineering Practices (3)</p> <p>Let students learn technology of energy engineering in order to be an energy engineer in the future. Especially, in the field of solar PV system, there is a License Counseling to help students to get a B grade license of Solar Photovoltaic. The content of this course includes Introduction of energy, fundamentals of solar radiation, solar hot water, solar electricity, design of solar heating systems/ photovoltaic system, license counseling—B grade license of solar photovoltaic system, theory of wind power, power generation engineering of wind turbine.</p> |
| 3 | <p>CEN 5402 Green City Planning and Configuration (3)</p> <p>Fundamental knowledge in the concept of green cities and the configuration; the establishment of humans and the ways of living in physical, economical, social, energy and environment; the studies of current issues in city and rural area; plans and problem solving method based on green city concept and key performance index</p> | <p>Green City Planning and Configuration (3)</p> <p>Fundamental knowledge in the concept of green cities and the configuration; the establishment of humans and the ways of living in physical, economical, social, energy and environment; the studies of current issues in city and rural area; plans and problem solving method based on green city concept and key performance index</p> |
| 4 | <p>CEN 5901 Thesis (6)</p> <p>The thesis work is under the supervision of advisory committee members</p> | <p>Thesis (6)</p> <p>The thesis work is under the supervision of advisory committee members</p> |
| 5 | <p>CEN 5202 Solar Energy (3)</p> <p>Solar radiation; solar ray characteristics; solar radiation measurement equipment; application of solar energy as thermal and</p> | <p>Solar Energy Theory and Applications (3)</p> <p>Fundamentals of Solar Radiation, The Theory of Solar and Solar Energy, Solar Collectors, Solar Water Heaters, Solar Energy House, Solar Energy Cooling and Air-conditioning, Power generation</p> |

| | CMRU (Credit) | NCUT (Credit) |
|---|---|--|
| | electricity; economic analysis of solar cell's application; and the marketing opportunity for solar cells | engineering of photovoltaic, solar power with smart grid. |
| 6 | <p>CEN 5204 Wind Energy Technologies (3)</p> <p>Potential of wind energy; electricity production system; application of wind energy; the effect of using wind energy; the analysis of economics; and marketing of wind energy</p> | <p>Wind Power (3)</p> <p>The content of this course includes the fundamental theory of wind power, windmill design, wind turbine system, special topics of wind power practice, and windmill characteristic experiment. The topics of this course are: Wind power introduction, Windmill classification, Windmill Design, Wind turbine system, Special topics of wind power practice, Windmill characteristic experiment.</p> |
| 7 | <p>CEN 5205 Hydrogen Energy Technology and Applications (3)</p> <p>Basic of hydrogen energy; hydrogen generation methods; hydrogen storage techniques; hydrogen transportation; fuel cell; hydrogen applications; application of hydrogen and fuel cell</p> | <p>Hydrogen Energy Technology and Applications (3)</p> <p>This course introduces fuel cell theory and applications. The contents include fuel cell introduction, fuel cell thermodynamics, fuel cell reaction kinetics, fuel cell charge transport, fuel cell types, fuel cell characteristic experimental measurements, DMFC paper reading & reports, and case studies.</p> |
| 8 | <p>CEN 5206 Fuel Cell Theory and Applications (3)</p> <p>Fuel cell introduction; fuel cell thermodynamics; fuel cell reaction kinetics; fuel cell charge and transport; fuel cell types; fuel cell characteristic; fuel cell application</p> | <p>Fuel Cell Theory and Applications (3)</p> <p>This course introduces fuel cell theory and applications. The contents include fuel cell introduction, fuel cell thermodynamics, fuel cell reaction kinetics, fuel cell charge transport, fuel cell types, fuel cell characteristic experimental measurements, DMFC paper reading & reports, and case studies.</p> |
| 9 | <p>CEN 5407 Physical and Environmental Control of Green Building (3)</p> <p>Physical and environmental characteristics of green building; building energy consumption analysis and technique; building climatology, urban environment and climate; indoor air/environmental control system; ventilation and air change control mode; green building heat transfer and insulation control; thermal loading of building envelope; energy saving technologies</p> | <p>Physical and Environmental Control of Green Building (3)</p> <p>Introduction to Physical and Environmental of Green Building. The Building Energy Consumption Analysis and Technique. The Building Climatology. The Urban Environmental and Climate. The Indoor Air/Environmental Control System. The Ventilation and Air Change Control Mode. The Green Building Heat Transfer and Insulation Control. The Thermal Loading of Building Envelope. The Heating, Ventilating, and Air-Conditioning Systems. The Energy Saving Techniques on HVAC Systems. The Green Building</p> |

| | CMRU (Credit) | NCUT (Credit) |
|-----------|--|--|
| | | in Thermal Environmental Control. The Smart Energy and Intelligent Building Environmental. |
| 10 | CEN 5911 Seminar I (3) Current problem or aspect relating to the energy and environment; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees. | Seminar III (1) Current problem or aspect relating to the energy engineering; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees. |
| 11 | CEN 5912 Seminar II (3) Current problem or aspect relating to the energy and environment; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees. | Seminar IV (1) Current problem or aspect relating to the energy engineering; guidance for the literature survey; seminar format presentation. The method and format of presentation will be in accordance to the curriculum committees. |

Annex 6: Thesis Advisors

CMRU

1. Dr. Worajit Setthapun
2. Dr. Hathaithip Sintuya
3. Asst. Prof. Dr.Chawit Jitvijarn
4. Prof. Manus Suwan
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