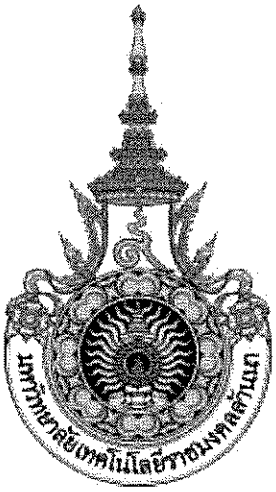

Certificate in Vocational Education

Year 2022

Industrial Engineering

Engineering Preparation Program

College of Integrated Science and Technology

Rajamangala University of Technology Lanna

สภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ให้ความเห็นชอบหลักสูตรนี้แล้ว
เมื่อวันที่ 12 ก.ย. 2564

สำนักงานคณะกรรมการการอาชีวศึกษา
ให้การรับรองหลักสูตรแล้ว
ตามหนังสือ ที่ ศธ 0603/4753
ลงวันที่ 27 ธันวาคม 2545

หลักสูตรประกาศนียบัตรวิชาชีพ

พุทธศักราช 2565

ประเภทวิชาอุตสาหกรรม

สาขาวิชาเตรียมวิศวกรรมศาสตร์

วิทยาลัยเทคโนโลยีและสหวิทยาการ

มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

รองฯ ฝ่ายวิชาการและกิจการ นศ.
ลงรับ 2054
วันที่ 9 ส.ค. 2565
เวลา 13.13 น.

มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
เลขรับ 7454
วันที่ 9 ส.ค. 2565
เวลา 11.50 น.

ที่ ศธ ๐๖๐๖/ ๕๗๖๓

สำนักงานคณะกรรมการการอาชีวศึกษา
กระทรวงศึกษาธิการ กทม. ๑๐๓๐๐

๒๗ กรกฎาคม ๒๕๖๕

เรื่อง รับรองหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ วิทยาลัยเทคโนโลยีและสหวิทยาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

เรียน อธิการบดีมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

อ้างถึง หนังสือมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ที่ อว ๐๖๕๔.๐๑(๐๘)/๓๓๐๖ ลงวันที่ ๑๕ ธันวาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย หลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ วิทยาลัยเทคโนโลยีและสหวิทยาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา จำนวน ๖ เล่ม

ตามหนังสือที่อ้างถึง มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ได้เสนอหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ วิทยาลัยเทคโนโลยีและสหวิทยาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา จำนวน ๓ สาขาวิชา ได้แก่ สาขาวิชาเตรียมบริหารธุรกิจ สาขาวิชาเตรียมวิศวกรรมศาสตร์ และสาขาวิชาเตรียมสถาปัตยกรรมศาสตร์ เพื่อให้สำนักงานคณะกรรมการการอาชีวศึกษาพิจารณารับรองหลักสูตร ความละเอียดแจ้งแล้ว นั้น

สำนักงานคณะกรรมการการอาชีวศึกษา ได้พิจารณาหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ วิทยาลัยเทคโนโลยีและสหวิทยาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา จำนวน ๓ สาขาวิชาดังกล่าว ในการประชุมคณะกรรมการการอาชีวศึกษา ครั้งที่ ๖/๒๕๖๕ เมื่อวันพุธที่ ๒๙ มิถุนายน ๒๕๖๕ ซึ่งที่ประชุมมีมติรับรองหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ วิทยาลัยเทคโนโลยีและสหวิทยาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา จำนวน ๓ สาขาวิชา คือ สาขาวิชาเตรียมบริหารธุรกิจ สาขาวิชาเตรียมวิศวกรรมศาสตร์ และสาขาวิชาเตรียมสถาปัตยกรรมศาสตร์ ให้เทียบเท่าหลักสูตรประกาศนียบัตรวิชาชีพ ตามประกาศคณะกรรมการการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒

จึงเรียนมาเพื่อโปรดทราบ

เรียน รองอธิการบดี ฝ่ายวิชาการฯ
- เพื่อโปรดทราบ การรับรองหลักสูตรประกาศนียบัตรวิชาชีพ พ.ศ. 2565 วิทยาลัยเทคโนโลยีสหวิทยาการ มทร.ล้านนา
- เห็นควรมอบ ผอ.สวท. ดำเนินการ

(นายทินภัทร อุปราสิทธิ์)
นิติกรชำนาญการพิเศษ รักษาราชการแทน
ผู้อำนวยการกองกลาง - 9 ส.ค. 2565

ขอแสดงความนับถือ

(นายมณฑล ภาคสุวรรณ)
รองเลขาธิการคณะกรรมการการอาชีวศึกษา ปฏิบัติราชการแทน
เลขาธิการคณะกรรมการการอาชีวศึกษา

มอบ ผอ.สวท. และแจ้ง ผอ.วทส.
ทราบ ดำเนินการส่วนที่เกี่ยวข้องต่อไป

9 ส.ค. 65
(รองศาสตราจารย์ธีระศักดิ์ อุรัจนานนท์)
รองอธิการบดีฝ่ายวิชาการและกิจการนักศึกษา

สำนักมาตรฐานการอาชีวศึกษาและวิชาชีพ
โทร. ๐ ๒๐๒๖ ๕๕๕๕ ต่อ ๕๐๐๕
โทรสาร ๐ ๒๒๘๒ ๙๓๕๔

มติการประชุม
สภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ครั้งที่ ๓๑(๒/๒๕๖๗)
วันอังคารที่ ๖ กุมภาพันธ์ ๒๕๖๗

๕.๑๒ พิจารณาหลักสูตรประกาศนียบัตรวิชาชีพ เตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program)

วิทยาลัยเทคโนโลยีและสหวิทยาการ ได้ดำเนินการพัฒนาหลักสูตรภาษาอังกฤษ ระดับประกาศนียบัตรวิชาชีพ (ปวช.) (English Program) โดยใช้หลักสูตร ปวช.เตรียมวิศวกรรมศาสตร์เป็นต้นแบบ การจัดการเรียนการสอนเพื่อมุ่งผลิตผู้สำเร็จการศึกษาให้มีคุณภาพและมาตรฐานสากลโดยใช้ภาษาต่างประเทศเป็นสื่อ ซึ่งเป็นการเรียนรู้คู่ขนานที่สร้างโอกาสและทางเลือกให้กับผู้เรียนสำหรับการพัฒนาทักษะภาษาอังกฤษ และเริ่มจัดการเรียนการสอนในภาคเรียนที่ ๑/๒๕๖๖ จำนวน ๑ ห้องเรียน (๑๘ คน) โดยรูปแบบการเรียนการสอนต้องคำนึงถึงความสามารถพื้นฐาน ความพร้อม ความสนใจที่จะเรียนรู้ภาษาอังกฤษ ควรจัดกิจกรรมง่าย ๆ ที่ทำให้นักศึกษามีความสุขสนุกสนาน สร้างความกระตือรือร้น และประสบความสำเร็จ เช่น การศึกษาดูงานในสถานประกอบการ การเล่นบทบาทสมมติ สอดคล้องบริบทของความเป็นไทยผสมผสานความเป็นสากล โดยมุ่งเน้นความรักท้องถิ่น ประเทศชาติ และความเป็นไทย โดยสอดแทรกคุณธรรม จริยธรรม และค่านิยมที่ดีงาม สร้างความมั่นใจ และส่งเสริมให้ผู้เรียนกล้าใช้ภาษาในการสื่อสาร

เพื่อจัดการเรียนการสอนหลักสูตร ประกาศนียบัตรวิชาชีพเตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program) ของมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา เป็นไปอย่างมีคุณภาพ สอดคล้องกับหลักการและจุดมุ่งหมายเป็นไปตามข้อกำหนดของมหาวิทยาลัย ซึ่งต้องบริหารจัดการบุคลากร สื่อ วัสดุ อุปกรณ์ ห้องปฏิบัติการ และสถานที่ต่างๆ ที่ให้คณาจารย์ นักศึกษาทุกคนได้ใช้ประโยชน์ร่วมกันและอย่างเท่าเทียมกัน และจัดให้นักศึกษาทำกิจกรรมร่วมกัน เช่น กิจกรรมพัฒนาผู้เรียน กิจกรรมของสถานศึกษา/ชุมชน โดยเฉพาะกิจกรรมที่ส่งเสริมความเป็นไทย ส่งเสริมคุณธรรม จริยธรรม และคุณลักษณะอันพึงประสงค์ โดยมีหลักเกณฑ์และรูปแบบการจัดการเรียนการสอน ดังนี้

๑. ต้องจัดการเรียนการสอนตามหลักสูตรของกระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรมและสอดคล้องกับนโยบายของกระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัยและนวัตกรรม และพระราชบัญญัติการศึกษาแห่งชาติ พ.ศ. ๒๕๔๒

๒. การจัดการเรียนการสอน ควรจัดในบริบทของความเป็นไทยผสมผสานความเป็นสากล โดยมุ่งเน้นความรักท้องถิ่น ประเทศชาติ และความเป็นไทย

๓. ต้องจัดการเรียนการสอนทุกวิชา โดยสอดแทรกคุณธรรม จริยธรรม และค่านิยมที่ดีงาม สร้างความมั่นใจ และส่งเสริมให้ผู้เรียนกล้าใช้ภาษาในการสื่อสาร

๔. การจัดการเรียนการสอนเป็นภาษาอังกฤษ ต้องคำนึงถึงความสามารถพื้นฐาน ความพร้อม ความสนใจที่จะเรียนรู้ภาษาอังกฤษ ควรจัดกิจกรรมง่าย ๆ ที่ทำให้นักศึกษามีความสุขสนุกสนาน สร้างความกระตือรือร้น และประสบความสำเร็จ เช่น การศึกษาดูงานในสถานประกอบการ การเล่นบทบาทสมมติ เป็นต้น

ผลการดำเนินงาน

๑. ผ่านการพิจารณาจากคณะกรรมการบริหารวิทยาลัยเทคโนโลยีและสหวิทยาการ ในการประชุมครั้งที่ ๔/๒๕๖๖ เมื่อวันที่ ๒๒ สิงหาคม ๒๕๖๖ ที่ประชุมรับทราบ และมอบผู้รับผิดชอบหลักสูตรปรับปรุงตามข้อสังเกตของคณะกรรมการวิชาการ และนำเสนอกรรมการสภาวิชาการ

๒. ผ่านการพิจารณาจากสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ในการประชุมครั้งที่ ๑๙๓ (ต.ค.๖๖) วันที่ ๕ ตุลาคม ๒๕๖๖ ที่ประชุมรับทราบการรายงานการจัดทำหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ ประเภทวิชาอุตสาหกรรม สาขาวิชาเตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program) และวิทยาลัยเทคโนโลยีและสหวิทยาการ ปรับปรุงตามข้อสังเกตของคณะอนุกรรมการวิชาการ และนำเสนอสภามหาวิทยาลัยต่อไป

๓. ผ่านการพิจารณาจากการประชุมคณะอนุกรรมการวิชาการ ในการประชุมครั้งที่ ๔/๒๕๖๖ (ธ.ค.๖๖) วันที่ ๒๘ ธันวาคม ๒๕๖๖ ที่ประชุมรับทราบการจัดทำหลักสูตรประกาศนียบัตรวิชาชีพ พุทธศักราช ๒๕๖๕ ประเภทวิชาอุตสาหกรรม สาขาวิชาเตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program) และมอบหมายให้วิทยาลัยเทคโนโลยีและสหวิทยาการนำเสนอสภามหาวิทยาลัยต่อไป

จึงเสนอต่อสภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา เพื่อโปรดพิจารณาเห็นชอบหลักสูตรประกาศนียบัตรวิชาชีพ เตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program)

มติสภา มทร.ล้านนา เห็นชอบหลักสูตรประกาศนียบัตรวิชาชีพ เตรียมวิศวกรรมศาสตร์ ฉบับภาษาอังกฤษ (English Program) ดังเสนอ

(รองศาสตราจารย์ธีระศักดิ์ อุรัจนานนท์)
เลขานุการสภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

Preface

College of Integrated Science and Technology, Rajamangala University of Technology Lanna has been established since 2008 to provide teaching and learning programs under a Certificate of Vocational Education. Rajamangala University of Technology Lanna aims to improve a Certificate of Vocational Education to meet Thailand's 20-Year National Strategy 2018-2037, the strategy of the Ministry of Higher Education, Science, Research and Innovation, and the strategy of the University in aiming to produce graduates with practical skills, knowledge, independent thinking, and moral and ethical responsibilities.This curriculum revision also aims to produce and develop graduates who can solve complex problems with analytical, synthesizing and creative thinking with work manamagement potentials for modern indurtial sector, teamwork skills, good human relations, and high emotional intelligence, who can adapt well in various situations with service mind and the ability to synthesize information for appropriate decision-making; and to revise the curriculum to be in line with a fast changing world.

Furthermore, this curriculum is revised in accordance with the "Standard Criteria for Vocational Education Qualifications at the Vocational Certificate Level, B.E. 2562" of The Office of Vocational Education Commission. It is therefore hoped that this curriculum will be in line with the changes in the current economic and social conditions, and be able to respond to the needs of learners and the labor market.

College of Integrated Science and Technology
Rajamangala University of Technology Lanna

Contents

Page

Contents (continued)

Certificate in Vocational Education

Year 2022

(Revised Curriculum, 2022)

1. Program Title Certificate in Vocational Education
Engineering Preparation Program

2. Degree Title Certificate of Vocational Education
(Engineering Preparation Program)
Cert. of Voc. Ed. (Engineering Preparation Program)

3. Faculty Responsible for the Program College of Integrated Science and Technology
Rajamangala University of Technology Lanna

Curriculum Principles

1. The curriculum offers a Certificate in Vocational Education for students who have completed lower secondary school (M3 or grade 9) or equivalent. The curriculum is designed to bridge academic courses and vocational courses, in accordance with the National Economic and Social Development Plan, The National Education Plan, and ASEAN Communities, in response to The National Qualifications Framework (Thailand NQF) and The National Qualifications Framework for Vocational Education, in order to produce and develop citizen with occupational competencies, morals, ethics, and professional ethics, who meet the needs and requirements of industrial sector, to be able to self-employ, and pursuit higher studies, i.e., higher vocational studies, higher studies in Engineering and Technology.

2. The curriculum aims to produce and develop learners with knowledge and abilities related to science, technology, fundamental engineering integrating with local wisdoms in designing and developing creative inventions, who comply with social norms with regard to moral and ethical standards.

3. The curriculum aims to promote learners' competencies, interests, creative thinking, and teamwork skills, in order to become innovative citizens who could develop an innovative technology for future.

4. The curriculum aims to offer learners with opportunities to develop their competencies through hands-on-learning. Learners are encouraged to choose their courses in relation to their potentials, and opportunities. The curriculum also allows learners to transfer their credits obtained from various sources, i.e., job training experiences from workplaces or enterprises.

5. The curriculum aims to encourage a collaboration between educational institutes within and beyond state-owned enterprises.

6. The curriculum aims to provide opportunities for educational institutions, organizations, localities, and communities in developing and improving the curriculum to meet their needs and interests adhering to professional standards, local contexts, and the strategical conditions of the region in order to enhance the nation's potential.

Curriculum Objectives

1. To produce learners with knowledge, skills, and professional experiences in accordance with the requirements of vocational education standards, and their future career prospects. Learners are encouraged to live and work appropriately in relation to their potentials, as well as actively engage in the development of their localities, communities, and nation.

2. To enhance learners' critical and creative thinking with passion for life and career improvement, who are skilled in communication, communication technology, lifelong learning, analyzing and problem solving, hygiene, safety, and essential managerial skills required for career advancement and professional development.

3. To provide learners with knowledge and skills in science, technology, and basic engineering skills, who are able to think systematically and creatively, as well as being inquisitive for personal development.

4. To provide learners with knowledge and understanding of interdisciplinary aspects mainly related to society, environment, culture, and local wisdom, which are required in designing, building, and presenting their inventions.

5. To produce learners with knowledge and skills associated to science, engineering technology, and mathematics, with the aim of enhancing their abilities to create, invent, and develop innovative technology for the development of their localities, communities, and nation.

6. To produce learners with knowledge and understanding associated with work plan, practical process, skills required for task completion, the ability to apply knowledge and skills in discovering new knowledge, offering suggestions and solutions to problems, and being responsible to themselves and society.

7. To produce learners with knowledge and communication skills in foreign languages to discover inventive and innovative technology for international recognition.

8. To produce learners with a set of desirable professional attitudes, i.e., be confident and proud of the program they study, appreciate their professions and organizations; acquire teamwork skills; respect their own rights and others', accept

diversities, recognize the need to comply with social and professional moral and ethical standards, as well as having social responsibility.

9. To educate learners with knowledge and sense of adaptability to cultural, economic, political, and social changes in a globalized world. Learners will be educated with a desirable social etiquette required to work and live in a society, who are against violence and drug abuse, with a sense of responsibility to their families, organizations, local communities, and nation. Learners will also be encouraged to apply the Philosophy of Sufficiency Economy on their living, being comprehensible and appreciative of the value of arts, culture, local wisdoms, with service mind and environmental concerns.

10. To prepare good personality graduates with good human relations, who comply with moral and ethical standards, being self-disciplined, and having good physical and mental health for their career.

11. To help learners recognize and solve national and global issues associated with economy, society, and politics. Graduates will be educated with a sense of patriotism, Thainess, and self-sacrifice for public good as to maintain national security, religion, monarchy, and the democratic monarchy.

12. To produce learners with a qualified vocational certificate as to enhance the nation's sustainable development, as well as preparing them for higher studies in engineering related fields.

Curriculum Implementation

Certificate in Vocational Education, Revised Curriculum 2022

1. Teaching and Learning

1.1 Students in this program are allowed to register in any of the offered courses and the credits obtained from the courses can be calculated for grading. Credit transferring can also be done as well as the transferring of knowledge, skills, and experiences. However, these must be approved by program committees and consistent with the Regulation of Rajamangala University of Technology Lanna on Diploma Education B.E. 2551 and additional announcements.

1.2 This program aims to encourage a practical-based learning; therefore; teaching and learning can be arranged in any forms. However, the integration of knowledge associated with science, technology, engineering, and mathematics (STEM Education) should be promoted through Active learning, Problem-Based and Project-Based Learning: PjBL in order to enhance learners' opportunities in research, design, and invention creation.

1.3 This program aims at promoting the integration of academic and professional knowledge, analytical thinking, critical thinking, new knowledge discovery, problem-solving, and presentation of new knowledge through an advanced technology, as well as to enable students to effectively integrate their ideas with knowledge on their own. Furthermore, this program aims to instill graduates with high moral virtue and ethical standards to take on social responsibilities and become a better global citizen in accordance with the regulations of Rajamangala University of Technology Lanna on Diploma Education B.E. 2551 and additional announcements.

2. Educational Management System and Teaching and Learning Duration

2.1 The arrangement of teaching and learning for students who have completed a lower secondary school or equivalent should be in accordance with the requirements of the program, with a total duration of 3 years.

2.2 The arrangement of teaching and learning is outlined below.

2.2.1 The regular academic year is divided into two semesters, which are the first and the second semester. Each semester lasts 18 weeks, including the examination period, with the equivalent number of class periods and credits in accordance with the regulations stated in the curriculum. A summer session may be offered dependent on the consideration of the curriculum committees.

2.2.2 For in-class learning system, teaching and learning should be arranged for not less than five days a week, and a maximum of 7 hours a day. Each class lasts 60 minutes.

3. The Calculations of Credits

For industrial engineering preparation programs, the total number of credits should be at least 132 credits. The calculations of credits are outlined below.

3.1 Courses with theory: 1 credit is made up of 1 hour per week or 18 hours per semester, including the examination period.

3.2 Courses to be practiced in a laboratory: 1 credit is made up of 2 hours per week or 36-54 hours per semester.

3.3 Courses to be practiced or trained at workplace: 1 credit is made up of 54 hours per semester or 3 hours per week.

3.4 On-the-job training in a Dual Vocational Training (DVT) program: 1 credit is made up of 54 hours per semester, including the examination period.

3.5 On-the job-training at the workplace: 1 credit is made up of (for not less) than 54 hours per semester, including the examination period.

3.6 Project: 1 credit is made up of (for not less than) 54 hours per semester, including the examination period.

4. Curriculum Structure

The structure of the curriculum for the Certificate in Vocational Education (Revised curriculum, Year 2022) in the field of Industrial Engineering Preparation Program offers at Rajamangala University of Technology Lanna consists of 3 courses and a number of extracurricular activities, as outlined below:

1. Core Courses	not less than 27 credits
1.1 Languages and Communication Skills	
1.1.1 Thai Language Courses	
1.1.2 Foreign Languages Courses	
1.2 Science and Mathematics Courses	
1.2.1 Science Courses	
1.2.2 Mathematics Courses	
1.3 Social Studies and Humanities Courses	
1.3.1 Social Studies Courses	
1.3.2 Humanities Courses	
1.3.3 Health Studies Courses	
2. Vocational-based Courses	not less than 95 credits
2.1 Basic Vocational Courses	not less than 26 credits
2.2 Specialized Vocational Courses	not less than 25 credits
2.3 Elective courses	not less than 36 credits
2.4 On-the-Job training	4 credits
2.5 Project	4 credits
3. Free Elective Courses	not less than 10 credits
4. Extracurricular Activities (2 hours/week)	

Remarks

1) The number of credits and courses for each group of courses throughout the program according to the regulation stated in the structure of each area and program of study.

2) Basic vocational courses and specialized vocational courses are compulsory in this curriculum as to maintain the standards of vocational education in the area of vocational

competencies, thus, providing adequate courses in accord with the number of credits as stated in the curriculum, which requires the students to attend every compulsory courses.

3) The university can organize elective courses as stated in the curriculum and/or revise in accordance with the requirements of the industrial sector or regional policies, in order to enhance the nation's capabilities in global competition. However, the revision of the program needs to be aligned with the regulations and standards of Vocational Education of each area and program of study.

5. On-the-Job Training

On-the-job-training is organized under a collaboration between the university and the manufacturing sector and/or service sector. This will be followed after the students have completed theory learning and practice-based learning or basic practice-based learning session at the university. This program aims to offer students with real-world environment at workplace to experience in work operations, tools, machines, advanced instruments, and teamwork atmosphere and to promote students' thinking skills, management skills, facing a variety of situations that may benefit students' practical skills, thinking skills, and further develop their self-initiated learning, confidence, and a desirable attitude for employment or self-employment. The arrangement of on-the-job training should follow the guidelines below:

5.1 The university should organize on-the-job training program for students to train or practice in workplaces, academic institutes, private enterprises, or state enterprises on semester 5 or 6, which is equivalent to 4 credits.

On-the-job training program during summer can be carried out, however, the numbers of training periods should be in accordance with the regulations stated in the curriculum.

For work relevant courses, the university is allowed to organize the courses in workplaces (i.e., private enterprises, state enterprises, or state agency) to promote students' profession competence at least 1 semester.

5.2 Evaluation and grading are done the same as other courses.

6. Occupational Competencies Development Project

This program offers students with opportunities for knowledge discovery, and the integration of their knowledge, skills, and experiences based on their aptitudes and interests on a basis of a practice-based learning starting from topic selection, experiment, developing, or creating a project by planning, designing procedures and methods, data collection, evaluation, and drawing a conclusion for report presentation in group or individual. However, it depends on the nature of each project. To organize occupational competencies development project, the following guidelines should be considered.

6.1 The university must ensure that students' projects are relevant to course objectives and should be carried out in semester 5 or 6 for a total number of 4 credits, which is equivalent to at least 216 hours of a study period. In such case, teaching and learning arrangement of a course with 4 credits should be organized 4 hours per week.

For a project with a total number of 2 credits, namely project 1 and 2, the university must organize the teaching and learning period in accordance with the above guidelines.

6.2 Evaluation and grading are done the same as other courses.

7. Extracurricular Activities

7.1 The university must organize extracurricular activities at least 2 hours per week in every semester to promote core competency and vocational competency; morals, ethics, values, self-discipline, anti-violence, substance abuse, and corruption; to strengthen the citizenship of Thailand and the world in terms of patriotism, honoring the King; to promote the democratic monarchy, art, culture, and Thai wisdom; to cultivate consciousness and volunteering habits in environmental conservation and benefiting communities and localities by using group process in planning, implementing, evaluating, and improving work.

Students of a Dual Vocation Education Program must participate in any activities organized by the collaborated enterprises under this program.

7.2 Evaluation of extra-curricular activities must be in accordance with the regulations of Rajamangala University of Technology Lanna on Diploma Education B.E. 2551 and additional announcements.

8. Arrangement of Teaching and Learning

Teaching and learning are arranged according to the curriculum structure as detailed in each semester. For vocational courses, the ratio between learning theory and practice is 20 : 80. However, it can be adjusted in accordance with the teaching and learning arrangement of each program under the following guidelines.

8.1 Course arrangement in each semester should consider a number of factors, i.e., the priority, levels of difficulty, continuity and relevance between subjects as well as the possibility to integrate subjects across disciplines in designing and developing work, project, and workpiece in each semester.

8.2 Provide students with compulsory courses: core courses, vocational courses, general vocational courses, specialized vocational courses, and extra-curricular activities as stated in the curriculum structure.

8.2.1 Teaching and learning of subjects as listed in core courses should be arranged proportionately in every semester.

8.2.2 Teaching and learning of subjects as listed in general vocational courses especially subjects related to vocational course should be arranged in academic year 1.

8.2.3 Teaching and learning of subjects as listed in specialized vocational courses should be provided before elective vocational courses and free elective courses.

8.3 The arrangement of teaching and learning should offer students to freely select their elective vocational courses and free elective courses based on their aptitudes and interests to benefit their career prospects or higher studies. However, this should be in accordance with vocational education standards in the area of vocational competencies of each program and their specialized areas.

8.4 Organize dual vocational courses that can be learned and practiced in workplaces under a discussion with private enterprises, state enterprises or government agencies in selecting which semester to organize on-the-job training period, specifying a course or a group of courses in accordance with the requirements of private enterprises, state enterprises or government agencies.

8.5 On-the-job training should be arranged in semester 1 or 2 in academic year 3 only once for 4 credits or an equivalent of 320 hours (20 hours per week per semester on average), or students may be allowed to register twice on semester 1 of an academic year 2 and semester 2 of an academic year 3 for 2 credits per each semester. Each course lasts

160 hours (10 hours per week per semester) in accordance with the specification of each program in the curriculum.

A semester which has on-the-job training program, the university is allowed to design a course or a group of courses in accordance with the requirements of enterprises, state enterprises, or state agency as to help learners complete their academic study and professional practice at the workplace.

On-the-Job training during summer can be carried out in accordance with a minimum period stated in the program specification.

8.6 The university must provide a course for students to develop their vocational-based project in semester 1 or 2 of an academic year 3 for 4 credits (12 hours per week per semester) or organize time for students to enroll twice, that is, in semester 1 of an academic year 2 and in semester 2 of an academic year 2, together the total number of credits should be equivalent to 4 credits (6 hours per week per semester) as stated in the program specification.

8.7 Extracurricular activities must be organized at least 2 hours per week in every semester.

8.8 Teaching and learning arrangement of a full-time course in each semester should be at a maximum of 22 credits, a maximum of 12 credits for a part-time course, and a minimum of 12 credits for a summer course. Together, a full-time course and a summer course can be arranged with a maximum of 35 hours per week on average, and a part-time course should not exceed 25 hours per week.

The university is allowed to adjust the number of credits and teaching and learning period for each semester as mentioned in the above guidelines, but the educational quality and standards should be maintained.

9. Dual Vocational Education System

On the basis of a dual vocational education system, the current curriculum is developed under a collaboration between the university and private enterprise, state enterprise or state agency. Students under this curriculum are required to complete a theoretical learning session at the university and complete a practical training session at private enterprise, state enterprise or state agency. To enhance the potential of teaching

and learning arrangement under a dual vocational education system with the aims to prepare and develop human resources for industrial demands, as well as to fulfill the curriculum objectives, the university should follow the guidelines as outlined below.

9.1 Select a course or courses in the elective vocational courses for at least 36 credits in designing a course specification with private enterprises, state enterprises or state agencies under the dual vocational education system such as course objectives, course competencies, course description, on-the-job-training period, number of credits, and occupational competency in accordance with the requirements of private enterprises, state enterprises, or state agencies. However, numbers of credits and learning period of a practical training in each course should align with the curriculum specification.

9.2 Plan on-the-job training program, design an assessment and evaluation criteria of each course with private enterprises, state enterprises or state agencies under a dual vocational education program.

9.3 Arrange the teaching and learning of a dual vocational education program according to the potential of private enterprises, state enterprises, and state agencies. Furthermore, similar courses can be combined.

10. Qualifications of the Applicants

The applicants must have completed at least a lower secondary school or equivalent program from institutions approved by the Ministry of Education, and must meet the admission criteria in accordance with the regulations of Rajamangala University of Technology Lanna on Diploma and additional announcements.

11. Evaluation

Measurement and evaluation of learning is performance-based, and students must meet the criteria in accordance with the regulations of Rajamangala University of Technology Lanna on the Certificate of Education Act of 2008 and additional announcements.

12. Graduation Criteria

Students must have:

12.1 Achieved the total number of credits according to the curriculum structure of each area and program of study.

12.2 Obtained a grade point average of not less than 2.00, and must have shown appropriate conduct that complies with regulations of Rajamangala University of Technology Lanna.

12.3 Passed English language tests according to the standards stated by College of Integrated Science and Technology, Rajamangala University of Technology Lanna.

12.4 Passed Vocational Standards Assessment Criteria

12.5 Participated in the extracurricular activities and passed them as determined on every semester.

13. Development of Curriculum Courses

13.1 The university can develop additional courses in each subject group apart from the compulsory courses. The additional courses can be integrated proportionately with Thai language courses, foreign language courses, science courses, mathematics courses, social studies and humanities courses according to the learning objectives of each program of study in order to obtain the objectives of core courses.

13.2 For vocational-based courses, the university is allowed to change, adjust the details of the course specified in any programs under the curriculum with regard to lesson planning as well as allowed to revise, improve or develop a course specified in the elective vocational-based courses to meet the requirements of enterprises or regional policies and to enhance the national competence in a competitive world. However, the adjustment of any course should be in accordance with course objectives and course competencies.

13.3 The university is allowed to develop or improve courses to meet the requirements of enterprises, localities, communities and regional policies to enhance the potential of nation in a global competition and for higher studies.

However, course coding, number of credits, and learning period of new courses should align with the curriculum specification.

14. Program Improvement/Revision Plan and Approval of Curriculum

14.1 The university has the authority to correct, add, change, or cancel any areas and programs of the curriculum in accordance with the Diploma of Vocational Education Standards and under the approval of the University Council.

14.2 The university has the authority to approve the curriculum with the approval of the University Council.

14.3 The endorsement of curriculum implementation can be announced through the university announcement.

14.4 The university has an authority to improve or add courses without the need to report to the University Academic Committee.

15. Quality Assurance of the Program

The curriculum has the responsibility to standardize the criteria of quality assurance as well as the arrangement of teaching and learning comprising of at least four aspects as outlined below.

15.1 Curriculum which aligns with professional standards

15.2 Teachers, resources, supporting facilities

15.3 Teaching and learning arrangement, assessment and evaluation of learning

15.4 Graduates

The university is responsible for the evaluation and report of the results of curriculum implementation in order to ensure that the curriculum is continuously improved at least in every 5 years.

7. Name and Qualification of Faculty Members Responsible for the Program

7.1 Rajamangala University of Technology Lanna

No.	Name-Surname	Academic Title/Position	Educational Qualification (Subject discipline)	(Institute)	Year of Graduation
1	Mr. Chatchawan Kantala	Lecturer	Doctor of Philosophy (Mechanical Engineering)	Thammasat University	2021
			M.Eng. (Materials Processing Technology and Manufacturing Innovation)	King Mongkut's University of Technology Thonburi	2007
			Bachelor of Industrial Technology (Mechanical Engineering)	Siam University	2002
2	Mr. Sittisak Yeeyoun	Lecturer	Master of Science in Technical Education (M.S. Tech. Ed. in Electrical Engineering Education)	King Mongkut's University of Technology North Bangkok	2012
			Bachelor of Science in Technical Education Program in Electronic Engineering and Telecommunication	Rajamangala University of Technology Lanna, Chiang Mai	2009

7.1 Rajamangala University of Technology Lanna (Continued)

No.	Name-Surname	Academic Title/Position	Educational Qualification (Subject Discipline)	Institution	Year of Graduation
3	Mr. Adisorn Kwawsibsam	Assistant Professor	Master of Science in Technical Education Program in Electrical Technology. Bachelor of Science in Technical Education Program in Electronic Engineering	King Mongkut's University of Technology North Bangkok Rajamangala University of Technology Lanna, Chiang Mai	2009 1996
4	Miss Thipphayaphawan Tanuan	Lecturer	Bachelor of Science in Technical Education in Civil Engineering	Rajamangala University of Technology Lanna, Chiang Mai	2012
5	Mr. Pichet Kowtakul	Lecturer	Master of Science in Technical Education in Mechanical Engineering Bachelor of Industrial Engineering	King Mongkut's University of Technology North Bangkok Rajamangala Technology Institute, Chiang Mai	2011 2004

7.1 Rajamangala University of Technology Lanna (Continued)

No.	Name-Surname	Academic Title/Position	Educational Qualification (Subject Discipline)	Institution	Year of Graduation
6	Mr. Visut Asanavijit	Assistant Professor	Master of Engineering in Electrical Engineering Bachelor of Engineering in Electrical Engineering	Chiang Mai University Rajamangala University of Technology Lanna, Chiang Mai	2012 2006
7	Mr. Watcharapong Potha	Lecturer	Master of Engineering in Mechanical Engineering Bachelor of Industrial Technology in Mechanical Technology	Rajamangala University of Technology Lanna, Chiang Mai Rajamangala University of Technology Lanna, Chiang Mai	2018 2011
8	Mr. Sikarint Munlikawong	Lecturer	Bachelor of Science in Technical Education in Civil Engineering	Rajamangala University of Technology Lanna, Chiang Mai	2012

Coding System

Curriculum for the Certificate of Vocational Education, Year 2022

Code description for each course CCCMMGXX

1. Core Courses

CCC refers to the abbreviation of degree certificate/ the abbreviation of name

GEC refers to Core courses for the Certificate of Vocational education

CER refers to Curriculum for the Certificate of Vocational Education

MM refers to curriculum/courses

LC : Languages and Communication Courses

SC : Science and Mathematics Courses

SO : Social Studies and Humanities Courses

CC : Inclusive Education Courses

BU : Vocational Education Program (Business Preparation Program)

EN : Vocational Education Program (Engineering Preparation Program)

AR : Vocational Education Program (Architecture Preparation Program)

G refers to specialized program, which is identified by the use of numbers 1-9.

1) Core Courses of Curriculum for the Certificate of Vocational Education.

- Languages and Communication Skills (LC)
  - 1 : Thai Language Courses
  - 2 : Foreign Languages Courses
- Science and Mathematics
  - 1 : Science Courses
  - 2 : Mathematics Courses
- Social Studies and Humanities (SO)
  - 1 : Social Studies Courses
  - 2 : Humanities Courses
  - 3 : Health Studies Courses

2) Engineering Courses

1 : Civil Technology Engineering

2 : Mechanical Technology

3 : Electrical Technology

4 : Mechatronics Technology

XX refers to the order of each course in major courses, which are identified by numbers 01-99.

2. Code Description for Time Allocation of Teaching and Learning C(T–P–E)

C refers to total credits of each course

T refers to duration of theory-based learning

P refers to duration of practical-based learning

E refers to duration of self-study

Certificate of Vocational Education, Year 2022

Industrial Engineering

Engineering Preparation Program

Course Objectives

1. To produce graduates with a Certificate of Vocational Education in Industrial Science in Engineering.
2. To enable graduates with the abilities to apply knowledge and skills in languages, science, mathematics, social studies, health and physical studies, arts, communication skills, thinking and problem-solving skills, social skills and living skills related to self-development and professional development.
3. To enable graduates with an understanding and skills in vocational administration and management, the use of technology, communication technology, and professional principles associated with scientific-based technical industry in order to cope with the fast-changing economy, society, and technology.
4. To produce graduates with knowledge and understanding regarding the principles and teamwork processes in the field of technical industry.
5. To produce graduates with knowledge and skills in manufacturing and service in industrial technology based on business-based scientific principles and methods, with efficient resource consumption, energy and environment preservation.
6. To enable graduates with the abilities to work in the field of technical industry either in enterprises or be self-employed, including applying basic knowledge and skills obtained from this program for higher studies.
7. To enable graduates' abilities in work and life by applying the Principles of Sufficiency Economy, the principles of using energy and resources efficiently under safety concerns for self, community, and environment.
8. To produce graduates with a set of desirable attitudes for career prospects, i.e., creativity, honesty, discipline, responsibility to society, environment, anti-violence and drug abuse, being motivated for self-development and can work effectively as a team.
9. To enable graduates with the abilities to apply knowledge, skills and technology in the field of scientific-based technical industry to solve problems, develop, invent, or create innovation based on the research principles and methods.

10. To increase educational opportunities for local communities.
11. To improve teaching and learning activities in accordance with the university policies with regard to educational management.

Vocational Education Standards of The Program

Students who have completed a Certificate of Vocational Education in Engineering Preparation Program should be able to :

1. Morals, Ethics, and Desirable Characteristics

1.1. Morals, Ethics, and Professional Ethics :

Graduates must be generous, honest, thankful, tolerant, advocative of drug abuse and gambling. They must maintain a set of desirable characteristics, i.e., morals and attitudes towards profession and society, patriotism, obey laws, and respect others' rights, fulfil one's duties according to rules and regulations as stated in the democratic monarchy, having service mind and environmental concerns.

1.2 Desirable Characteristics :

Graduates must be disciplined, responsible, reconciled, sociable, confident, inquisitive, creative, hardworking, economical, tolerant, independent, and advocative of anti-violence and corruption, live and work according to the Philosophy of Sufficiency Economy, hygiene and environmental preservation.

2. Core Competency

2.1 Knowledge Development in areas as outlined below:

2.1.1 Principles of language usage and information technology for communication.

2.1.2 Principles of reasoning, analytical thinking, problem solving, and management.

2.1.3 Principles of living with others in society.

2.1.4 Principles of adapting and living in modern society.

2.2 Skill Development in areas as outlined below:

2.2.1 Communication skills through languages and communication technology.

2.2.2 Thinking skills and problem-solving skills using scientific and mathematical principles and processes.

2.2.3 Social skills and life skills in relation to principles of religions, cultures, citizenship, personality development, and hygiene.

2.3 Skill development in applicability and responsibility in areas as outlined below :

2.3.1 Communicate in Thai, foreign languages, and information technology in daily life and career.

2.3.2 Solve professional-related problems using scientific and mathematical principles and processes.

2.3.3 Behave according to principles of religions, cultures, traditional values, moral and ethical standards of society and citizenship roles.

2.3.4 Develop personality and hygiene using principles and processes of health studies and physical studies.

3. Vocational-based Competencies:

3.1 Knowledge development in the following areas:

3.1.1 General principles of specialized careers and basic analysis.

3.1.2 Principles of decision making, planning, and problem-solving.

3.1.3 Principles of tools and equipment selection for career.

3.1.4 Principles of using information technology.

3.1.5 Principles of professional management.

3.2 Skill development in the following areas :

3.2.1 Selection and application of tools, equipment, and basic materials in work operations.

3.2.2 Work operations in general careers and specialized careers according to work plans.

3.2.3 Thinking skills, i.e., analytical thinking and work-related problem-solving.

3.2.4. Computer and information technology skills for lifelong learning.

3.2.5 Hygiene and safety concerns in work operations.

3.3 Skill Development in application and responsibility in areas as outlined below :

3.3.1 Plan and work according to principles and processes concerning a qualified management, energy, resources, and environmental conservation, hygiene, safety, and related laws.

3.3.2 Perform basic occupations in the field of industrial technicians in accordance with principles and processes.

3.3.3 Select and maintain tools, materials, equipment in professional work according to principles and processes in consideration of economy and safety.

2.3.4 Apply computer and information technology for professional development and support.

Civil Technology Program

1) Appropriately select materials, equipment, tools, as well as maintain tools and equipment required for civil works.
2) Read and write civil work drawings by applying computer knowledge.
3) Operate woodworks, masonry works, steel works and civil work surveys.
4) Make decisions, work plans, and solve problems in civil works.
5) Integrate knowledge and skills in civil works for the production of workpieces or inventions.

Mechanical Technology Program

1) Appropriately select materials, tools and equipment for mechanical technology related works.
2) Appropriately inspect, maintain, and store tools and equipment.
3) Calibrate the measuring instruments to meet the standards.
4) Read and write mechanical drawings and standard symbols in accordance with principles.
5) Adjust, process, and form workpieces with mechanical tools.
6) Write basic NC and CNC programs.
7) Inspect workpieces with measuring tools, repair, and maintain machinery.
8) Integrate and apply knowledge and skills of industrial mechanic for the production of workpieces or inventions.

Electrical Technology Program

1) Decide, plan, and resolve unexpected problems in the field of electrical technology.

2) Apply knowledge, professional skills, information technology, and communication skills in problem solving and perform electrical works.
3) Provide co-workers with basic information for decision-making and work operations.
4) Appropriately select materials, tools and equipment for electrical works.
5) Read and write drawings, as well as estimate prices for electrical control installations according to the standards.
6) Install wiring according to the specified design.
7) Install, test, and maintain electrical equipment according to the standards.
8) Integrate and apply knowledge and skills in electrical technology for the production of workpieces or inventions.

Mechatronics Technology Program

1) Apply computer knowledge and skills in drawing and analyzing mechatronics systems.
2) Apply knowledge in electrical technology in controlling mechatronics systems.
3) Appropriately select materials, tools and equipment to design workpieces using automatic machinery.
4) Decide, plan, and solve problems related to mechatronics works.
5) Integrate knowledge and skills in mechatronics for the production of workpieces or inventions.

Curriculum Structure

Certificate in Vocational Education

Industrial Engineering

Engineering Preparation Program

To be eligible for a Certificate in Vocational Education (B.E. 2565), students majoring in Engineering Preparation Program are expected to achieve the total number of at least 132 credits, and have participated and passed in the extracurricular activities as outlined below.

1. General Courses (not less than)	**27 credits**
1.1 Languages and Communication Skills	
1.1.1 Thai Language (not less than)	4 credits
1.1.2 Foreign Languages (not less than)	6 credits
1.2 Science and Mathematics	
1.2.1 Science (not less than)	4 credits
1.2.2 Mathematics (not less than)	6 credits
1.3 Social Studies and Humanities	
1.3.1 Social Studies (not less than)	3 credits
1.3.2 Humanities (not less than)	2 credits
1.3.3 Health Studies (not less than)	2 credits
2. Vocational-based Courses (not less than)	**95 credits**
2.1 Vocational-based General Courses	26 credits
2.2 Specialized Vocational Courses	25 credits
2.3 Elective Vocational Courses (not less than)	36 credits
2.3.1 Elective Vocational Courses (not less than)	24 credits
2.3.2 Project (not less than)	12 credits
2.4 On-the-job Training	4 credits
2.5 Project	4 credits
3. Elective Courses	**10 credits**
4. Extracurricular activities (2 hours/week)	
Total (not less than)	**132 credits**

1. General Courses 27 credits

Students can choose courses from any area of study from the list provided in the Curriculum for the Certificate of Vocational Education. However, the students are expected to achieve the number of credits in a total of not less than 27 credits.

1.1 Language and Communication Studies

Students can choose to study 10 credits from the list as outlined below.

1) Thai Language- Students can choose to study no less than 4 credits from the following list:

GECLC101	Fundamental Thai	2(2-0-4)
GECLC102	Thai for Searching and Writing Reports	1(1-0-2)
GECLC103	Thai for Communication	1(1-0-2)
GECLC104	Thai for Creativity	1(1-0-2)
GECLC105	Speaking and Writing for Career	1(1-0-2)

2) Foreign Languages- Students can choose to study no less than 6 credits from the following list:

GECLC201	English for Everyday Communication 1	2(1-2-3)
GECLC202	English for Everyday Communication 2	2(1-2-3)
GECLC203	English for World Outlook 1	1(0-2-1)
GECLC204	English for World Outlook 2	1(0-2-1)
GECLC212	English for Reading and Writing	2(1-2-3)
GECLC213	Basic Chinese	2(1-2-3)
GECLC214	Chinese for Communication	2(1-2-3)

1.2 Science and Mathematics

1) Science- Students can choose to study no less than 4 credits from the following list:

GECSC102	Mechanics	2(1-2-3)
GECSC107	Principles of Chemistry 1	2(2-0-4)
GECSC113	Computing Science	2(1-2-3)
GECSC114	Process of Thinking and Problem Solving	2(1-2-3)

2) Mathematics- Students can choose to study no less than 6 credits from the following list:

GECSC201	Basic Mathematics 1	3(3-0-6)
GECSC202	Basic Mathematics 2	3(3-0-6)

1.3 Social Studies and Humanities

1) Social Studies- Students can choose to study no less than 3 credits from the following list:

GECSO101	Citizenship and Morals	2(2-0-4)
GECSO102	The King's Philosophy for Sustainable Development	1(1-0-2)
GECSO103	Geography and Geo-Social	1(1-0-2)
GECSO104	Thai Civilization and Oriental Civilization	1(1-0-2)
GECSO105	World Civilization	1(1-0-2)
GECSO106	Current Affairs	1(1-0-2)
GECSO107	ASEAN Studies	1(1-0-2)
GECSO108	Law and Life	1(1-0-2)

2) Humanities- Students can choose to study no less than 2 credits from the following list:

GECSO201	The Wisdom of Life	1(1-0-2)
GECSO202	The Beauty of Lanna	2(1-2-3)
GECSO203	Visual Arts	2(1-2-3)
GECSO204	Photography	2(1-2-3)

3) Health Studies- Students can choose to study no less than 2 credits from the following list:

GECSO301	Sexuality Education	1(1-0-2)
GECSO302	Life Safety	1(1-0-2)
GECSO303	Track and Field	1(0-2-1)
GECSO304	Table Tennis	1(0-2-1)
GECSO305	Badminton	1(0-2-1)

GECSO306	Volleyball	1(0-2-1)
GECSO307	Basketball	1(0-2-1)
GECSO308	Social Dance	1(0-2-1)
GECSO309	Martial Arts	1(0-2-1)
GECSO311	Food and Health	1(0-2-1)

2. Vocational-based Courses 95 credits

2.1 Basic Vocational Courses- Students can choose to study 26 credits from the following list:

2.1.1 English for Career- Students can choose to study 4 credits from the following list:

GECLC205	English for Engineering 1	1(0-2-1)
GECLC206	English for Engineering 2	1(0-2-1)
GECLC211	English for Listening and Speaking	2(1-2-3)

2.1.2 Science and Mathematics- Students can choose to study 18 credits from the following list:

1) Physics- Students can choose to study 4 credits from the following list:

GECSC104	Wave Light and Sounds in Physics	2(1-2-3)
GECSC105	Fundamental Electrical and Electronics	2(1-2-3)

2) Chemistry- Students can choose to study 6 credits from the following list:

GECSC108	Principles of Chemistry 2	2(2-0-4)
GECSC109	Principles of Chemistry 3	2(1-2-3)
GECSC110	Principles of Chemistry 4	2(1-2-3)

3) Biology- Students can choose to study 2 credits from the following list:

GECSC111	Fundamental Biology	2(1-2-3)

4) Mathematics- Students can choose to study 6 credits from the following list:

GECSC203	Mathematics for Career 1	3(3-0-6)

GECSC204	Mathematics for Career 2	3(3-0-6)

2.1.3 Core Vocational Courses- Students can choose to study 4 credits from the following list:

CERCC501	Occupational Health and Safety	2(2-0-4)
CERCC502	Entrepreneurship	2(1-2-3)

2.2 Specialized Vocational Courses- Students can choose to study 25 credits from the following list:

CERCC101	Basic Engineering Training	3(1-6-4)
CERCC102	Technical Drawing for Engineering	2(1-2-3)
CERCC103	Basic Construction Engineering	2(1-3-3)
CERCC104	Introduction to Engineering Profession	2(1-2-3)
CERCC105	Materials Science	2(2-0-4)
CERCC106	Basic Electrics and Electronics	2(1-3-3)
CERCC107	Sheet Metal Welding	2(1-3-3)
CERCC108	Computer and Information Technology	2(1-2-3)
CERCC109	Data Communication System and Networking	2(1-2-3)
CERCC110	Computer Programming	2(1-2-3)
CERCC111	Energy and Environment	2(2-0-4)
GECSC103	Fundamental Thermofluid	2(1-2-3)
GECSC205	Calculus for Career	3(3-0-6)
GECSC206	Basic Statistic	3(3-0-6)

2.3 Elective Vocational Courses with a total of 36 credits

2.3.1 Project- Students can choose to study 12 credits from the following list:

CERCC112	Scientific Project-based Learning 1	3(2-3-5)
CERCC113	Scientific Project-based Learning 2	3(2-3-5)
CERCC114	Engineering Project-based Learning 1	3(2-3-5)
CERCC115	Engineering Project-based Learning 2	3(2-3-5)

2.3.2 Students can choose any area of study from the following list with 24 credits to fulfill the requirement of the program.

1) Civil Technology- Students can choose to study 24 credits from the following list:

CEREN101	Construction Materials	2(2-0-4)
CEREN102	Construction Drawing	2(1-3-3)
CEREN103	Structural Model	2(1-3-3)
CEREN104	Construction Techniques	2(1-3-3)
CEREN105	Computer-Aided Design and Drafting	2(1-3-3)
CEREN106	Concrete Technology	2(1-3-3)
CEREN107	Surveying	2(1-3-3)
CEREN108	Fundamental Structures	2(2-0-4)
CEREN109	Cost Estimation	2(2-0-4)
CEREN110	Sanitary System	2(1-3-3)
CEREN111	Construction Law	2(2-0-4)
CEREN112	Building Electrical	2(1-3-3)

2) Mechanical Technology- Students can choose to study 24 credits from the following list:

CEREN201	Manufacturing Process	2(2-0-4)
CEREN202	Detailed Measurement Work	2(1-3-3)
CEREN203	Engineering Material	2(2-0-4)
CEREN204	Machine Drawing	2(1-3-3)
CEREN205	Mechanical Parts	2(2-0-4)
CEREN206	Machine Tools	2(0-6-2)
CEREN207	Computer Aided Design and Drafting	2(1-3-3)
CEREN208	Mechanics and Machinery	2(1-3-3)
CEREN209	Industrial Electrical	2(1-3-3)
CEREN210	Pneumatics and Hydraulics	2(1-3-3)
CEREN211	CNC Machine Tool	2(0-6-2)
CEREN212	Machine Tools Maintenance	2(1-3-3)
CEREN213	Refrigeration and Air Conditioning	2(1-3-3)

CEREN214	Fan Pump Compressor and Piping System	2(1-3-3)
CEREN215	Automotive Technology	2(1-3-3)
CEREN216	Sheet Metal and Piping	2(1-3-3)

3) Electrical Technology- Students can choose to study 24 credits from the following list:

CEREN301	Electronic Devices and Circuits	2(1-3-3)
CEREN302	DC Circuits	2(1-3-3)
CEREN303	Practice Wiring and Transformers	2(1-3-3)
CEREN304	AC Circuits	2(1-3-3)
CEREN305	Digital Circuits	2(1-3-3)
CEREN306	Fundamental and Application of Photovoltaic Systems	2(1-3-3)
CEREN307	Microcontroller and Sensor	2(1-3-3)
CEREN308	D.C. Electrical Machine	2(1-3-3)
CEREN309	Fundamental of Telecommunication Systems	2(2-0-4)
CEREN310	A.C. Electrical Machine	2(1-3-3)
CEREN311	Programmable Logic Control	2(1-3-3)
CEREN312	Basic Automatic Controls	2(1-3-3)
CEREN313	Electrical Drawing	2(1-3-3)

4) Mechatronics Technology- Students can choose to study 24 credits from the following list:

CEREN301	Electronic Devices and Circuits	2(1-3-3)
CEREN305	Digital Circuits	2(1-3-3)
CEREN307	Microcontroller and Sensor	2(1-3-3)
CEREN207	Computer Aided Design and Drafting	2(1-3-3)
CEREN208	Mechanics and Machinery	2(1-3-3)
CEREN209	Industrial Electrical	2(1-3-3)
CEREN401	Electrical Circuits	2(1-3-3)
CEREN402	Basic Machine Tools	2(1-3-3)
CEREN403	Basic Mechatronics	2(1-3-3)

CEREN404	Electrical Machine and Control	2(1-3-3)
CEREN405	Basic robot	2(1-3-3)
CEREN406	Computer-Aided for Engineering Analysis	2(1-3-3)
CEREN407	Internet of Things (IoT)	2(1-3-3)

2.4 On-the-Job Training- Student should complete 4 credits.

Students can choose to study CERCC116 to complete 4 credits or CERCC117 and CERCC118 to complete 4 credits. The details are provided below.

CERCC116	Job Training	4(0-40-0)
CERCC117	Job Training 1	2(0-20-0)
CERCC118	Job Training 2	2(0-20-0)

2.5 Project- Student should complete 4 credits.

Students can choose to study CERCC119 to complete 4 credits or CERCC120 and CERCC121 to complete 4 credits. The details are provided below.

CERCC119	Pre-Engineering Project	4(0-12-4)
CERCC120	Pre-Engineering Project 1	2(1-3-3)
CERCC121	Pre-Engineering Project 2	2(0-6-2)

3. Elective Courses- Student should complete at least 10 credits.

Students can choose any area of study, according to their aptitudes and interests, from the list provided in the Curriculum for the Certificate of Vocational Education (Revised Curriculum, Year 2020) according to the general courses section, and the Curriculum for the Certificate of Vocational Education (Revised Curriculum, Year 2022) according to courses and areas of study section. However, the institutes can revise their elective courses to meet the needs of local contexts and communities.

4. Extracurricular activities- 2 hours/week

CERCC503	Art of Living	0(0-2-1)
CERCC504	Happiness in Lifelong Learning	0(0-2-1)
CERCC505	Health of Life	0(0-2-1)
CERCC506	Wisdom and Way of Life Value	0(0-2-1)
CERCC507	Social Innovation	0(0-2-1)
CERCC508	Leadership of Happiness	0(0-2-1)

5. Study Plan

Students in a regular program can complete the study within 3 academic years.

Year 1

Semester 1

Code	Course	Credits	Prerequisite
GECLC201	English for Everyday Communication 1	2 (1-2-3)	
GECSC107	Principles of Chemistry 1	2 (2-0-4)	
GECSC201	Basic Mathematics 1	3 (3-0-6)	
GECSO101	Citizenship and Morals	2 (2-0-4)	
GECSO301	Sexualities Education	1 (1-0-2)	
CERCC501	Occupational Health and Safety	2 (2-0-4)	
CERCC101	Basic Engineering Training	3 (1-6-4)	
CERCC102	Technical Drawing for Engineering	2 (1-2-3)	
CERCC103	Basic Construction Engineering	2 (1-3-3)	
CERCC112	Scientific Project-Based Learning 1	3 (2-3-5)	
CERCC503	Art of Living	0 (0-2-1)	
	Total	22 credits	

Year 1

Semester 2

Code	Course	Credits	Prerequisite
GECLC101	Fundamental Thai	2 (2-0-4)	
GECLC202	English for Everyday Communication 2	2 (1-2-3)	
GECSC102	Mechanics	2 (1-2-3)	
GECSC202	Basic Mathematics 2	3 (3-0-6)	
GECSC108	Principles of Chemistry 2	2 (2-0-4)	
CERCC108	Computer and Information Technology	2 (1-2-3)	
CERCC104	Introduction to Engineering Profession	2 (1-2-3)	
CERCC105	Materials Science	2 (2-0-4)	
CERCC106	Basic Electrics and Electronics	2 (1-3-3)	
CERCC113	Scientific Project-Based Learning 2	3(2-3-5)	
CERCC504	Happiness in Lifelong Learning	0(0-2-1)	
	Total	22 credits	

Year 2

Semester 1

Code	Course	Credits	Prerequisite
GECLC102	Thai for Searching and Writing Reports	1(1-0-2)	
GECLC203	English for World Outlook 1	1(0-2-1)	
GECSC109	Principles of Chemistry 3	2(1-2-3)	
GECSC203	Mathematics for Career 1	3(3-0-6)	
CERCC107	Sheet Metal Welding	2(1-3-3)	
GECSC103	Fundamental Thermofluid	2(1-2-3)	
CERCC114	Engineering Project-Based Learning 1	3(2-3-5)	
GECLC213	Basic Chinese***	2(1-2-3)	
CERCC505	Health of Life	0(0-2-1)	
	Total	**16 credits**	

Civil Technology Program

CEREN101	Construction Materials**	2(2-0-4)	
CEREN102	Construction Drawing**	2(1-3-3)	
CEREN103	Structure Model	2(1-3-3)	
	Total	**6 credits**	

Mechanics Technology Program

CEREN201	Manufacturing Process**	2(2-0-4)	
CEREN202	Detailed Measurement Work**	2(1-3-3)	
CEREN203	Engineering Material**	2(2-0-4)	
CEREN204	Machine Drawing**	2(1-3-3)	
	Total	**8 Credits**	

Electrical Technology Program

CEREN301	Electronic Devices and Circuits**	2(1-3-3)	
CEREN302	DC Circuits**	2(1-3-3)	
CEREN303	Practice Wiring and Transformers**	2(1-3-3)	
	Total	**6 credits**	

Mechatronics Technology Program

CEREN301	Electronic Devices and Circuits**	2(1-3-3)	
CEREN401	Electrical Circuits**	2(1-3-3)	
CEREN402	Basic Machine Tools**	2(1-3-3)	
	Total	6 credits	

Year 2

Semester 2

Code	Course	Credits	Prerequisite
GECLC204	English for World Outlook 2	1(0-2-1)	
GECSO106	Current Affairs	1(1-0-2)	
GECSC104	Wave Light and Sounds in Physics	2(1-2-3)	
GECSC110	Principles of Chemistry 4	2(1-2-3)	
GECSC204	Mathematics for Career 2	3(3-0-6)	
CERCC115	Engineering Project-Based Learning 2	3(2-3-5)	
CERCC506	Wisdom and Way of Life Value	0(0-2-1)	
GECLC214	Chinese for Communication***	2(1-2-3)	
GECLC212	English for Reading and Writing***	2(1-2-3)	
	Total	16 credits	

Civil Technology Program

CEREN104	Construction Techniques**	2(1-3-3)	
CEREN105	Computer-Aided Design and Drafting**	2(1-3-3)	
CEREN106	Concrete Technology**	2(1-3-3)	
	Total	6 credits	

Mechanical Technology Program

CEREN205	Mechanical Parts**	2(2-0-4)	
CEREN206	Machine Tools**	2(0-6-2)	
CEREN207	Computer Aided Design and Drafting**	2(1-3-3)	
	Total	6 credits	

Electrical Technology Program

CEREN304	AC Circuits**	2(1-3-3)	
CEREN305	Digital Circuits**	2(1-3-3)	
CEREN306	Fundamental and Application of Photovoltaic Systems**	2(1-3-3)	
	Total	6 credits	

Mechatronics Technology Program

CEREN305	Digital Circuits**	2(1-3-3)	
CEREN207	Computer Aided Design and Drafting**	2(1-3-3)	
CEREN403	Basic Mechatronics**	2(1-3-3)	
	Total	6 credits	

Year 2

Summer

CERCC116	On-the-Job training	4(0-40-0)	
	Total	**4 credits**	

Year 3

Semester 1

Course Code	Course	Credit	Prerequisite
GECLC105	Speaking and Writing for Career	1(1-0-2)	
GECSO203	Visual Arts	2(1-2-3)	
GECLC205	English for Engineering 1	1(0-2-1)	
GECSC105	Fundamental Electrical and Electronics	2(1-2-3)	
CERCC502	Entrepreneurship	2(1-2-3)	
GECSC206	Basic Statistics	3(3-0-6)	
CERCC118	Pre-Engineering Project 1	2(1-3-3)	
CERCC507	Social Innovation	0(0-2-1)	
GECSC114	Process of Thinking and Problem Solving***	2(1-2-3)	
	Total	15 credits	

Civil Technology Program

CEREN107	Surveying**	2(1-3-3)	
CEREN108	Fundamental Structures**	2(2-0-4)	
CEREN109	Cost Estimation**	2(2-0-4)	
	Total	6 credits	

Mechanical Technology Program

CEREN208	Mechanics and Machinery**	2(1-3-3)	
CEREN209	Industrial Electrical**	2(1-3-3)	
CEREN210	Pneumatics and Hydraulics**	2(1-3-3)	
	Total	6 credits	

Electrical Technology Program

CEREN307	Microcontroller and Sensor**	2(1-3-3)	
CEREN308	D.C. Electrical Machine**	2(1-3-3)	
CEREN309	Fundamental of Telecommunication Systems**	2(2-0-4)	
	Total	6 credits	

Mechatronics Technology Program

CEREN307	Microcontroller and Sensor**	2(1-3-3)	
CEREN208	Mechanics and Machinery**	2(1-3-3)	
CEREN209	Industrial Electrical**	2(1-3-3)	
	Total	6 credits	

Year 3

Semester 2

Course Code	Course	Credit	Prerequisite
GECSO303	Track and Field	1(0-2-1)	
GECLC206	English for Engineering 2	1(0-2-1)	
GECLC211	English for Listening and Speaking	2(1-2-3)	
GECSC111	Fundamental Biology	2(1-2-3)	
GECSC205	Calculus for Career	3(3-0-6)	
CERCC119	Pre-Engineering Project 2	2(0-6-2)	
CERCC111	Energy and Environment***	2(2-0-4)	
CERCC508	Leadership of Happiness	0(0-2-1)	
	Total	13 credits	

Civil Technology Program

CEREN110	Sanitary System**	2(1-3-3)	
CEREN111	Construction Law**	2(2-0-4)	
CEREN112	Building Electrical**	2(1-3-3)	
	Total	6 credits	

Mechanical Technology Program

CEREN211	CNC Machine Tool**	2(0-6-2)	
CEREN212	Machine Tools Maintenance**	2(1-3-3)	
	Total	4 credits	

Electrical Technology Program

CEREN310	A.C. Electrical Machine**	2(1-3-3)	
CEREN311	Programmable Logic Control**	2(1-3-3)	
CEREN312	Basic Automatic Controls**	2(1-3-3)	
	Total	6 credits	

Mechatronics Technology Program

CEREN404	Electrical Machine and Control**	2(1-3-3)	
CEREN405	Basic Robot**	2(1-3-3)	
CEREN406	Computer-Aided for Engineering Analysis**	2(1-3-3)	
	Total	6 credits	

Remarks : 1. ** refers to Elective Vocational Courses

2. *** refers to Free Elective Courses

1. General Core Courses 27 credits

1.1 Languages and Communication Skills

1.1.1 Thai Language

GECLC101 Fundamental Thai 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the usage of Thai language.
2. Develop skills in using Thai language accurately according to the principles of Thai language usage, as well as communicate in Thai language appropriately concerning speaking partners, occasions, and situations.
3. Apply knowledge and skills of listening, viewing, speaking, reading and writing for daily communication according to the principles of Thai language usage.
4. Recognize the values and importance of Thai language usage.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of Thai language usage in listening, viewing, speaking, reading, and writing.
2. Demonstrate the abilities to analyze and evaluate the messages from listening, viewing, reading, writing, analyzing, and solving Thai language related problems.
3. Demonstrate the abilities to speak competently and appropriately in various occasions, and maintain well-established social etiquette.

Course Description :

Study tone rules, words with long and short vowel sounds, spelling, Thai for communication, word usages, idioms, and various levels of language. News articles, documentaries, advertisements, fictional works, and works of local wisdom in printed or electronic mediums. Practice speaking in various contexts. Use Thai for greetings, introductions, accepting and refusing requests, giving congratulations and condolences, business dealings, summarizing, commenting, writing business messages, explaining, narrating, and form filling.

GECLC102 Thai for Searching and Writing Reports 1(1-0-2

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand how to use skills in Thai language for information searching and report writing.
2. Acquire skills in analyzing and synthesizing information to improve their Thai language skills.
3. Appreciate the importance of writing as well as recognizing the significance of information searching.

Course Competencies : Student should be able to :

1. Use skills associated with listening, speaking, reading, and writing in Thai language for searching and analyzing information.
2. Effectively integrate multiple skills associated with Thai language usage for information searching from various sources.
3. Promote a continuous learning through communication, information searching and analyzing in daily life for lifelong learning.
4. Demonstrate the abilities in work reports writing, academic writing, or project writing accurately and appropriately with their writing principles.

Course Description :

Study to develop listening, speaking, reading, and writing skills as a tool for communication and research from various sources. Practice deciphering, translating, summarizing, interpreting, explaining, analyzing, contemplating, and assessing. Present results of study in written, spoken, and other types of forms. Learn about writing for professional work, composing phrases, idioms and sentences for professional work, word spelling, transliteration and technical terms in professional work, tips and techniques in writing reports, researching and collecting data, writing references, giving presentations, demonstrating work procedures or production processes, writing work reports, writing academic reports, and project writing.

GECLC103 Thai for Communication 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the elements of communication.
2. Acquire the ability to speak in a variety of situations in a timely manner.
3. Acquire skills in listening and reading for comprehension, interpretation, translation, and inferring.
4. Develop writing skills to convey knowledge, ideas, feelings and emotions from senders to receivers.
5. Appreciate the values and importance of Thai language usage.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of Thai language usage in listening, viewing, speaking, reading, and writing.
2. Effectively use Thai language for various communication activities, i.e., listening, speaking, reading, and writing.

Course Description :

Study components of communication, language and communication, fundamental knowledge of communication, relationship between language and communication, report writing, project writing, general information about listening skills, assessment of listening skills, general information about reading skills, skimming, questioning, summarizing, speed-reading, inferring, reading with discretion, general information about speaking, different types of speaking strategies, speaking evaluation, work presentation and evaluation, evaluation principles, oral presentations, written presentations, aesthetic aspects of language, and uses of Thai in daily life and work.

GECLC104 Thai for Creativity 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand how to use Thai language creatively.
2. Develop skills for speaking and creative writing according to the principles of Thai language usage.
3. Create literary works using the principles of creative writing.
4. Appreciate the values and importance of Thai language usage.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of word compositions, idioms, and rhetoric.
2. Speak creatively according to grammatical structures and the principles of creative speaking.
3. Write creatively according to grammatical structures and the principles of creative writing.

Course Description :

Study the use of Thai for creative works, word compositions, idioms, dictions, giving speeches, telling stories, explaining, lecturing, persuasive speaking, work presentations, summary writings, and writing tales, short stories, novels, verses, non-fictions, articles, and memorandums. Criticize, analyze, and give opinions in various contexts. Analyze classical Thai literature, contemporary literature, and compose literary works with the principles of creative writing.

GECLC105 Speaking and Writing for a Career 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles of speaking and writing for career.
2. Acquire speaking skills for various contexts and in a timely manner, as well as improve their writing skills for professional communication.
3. Appreciate and realize the importance of using Thai language in speaking and writing for career.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of using and composing words, idioms, and rhetoric.
2. Write professional documents, and reports related to work, academic, and project.
3. Effectively use Thai language in speaking and writing for professional communication purposes.

Course Description :

Study the use of Thai in communication, analysis, deductive reasoning, evaluation of information in daily life and professional work from various media, professional writing, composition of sentences and idioms in professional work, word spelling, transliteration of technical terms in the work place, work presentations, demonstration of work procedures or production processes, work report writing, academic report writing or project writing, fundamental information about speaking, speaking in various situations, speaking evaluations, work presentations and evaluations, evaluation principles, and oral presentations.

1.1.2 Foreign Languages Courses

GECLC201 English for Everyday Communication 1 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand basic principles of English usage in everyday use.
2. Listen, speak, read, and write basic English in everyday life.
3. Develop a desirable attitude and manner in everyday English communication.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of basic English usage according to the principles of English usage.
2. Converse with basic English in everyday life.
3. Read and write with basic English in everyday life.

Course Description :

Study and practice vocabulary, idioms, sentences, and basic grammar rules. Learn about parts of speech and language usages in sentence compositions. Practice speaking, listening, reading, and writing in daily life, introductions, greetings, thanking, apologizing, telling the time, and giving directions.

GECLC202 English for Everyday Communication 2 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of English usage for various contexts.
2. Listen, speak, read, and write in English for various contexts.
3. Develop desirable attitude and manner while using English for communication in a variety of contexts.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of appropriate English usages for various contexts.
2. Effectively engage in English conversation in a variety of contexts.
3. Read and write English in different contexts.

Course Description :

Study and practice vocabulary, idioms, sentences, and grammar rules. Practice speaking, listening, reading, and writing in various situations, hotel and flight bookings, telephoning, e-mail writing, work presentations, and job applications.

GECLC203 English for World Outlook 1 1(0-2-1)

Former Course Code : "None"

Prerequisite : " None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of cultures and traditions of native speaker as well as able to communicate in English using language, postures, and gestures accurately and appropriately in various situations.
2. Use English in learning and presenting cultural diversity of different countries, as well as follow and present important news happening in different periods and regions.
3. Apply information technology for information searching and ideas presenting.
4. Recognize and acknowledge cultural diversity to adapt and increase work competency as well as social skills.

Course Competencies : Students should be able to :

1. Listen, view, and read conversations or stories related to the diversities in cultural and traditional practices of native speaker and other nations from audiovisual media.
2. Appropriately communicate in English in a variety of contexts.
3. Speak, write and take part in a role play to present the culture of different countries as well as analyze and express opinions towards the differences and similarities of each country in terms of their cultural aspects.
4. Listen, read, analyze and present important news happening in different periods and regions from audiovisual media.

Course Description :

Practice to understand a native speaker's cultures and use of English to be able to appropriately communicate in various situations. Use English to learn and talk about cultural diversities in different countries. Follow up and present important events in various parts of the world.

GECLC204 English for World Outlook 2 1(0-2-1)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Listen and read English articles related to social, cultural, and workplace situations.
2. Reflect their opinions through speaking and writing about their living and working situations, social issues, and cultural diversity.
3. Apply media and information technology in searching and presenting ideas and opinions.
4. Responsible to self and society and able to work with others.

Course Competencies : Students should be able to :

1. Describe, compare and choose vocabulary and idioms related to life skills, society, and cultures.
2. Listen, view, and read English related to life skills required for living and working in a present society from audiovisual media.
3. Reflect opinions on their living and working situations concerning social and cultural diversity through speaking and writing.
4. Engage in English conversations in a variety of social and cultural diversity.

Course Description :

Practice English listening, speaking, reading, and writing skills related to life, society, cultures, and work situations.

GECLC212 English for Reading and Writing 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Acquire knowledge and understanding regarding the grammatical structures of English language for reading, writing in everyday life as well as writing for academic purposes.
2. Develop reading and writing skills in various situations.
3. Recognize the importance of comprehensive reading and accurate writing according to writing principles.

Course Competencies : Student should be able to :

1. Use vocabulary, idioms, and grammatical structures of English language in writing and reading accurately.
2. Write descriptions of events and professional reports correctly.
3. Understand the message in articles or print media and be able to explain to others.

Course Description :

Study and practice English reading and writing for both daily and professional life. Improve reading skills to develop better writing skills by reading articles, research papers, literature writings, and news. Learn about writing for various purposes. Give opinions on study or work and write summaries for lectures or articles related to various professional fields.

GECLC213 Basic Chinese 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Acquire fundamental knowledge and understanding associated with Chinese culture.
2. Pronounce Chinese vocabulary correctly according to Chinese pronunciation (Pinyin).
3. Communicate in basic Chinese.
4. Realize the correct use of Mandarin Chinese and understand basic principles of Chinese language.

Course Competencies : Students should be able to :

1. Acquire fundamental knowledge and understanding associated with Chinese culture.
2. Pronounce and communicate in Mandarin Chinese correctly according to the principles usage of Mandarin Chinese.
3. Use basic Chinese sentences appropriately in various situations.

Course Description :

Study Chinese vocabulary, idioms, sentences, and basic grammar rules. Practice pronunciation using Pinyin system, basic Chinese alphabet sounds, basic alphabet writing, and basic Chinese daily life conversations for beginners. Practice listening, speaking, reading, and writing skills with daily life vocabulary.

GECLC214 Chinese for Communication 2(1-2-3)

Former Course Code : "None"

Prerequisite : GECLC213 Basic Chinese

Course Objectives : To enable students to :

1. Develop knowledge and understanding of Chinese vocabulary, and idioms in complex situations.
2. Develop appropriate communication skills for various situations.
3. Develop skills in reading and writing complex Chinese conversations.

Course Competencies : Students should be able to :

1. Know and understand complex vocabulary, idioms, and grammatical structure of Chinese.
2. Choose appropriate sentence patterns for oral communication in a variety of contexts.
3. Write essays, short articles, and draw conclusions for stories or articles.

Course Description :

Study and practice advanced Chinese vocabulary, idioms, sentences, and grammar rules starting with reviewing and fixing problems in pronunciation. Practice conversations in situations that demand advanced knowledge of Chinese. Use Chinese in asking for permission, giving reasons, comparing, explaining, and giving information in the form of speaking and writing sentences and paragraphs.

1.2 Science and Mathematics

1.2.1 Science Courses

GECSC102 Mechanics 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of computational principles and theories concerning units of measurement, scalar and vector quantities, Newton's laws of motion, motions in one dimension, projectiles, circular motion, simple harmonic motion, equilibrium and energy, law of conservation of energy, power, linear momentum and collisions, angular velocity and acceleration, angular momentum, elasticity, stresses and strains.
2. Develop basic skills in physics laboratory.
3. Develop the ability to think, analyze, calculate and solve physics problems.
4. Develop a desirable attitude towards mechanics as set of desirable work habits.

Course Competencies : Students should be able to :

1. Convert units of measurement in physics.
2. Explain different motions of objects, force, Newton's laws of motion, work, energy, law of conservation of energy, collision, momentum, law of conservation of momentum, equilibrium and elasticity.
3. Calculate quantities related to: the motion of an object in one dimension; force; net force; work, energy; momentum; equilibrium of force; moment; stress and strain; and Young's modulus.
4. Prepare a preliminary experimental plan, conduct experiments, and use physics tools and equipment appropriately and safely.
5. Discuss the experimental results accurately based on the principles and theory.

Course Description :

Study and practice units of measurement, scalar and vector quantities, linear and vertical motion, Newton' s laws of motion, circular motion, projectiles, basic harmonic motion, equilibrium and energy, law of conservation of energy, power, linear momentum, impacts, angular velocity and acceleration, angular momentum, flexibility, stresses and strains.

GECSC107 Principles of Chemistry 1 2(2-0-4)

Former Course Code : 22092107 Chemistry 1

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding principles and theories associated with substances and changes of atomic structure, periodic table, properties of elements and compounds, and chemical bonds.
2. Develop the ability to think, analyze, calculate, and solve chemistry-related problems.
3. Develop positive attitude towards chemistry and good habits at work.

Course Competencies : Students should be able to :

1. Classify types of substances, describe the purification of substances, and calculate the energy of phase changes.
2. Explain the differences of various atomic models, and analyze the relationship between the arrangement of electrons in atoms and the periodic table.
3. Classify the periodic table and describe the properties of elements and compounds in groups and periods.
4. Explain the principles of chemical bonding, and classify types of chemical bonds in the molecules of substances.

Course Description :

Study substances and chemical changes, changes of energy status, atomic structures and electrons in atoms, the periodic table, properties of

elements and compounds in groups and periods, representative elements, nonmetals, transition metals, radioactive elements and chemical bonds.

GECSC113 Computing Science 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Solve problems related to mathematics, science, or in everyday life using information technology.
2. Solve problems with abstract concepts and computational concepts in order to create a troubleshooting process, making choices and decisions.
3. Use information technology with respect to morality, ethics, laws related to computer systems and information technology.

Course Competencies : Students should be able to :

1. Design flowcharts or write programs to explain or solve math, science, or real-life related problems.
2. Manage information systematically for collecting, storing, processing, evaluating and presenting information with computer systems and information technology.
3. Use information technology safely according to morals, ethics and legal principles concerning trends transforming in information technology that affects life, society, and culture.

Course Description :

Study and practice abstract concepts, selection of features needed to solve problems, computing concepts, component extraction, problem analysis, problem scope and flowchart design for problems and solutions with various factors and conditions, primary data collection, data analysis, defining data inputs and outputs, conditions of problems and solutions, algorithm designs, recursive functions, data searching and categorization, and decision making .Use computer systems and information technology to help in problem solving, and systematic data categorization. Use information technology to understand

ethics, copyright and intellectual property laws, and to solve problems in mathematics and science in both professions and real life contexts .

GECSC114 **Process of Thinking and Problem Solving** **2(1-2-3)**

Former Course Code : " None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand a systematic thinking process or reasoning thinking.
2. Use thinking skills in problem-solving systematically.

Course Competencies : Students should be able to:

1. Demonstrate knowledge of problem-solving, analyzing, and reasoning systematically and creatively.
2. Engage in analytical thinking and systematic thinking to solve problems step-by-step.

Course Description :

Study and practice concepts, theories, techniques and development processes of thinking and reasoning, inspiration for encouraging ideas, and processes of problem solving in different scenarios .Reflect on ideas from reading and listening, to encourage positive changes in life and give valuable outcomes .Encourage better thinking processes by employing Lanna and Thai wisdom, innovation, and modern technology through case studies.

1.2.2 Mathematics Courses

GECSC201 Basic Mathematics 1 3(3-0-6)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding real number systems, matrices, and logic.
2. Be able to solve mathematical problems and apply problem-solving processes in everyday life.
3. Recognize the application of knowledge for higher studies.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of matrices, the operations of matrices, and the ability to find the determinant of matrices, as well as solving the system of equations using matrices.
2. Draw a conclusion based on the basic principles of logic.
3. Solve equations and inequalities of one variable with up to two degrees based on mathematical principles and processes.
4. Demonstrate knowledge and practice related to mathematical principles and processes.

Course Description :

Study solving single-variable equations and inequalities, solving absolute value equations and inequalities, solving the quadratic equation with one variable, matrices and properties of addition and multiplication, finding the value of the determinant and properties of the determinant, finding the inverse of matrix multiplication using adjoint matrices, and the implementation of the row, solving systems of linear equations using the inverse of matrix multiplication and the implementation of the row, propositions, conjunctive propositions, propositions for the equivalent of eternal truth, tautology, logic quantifiers, open sentences, quantifiers, and truth-value of sentences that have one or two quantifiers.

GECSC202 Basic Mathematics 2 3(3-0-6)

Former Course Code : "None"

Prerequisite : " None "

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding analytical geometry, conic sections, sets, relationships and functions.
2. Acquire mathematical problem-solving skills and apply problem solving processes in everyday life.
3. Recognize the application of knowledge for higher studies.

Course Competencies : Students should be able to :

1. Explain the concepts of analytical geometry, conical section, and their application in problem solving.
2. Calculate sets and create Wayne-Euler diagrams to solve problems according to mathematical principles and processes.
3. Demonstrate a knowledge of relations and functions and solve relations and functions related problems.
4. Demonstrate knowledge and practice of mathematical principles and processes.

Course Description :

Study rectangular coordinate systems, linear equations, slopes of straight lines, equations of parallel and perpendicular lines, equations of the circle, parabolas, ellipses, hyperbolas, scrolling graphs, sets, operations between sets, set problems, relations and functions, ordered pairs, the Cartesian product, types of functions, domains and ranges of functions, algebraic functions, composite functions, injective functions, surjective functions, and inverse functions.

1.3 Social Studies and Humanities

1.3.1 Social Studies

GECSO101 Citizenship and Morals 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding religion, principles,
2. Behave as a good citizen according to law and regulations of the democratic monarchy.
3. Recognize the duty of a good religious person according to one's own religion.

Course Competencies : Students should be able to :

1. Develop knowledge and understanding regarding religion, principles, morals, ethics, fundamental laws, wisdom, and culture.
2. Demonstrate knowledge and understanding regarding the current law in force and the regulations of the democratic monarchy.
3. Demonstrate knowledge and understanding according to moral and ethical principles of each religion.

Course Description :

Study history of religions, moral principles, religious rites, virtues and morals of good citizens, fundamental laws for citizens, social structures, social institutions, social organizations, local Thai wisdom, Thai culture, regional cultures in various parts of the country, and conservation of the nation's culture. Analyze the importance of social structures of man and the environment.

GECSO102 The King's Philosophy for Sustainable Development 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the significance of basic economic concepts.
2. Develop knowledge and understanding regarding His Majesty's working ethics, and the principles of the King's Philosophy for sustainable development.
3. Recognize and apply the principles of the King's Philosophy for sustainable development to personal development and improvement of living conditions.

Course Competencies : Students should be able to :

1. Develop useful knowledge for keeping up with the changes of global economy.
2. Demonstrate knowledge and understanding regarding His Majesty's working ethics, and the principles of the King's Philosophy for sustainable development.
3. Analyze, compare, and apply the philosophy of Sufficiency Economy in everyday life.

Course Description :

Study fundamental economics, definitions, principles, theories, and the importance of the world economic system, market and types of markets, pricing, government policies regarding development and resolution of economic problems, important economic organizations, and factors leading to economic reliance and competition. Learn about the objectives of Philosophy of Sufficiency Economy, His Majesty's working ethics. Understand the principles of the King's Philosophy for sustainable development. Analyze and apply the King's Philosophy in the community, from individuals to business organizations, in the regional community and the nation as a whole.

GECSO103 Geography and Geo-Social 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the physical geography of regions in Thailand and the world.
2. Be able to apply knowledge, tools, and information technology related to geography in daily life.
3. Recognize problems related to physical environment causing by humans, provide suggestions to prevent and solve the raising problems.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding regarding the physical geography of regions in Thailand and the world.
2. Use geographical tools to collect data according to the principles and methods in geography.
3. Analyze the relationship between human and their physical environment for sustainable living.

Course Description :

Study, analyze and research the physical geography of regions in Thailand and the world in terms of location, topography, climate, natural resources, relationships between the physical environment and life, human's way of life, and environmental problems caused by human activity. Learn the topics by doing research, group work, analyzing processes, problem-solving processes and training processes that make students develop an understanding of the physical environment and its effect on human's way of life. Realize the need to adjust to the environment, use it wisely, improve its condition, and help to preserve and develop the environment.

GECSO104 Thai Civilization and Oriental Civilization 1(1-0-2)

Former Course Code : " None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the historical processes, and the history of Thai and eastern nations.
2. Apply knowledge of history to find the relations for a living fundament.
3. Realize the significance of Thai history as to maintain the national institutions, religion, and monarchy.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding regarding the historical processes, and the history of Thai and eastern nations.
2. Draw a comparative analysis of politics, government, economy, society, and culture of Thai and Eastern history.
3. Analyze the works of notable Thai and foreign figures who have greatly contributed to the creation of Thai culture and culture of eastern nations.

Course Description :

Study and analyze Thai history, culture, and tradition from ancient times to modern day, the political, economic, social and cultural development of Thai civilization, the preservation of local wisdom and cultural heritage, creative economic development, the ASEAN community, needs for morals in society, the rise and fall of individuals, religions, nations, and civilizations; history, development and the pinnacle of oriental civilizations from ancient to modern times; multiculturalism and globalization in the community and various organizational levels, cross-cultural communication, and notable characteristics of the oriental civilization that influence the world today.

GECSO105 World Civilization 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding world historical events that influence changes in human society.
2. Apply knowledge regarding world history and its crucial roles in a basis of living.
3. Acknowledge population diversity that influence mankind's relationship and draw a comparison with regard to political, cultural, economic, and social aspect of world history.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding of world historical events that influence changes in human society.
2. Analyze and compare important historical roles that influence global events in the past and present.
3. Apply the advantages of population diversity that influence mankind's relationships in the past and present for peaceful living in society.

Course Description :

Study and analyze important events in world history that influence social changes and social institutions, roles of institutions and organizations in the past and present, population diversity and its effects on mankind's relationships, influences of the environment on culture, economics and society, social values in a global society, roles of human rights to a global society, problems and conflicts in a world society, conflict resolutions from lessons in historical events for harmony in the age of globalization.

GECSO106 Current Affairs 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding current economic, social, political, educational, technological, and environmental conditions in Thailand.
2. Analyze information to benefit personal development, and improvement of localities, communities, society, and nation.
3. Recognize the effect of changes in the current situation to create a peaceful society.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of the current economic, social, political, educational, technological, and environmental conditions in Thailand.
2. Plan to build immunity for oneself, community, and society using information from current events.

Course Description :

Study about the current economic, social, political, educational, technological, and environmental situation in Thailand.

GECSO17 ASEAN Studies 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding towards ASEAN community.
2. Apply knowledge to create a better understanding as a citizen of ASEAN community.
3. Realize the importance of being a citizen of ASEAN community for personal development and improvement of society and nation.

Course competencies : To enable students to :

1. Demonstrate knowledge of ASEAN community.
2. Demonstrate knowledge of life planning in accordance with the development of the ASEAN Community in various fields.
3. Behave as a good ASEAN citizen.

Course Description :

Study histories and developments of ASEAN community in the aspects of economics, society, politics, governing, education, culture, environment, technology, and international relations of countries in the ASEAN community with other regions in the world.

GECSO108 Law and Life 1(1-0-2)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives: To enable students to:

1. Develop knowledge and understanding regarding the fundamental law.
2. Analyze the relationship between law and judicial process.
3. Recognize the importance of acquiring knowledge of law as well as complying with law in force.

Course Competencies : Students should be able to :

1. Demonstrate basic knowledge and understanding of law relating to civil law, criminal law, and intellectual property law.
2. Demonstrate knowledge and understanding of law related to everyday life.
3. Analyze the relationship between law and the judicial process, i.e., law enforcement, problems relating to law enforcement, solutions to laws enforcement issues, and the need-to-know law and comply with law.

Course Description :

Study fundamental knowledge of law, principles of civil law, criminal law, laws relating to national and international intellectual property, including law related to daily life, relationships between law and judicial administration, and law enforcement and solutions.

1.3.2 Humanities Studies

GECSO201 The Wisdom of Life 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding living principles under social diversity.
2. Apply the principles of human relations in everyday life, maintain citizenship role to improve the quality of life and society.
3. Develop a positive attitude towards improving the quality of life and living as a social member.

Course Competencies : Student should be able to :

1. Demonstrate knowledge relating to living principles in a diversified society with respect to the principles of human relations and life quality improvement.
2. Apply the principles of human relations in everyday life as well as behaving as a good citizen in various situations.
3. Creatively create a plan to improve life quality according to moral and ethical principles of social living.

Course Description :

Study self-perception and self-understanding, morals and social ethics for the way of life and society. Perform good deeds for society. Show an appropriate behavioral disposition, systems thinking, and creative evaluations of one's surroundings.

GECSO202 The Beauty of Lanna 2(1-2-3)

Former Course Code : " None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge regarding the history of Lanna.
2. Analyze and compare economic, political, religious, architectural, societal, and cultural aspects of Lanna.
3. Realize the importance of a diversified society of Lanna that influence mankind's relationships.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding towards the history of Lanna.
2. Analyze and compare economic, political, religious, architectural, societal, and cultural aspects of Lanna from past to present.
3. Apply the diversity of Lanna for a peaceful living in society.
4. Demonstrate the importance of Lanna characteristics to creatively apply to everyday life.

Course Description :

Study to understand and be able to analyze the history of Lanna in terms of religions, beliefs, rites, traditions, culture, architecture, ways of life, and local wisdom. Develop an understanding of the history of Lanna and be able to apply the knowledge in daily life.

GECSO203 Visual Arts 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand meaning and scope of visual arts, visual elements, and principles of design for different types of artistic presentations.
2. Understand skills and techniques in using materials and tools, and able to create visual arts works with the aid of technology, focusing on composition and elements of design.
3. Analyze, criticize, and comment on the values of visual arts, and apply the values of visual arts in daily life.

Course Competencies : Students should :

1. Demonstrate knowledge of visual arts and their scopes.
2. Acquire skills and techniques in using materials and tools, and be able to create visual arts works with the aids of technology, focusing on composition and elements of design.
3. Create visual arts works.

Course Description :

Study definitions and scope of visual arts, visual elements, principles of design for different types of artistic presentations, skills and techniques in using tools and materials. Create visual art works with the aid of technology, focusing on composition and elements of design. Design visual art works appropriate to the place and time. Create visual art works with creativity. Analyze, criticize, and comment on the values of visual arts, and apply the values of visual arts in daily life.

GECSO204 Photography 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the development of photography technology from past to present, and fundamental principles of still and motion photography.
2. Develop knowledge and understanding regarding science of photography and photographic equipment, as well as the correct use and maintenance.
3. Develop skills in operating cameras, photo editing, and photographic equipment.
4. Develop a positive attitude towards photography.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of film and digital cameras.
2. Demonstrate knowledge regarding the principles of composition of Photography and use of light in photography.
3. Adopt various photography techniques in studio and outdoors.

Course Descritpion :

Study and practice basic photography principles, camera operating techniques, photography equipment and maintenance, techniques and methods for photography, composition of photography, uses of light in photography, photography techniques in the studio and outdoors for portraits, landscapes, flowers, animal images, still life, close-up images, night shots, backlit images, and animations. Create photographs from imagination or things in everyday life with the aid of computers.

1.3.3 Health Studies

GECSO301 Sexuality Education 1(1-0-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the principles of health care, sexual development stages, and adolescent mental health.
2. Develop accurate knowledge and understanding regarding genital hygiene and the ability to evaluate risks from sexual behavior and problems from unprepared sexual activity.
3. Develop knowledge about appropriate sexual behaviors and sexual relations according to social and cultural norms.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of health care, sexual development stages, and good understanding of genital hygiene.
2. Plan to prevent and solve physical illness and mental health illness.
3. Evaluate risks from sexual behavior and problems from unprepared sexual activity.
4. Establish a good relationship with family, friends, society, and sexually behave appropriately according to social and cultural norms in Thai context.

Course Description :

Study principles of health care, sexual development stages, adolescent mental health, and genital hygiene. Evaluate risks from sexual behavior and problems from unprepared sexual activity. Understand personal preferences that affect sexual behavior, self-esteem and respecting others' rights, rights to behave according to one's gender in the scope of social norms and culture. Use knowledge and skills of sexuality education in daily life sensibly, critically, and creatively.

GECSO302 Life Safety 1(1-0-2)

Former Course Code : " None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding basic principles of life safety and accident prevention.
2. Develop correct knowledge and understanding regarding working in industrial plants and accident risks.
3. Develop knowledge regarding rescue and first aid.

Course Competencies: To enable students to:

1. Demonstrate knowledge of the basic principles of life safety and accident prevention.
2. Demonstrate knowledge of working in industrial plants and accident risks.
3. Plan accident prevention, rescue, and first aid.

Course Description :

Study basic principles of life safety, accident prevention, working in industrial plants, accident risks, physical fitness and mechanisms, factors causing accidents, assistance, and first aid. Apply knowledge and skills of life safety in daily life sensibly, critically, and creatively.

GECSO303 Track and Field 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge regarding the history and development of athletics from past to present.
2. Develop skills in athletics including track and field events.
3. Understand skill training patterns and techniques in basic athletics training including individual athletics competitions.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding history and development of esthetics from past to present.
2. Demonstrate skills in esthetics including track and field events.
3. Explain the training patterns of basic athletics skills and techniques including individual athletics competitions.

Course Description :

Study and practice the history and development of athletics from past to present, track and field events, skills and techniques in basic athletic training, and rules of the game for various types of atheletic events.

GECSO304 Table Tennis 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge regarding the history of table tennis, advantages, and techniques of table tennis.
2. Develop basic movement skills and familiarity in tennis racquet holding, basic skills and techniques, advanced skills of table tennis, serving and receiving.
3. Understand the principles and rules of practice, rules, etiquette, strategies for playing singles and doubles.

Course Competencies: Students should be able to :

1. Demonstrate knowledge about history, advantages, and techniques of table tennis.
2. Develop basic movement skills and familiarization with playing, tennis racquet holding, techniques and basic skills, and advanced skills of table tennis, serving and receiving.
3. Explain principles, rules, etiquette, and tactics in singles and doubles table tennis games.

Course Description :

Study and practice the history, benefits, and techniques of table tennis, basic movements and develop a familiarity of playing, grip styles, techniques, basic and advanced skills in table tennis, serving and receiving, principles and tactics in singles and doubles games.

GECSO305 Badminton 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop skills and knowledge associated with badminton including history, benefits, proper court etiquette, and exercise for physical fitness as well as badminton equipment maintenance.
2. Develop basic skills associated with badminton playing including proper racket holding, grips, forehand strokes, backhand strokes, hits, receives, and passes shuttlecock.
3. Develop an understanding regarding basic rules associated with singles, doubles, or mixed doubles badminton competition.

Course Competencies : Students should be able to :

1. Demonstrate knowledge associated with badminton including history, benefits, proper court etiquette, and exercise for physical fitness as well as badminton equipment maintenance.
2. Demonstrate basic skills associated with badminton playing including proper racket holding, grips, forehand strokes, backhand strokes, hits, receives, and passes shuttlecock.
3. Explain basic rules associated with badminton competition i.e., singles, doubles, mixed doubles.

Course Description :

Study and practice the history, benefits, and court etiquette of badminton; exercise for physical fitness, badminton equipment maintenance, basic playing skills, grips, forehand strokes, backhand strokes, hits, receives, passes, basic rules and regulations of the game, for singles, doubles, and mixed doubles.

GECSO306 Volleyball 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop basic knowledge of volleyball associated with history, benefits, volleyball games, basic movements, and familiarization with volleyball.
2. Develop skills and sequencing techniques associated with volleyball, i.e., underhand and forearm moves, serving, hitting, attacking, and blocking, offensive and defensive skills in team, and more advanced skills of volleyball.
3. Develop an understanding of basic rules associated with volleyball, i.e., proper court etiquette and good sportsmanship, gaming, and competition.

Course Competencies : Students should be able to :

1. Demonstrate basic knowledge of volleyball associated with history, benefits, volleyball games, basic movements, and familiarization with volleyball.
2. Demonstrate skills and sequencing techniques associated with Volleyball, i.e., underhand and forearm moves, serving, hitting, attacking, and blocking, offensive and defensive skills in team, and more advanced skills of volleyball.
3. Explain basic rules associated with volleyball, i.e., proper court etiquette and good sportsmanship, gaming, and competition.

Course Description :

Study and practice the history, benefits, and general knowledge of volleyball, introductory movements and familiarity with the ball, skills and techniques in underhand and forearm moves, serves, hits, blocks, offensive and defensive teamwork, advanced skills in volleyball, and basic rules of play.

GECSO307 Basketball 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge associated with the history and evolution of Basketball, benefits, and proper court etiquette and good audience.
2. Develop basic skills of basketball, warm-up exercises, and muscle flexing and stretching.
3. Develop an understanding of basic rules and regulations associated with basketball, i.e., proper court etiquette and good sportsmanship, gaming, and competition.

Course Competencies: Students should be able to:

1. Demonstrate knowledge associated with the history and evolution of Basketball, benefits, and proper court etiquette and good audience.
2. Demonstrate basic skills of basketball, warm-up exercises, and muscle flexing and stretching.
3. Explain basic rules and regulations associated with basketball i.e., proper court etiquette and good sportsmanship, gaming, and competition.

Course Description:

Study and practice the history and evolution of basketball, benefits of the game, court etiquette for players and spectators, basic skills, warm-up exercises, muscle flexing and stretching, and basic rules of play.

GECSO308 Social Dance 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge associated with history, types, and steps of social dance, proper dance etiquette, its benefits, and the rhythm of music and songs.
2. Develop skills associated with social dance, i.e., choosing a partner, leading, and performing in different dancing steps.
3. Develop an understanding of social dance, i.e., rules, regulations, etiquette, and competition.

Course Competencies : Students should be able to :

1. Demonstrate knowledge associated with history, types, and steps of social dance, proper dance etiquette, its benefits and the rhythm of music and songs.
2. Demonstrate skills associated with social dance, i.e., choosing a partner, leading, and performing in different dancing steps.
3. Explain social dance, i.e., rules, regulations, etiquette and competition.

Course Description :

Study and practice the history, categories, and rhythms of social dance, social etiquettes of dancing, benefits of social dance, recognition of rhythm in music and songs, dance partners, leading and following, styles of dance movements for different dance steps, and the basic rules of social dance competitions. Focus on the movement of the body and be able to participate and apply the movements in various dance events. Use dance movements as daily life exercises. Understand the value of fitness for building a healthy body.

GECSO309 Martial Arts 1(0-2-1)

Former Course Code : 13114006 Martial Arts

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge associated with martial arts, i.e., history, evolution, benefits, proper etiquette of good sportsmanship.
2. Develop basic skills associated with martial arts, warm-up exercises, and muscle stretching.
3. Develop an understanding of basic rules, regulations, and proper etiquette and good sportsmanship associated with martial arts.

Course Competencies : Students should be able to :

1. Demonstrate knowledge associated with martial arts, i.e., history, evolution, benefits, proper etiquette of good sportsmanship.
2. Demonstrate basic skills associated with martial arts, warm-up exercises, and muscle stretching.
3. Explain basic rules, regulations, and proper etiquette and good sportsmanship associated with martial arts.

Course Description:

Study and practice the history and evolution of martial arts, benefits, courtesy of being a good player. Practice basic skills of martial arts in order to be knowledgeable and understanding about movement and movement patterns. Reasons for practicing of self-defense. Practice in various forms of defense. Warming up and stretching muscles. Basic rules for playing martial arts. Applying martial arts in everyday life. Strengthening physical fitness and seeing the value of exercise.

GECSO311 Food and Health 1(0-2-1)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of healthy diets, and various types of nutrition.
2. Develop knowledge and understanding of ingredients selection for cookery of healthy diets.
3. Develop knowledge and understanding associated with health care, health prevention and avoidance of negative health effects.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding of healthy diets, and various types of nutrition.
2. Select proper ingredients for healthy diets.
3. Demonstrate knowledge concerning the principles and processes of health improvement, health prevention, and avoidance of negative health effects.
4. Demonstrate personal health care according to the correct principles and processes.

Course Description :

Study principles of eating healthy food, types of nutrients, ingredient selection in making healthy food, principles and processes of health improvement, prevention of health risks, principles of health care, physical activity as exercises, physical fitness tests, body mass index calculations, and steps to improve physical fitness. Use the knowledge and skills of food and health in daily life sensibly, critically, and creatively.

GECSO312 Everyday Life Skills 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand associated life skills in everyday routines, i.e., work to support oneself and society, selection of materials and tools appropriately to work requirements.
2. Develop knowledge and understanding of daily routine materials, i.e., selection of equipment appropriately to work, being creative in using everyday items, and effectively manage the utensils by reusing them.
3. Develop knowledge and understand about the ability to use life skills. Possess careful and safe working process skills.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding associated with life skills in everyday routines, i.e., work to support oneself and society, selection of materials and tools appropriately to work requirements.
2. Manage everyday routines, selection of materials, tools appropriately and creatively, reuse tools and materials at their great value.
3. Apply learned life skills in everyday life, as well as possess safety working skills.

Course Description :

Study everyday life skills, perform daily routines, take care of oneself and help others. Use materials, tools and equipment appropriate to the nature of the task, apply life skills to everyday life, perform tasks systematically with caution and safety. Practice self-learning, lifelong and continual learning, working and living respectably by building a good relationship with others in the society. Possess good problem solving and conflict management skills. Adapt to a fast-changing society and the environment.

2. Vocational-based Courses 95 Credits.

2.1 Vocational-based General Courses 26 credits

2.1.1 Professional English Courses 4 credits.

GECLC205 English for Engineering 1 1(0-2-1)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles of English for Engineering.
2. Apply knowledge of English in Engineering tasks.
3. Recognize the value and significance of English for Engineering related works and for higher studies.

Course Competencies : Students should be able to :

1. Listen, read, speak, and write the names of tools, machines, equipment and parts of machines.
2. Read signs, symbols, warning signs and announcements in the workplace.
3. Explain and present engineering reports.

Course Description :

Practice engineering vocabulary, names of equipment, machines, tools and parts, reading of manuals, and English in the workplace .Use various media and technology to improve language skills and search for technical information from various sources .

GECLC206 English for Engineering 2 1(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles of English usage in advanced Engineering tasks.
2. Apply knowledge of English in Engineering works.
3. Recognize the value and significance of English for Engineering and higher studies.

Course Competencies : Students should be able to :

1. Use English for telephone conversations, job applications, and job interviews related to Engineering.
2. Read, write, and present engineering reports, describe flowcharts, charts, and graphs used in engineering.

Course Description :

Practice English skills related to telephone conversations, job applications, interviews, meetings, and work reports .Write about flowcharts, charts, and graphs related to engineering .Use various media and technology to improve language skills and search for technical information from various sources.

GECLC211 English for Listening and Speaking 2(1-2-3)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles of English pronunciation and principles of using the international phonetic alphabet.
2. Develop English skills in listening, watching, speaking in various everyday situations.
3. Know and understand the culture of native speakers and the principles of English usage according to social etiquette.
4. Recognize the benefits and importance of English in everyday life.

Course Competencies : Students should be able to :

1. Read and speak English according to the principles of pronunciation. and principles of using the phonetic alphabet correctly.
2. Listen, watch, and explain news, films, or media in different forms correctly.
3. Engage in English conversations appropriately in various situations.
4. Use English vocabulary and idioms relevant to contexts, social etiquette, and the cultures of native speakers.

Course Description :

Study and practice listening and conversation skills, and English from movies, songs, and websites. Practice pronunciation and the rules of International Phonetic Alphabets. Explore different accents from various parts of the world, do role-plays, and use vocabulary and idioms in real life. Use English appropriately based on the cultures of native speakers.

2.1.2 Vocational-based Science and Mathematics Courses 18 credits

(1) Courses in Physics 4 credits

GECSC104 Wave Light and Sounds in Physics 2(1-2-3)

Former Course Code : 22092205 Wave Light and Sounds in Physics

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles and theories about nature and properties of wave, light, and sounds.
2. Develop basic skills in physics.
3. Develop thinking skills, i.e., analyze, calculate, and solve physics problems.
4. Develop a positive attitude towards studying physics of waves, light, and sound as well as developing good work habits.

Course competencies : Students should be able to :

1. Explain waves elements, properties of mechanical waves, light waves, sound waves, polarization, and scattering of light.
2. Calculate the physical quantities of mechanical waves, light waves, sound waves, sound intensity, sound intensity level, focal length, image distance, magnification of concave lens, convex lens, concave mirror, convex mirror and various physical properties of light.
3. Draw light rays, the focus point of concave lens, convex lens, concave mirror, and convex mirror.
4. Prepare a preliminary experimental plan, conduct experiments, and use physics tools and equipment appropriately and safely.
5. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice waves and wave functions, longitudinal waves, transverse waves, properties of waves, wave energy transfer, superpositions, the nature of sound, sound movements, properties of sound, standing waves, hearing, sound phenomena, physical optics, geometric optics, concave mirrors, convex mirrors, concave lenses and convex lenses.

GECSC105 Fundamental Electrical and Electronics 2(1-2-3)

Former Course Code : 51020310 Fundamental Electrical and Electronics

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand principles and theories associated to the fundamental concepts of electrical, electromagnetic waves, and modern physics.
2. Develop basic skills in physics laboratory.
3. Develop thinking skills i.e., analyze, calculate, and solve physics problems.
4. Develop positive attitude towards fundamental electrical and electronics and possess good work habits.

Course Competencies : Students should be able to :

1. Explain basic principles of electricity and magnetism, electromagnetic waves, types and properties of electromagnetic waves, Heisenberg's uncertainty principle in quantum mechanics, and properties of the three types of radioactive elements.
2. Calculate electric force, electric field, electric capacitance, electric potential capacitor, ohm's law, energy, and electric power, electromotive force , direct current, resistivity, conductivity, spectra of hydrogen, quantum of energy, radioactive, decay binding energy, and nuclear energy obtained from nuclear reactions.
3. Prepare a preliminary experimental plan, conduct experiments, and use physics tools and equipment appropriately and safely.
4. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice basic principles of electricity, Coulomb's law, electrical forces, electric fields, capacitance, electric potential, capacitors, Ohm's law, electrical power and energy, electromotive forces, direct currents, electrical resistivities, electrical conductivities, connecting resistors

and capacitors, simple circuits, alternating currents, introduction to electromagnetic waves, atomic physics, and nuclear physics.

(2) Chemistry Courses 6 Credits

GECSC108 Principles of Chemistry 2 2(2-0-4)

Former Course Code : 22092108 Chemistry 2

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand principles and theories about hydrocarbon compounds and their derivatives, biomolecules, coal, petroleum, polymers, solid, liquid, and gas properties.
2. Develop thinking skills, i.e. analyze, calculate, and solve chemistry problems.
3. Develop positive attitude towards chemistry and good work habits.

Course Competencies : Students should be able to :

1. Identify the types of hydrocarbon compounds, derivatives of hydrocarbon compounds, and biomolecules.
2. Explain the principle of coal, petroleum, petroleum separation process, and polymer synthesis.
3. Explain and compare the properties of solids, liquids and gases.
4. Demonstrate the calculation of volume, pressure, temperature, and moles of gas.

Course Description :

Study hydrocarbon compounds and hydrocarbon derivatives, biomolecules, coal, petroleum, polymers, and properties of solids, liquids and gases.

GECSC109 Principles of Chemistry 3 2(1-2-3)

Former Course Code : 22092209 Chemistry 3

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles and theories of stoichiometry and electrochemical cells.
2. Develop basic skills in chemistry laboratory.
3. Develop thinking skills, i.e., analyze, calculate, and solve chemistry problems.
4. Develop positive attitude towards the principles of chemistry and good work habits.

Course Competencies : Students should be able to :

1. Write chemical formulae, chemical equations, redox equations, and balanced chemical equations.
2. Demonstrate steps in the calculation of solution concentration, chemical formula, amount of substance in chemical reaction, and cell potential.
3. Prepare a preliminary experimental plan, conduct experiments, and use chemistry tools and equipment appropriately and safely.
4. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice stoichiometry, concentrations and properties of solutions, chemical formulae, chemical equations, balanced chemical equations, the amount of substances in chemical reactions, percentage yields, electrochemical cells, galvanic cells, electrolytic cells, redox reactions, redox equations, and cell potentials.

GECSC110 Principles of Chemistry 4 2(1-2-3)

Former Course Code : 22092210 Chemistry 4

Prerequisite : " None"

Course Objectives : To enable students to :

1. Know and understand the principles and theories of chemical reaction rates, chemical equilibrium, and acid-base.
2. Develop basic skills in chemistry operations.
3. Develop thinking skills, i.e., analyze, calculate, and solve chemistry problems.
4. Develop positive attitude towards the principles of chemistry and good work habits.

Course Competencies : Students should be able to :

1. Write the dissociation equations of acids and bases.
2. Demonstrate steps in the calculation of chemical reaction rate, rate law, equilibrium constant, and the pH of the solution.
3. Describe the factors affecting the rate of chemical reactions and chemical equilibrium.
4. Prepare a preliminary experimental plan, conduct experiments, use chemistry tools and equipment appropriately and safely.
5. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice rates of chemical reactions, energy in chemical reactions, laws and factors that affect the rate of chemical reactions, chemical equilibrium, equilibrium constant and factors affecting chemical equilibrium, acid-base theory, acid-base disintegration, pH of solutions, acid-base reactions, acid-base titration, and buffer solutions.

(3) Biology Courses 2 Credits

GECSC111 Fundamental Biology 2(1-2-3)

Former Course code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles and theories regarding the nature of living things in biodiversity and ecosystems, cell organisms and their functions, the maintenance of human and animal balance, evolution, and plant life.
2. Develop basic skills in biology laboratory.
3. Develop thinking skills, i.e., analyze, calculate, and solve biology problems.
4. Develop positive attitude towards the principles of biology and good work habits.

Course Competencies : Students should be able to :

1. Describe the main characteristics of living things, the importance of living things in different ecosystems, the maintenance of human and animal balance, evolution and plant life.
2. Analyze structure, components, and responsibilities of cells.
3. Compare different types of reproduction characteristics of living things, cell division, shape, genetic material characteristics, and genetic variation.
4. Prepare a preliminary experimental plan, conduct experiments, and use biology tools and equipment appropriately and safely.
5. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice the science of biology, biodiversity and ecosystems, cell organisms and their functions, homeostasis in humans and animals, genetic characteristics, evolution, and maintenance of plant life.

(4) Mathematics Courses 6 Credits

GECSC203 Mathematics for Career 1 3(3-0-6)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of exponential functions, logarithmic functions, trigonometric functions, and graph theory.
2. Be able to solve mathematical problems and apply problem solving processes in daily life.
3. Recognize the use of knowledge in this field for higher studies.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of exponential functions and logarithmic functions.
2. Apply knowledge of trigonometric functions to estimate distance, height and solve professional measurement problems.
3. Demonstrate theoretical and practical knowledge about graphs.

Course Description :

Study square numbers, exponential functions, logarithm functions, common logarithms and natural logarithms, antilogarithms, solving equations and inequalities in exponential and logarithmic forms, the unit circle, trigonometric functions of angles, trigonometric functions of right- angled triangles, values of the trigonometric functions, graphs of trigonometric functions, trigonometric functions of the sums and the relative differences of angles, the products and the sums of sine and cosine functions, the inverse trigonometric functions, rules of cosine and sine, finding distance and height, graphs with vertices, the Eulerian trail, and the applications of graphs.

GECSC204 Mathematics for Career 2 3(3-0-6)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of vectors, complex number, sequence, and serial.
2. Able to solve mathematical problems and apply problem solving processes in daily life.
3. Recognize the use of knowledge in this field for higher studies.

Course Competencies : Students should be able to :

1. Solve vector problems in two and three dimensions, find the results of vector operations and their applications.
2. Arrange the arithmetic sequence, geometric sequence, infinite sequence, and the regular term of a given finite sequence.
3. Calculate the sum of the first *n* terms of the arithmetic series. geometric series, and infinite series to solve problems
4. Demonstrate knowledge of complex numbers and solve problems related to complex numbers.
5. Demonstrate knowledge and apply mathematical process principles in real-life situations.

Course Description :

Study vectors and properties of addition, subtraction, and multiplication of scalars, vectors in two- dimensional and three- dimensional coordinate systems, the direction cosine, finding the volume of parallelogram shapes, complex numbers, properties associated with addition, subtraction, multiplication, and division of complex conjugation, graphs and absolute values of conjugate complex numbers, complex numbers in polar form, theory of de Moore, finding the n^{th} root of complex numbers, finding the general term of the sequence, arithmetic sequences, geometric sequences, infinite sequences, limits of sequences, arithmetic series, geometric series, and sums of the series, including infinite series.

2.1.3 General Courses and Vocational-based Courses 4 credits.

CERCC501 Occupational Health and Safety 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding basic safety principles and methods of handling as well as occupational health.
2. Prevent accidents in everyday life and works.
3. Develop positive attitude and good work habits concerning the principles of occupational health and safety.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of occupational health and safety principles in every life and career performance.
2. Take preliminary actions in preventing accidents in daily routines and works.
3. Read, interpret, and follow safety instructions and signs.
4. Choose a protective device according to the situation.
5. Provide first aid according to principles and procedures.

Course Description :

Study and apply principles of safety and occupational health, workplace accidents, occupational preventions, safety signs and symbols, personal protective equipment, and first aid.

CERCC502 Entrepreneurship 2 (1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand basic concepts in the areas of entrepreneurship, financial planning and management, quality management and productivity, and related laws.
2. Create a simple business plan by applying the Sufficiency Economy Philosophy and principles of quality management and productivity.
3. Develop knowledge and skills related to business management with the use of technology.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of a good entrepreneurship.
2. Create a simple business plan.
3. Apply the Sufficiency Economy Philosophy in planning and operating works.

Course Description :

Study concepts of business and entrepreneurship, basic law of entrepreneurship, simple business planning, financial planning, quality management and productivity in an organization, technology tools related to entrepreneurs, the application of Sufficiency Economy Philosophy in business and entrepreneurship.

2.2 Specialized Vocational Courses 25 credits.

CERCC101 Basic Engineering Training 3(1-6-4)

Former Course Code : 51020102 Bench Work

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of various measurement tools, maintenance, and storage.
2. Develop skills in the areas of metal work, filing, drafting, measuring and sizing, sawing, drilling, cutting, turning, adjusting, thread cutting by hand, chiseling, forging, and scraping.
3. Develop knowledge and understanding regarding the classification of components, working principles, maintenance, and safety principles in using basic mechanical tools.
4. Understand the calculation of speed, cutting speed, feeding rate, and the necessary elements for sharpening operations.
5. Develop skills in face turning, stripping, thread turning, planning, shoulder planning, drilling, reamer, planning, milling, flat grinding, and round grinding.
6. Develop a positive attitude and good learning habits as well as having a responsibility and taking safety precautions.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding of various measurement tools, maintenance, and storage.
2. Practice and test related to metal work, file work, drafting, and related work.
3. Demonstrate knowledge and understanding regarding the classification of components, working principles, maintenance, and safety principles in using basic mechanical tools.
4. Calculate speed, cutting speed, feeding rate, and the necessary elements for sharpening operations.
5. Perform tasks and conduct tests related to face turning, stripping, thread turning, planning, shoulder planning, drilling,

reamer, planning, milling, flat grinding, and round grinding.

Course Description :

Study and practice about instrumentation and maintenance, steel rule, caliper and divider, vernier caliper, vernier depth gauge, micrometer, thickness gauge, taper gauge, angel protractor, bolt, screw pitch gauge, radius gauge. Practice about metal work, filing work, drafting, measuring and sizing, sawing, drilling, cutting, basic machining, customizing, cutting threads by hand, extracting, steeling, scraping, dial gauge tester and safety rules in the work place. Study and practice about classification, composition, working principles, maintenance, and safety in operation and basic machine tools, calculation of speed, cutting speed, feeding speed, necessary element in sharpening cutting, machining, shaping, drilling, reamer, milling, and grinding.

CERCC102 Technical Drawing for Engineering 2(1-2-3)

Former Course Code : 51020103 Technical Drawing

Prerequisite : "None"

Course Objectives : To eanble students to :

1. Know and understand the principles of technical drawings and maintenance of technical drawing tools.
2. Develop skills related to technical drawings for industrial technicians.
3. Develop a positive attitude and recognize the value and significance of correct drawing principles.

Course Competencies : Students should be able to :

1. Demonstrate knowledge related to the principles of technical drawings.
2. Maintain technical drawing tools.

Course Description :

Study and practice about principles of technical drawing, drawing tools usage and maintenance, standards of technical drawing line, number and alphabet, Geometry drawing, sizing of dimension and scaling, 1st angle and 3rd angle orthographic projection, 3-D Drawing e.g. Oblique and Isometric,

sketching, sectional view drawing, basic symbol in the industrial work, standards in mechanical drawings, size of paper, size of number and character, type and thickness of the lines in the drawings, geometric shape writing and dimensioning, drawing of sheet shape, square shape, cylindrical shape, pyramid shape, cone shape and spherical shape, L, U and T cross sectional drawing, straight cutting, offset cutting, drilling, and other types of section drawing.

CERCC103 Basic Construction Engineering 2(1-3-3)

Former Course Code : 51020106 Basic Woodworking

Prerequisites : "None"

Course Objectives : To enable students to :

1. Know and understand about materials and tools related to construction works and works related to civil engineering.
2. Develop skills in using tools for woodworking, concrete work, structural steels, and structural work.
3. Develop work good habits, i.e., meticulousness, neatness, honesty and responsibility.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about materials and tools related to construction works and works related to civil engineering.
2. Use tools for woodworking, concrete work, structural steels, and structural work.

Course Description :

Study building materials and construction equipment. Practice wood, concrete, steel and building structure working skills and experience field trips.

CERCC104 Introduction to Engineering Profession 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding roles and responsibilities of technology engineers, curriculum, teaching and learning related to engineering and engineering problems.
2. Develop knowledge and understanding regarding engineering related laws, safety principles, relationships between engineer, society, and environment as well as technology development.
3. Develop self-directed learning disposition and recognize the significance of the course as well as having a code of conduct.

Course Competencies :

1. Demonstrate knowledge and understanding regarding roles and responsibilities of technology engineers, curriculum, teaching and learning related to engineering and engineering problems.
2. Demonstrate knowledge regarding engineering related laws, safety principles, the relationship between engineer, society, and environment as well as technology development.

Course Description :

Study about the roles and duties of technology engineers in the field of engineering and teaching. Basic science and engineering subjects, responsibilities and ethics of engineers. Communication methods for engineering tasks, Information technology for engineering work. Engineering solutions. Importance of experimentation, testing and presentation. Basic laws for engineers, engineers and safety, engineers and society and environment. Engineers and technology development and field trips related to engineering work.

CERCC105 Materials Science 2(2-0-4)

Former Course Code : 51000004 Materials Science

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding about chemistry, elements, compounds, mixtures, microstructures of materials, equilibrium diagrams, phase diagrams, types of artisan materials.
2. Know and understand about manufacturing process, properties, and applications of ferrous metals Nonferrous metals, polymers, composites and shinter metals.
3. Develop self-directed learning disposition and responsibilities.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about basic chemistry, compounds, mixtures, microstructures of materials, balance diagram, phase diagram, and types of materials in mechanic works.
2. Demonstrate knowledge about manufacturing processes, properties and applications of ferrous metals, non-ferrous metals, steels, polymers, composite materials and metals.

Course Description :

Study basic chemistry, compounds, mixtures, microstructures of materials, balance diagram, phase diagram, types of materials, technical properties of mechanic work materials that must be considered when used in various applications, manufacturing processes, properties and applications of ferrous metals, non-ferrous metals, steels, polymers, composite materials and metals.

CERCC106 Basic Electrics and Electronics 2(1-3-3)

Former Course Code : 51020101 Basic Electrics and Electronics

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of electrical and electronic work, and electrical safety system.
2. Develop skills in using measuring and testing equipment of electrical and electronic circuits.
3. Choose right equipment in assembling electrical and electronic circuits.
4. Develop a positive attitude and good working habits, being responsible, punctual, and careful person.

Course Competencies : Students should be able to :

1. Demonstrate an understanding regarding the principles of electrical and electronic work, and electrical safety system.
2. Test equipment, electrical circuits and electronics using electrical measuring instruments.
3. Choose appropriate equipment in assembling electrical and electronic circuits.

Course Description :

Study and practice about electrics and electronics, source of electrics, Ohm's law, basic electric circuits, lighting circuits, basic motor control, protection devices and ground connection, electronic devices, transformer, relays, microphone, speakers, semi-conductors, soldering technique, multimeter, oscilloscope, function generator, basic electronic components on printed circuit boards, and introduction to security in the workplace.

CERCC107 Sheet Metal Welding 2(1-3-3)

Former Course Code : 51020205 Sheet Metal Welding

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the principles of welding and sheet metal, safety, gas and electric welding processes, synchronized sailing, and welding equipment.
2. Develop skills in assembling and installing tools related to gas and electric welding, forming by folding, bending, tapping, edge forming, winding, and workpiece assembly.
3. Develop a good attitude and working habits, being responsible and having safety concerns at work.

Course Competencies : Student should be able to :

1. Demonstrate knowledge and understanding regarding the principles of welding and sheet metal, safety, gas and electric welding processes, synchronized sailing, and welding equipment.
2. Assembling and installing tools related to gas and electric welding, forming by folding, bending, tapping, edge forming, winding, and workpiece assembly.

Course Description :

Study and practice basic principles of welding and sheet metal works, safety in welding and sheet metal work, gas and electric welding, welding machines and equipment, sheet metal machines and equipment, brazing, sheet metal drawing, edge of the seam, soldering. Practice installing gas and electric welding equipment, starting arc, edge welding, sheet metal drawing to worksheet, seaming, soldering, forming the folding, bending, peening, spinning and assembly with safety equipment according to safety and occupational health principles.

CERCC108 Computer and Information Technology 2(1-2-3)

Former Course Code: 51002101 Computer and Information Technology

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the principles of computer and information technology.
2. Develop skills in analyzing and sorting data for the benefit of information technology.
3. Develop self-directed learning disposition and work safety.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding regarding the principles of computer and information technology.
2. Collect, analyze, and present the obtained information in the form of information technology.

Course Description :

Study and practice about various operating systems use of various office programs necessary to work basic principles of information technology history of information technology information management and information technology components of information systems, hardware, software data format, presentation, storage and maintenance of information use of information systems on the current network system, impact of using information technology ethics and responsibility in using computers with information systems and occupations, computer maintenance and basic troubleshooting.

CERCC109 Data Communication System and Networking 2(1-2-3)

Former Course Code : 51002303 Data Communication System and Networking

Prerequisites : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the principles of networking and its components.
2. Select equipment for basic networking connection.
3. Apply networking at home or small organizations.
4. Develop good morals, ethics, and values in using computers.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding regarding the principles of networking and its components.
2. Select equipment for basic networking connection.
3. Apply networking at home or small organizations.

Course Description :

Study the principle of computer communication, components, devices, standard of data communication with computer network, computer network topology, internet and intranet network, protocol, application of computer network in the work nowadays. Practice in using data communication and network, and building small network, computer maintenance and basic troubleshooting.

CERCC110 Computer Programming 2(1-2-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of computer programming.
2. Develop skills in planning, reviewing, and editing related to computer programming.
3. Develop positive attitude and good working habits, being responsible, and work safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of computer programing.
2. Develop computer programs in C or other computer languages.
3. Review and edit according to the principles of computer programing.

Course Description :

Study and practice about principles of programing language, program features, command, variables, flow chat, functions, sub programs, program components, and planning writing checking and editing programs using C language program or other programs.

CERCC111 Energy and Environment 2(2-0-4)

Former Course Code : 51000003 Energy and Environment

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding about energy in daily life, environment, ISO 14000, ISO 14001, ISO 50001, alternative energy, conservation of natural resources, and related laws.
2. Develop knowledge and understanding about the impacts of global warming, acid rain, forest fires, innovation and technology, as well as the principles of various renewable energy systems.
3. Develop self-directd learnig disposition, being resonsible, and actively involved in the conservation of energy and environment.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about energy in daily life, environment, ISO 14000, ISO 14001, ISO 50001, alternative energy, conservation of natural resources, and related laws.
2. Demonstrate knowledge and understanding about the impacts of global warming, acid rain, forest fires, innovation and technology, as well as the principles of various renewable energy systems.

Course Description :

Study about basic knowledge of energy consumption in daily life, energy consciousness, ISO 14000, ISO 14001, ISO 50001 natural resource and environmental conservation, laws related to energy conservation, water, soil, forest, minerals, effects of global warming, acid rain, forest fire, innovation and energy technology, principles of various renewable energy systems such as wind energy, water energy, solar energy, and biomass.

GECSC103 Fundamental Thermofluid 2(1-2-3)

Former Course Code : 51020109 Fundamental Thermofluid

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding the principles and theories related to fluid properties, fluid dynamics, Pascal's law, Bernoulli's equation, heat energy, heat transfer, thermal expansion, internal energy of systems, and the zeroth and first laws of thermodynamics.
2. Develop basic skills in physics laboratory.
3. Develop thinking skills, i.e., analyze, calculate, and solve physics related problems.
4. Develop a positive attitude towards fundamental thermofluidic and good working habits.

Course Competencies : Students should be able to :

1. Explain fluid properties, Pascal's law, fluid dynamics, heat energy, heat transfer, internal energy of systems, and the zeroth and first laws of thermodynamics.
2. Calculate quantities related to density, pressure, buoyancy, viscosity, Pascal's law, fluid dynamics, heat energy, object expansion due to heat and internal energy of systems.
3. Prepare a preliminary experimental plan, conduct experiments, and use physics tools and equipment appropriately and safely.
4. Discuss the experimental results with proper principles and theories.

Course Description :

Study and practice fluid properties, fluid dynamics, Bernoulli's equation, heat energy, heat transfer, thermal expansion, internal energy of systems, and the zeroth and first laws of thermodynamics.

GECSC205 Calculus for Career 3(3-0-6)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding calculus, limits, continuity, differentiation, and integration.
2. Develop skills in solving mathematic problems and apply problem-solving process in daily life.
3. Recognize the importance of applying the knowledge in the field for higher studies.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding limits, continuity of functions, calculation of limits value and continuity of a given function and their applications.
2. Demonstrate knowledge about derivatives and differentiation, as well as able to apply knowledge of derivatives in career.
3. Find indefinite integral and definite integral of a given function.
4. Apply knowledge of integration to find the area enclosed by a curve on a given interval.

Course Description :

Study limits and derivatives, continuity, finding the derivatives of functions, the slopes of curves, derivatives of composite functions, higher derivatives, applications of derivatives, indefinite integrations and finding the area enclosed by a curve.

GECSC206 Basic Statistics 3(3-0-6)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of basic statistics, probability, and functional relationship between data.
2. Solve mathematic related problems and apply problem-solving process in daily life.
3. Apply knowledge and recognize the need of knowledge for further studies.

Course Competencies: Students should be able to:

1. Demonstrate knowledge of basic statistics.
2. Apply statistical principles at work.
3. Solve problems using the principle of probability.

Course Description :

Study statistics and data, frequency distributions of the data, measuring the positions of data, measuring the mean value of the data, the distributions of information, normal distributions, preliminary data analysis, introduction about basic rules of counting, permutations, combinations, the binomial theorem, the probability of a random experiment and other important rules of probability, functional analysis of the relationship of data, scatter plots and estimation of constants using the method of least-squares.

2.3 Elective Vocational-based Courses 36 Credits

1) Projects 12 credits

CERCC112 Scientific Project-Based Learning 1 3(2-3-5)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding about scientific processes.
2. Develop basic skills related to scientific projects.
3. Develop positive attitude towards scientific learning and good working habits.

Course Competencies : Students should be able to :

1. Ask questions or identify problems on the basis of knowledge that can be discovered or checked.
2. Search and collect information from reliable sources for scientific projects.
3. Identify hypotheses based on the available theories, identify variables, plan and conduct an experiment to test the hypotheses.
4. Conduct an experiment with appropriate tools and methods.
5. Discuss the experimental results with proper principles and theories.

Course Description :

Study and explore scientific knowledge, research processes, and research methodologies. Practice asking and refining questions, debating ideas, making predictions, designing plans and/or experiments, collecting and analyzing data, writing conclusions, presenting results to others, and listening others' opinions and ideas.

CERCC113 Scientific Project-Based Learning 2 3(2-3-5)

Former Course Code : "None"

Prerequisite : "None"

Objectives : To enable students to :

1. Develop knowledge and understanding related to scientific projects and application of knowledge and understanding in developing scientific projects.
2. Develop thinking skills, i.e., analytical thinking and problem-solving skills related to scientific projects.
3. Develop positive attitude towards scientific learning and desirable working habits.

Course Competencies : Students should be able to :

1. Explain knowledge about science project topics that students are interested in.
2. Present ideas, work processes, solutions to problems, and results in a systematic way.
3. Plan preliminary experiments, conduct experiments, use scientific tools and equipment appropriately and safely.
4. Discuss the experimental results with proper principles and theories.

Course Description :

Study interesting scientific projects based on scientific processes. Analyze relationships of factors, discuss results, summarize results, and present reports with problem-solving knowledge and skills.

CERCC114 Engineering Project-Based Learning 1 3(2-3-5)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding of concepts, theories, techniques, design processes in engineering, as well as integrate engineering knowledge with other disciplines.
2. Apply engineering process to develop projects, inventions or innovations, and present the design procedures and process in developing an invention or innovation project.
3. Develop a positive attitude towards engineering learning and possess desirable working dispositions.

Course Competencies : Students should be able to :

1. Demonstrate knowledge and understanding of concepts, theories, techniques, design processes in engineering, as well as integrate engineering knowledge with other disciplines.
2. Apply engineering process to develop projects, inventions or innovations, and present the design procedures and process in developing an invention or innovation project.
3. Develop self-directed learning disposition and responsibility for the works that have been designed and built.

Course Description :

Study principles, theories, techniques of engineering design thinking integrated to scientific, mathematical, technological knowledge and social, environmental, local wisdom to design a demanding and problem-solving project and present the results of the project.

CERCC115 Engineering Project-based Learning 2 3(2-3-5)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding project outline writing process as well as conduct a systematic study on the feasibility of project.
2. Integrate scientific processes into engineering to solve problems of locality, community, and society.
3. Present ideas, processes, and results of study in a comprehensive way.
4. Develop self-directed learning disposition, hardworking skills, and responsibility.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of project outline writing process, i.e., principles and process of developing a systematic project.
2. Operate project works as planned in accordance with the principles and the process of collecting data, analyzing, summarizing and evaluating project performance.
3. Present work processes, techniques or methods used in problem-solving, as well as reports writing and performance reports.

Course Description :

Study integrated scientific and engineering knowledge and find questions to solve social, community, and local problem. Collect and analyze data, design plans and experiments, summarize results. Present the results through various forms, reports, drawing pictures, videos, photographs, or modern technology presentations.

2) Specialized Courses 4 Programs

(1) Civil Technology Program 24 Credits

CEREN101 Construction Materials 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand principles of classification, size, property, storage, use of materials and equipment in construction.
2. Develop skills in selecting materials and equipment for construction correctly and appropriate to the nature of the work.
3. Develop a positive attitude and good learning habits, being responsible and having self-directed learning disposition.

Course Competencies :

1. Demonstrate knowledge related to principles of classification, size, properties, storage, use of materials and equipment in construction.
2. Select materials and equipment for construction correctly and appropriate to the nature of the work.

Course Description :

Study types, sizes, styles, symbols, and properties of materials used in construction and carpentry. Practice usages and material maintenances such as woods, bricks, sandstones, limestones, cements, plastics, steels, glues, oil paints, thinners, alcohols, and other required materials.

CEREN102 Construction Drawing 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding related to the selection of tools and equipment for drawing in civil engineering.
2. Develop knowledge and understanding about principles of architecture and engineering drawings for single storey buildings.
3. Develop skills in civil drawings and construction drawings.
4. Develop a positive attitude and good work habits, work safely and punctually.

Course Competencies : Students should be able to :

1. Demonstrate knowledge related to tools and equipment selection for drawing in the field of civil engineering.
2. Demonstrate knowledge and understanding about principles of architectural drawing and drawings of single storey residential buildings.
3. Draw architectural and engineering drawings of single storey residential buildings.

Course Description :

Learn about tools and equipment for civil works, principles and procedures for civil drawings, symbolic markers of material and symbol used in the drawing, methods and principles of architectural drawings of single storey residential buildings, methods and principles of engineering drawing of single storey residential building, methods and principles of electrical and sanitary single storey residential buildings, list building is a single storey residential building.

CEREN103 Structure Model 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand how to use and maintain modeling tools and equipment.
2. Create a model for the construction of a residential building with various materials.
3. Recognize the importance of working neatly, orderly, and timely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge in using and maintaining modeling tools and equipment.
2. Maintain physical fitness, get ready with tools and equipment required for creating structural models.
3. Create structural models, foundations, columns, beams, floors, stairs, roof trusses, and residential buildings using various construction materials.

Course Description :

Study and practice making structural models, foundations, pillars, beams, stairs, and various forms of building construction roof structures.

CEREN104 Construction Techniques 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding principles, techniques, and construction methods of buildings, foundations, beams, columns, floors, roof structures, and roofing materials.
2. Develop the ability to apply principles, techniques, and methods in construction of buildings.
3. Develop a positive attitude and good work habits, responsibility, and recognize the importance of working safely.

Course Competencies : Student should be able to :

1. Demonstrate knowledge related to principles and construction methods of two storey buildings.
2. Work systematically in the construction of the building according to the principles and the construction process.

Course Description :

Study and practice about building construction techniques, foundations, beams, poles, floors, ribs, and household roofing materials.

CEREN105 Computer-Aided Design and Drafting 2(1-3-3)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of designing and drafting residential buildings using computer.
2. Develop the ability in residential building drawings for construction using computer.
3. Develop desirable work habits, i.e., working neatly, being responsible, honest, and punctual.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles and methods of drawing residential building for construction using computer.
2. Draw residential building drawings based on architecture and engineering principles using computer.

Course Description :

Study and practice on the principles of writing residential building designs, brief maps, layouts, architectural styles, engineering models, utility models and expand the details by computer.

CEREN106 Concrete Technology 2(1-3-3)

Former Couse Code : 51023004 Concrete technology

Prerequisites : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding material properties, and methods used in estimating the ratio for concrete mixture.
2. Develop an understanding regarding the use of technology in mixing, conveying, pouring, and compacting concrete.
3. Develop an understanding related to concrete formwork removal time and concrete curing methods.
4. Develop desirable learning habits, i.e., being responsible and regulated, as well as being aware of working safety.

Course Competencies : Students should be able to :

Demonstrate knowledge related to the principles of standard concrete making.

Course Description :

Study about type and quality of different kinds of cement, principle of choosing the good quality of aggregates for making concrete, transportation, usage of concrete molding technology, solid concrete making, time duration of removing concrete formwork, and concrete curing.

CEREN107 Surveying 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the priciples of surveying, map scale, and the applications.
2. Develop skills in measuring and using measuring tools.
3. Develop the ability to measure triangles with a tape measure, details collection and landing.
4. Develop desirable work habits, i.e., work neatly, orderly, correctly, and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles and processes of basic survey tools.
2. Explore triangular surveyor with tape measure.
3. Conduct details surveys, and plotting with survey tools.

Course Description :

Study and practice about basic principle of surveying, map scale, measurement with tools and other kinds of equipment, direct measurement, simulated measurement, measuring adjustment, observation with measurement tape, detail observation with measurement tape and optical square, and map marking.

CEREN108 Fundamental Structures 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand types of forces, weights, types of supports.
2. Understand the calculation of structural reaction force, centroid, center of gravity, stress, strain, bending moment, shear force in building, finding forces within trusses, and hypotheses in truss analysis.
3. Develop desirable learning disposition, i.e., responsible, honest, and punctual.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about types of forces, weights, and types of supports.
2. Calculate structural reaction force, centroid, center of gravity, stress, strain, bending moment, shear force in building, forces calculation within trusses, and hypotheses in truss analysis.

Course Description :

Study about centroid, center of gravity, stress, strain, force or loading weight for building construction, type of force or loading weight, type of support, reaction, shear force, bending moment, shear force drawing and bending moment of beam, truss force, and hypothesis of truss analysis.

CEREN109 Cost Estimation 2(2-0-4)

Former Course Code : 51023002 Cost Estimation

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of cost estimation.
2. Understand the separation of material, equipment, and labor cost.
3. Understand the calculation of material costs, labor costs, processing costs, taxes and profits.
4. Develop desirable learning disposition, i.e., responsibility, and self-directed learning skills.

Course Competencies : Students should be able to :

1. Demonstrate knowledge related to the principles of cost estimation.
2. Demonstrate knowledge regarding the separation of materials, equipment, and labor costs.
3. Calculate material costs, labor costs, processing costs, taxes and profits

Course Description :

Study about principles and cost estimation process, separation of material, equipment, labor cost. Calculation of the area and volume of excavated soil and covered soil. Calculation of the volume of wood, concrete, steel and estimation the labor cost, overhead expense, profit and tax.

CEREN110 Sanitary System 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the principles of sanitary ware, and sanitary piping work in residential buildings.
2. Develop the ability to assemble and install pipe systems, sanitary wares and various equipment.
3. Develop good work habits with neatness, responsibility and work safety.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of sanitary ware, sanitary piping work in residential buildings.
2. Assemble and install pipe systems, sanitary wares and various equipment.

Course Description :

Study and practice about the principle of piping system, sanitary ware, installation methods, usage, tool maintenance, installation tools, cold water pipe, soil-waste water pipe air-vent-pipe setting methods, sanitary ware and other tools, and household piping system test.

CEREN111 Construction Law 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of Building Construction Law, control building, employment contracts, house construction license request, building construction, modification, demolition, or movement request, control zone, fire prone area regulation, authority of legal officers, and local building construction regulation.
2. Apply the principles of Building Construction Law, control building, employment contracts, house construction license request, building construction, modification, demolition, or movement request, control zone, fire prone area regulation, authority of legal officers, and local building construction regulation in professional practices.
3. Develop self-directed learning skills, recognize the significance of learning the course, and behave morally.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of Building Construction Law, control building, employment contracts, house construction license request, building construction, modification, demolition, or movement request, control zone, fire prone area regulation, authority of legal officers, and local building construction regulation.
2. Apply the principles of Building Construction Law, control building, employment contracts, house construction license request, building construction, modification, demolition, or movement request, control zone, fire prone area regulation, authority of legal officers, and local building construction regulation in professional practices.

3. Apply the principles of Sufficiency Economy Philosophy to laws, regulations, ordinances in professional practices, and impacts from the economy, society, culture, and environment.

Course Description :

Study the principles of Building Construction Law, control building, employment contracts, house construction license request, building construction, modification, demolition, or movement request, control zone, fire prone area regulation, authority of legal officers, and local building construction regulation.

CEREN112 Building Electrical 2(1-3-3)

Former Course Code : "None"

Course Objectives : To enable students to :

1. Know and understand safety principles, units for measuring basic electrical circuits, electric lighting, electrical systems in residential buildings, tools, equipment, and materials used, types, sizes, and standards of electrical wires, fixing electrical wiring, types of lamps for lighting in residential buildings.
2. Operate basic electrical circuits and electric lighting.
3. Develop a positive attitude and desirable learning habits, i.e., work safely, being responsible, honest, and punctual.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about safety principles, tools, equipment, materials, types, size, and standard of electrical wires, connecting wires, and install electrical lighting in residential buildings.
2. Prepare physical body, materials, tools and electrical equipment.
3. Install basic electrical circuits and electrical lighting.

Course Description :

Study and practice about electrical unit, basic electrical network, and lighting, building electrical system, building electrical setting equipment, types,

sizes, and standard of electrical wires, light bulb connection, and building electrical installation.

(2) Mechanical Technology Program 24 credits

Students can choose the courses from the list below.

CEREN201 Manufacturing Process 2(2-0-4)

Former Course Code : "None"

Pre-requisite : "None"

Course Objectives : To enable students to :

1. Understand the manufacturing processes of industrial parts.
2. Select production method appropriately with the manufacturing processes of industrial parts and products.
3. Develop desirable work habits, i.e., being organized, work creatively, having safety concerns, and being responsible to self and community.

Course Competencies : Students should be able to :

Demonstrate knowledge regarding principles, processes, selection of manufacturing processes for industrial parts and products.

Course Description :

Study the principles of metal and non-metal forming processes by machine tools, hot working, cold working, and electrical and chemical forming process.

CEREN202 Detailed Measurement Work 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of measuring and testing tools, i.e., types, functions.
2. Use measuring and testing tools.
3. Calibrate and maintain measuring instruments.
4. Develop desirable working habits, i.e. systematic plan, being responsible for self and community.

Course Competencies : Students should be able to :

1. Understand the principles of usage and maintenance of measuring tools, non-scale and scale testing tools.
2. Select measuring tools and testing tools appropriate to work requirements.
3. Calibrate micrometer using gauge block and adjust parts of measuring tools for basic inspections.
4. Maintain all types of measuring tools.

Course Description :

Study types, functions, usages and maintenances of scale and non-scale measuring tools and measuring test methods according to the standard measuring tools regulations and different measuring tools such as steel ruler, vernier caliper, micrometer, caliper and divider, protractor, universal protractor, engineer's square, combination square, measuring clock, comparator, gauge block, cylinder gauge, caliper gauge etc., thread check, morse taper check, radius check, screw pitch gauges, telescopic gauge, spirit level, the standard storage and maintenances of tools and die technology level T1, T2 of curriculum for tools and die technology personnel development.

CEREN203 Engineering Material 2(2-0-4)

Former Course Code : "None"

Prerequisites : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding basic principles of classification, characteristics, properties, standards, and applications of industrial materials.
2. Choose and maintain industrial materials appropriately according to standards.
3. Develop a positive attitude and realize the importance of materials and utilize them at their maximum benefits.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding basic principles of classification, characteristics, properties, standards, and applications of industrial materials.
2. Choose industrial materials appropriately according to task requirements.

Course Description :

Study about properties, types, standards, manufacturing processes, usages, storages, industrial materials selections for example metal, non-metal, and mixed metal. Influences of substance to mixed metal, fuel materials and lubricant, cutting fluid, synthetic materials, corrosion and protection, and basic materiel check.

CEREN204 Machine Drawing 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of reading machine drawing, drawing, and working drawing.
2. Develop skills in assembly drawing and detail drawing.
3. Develop working habits with a set of desirable working disposition, i.e., systematic planning skill and carefulness.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles and processes associated with drawing reading and drawing.
2. Read and draw assembly drawing, detail drawing, exploded assembly drawing, and working drawing in accordance with the principles of technical drawing.

Course Description :

Study and practice about engineering drawing reading, mechanical equipment drawing, mechanical equipment sketching, equipment parts drawing, assembly drawing, explode drawing, list of part drawing, welding symbols and GD&T symbols.

CEREN205 Mechanical Parts 2(2-0-4)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Demonstrate a knowledge of the principles of assembly, installation, setting and adjustment of machine tools.
2. Plan, prepare, and inspect an assembly, installation, setting and adjusting of joints, general parts, and transmission parts of mechanical tools.
3. Maintain mechanical parts according to work manual.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of the principles of assembly, installation, setting and adjustment of mechanical tools.
2. Plan, prepare, and inspect an assembly, installation, setting and adjusting of connecting parts, general parts, and transmission parts of mechanical tools.
3. Maintain mechanical parts according to work manual.

Course Description :

Study and practice about the principles of hand tools usages, measurements, and fits and tolerances check, disassembly, setting and adjustment, general safety, plan, joint and general materials disassembly such as bolt, screw, bolt and nut, rivet, spring etc. transmission materials disassembly such as machine keys, spline, bearing, gear, belt and pulley, cams, clutch, brake, and work specific safety.

CEREN206 Machine Tools 2(0-6-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards the manufacturing processes of mechanical parts using lathe machine, milling machine, grinding machine, and special tools.
2. Develop skills in mechanical parts manufacturing using lathe machine, milling machine, griding machine, and special tools.
3. Develop desirable work habits, i.e., working systematically, being responsibility to themselves and community, as well as working safely according to safety instructions.

Course Competencies : Students should be able to :

1. Create mechanical part forming according to principles and processes of lathing.
2. Create mechanical part forming according to principles and processes of milling.
3. Create mechanical part forming according to the principles and processes of grinding.

Course Description :

Study and practice about mechanical works, tool parts, part forming by multiple thread turning, curve cutting, special equipment cutting, milling, gear milling, bevel gear milling, dovetail milling, special equipment milling, hole grinding, morse taper grinding, measurement tools usage and mechanical equipment safety maintenance.

CEREN207 Computer Aided Design and Drafting 2(1-3-3)

Former Course Code : 51021006 Computer Aided Design and Drafting

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards the principles of using computer-aided program in drawing machine tools.
2. Develop skills in exploded assembly drawings, general assembly drawings of machine tools, dimensions, symbols, and making a list of materials using computer-aided program.
3. Develop a set of desirable work habits, i.e, systematic plan, responsibility to themselves and community.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of engineering drawings using computer-aided program.
2. Draw exploded assembly drawings, general assembly drawings of machine tools using computer-aided program.

Course Description :

Study and practice about how to use drawing computer program, two-dimension drawing, assembly drawing, first angle projection drawing, third angle projection drawing, different section view drawing, detail drawing, auxiliary view drawing, dimension, deviation, fitting, standard parts, work surface quality symbol, GD&T symbol, basic list of part drawing, and drawing printing.

CEREN208 Mechanics and Machinery 2(1-3-3)

Former Course Code : 51021004 Mechanics and Machinery

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding towards the fundamentals of solid mechanics, speed, and torsion.
2. Develop an understanding regarding ratio, working system of planetary gear, and its transmission system.
3. Develop practical skills related to machine parts and various engine systems.
4. Develop a positive attitude and recognize the importance of work safety in machine parts operation.

Course Competencies : Students should be able to :

1. Demonstrate knowledge related to the fundamentals of solid mechanics, speed ratio, and torque ratio.
2. Demonstrate knowledge of ratio, working system of planetary gear, and its transmission system.
3. Remove and assemble machanical parts and resolve engine issues.

Course Description :

Study and practice basic solid mechanics, misalignment, impact misalignment of machinery, machinery analysis, transmission ratio, torque ratio, characteristics and ratio of gear systems, planetary gears, cams, chains, belts, bearings, screws, transmission systems, clutches, automatic clutches, fluid couplings, gears, suspension systems, beams, leaf springs, coil springs, steering, wheel angles, and braking systems.

CEREN209 Industrial Electrical 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know, understand, and apply knowledge of work safety in electrical work.
2. Develop skills in using electrical circuit test equipment, equipment preparation, assembly, electrical circuit testing, and selection of electrical appliances.
3. Develop a positive attitude and a set of desirable work habits, i.e., working carefully, being organized, being punctual, being honest, being responsible, and having environmental concerns.

Course Competencies : Students should be able to :

1. Demonstrate the principles of measurement, inspection, and an assembly of electrical circuits, as well as safety principles.
2. Assemble and check basic electrical circuits.
3. Conduct a basic electrical circuit assembly.

Course Description :

Study and practice about electrical work safety guidance, indoor wiring regulations, correct usages of electricity suggestions, Ohm's Law, electrical power, basic electrical circuit, light electrical circuit, basic motor control, fire protection equipment and grounding conductor, electric transformers, the use of multimeter, electrical circuit assembly, model symbol and circuit, electrical standard controlling work, the selection of equipment for controlling, setting, testing, maintenance electrical motors in industrial work.

CEREN210 Pneumatics and Hydraulics 2(1-3-3)

Former Course Code : "None"

Prerequisite: "None"

Course Objectives : To enable students to:

1. Develop knowledge and understanding regarding pneumatic and hydraulic systems.
2. Develop skills in reading, writing, and connect pneumatic and hydraulic control circuit systems.
3. Develop a positive attitude and a set of desirable work habits, i.e., working carefully, being organized, being punctual, being honest, being responsible, and having environmental concerns.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of pneumatic and hydraulic systems.
2. Read and write a control circuit of pneumatic and hydraulic systems.
3. Connect a control circuit on a pneumatic and a hydraulic system.

Course Description :

Study structures, parameters, impact parameters, symbols, basic operations and procedures of Pneumatics and Hydraulics systems, usages of equipment and basic work circuits, and different basic operations. Practice testing equipment, reading, writing, and connecting different manual control circuits and maintaining Pneumatics and Hydraulics systems.

CEREN211 CNC Machine Tool 2(0-6-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles, structures, and components of CNC.
2. Write CNC programs and operate CNC.
3. Develop a set of desirable work habits with systematic plan, responsibility to themselves and society and work according to safety instructions.

Course Competencies : Students should be able to :

1. Write CNC program based on the principles and processes of CNC.
2. Produce parts using CNC on the basis of CNC operational principles and processes.

Course Description :

Practice using turning machines and CNC turning machines combining with the procedure, drawing, feeding, checking, and repairing CNC program, tools and equipment preparation, the use of measurement tools for checking the size of work, CNC turning machine maintenance and safety work.

CEREN212 Machine Tools Maintenance 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the maintenance and disassembly of machine tools.
2. Develop skills in machine tools maintenance and disassembly.
3. Develop desirable work habits, i.e., being organized, and being responsible to themselves and society, as well as working according to safety instructions.

Course Competencies :

1. Maintain machine tools according to the operational principles and processes.
2. Produce alternative machine parts according to the principles and processes.

Course Description :

Practice mechanical equipment maintenances, preventive maintenances, and breakdown maintenances, reactive maintenances, proactive maintenances, predictive maintenances, measurements of deterioration, deterioration preventions, deterioration repairing to mechanic standard. Study manual guides. Practice parts disassembly, adjustments, settings, lubricant settings, spare preparations, easy replacement parts makings, basic Pneumatics and Hydraulics system maintenances, work system checking and testing, maintenance recording based on safety principles.

CEREN213 Refrigeration and Air Conditioning 2(1-3-3)

Former Course Code : 51021009 Refrigeration and Air Conditioning

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of refrigeration.
2. Use tools to perform mechanical and electrical operations of refrigeration and air conditioning systems.
3. Be responsible, punctual, and have desirable work habits and positive attitude.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of refrigeration and air conditioning.
2. Assemble, install, and inspect refrigeration pipe works.
3. Check and repair refrigerators.

Course Description :

Study and practice about the principle of refrigeration, heat transfer, type of heat, pressure, components and working principles of vapor compression systems, refrigerants, lubricant, pipe work, pipe welding, electrical circuit connection, mechanical circuit, vacuuming, packing of refrigerant in refrigeration and air conditioning, inspection and maintenance.

CEREN214 Fan Pump Compressor and Piping System 2(1-3-3)

Former Course Code : 51021010 Fan Pump Compressor and Piping System

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding towards working principles of fans, pumps, compressors and piping systems.
2. Develop knowledge and understanding about safety control equipment, piping and valve systems, and power engines.
3. Develop skills in installing, and fixing piping systems, experimenting, and quality testing.
4. Develop a positive attitude and desirable habits towards the course.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of working principles of fans, pumps, compressors and piping systems.
2. Demonstrate knowledge of safety control equipment, piping and valve systems, and power engines.
3. Install and fix issues related to fans, pumps, compressors, and piping systems.
4. Maintain pumps, pipe compressors, valves, and power engines.

Course Description :

Study and practice about energy conservation, operations, components and maintenances of fan, pump, and compressor, safety control equipment, installations and troubleshooting of piping and valve systems, piping coupling, flow types, pressures, types of piping seal systems and various efficiency testing.

CEREN215 Automotive Technology 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding technology of internal combustion engines.
2. Develop knowledge and understanding regarding automative and electrical technology, battery systems, and electric charges.
3. Develop skills in testing and analyzing issues related to automative systems.
4. Develop a positive attitude and a set of desirable characteristics, i.e., realized the importance of learning, being resposible, and behave according to professional morals and ethics.

Course Competencies : Students should be able to :

1. Demonstarte knowledge of the technology of internal combustion engines.
2. Demonstrate knwoledge of automotive and electrical technology, battery systems, and electric charges.
3. Resolve automative systems-related issues.

Course Description :

Study and practice components, systems, types and developments of automotive and electrical technology, internal combustion engine technology and gasoline engines and diesel engines. Analyze and repair engine failure of modern technology, battery systems, and electric charges.

CEREN216 Sheet Metal and Piping 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding thin and thick sheet metals, sheet metal drawing, thick sheet metal forming using cutting, folding, and winding machines.
2. Develop an understanding regarding the use of tools and equipment for pipe threading manually and by machines, assembling of thread pipe, measuring and calculating pipes, connecting and bending pipes.
3. Acquire skills in securing edges with seam joints and rivet joints.
4. Develop a positive attitude and desirable work habits, i.e., meticulousness, self-discipline, safety concerns, and punctuality.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of thin and thick sheet metals, thin sheet metal forming using cutting and folding machines.
2. Demonstrate knowledge related to the use of tools and equipment for pipes threading manually and by machines, assembling thread pipes, measuring and calculating pipes, connecting and bending pipes.
3. Be able to secure edges with seam joints and rivet joints.

Course Description :

Study and practice thin sheet metals and thick sheet metals with parallel and radius methods, soldering, sheet metal drawing, seaming, folding, bending, peening, rolling and assembly with safety equipment according to safety and occupational health principles. Practice thin metal sheet forming by using cutting and folding machine, thick sheet metal forming, metal sheet drawing and construction of 3-ways joint, usages of pipe threading manually and by machines, assembly of thread pipe, measuring and calculating pipe for making thread pipe, cast iron pipe connection, hot bending, cool bending, and gas bending.

(3) Electrical technology Total 24 credits

Students can choose any course from the following list.

CEREN301 **Electronic Devices and Circuits** **2(1-3-3)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding structures and electrical properties of electronic devices.
2. Acquire skills in reading various signs and symbols, connecting, measuring, and testing electronic circuits.
3. Acquire skills in assembling electronic circuits and fixing related issues.
4. Develop a positive attitude and desirable work habits, i.e., being meticulous, working safe, being organized, being punctual, being honest, and being responsible.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of structures and the working principles of electronic devices.
2. Connect and measure the value of electronic circuits.
3. Test and resolve issues associated with electronic devices and electronic circuits.

Course Description :

Study and practice about the symbol, structure, electrical properties and the working principle of electronic devices, electronic circuit module, circuit testing and correction, recording of circuit test results, the use of electronic circuit modules Including Modern technology equipment, various types of sensors, printed circuit board design, creating circuits for application, presentation and the use of electrical measuring instruments.

CEREN302 DC Circuits 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles and theories associated with basic electric circuit.
2. Acquire skills in connecting circuit, findings various values of a direct current (DC) circuit.
3. Acquire skills in using electrical measuring instruments.
4. Develop a positive attitude towards the course, and develop self-directed learning disposition, as well as work safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge in finding various values of a direct current (DC) circuit.
2. Connect a direct current (DC) circuit.
3. Measure and test various values of a direct current (DC) circuit.

Course Description :

Study and practice about basic electric circuit, Ohm's law, power and resistor, series circuit, parallel circuit, series-parallel circuit, voltage divider, current divider, ladder circuit, network transformations, multisource circuit, Mesh analysis, Node analysis, super position, Thevenin's theorem, Norton's theorem, Thevenin and Norton equivalent circuit transformations, maximum power transfer theorem, Millman's theorem, Capacitor circuits, transient in series RC networks, transient in series-parallel RC Networks, inductor circuits, transient in series RL networks, transient in series-parallel RL networks, and using the electric circuit analysis program.

CEREN303 Practice Wiring and Transformers 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of wiring and transformers.
2. Acquire skills in wiring and connecting transformers.
3. Develop self-directed learning disposition, work meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of wiring and transformers.
2. Connect electrical wires on various lamp control circuits.
3. Wind the coil and connect the transformer.
4. Test and resolve issues related to wiring and transformers.

Course Description :

Study and practice about types and using electrical wires, various wiring connections, high voltage system and transmission system, low voltage system and the use of 1-phase and 3-phase power systems, building wiring rules, electrical wiring for indoor lighting, connecting the wires in various lamp control circuits, lighting circuit at night by using the sunlight control switch, various ladder switch circuits, basic lighting system design, structure, type, size of transformer, principle of induction power, electric force equation,change ratio, bobbin, winding, design and build a small transformer, using electrical measuring instruments, usage and maintenance.

CEREN304 AC Circuits 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles and theories associated with alternating electric circuit.
2. Acquire skills in connecting circuit, findings various values of an alternating current (AC) circuit.
3. Develop skills in using electrical measuring instruments for measuring various values in circuits or using computer program to test their operations.
4. Develop a positive attitude towards the course, and develop self-directed learning disposition, work meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge in finding various values of an alternating current (AC) circuits.
2. Connect an alternating current (AC) circuits.
3. Measure and test various values of an alternating current (AC) circuits.

Course Description :

Study and practice about basic alternating current, complex number, phasor of AC voltage and current, series AC circuit, parallel AC circuit, series-parallel AC circuit, AC network transformations and multisource circuit, Mesh analysis, Node analysis, super position, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, series and parallel resonance, three-phase circuit, and using the electric circuit analysis program.

CEREN305 Digital Circuits 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the working principles of digital circuits.
2. Acquire skills in connecting, assembling, and testing digital circuits.
3. Acquire skills in using electrical measuring instruments for measuring various values in digital circuits.
4. Develop a positive attitude towards the course, and develop self-directed learning disposition, work meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate a knowledge related to digital circuits.
2. Connect digital circuits.
3. Measure and test various values in digital circuits.

Course Description :

Study and practice about number system, calculation and number conversion, binary code, Mathematics logic, Boolean algebra, logic diagram, adder and subtractor, encoder, decoder, code converter, combination circuit, flipflop, counter, shift register, display circuit, memory, features of digital ICs and reading the digital IC handbook, and digital circuit assembly and applications.

CEREN306 Fundamental and Application of Photovoltaic Systems 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding associated to solar cell system, p-n junction, single crystal cell solar cell production, double crystal and amorphous, serial parallel and compound cell connections.
2. Develop knowledge and understanding associated to bypass and solar cell diode blocking, effect of shading, battery, battery charge controller, and system design of solar cell.
3. Acquire skills in installing solar cell system.
4. Develop a positive attitude towards work operations and self-directed learning disposition, i.e., work meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of solar cell system, p-n junction, single crystal cell solar cell production, double crystal and amorphous, serial parallel and compound cell connections.
2. Demonstrate knowledge of bypass and solar cell diode blocking, effect of shading, battery, battery charge controller, and system design of solar cell.
3. Install, test, and resolve issues related to solar cell system.

Course Description :

Study and practice the basic principles of electricity production of solar cell systems, p-n junction, single crystal cell solar cell production, double crystal and amorphous, serial parallel and compound cell connections, bypass and solar cell diode blocking, effect of shading, battery, battery charge controller, system design, basic installation of structures and electrical wiring systems, applications for independent power generation systems, connection form and pumping system with solar cells, basic economic value analysis.

CEREN307 Microcontroller and Sensor 2(1-3-3)

Microcontroller and Sensor

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the working principles of microcontroller board and sensor devices.
2. Acquire skills in writing computer programs for controlling microcontroller board and internal devices.
3. Acquire skills in connecting control circuits and control devices.
4. Develop a positive attitude towards the course, develop self-directed learning disposition, and work meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate a knowledge of the working principles of microcontroller board and sensor devices.
2. Write computer programs for microcontroller board and internal devices control.
3. Connect control circuits and control devices.

Course Description :

Study and practice structures, components, architectural operating principles of the current controllers. Features and applications of different types of sensors. Write commands to control external devices connecting a microcontroller board to input and output devices, sensor devices, heats, temperatures, lights, sounds, mechanical forces, liquid levels, magnetic fields, humilities, gases, smokes, pressures, flows rates, speed, lamp displays, LCD displays, operation tests, circuit connections, and applications.

CEREN308 D.C. Electrical Machine 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards the theory of magnetism, electromagnet, structure, and working principles of DC electromechanical.
2. Acquire skills in disassembling DC electric machines.
3. Develop a desirable professional attitude, i.e., work meticulously, cleanly, safely, and responsibly.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of symbols, structure, and working principles of electromechanical devices.
2. Disassemble and assemble the armature winding circuit of DC electromechanical unit.
3. Test DC motors including starting point, speed control, and turning direction.
4. Maintain, inspect, and resolve issues related to DC

Course Description :

Study and practice about electromagnetism and basic properties of electromagnetic, circuits DC electric machines, principle of DC machines, components, features of various types of DC electric machines, Armature reaction, control of electrical machinery at various conditions, measurement and inspection of DC motors and DC generators, and maintenance of DC motors and DC generators.

CEREN309 Fundamental of Telecommunication Systems 2(2-0-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the evolution of telecommunication system technology, telecommunications standards and organizations, rules and regulations of the Telecommunications Act.
2. Develop an understanding towards frequency bands, radio wave propagation, principles of AM and FM radios, signal combinations in telecommunication systems, block diagram, cycle and operation of different sectors.
3. Acquire skills in assembling telecommunication circuits, measuring and testing with relevant tools.
4. Develop a positive attitude, self-directed learning disposition, and hard working.

Course Competencies :

1. Demonstrate knowledge regarding the evolution of telecommunication system technology, telecommunications standards and organizations, rules and regulations of the Telecommunications Act.
2. Demonstrate a knowledge of frequency bands, radio wave propagation, principles of AM and FM radios, signal combinations in telecommunication systems, block diagram, cycle and operation of different sectors.
3. Assemble telecommunication circuits, measure and test with relevant tools.

Course Description :

Study about the evolution of telecommunication system technology, telecommunications standards and organizations, rules and regulations of the telecommunications Act, frequency band, principles of radio wave propagation from the antenna, block diagram, circuits and functions of various sectors of

AM and FM radio receivers, principles of audio and image systems, signal combinations in telecommunication systems, practice in the assembly of radio communication circuits, measurement and testing with related tools.

CEREN310 A.C. Electrical Machine 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards types, structures, components, working principles, and properties of a single-phase and a three-phase AC electrical motors.
2. Acquire skills in inspecting and disassembling motors, coil winding, circuits connecting, testing, and maintaining motors.
3. Develop a positive attitude and a set of desirable work disposition, i.e., working meticulously, safely, orderly, cleanly, punctually, honestly, and responsibly.

Course Competencies : Students should be able to :

1. Demonstrate a knowledge of the structure and working principles of a single-phase and three-phase AC electrical motors.
2. Disassemble parts and winding coil, connecting a single-phase and a three-phase AC electrical motors.
3. Measure and test the properties of a single-phase and a three-phase AC electrical motors.
4. Operate, maintain, and repair a single-phase and a three-phase AC electrical motors.

Course Description :

Study and practice about types structure and components of 1-phase and 3-phase AC electric motors, basic principles of induction motors, single phase power type, three-phase power type, universal motor, connection of circuit and turnstile control method, techniques for starting the engine, load-bearing characteristics of an AC motor, torque calculation, selection of motor types for industrial applications.

CEREN311 Programmable Logic Control 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding how to write control programs of electromechanical and electronic devices.
2. Acquire skills in installing input and output equipment, writing and editing the programmable logic control for programing of electromechanical and electrical devices.
3. Develop a set of desirable work disposition, i.e., working meticulously, carefully, and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of applying the programmable logic control in controlling electromechanical and electronic devices.
2. Design, install, and test the programmable logic control in controlling electromechanical and electronic devices.
3. Maintain the programmable logic control in controlling electromechanical and electronic devices.

Course Description :

Study and practice about symbol, structure, command, input / output devices of the control system with the programmable logic control, writing commands with ladder diagrams and other programs, connecting the input / output device of the programmable logic control program, mechanical, electrical and electronic control, installation and testing and maintenance.

CEREN312 Basic Automatic Controls 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards the principles of automatic controls.
2. Acquire skills in selecting, installing, testing, adjusting, and maintaining automatic control devices.
3. Develop a positive attitude and a desirable work habits, i.e., working meticulously, carefully, and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of automatic controls.
2. Select and adjust automatic control devices.
3. Install and test automatic control devices.

Course Description :

Study and practice about basic automatic control principles, symbols, types of continuous and discrete control signals, selection of equipment, control board or module, configuration per control loop, and testing and maintenance.

CEREN313 Electrical Drawing 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Understand the principles of international standards of electrical drawings.
2. Acquire skills in reading and writing lighting system drawings, electrical and communication system drawings.
3. Recognize the significance of reading and drawing electrical drawings.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about the principles of international standards of electrical drawings.
2. Read and write structure drawing, building floor plan, electrical and communication system.
3. Create load schedules.
4. Read and write basic electrical drawings, installation drawings, electrical control drawings, and final installation drawings.

Course Description :

Study symbols in electrical drawing and standard building drawing, structure drawing, building floor plan, electrical and communication system, Single Line Diagram, Riser Diagram, and Load Schedule. Practice electrical drawing, installation drawing, electrical control drawing and final installation drawing, Schematic Diagram drawing, Wiring Diagram drawing, Pictorial Diagram drawing, and One Line Diagram drawing.

(4) Mechatronics Technology 24 credits

1) Students can choose any course from the list for 6 credits as outlined below.

CEREN301	Electronic Devices and Circuits	2(1-3-3)
CEREN305	Digital Circuits	2(1-3-3)
CEREN307	Microcontroller and Sensor	2(1-3-3)

2) Students can study the following courses as outlined in Mechanical Technology Program for 6 credits.

CEREN207	Computer-aided Design and Drafting	2(1-3-3)
CEREN208	Mechanics and Machinery	2(1-3-3)
CEREN209	Industrial Electrical	2(1-3-3)

3) Students can choose any course from the following list including 1-3 for not less than 24 credits.

CEREN401 Electrical Circuits 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding towards the principles and theories of DC and AC electrical circuits.
2. Calculate, connect, measure, and test various values of DC and AC electrical circuits.
3. Acquire skills in circuits connection, use of measuring instruments, and test electrical circuits.
4. Develop a positive attitude and desirable work habits, i.e., working responsibly, meticulously, and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles and theories of DC and AC electrical circuits.
2. Calculate various values of DC and AC electrical circuits.
3. Connect circuits, measure, and test various values of electrical circuits.

Course Description :

Study and practice about Ohm's law, power, determination of the total resistance in series, parallel and compound, delta-star resistor connection, voltage divider, current divider, bridge circuit, solving electrical problems, AC power generation, signal waveform, and parameters in AC circuit.

CEREN402 **Basic Machine Tools** **2(1-3-3)**

Former Course Code : 51020204 Basic Machine Tools

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding classifications, compositions, working principles of maintenance and storage, and basic machine tools safety.
2. Understand the calculation of speed, cutting speed, feeding speed, and necessary components of sharpening cutting.
3. Acquire skills in turning operations such as face turning, treading, shaping, drilling, reaming, milling, surface grinding, cylindrical grinding.
4. Develop a positive attitude and desirable work habits, i.e., having responsibility and safety concerns.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of classifications, compositions, working principles of maintenance and storage, and basic machine tools safety.
2. Calculate speed, cutting speed, feeding speed, and necessary components of sharpening cutting.
3. Operate turning operations such as face turning, treading, shaping, drilling, reaming, milling, surface grinding, cylindrical grinding.

Course Description :

Study and practice classifications, compositions, working principles of maintenances and storages, and basic machine tools safety, calculations of

speed, cutting speed, feeding speed, necessary components of sharpening cutting, machining, shaping, drilling, reaming, milling, surface grinding, cylindrical grinding based on safety principles.

CEREN403 **Basic Mechatronics** **2(1-3-3)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of automatic control systems, pneumatic and hydraulic systems.
2. Acquire skills in using detectors, basic detection cameras, and basic design automatic control system.
3. Develop self-directed learning disposition and work meticulously, and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of automatic control systems, pneumatic and hydraulic systems.
2. Choose detectors, use basic detection cameras and know the basic principles of automatic control system design.
3. Test the control circuits of the automatic control systems.

Course Description :

Study and practice basic of automatic control systems, pneumatic and hydraulic systems, control devices, sensors and transducers, controls of different types of motors, symbols, characteristics, and usages of different equipment, and design control systems for the steering circuits, speed adjustments, voltages, and other control circuits.

CEREN404 Electrical Machine and Control 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of electrical inductance, structures, working principles of generators, transformers, electrical motors, and control devices.
2. Acquire skills in calculating various values, using, selecting, controlling, and maintaining electrical machines and control devices.
3. Develop a positive attitude and desirable professional habits, i.e., being responsible, working meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge regarding the principles of electromechanical control devices.
2. Select control devices and electromechanical protection devices.
3. Connect and test the control circuits and the electromechanical control power circuits.

Course Description :

Study and practice about symbols, control diagram according to electrical standards, type, structure, components of the generator, transformer, control equipment, controlling DC and AC motors with magnetic contactors, using the inverter, module, solid state, how to use stepping motor and servo motor, using electrical measuring instruments, testing and maintenance of electric motors.

CEREN405 Basic Robot 2(1-3-3)

Former Course Code : 51022012 Basic Robot

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the working principles of basic robot and control programing of basic robot.
2. Acquire skills in assembling, testing, and controlling basic robot.
3. Develop a positive attitude and desirable work habits, i.e., having responsibility, carefulness, and safety concerns.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of the working principles of robots and explain steps in programming basic robot.
2. Select tools and equipment for robot assembly according to the design.
3. Control and test basic robot operations.

Course Description :

Study structures, working principles of control circuit, principles of artificial intelligence, principles of basic robot writing, assembly of small robot in manual control and automatic control by using electrical-electronic equipment, usages of electrical measuring instruments. Practice testing operation of the circuits in simulation program, and programming robot operations with Robolab program, Mindstorms program or other new programs.

CEREN406 Computer-Aided for Engineering Analysis 2(1-3-3)

Former Course Code: "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the principles of engineering design.
2. Acquire skills in designing mathematical models, numerical analysis of behavioral simulation using computer methods.
3. Acquire skills in data processing, engineering analysis and designs of manufacturing product using computer software.
4. Develop a positive attitude and desirable work habits, i.e., having responsibility, working meticulously and safely.

Course Competencies : To enable students to :

1. Demonstrate knowledge regarding the principles of engineering design.
2. Select computer methods in designing mathematical models, and numerical analysis of behavioral simulation.
3. Present the results of data processing, engineering analysis and designs of manufacturing product using computer software.

Course Description :

Study and practice the Engineering design processes, mathematical models for analysis and synthesis, numerical methods for system behavior simulation, computer methods for data processing, engineering analysis and designs of manufacturing product using computer software.

CEREN407 Internet of Things (IoT) 2(1-3-3)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding the basic principles of IoT.
2. Acquire skills in building IoT devices, and apply tools for application designs.
3. Develop a positive attitude and a desirable work habits, i.e., having responsibility, working meticulously and safely.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about the principles of basic engineering design.
2. Select computer methods in designing mathematical models, and numerical analysis of behavioral simulation.
3. Present the results of data processing, engineering analysis and designs of manufacturing product using computer software.

Course Description :

Study and practice about IoT, working with sensor and actuators, connecting an IoT device to Internet, creating network of IoT devices, building smart application with IoT, IoT data analytics.

2.4 Vocational-based Job Training 4 credits.

CERCC116 Job Training 4(0-40-0)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding job training appropriate with the course.
2. Acquire working skills, expertise, and working experience from workplace.
3. Develop a positive attitude and a desirable work habits, i.e., having responsibility, punctuality, and discipline.

Course Competencies : Students should be able to :

Engage in job training with responsible, desirable attitudes, self-directed learning, self-discipline, honesty, and punctuality.

Course Description :

Engage in job training according to job description not less than 320 hours in workplaces, private enterprises or knowledge sources to get experience and skills by approval from the administrative team in the field, as well as report the progress of job training throughout the job training period.

CERCC117 Job Training 1 2(0-20-0)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding job training appropriate with the course.
2. Acquire working skills, expertise, and working experience from workplaces.
3. Develop a positive attitude and a desirable work habits, i.e., having responsibility, punctuality, and discipline.

Course Competencies : Students should be able to :

Engage in job training with responsible, desirable attitudes, self-directed learning, self-disciplined, honest, and punctual

Course Description :

Engage in job training according to job description not less than 320 hours in workplaces, private enterprises or knowledge sources to get experience and skills by approval from the administrative team in the field, as well as report the progress of job training throughout the job training period.

CERCC118 Job Training 2 2(0-20-0)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop an understanding regarding job training appropriate with the course.
2. Acquire working skills, expertise, and working experience from workplaces.
3. Develop a positive attitude and a desirable work habits, i.e., with responsibility, punctuality, and discipline.

Course Competencies : Students should be able to :

Engage in job training with responsibility, desirable attitudes, self-directed learning, self-discipline, honesty, and punctuality.

Course Description :

Engage in job training according to job description not less than 320 hours in workplaces, private enterprises or knowledge sources to get experience and skills by approval from the administrative team in the field, as well as report the progress of job training throughout the job training period.

2.5 Project 4 Credits

CERCC119 Pre-Engineering Project 4(0-12-4)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and understanding regarding design thinking to select and present topics, ask for an approval to do a project as well as collect information related to the project and the feasibility of conducting the project. Develop skills in using technology in planning and working on projects.
2. Develop knowledge and understanding in experimenting and testing professional engineering related projects. Report evaluation results of innovations, drawing conclusions, giving suggestions, writing final reports, and giving a project defense.
3. Acquire skills in project work, and organize an exhibition of inventions and innovation showcase.
4. Develop self-directed learning character and have confidence while presenting information.

Course Description :

1. Demonstrate knowledge regarding project outline presentation, data collection, analysis of the feasibility of the project, experiment, evaluation, and reports of the results.
2. Present ideas in a systematic way, write a project proposal, and use technology in project planning.
3. Draw conclusions and suggestions of the project, write a complete project report, and attend a defense.
4. Do a project/research according to the plan and present the results.

Course Description :

Study the possibilities to create a project through design thinking processes and present the project topic. Design and create the project in the form of invention and innovation based on integrated academic theories and

professional skills. Choose and use materials, equipment based on cost-effectiveness principle and safety principle. Conduct the experiments and test the professional engineering projects. Report and evaluate the inventions or innovations. Summarize the results and recommendations for this ongoing project from the pre-engineering project 1. Write a completed project report. Present the project and organize an engineering exhibition to present the inventions and innovations, submit the paper articles to academic conferences, or participate engineering professional skills competitions.

CERCC120 **Pre-Engineering Project 1** **2(1-3-3)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop knowledge and an understanding about design thinking in order to select and present topics, asking for an approval to conduct a project as well as collect information related to the project and the feasibility of conducting the project. Develop skills in using technology in planning and working on projects.
2. Acquire technology skills in planning and working on a project.
3. Develop self-directed learning disposition and be confident in presenting project.

Course Competencies : Students should be able to :

1. Demonstrate knowledge about project topic presentation, data collection, analysis of the feasibility of the project.
2. Present ideas in a systematic way, write a project outline, and use technology in project planning.
3. Work on a project according to the plan.

Course Description :

Study the possibilities to create a project through design thinking processes and present the project topic. Design and create the project in the form of invention and innovation based on integrated academic theories and professional skills. Choose and use materials, equipment based on cost-

effectiveness principle and safety principle. The project should be examined by the professional committees under supervised by their supervisors. The project should be done 50% of the overall works.

CERCC121 **Pre-Engineering Project 2** 2(0-6-2)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Know and understand the experimentation, and evaluation of engineering-related projects, report innovative designs innovations.
2. Understand the principles of drawing conclusions and suggestions in project management, write a project report, and attend a defense.
3. Acquire skills in conducting a project, and organizing innovative projects showcase.
4. Develop self-directed learning disposition, and present information with confidence.

Course Competencies : Students should be able to :

1. Demonstrate knowledge of experiments, tests, and reports on project results.
2. Summarize results and suggestions for project implementation, write complete project reports, and attend a project defense.
3. Work on projects according to the plan and presentation of information.

Course Description :

Conduct the experiments and test the professional engineering projects. Report and evaluate the inventions or innovations. Summarize the results and recommendations for this ongoing project from the pre-engineering project 1 . Write a completed project report. Present the project and organize an engineering exhibition to present the inventions and

innovations, submit the paper articles to academic conferences, or participate engineering professional skills competitions.

3. Free Elective Courses (not less than 10 credits)

Students can choose any area of study, according to their aptitudes and interests, according to the general courses section (Revised Curriculum, Year 2020), and the Curriculum for the Certificate of Vocational Education (Revised Curriculum, Year 2022) in all areas of study. However, the institutes can revise their free elective courses to meet their contexts and needs of their local communities.

4. Extracurricular Activities 2 hours/week

CERCC503 **Art of Living** **0(0-2-1)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Acquire the adaptability to new environments and desirable social etiquette.
2. Improve life skills, learn organizational culture, and learn to live together with others.
3. Develop problem-solving skills in daily life.

Course Competencies : Students should be able to :

1. Adapt to the context of society, dormitory, and college.
2. Have life skills, proper ethics, understand way of living, and have a positive attitude towards life.
3. Maintain their own hygiene and solve basic daily life problems by themselves.

Course Description :

Practice adaptations and manners of compatibility in college dormitory and society. Develop skills of living and understand living. Create positive thinking toward living and develop skills of communication and understanding others. Have ability to take care of one's own hygiene, have

basic principles of first aid, and develop ability to solve basic daily life problems by oneself.

CERCC504 **Happiness in Lifelong Learning** **0(0-2-1)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Develop emotional intelligence.
2. Develop the ability to recognize and motivate oneself (self-esteem and motivation).
3. Develop the ability to understand others (empathy).

Course Competencies : Students should be able to :

1. Help students lead a creative and happy life.
2. Enable students to recognize their potentials, motivation, and determination to achieve life goals.
3. Enable students to be attentive, empathetic, and accept others appropriately.

Course Description :

Practice concepts of emotional intelligence. Live with creative thinking and happiness. Know one's own potentials, create motivation and determination to reach life's goals, pay attention to others with sympathy and acceptance.

CERCC505 Health for Life 0(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Help students to have good physical health and proper hygiene.
2. Promote safe food consumption.
3. Promote mental health care, depression, and prevent bullying.
4. Strengthen understanding of diversity and gender equality.
5. Acquire knowledge on preventing accidents, imminent dangers, and basic disaster relief.

Course Competencies : Students should be able to :

1. Exercise for good health, take care of body and health.
2. Consume healthy and safe food.
3. Take good mental health care, depression, and prevent bullying.
4. Understand diversity and gender equality.
5. Be able to prevent accidents and dangers near them, and to moderate basic disasters.

Course Objectives : To enable students to :

Practice daily exercises and healthcare and well-being. Eat clean and healthy food, maintain good mental health, depression condition, and prevent bullying. Foster gender diversity and equality and have ability to prevent accidents, impending threats, and basic public hazards.

CERCC506 Wisdom and Way of Live Value 0(0-2-1)

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Create an awareness of local wisdoms and their values.
2. Preserve local traditions and cultures.
3. Apply local wisdoms in daily life.

Course Competencies : Students should be able to :

1. Recognize the value of local wisdoms and live comprehensively in a diverse cultural society.
2. Convey knowledge of their interested local wisdoms.
3. Apply their knowledge of local wisdoms in their daily life creatively.

Course Description :

Appreciate the values of local wisdom, promote, and instruct others on local wisdom of interested communities. Have ability to expand local wisdom creatively and have ability to solve problems in real daily life.

CERCC507 Social Innovation 0(0-2-1)

Former course Code : "None"

Prerequisite :"None"

Course Objectives : To enable students to :

1. Foster learners with design thinking processes in order to solve real-life issues.
2. Transform learners' abstract ideas into a concrete form of an innovation.
3. Develop leadership and teamwork skills.

Course Competencies : Students should be able to :

1. Be able to use their design thinking to solve real-life problems.
2. Be able to create and design any innovations to solve social issues.
3. Be able to work as a team.

Course Description :

Practice design-thinking processes to solve problems in real life with ability to create innovations to solve social problems and have ability to perform as teamwork.

CERCC508 **Leadership of Happiness** **0(0-2-1)**

Former Course Code : "None"

Prerequisite : "None"

Course Objectives : To enable students to :

1. Promote leadership qualities for career.
2. Promote the use of creativity in managerial tasks.
3. Promote the significance of working as a team.

Course Competencies : Students should be able to :

1. Develop leadership skills for career.
2. Be able to engage in managerial tasks creatively.
3. Recognize the significance of working as a team.

Course Description :

Practice professional leadership potential, application of creativity in management, and appreciate benefits of teamwork.

Appendix A

The Curriculum Comparison Table

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
General Courses	65	Core Competencies Courses	27
Thai Language Courses	6	1. Language and Communication Studies	
13130103 Thai 1	2(2-0-4)		
13130104 Thai 2	2(2-0-4)		
13130105 Thai 3	2(2-0-4)		
		1.1 Thai Language Courses	4
		GECLC101 Fundamental Thai	2(2-0-4)
		GECLC102 Thai for searching and writing reports	1(1-0-2)
		GECLC103 Thai for communication	1(1-0-2)
		GECLC104 Thai for creativity	1(1-0-2)
		GECLC105 Thai for speaking and writing for a career	1(1-0-2)
Foreign Language Courses	12	1.2 Foreign Language Courses	6
13126101 English for Everyday Communication 1	2(2-0-4)		
13126102 English for Everyday Communication 2	2(2-0-4)		
13126103 English for World Outlook 1	2(2-0-4)		
13126204 English for World Outlook 2	2(2-0-4)		
13126307 English for Engineering 1	2(2-0-4)		

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
13126308 English for Engineering 2	2(2-0-4)		
		GECLC201 English for Everyday Communication 1	2(1-2-3)
		GECLC202 English for Everyday Communication 2	2(1-2-3)
		GECLC203 English for World Outlook 1	1(0-2-1)
		GECLC204 English for World Outlook 2	1(0-2-1)
		GECLC212 English for Reading and Writing	2(1-2-3)
		GECLC213 Basic Chinese	2(1-2-3)
		GECLC214 Chinese for Communication	2(1-2-3)
		GECLC212 English for Reading and Writing	2(1-2-3)
		GECLC213 Basic Chinese	2(1-2-3)
		GECLC214 Chinese for Communication	2(1-2-3)
Mathematics Courses	**18**	**2. Science and Mathematics Courses**	
22091101 Mathematics 1	3(3-0-6)		
22091102 Mathematics 2	3(3-0-6)		
22091203 Mathematics 3	3(3-0-6)		
22091204 Mathematics 4	3(3-0-6)		
22091305 Mathematics 5	3(3-0-6)		
22091306 Mathematics 6	3(3-0-6)		

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		2. Mathematics Courses	6
		GECSC201 Basic Mathematics 1	3(3-0-6)
		GECSC202 Basic Mathematics 2	3(3-0-6)
Science Courses	14	3. Science Courses	4
- Physics Courses	4		
22092205 Wave light and Sounds in Physics	2(2-0-4)	(*Moved to Vocational-based Science and Mathematics Courses GECSC104 Wave light and Sounds in Physics*)	
22092304 Modern Physics	2(2-0-4)		
- Chemistry Courses	10		
22092107 Chemistry 1	2(2-0-4)	GECSC107 Principles of Chemistry 1	2(2-0-4)
22092108 Chemistry 2	2(2-0-4)	(*Moved to Vocational-based Science and Mathematics Courses GECSC108 Principles of Chemistry 2*)	
22092209 Chemistry 3	2(2-0-4)	(*Moved to Vocational-based Science and Mathematics Courses GECSC109 Principles of Chemistry 3*)	
22092210 Chemistry 4	2(2-0-4)	(*Moved to Vocational-based Science and Mathematics Courses GECSC110 Principles of Chemistry 4*)	
22092311 Chemistry 5	2(2-0-4)		
		GECSC102 Mechanics	2(1-2-3)
		GECSC113 Computing Science	2(1-2-3)

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		GECSC114 Process of Thinking and Problem Solving	2(1-2-3)
Social Studies Courses	**6**	**4. Social Studies and Humanities**	
13143101 Being a Good Citizen and a Thai Way of Life	1(1-1-2)		
13143102 Introduction to Economics and Sufficiency Economics	1(1-1-2)		
13143203 Geography	1(1-1-2)		
13143204 Historical Development	1(1-1-2)		
13143305 Religion, Morality, Ethics and Life Development	1(1-1-2)		
13143306 Thai Wisdom	1(1-1-2)		
		4.1 Social Studies	**3**
		GECSO101 Citizenship and Morals	2(2-0-4)
		GECSO102 The King's Philosophy for Sustainable Development	1(1-0-2)
		GECSO103 Geography and Geo-Social	1(1-0-2)
		GECSO104 Thai Civilization and Oriental Civilization	1(1-0-2)
		GECSO105 World Civilization	1(1-0-2)
		GECSO106 Current Affairs	1(1-0-2)
		GECSO107 ASEAN Studies	1(1-0-2)

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		GECSO108 Law and Life	1(1-0-2)
		4.2 Humanities Studies	2
		GECSO201 The Wisdom of Life	1(1-0-2)
		GECSO202 The Beauty of Lanna	2(1-2-3)
		GECSO203 Visual Arts	2(1-2-3)
		GECSO204 Photography	2(1-2-3)
Health Studies and Physical Studies	6	**4.3 Health Studies**	2
13114101 Human Growth and Development	1(1-0-2)		
13114202 Life and Family	1(1-0-2)		
13114303 Health and Life Safety	1(1-0-2)		
13114004 Racket Skills	1(0-2-1)		
13114005 Ball Skills	1(0-2-1)		
13114006 Martial Arts	1(0-2-1)	GECSO309 Martial Arts	1(0-2-1)
13114007 Rhythm and Movement	1(0-2-1)		
13114008 Water Sports	1(0-2-1)		
		GECSO301 Sexuality Education	1(1-0-2)
		GECSO302 Life Safety	1(1-0-2)
		GECSO303 Track and Field	1(0-2-1)
		GECSO304 Tennis	1(0-2-1)
		GECSO305 Badminton	1(0-2-1)
		GECSO306 Volleyball	1(0-2-1)
		GECSO307 Basketball	1(0-2-1)
		GECSO308 Social Dance	1(0-2-1)
		GECSO311 Food and Health	1(0-2-1)

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		GECSO312 Everyday Life Skills	1(0-2-1)
Art Studies	3		
13145101 Theoretical Esthetics and Performance	1(0-2-1)		
13145202 Visual Arts	1(0-2-1)		
13145303 Musical Esthetics	1(0-2-1)		
Vocational Courses	65	**Vocational Competency Courses**	95
Integration Courses			
Interdisciplinary Courses	6		
51000001 Introduction to Management and Innovation	2(2-0-4)		
51000002 Introduction to Entrepreneurship	2(2-0-4)		
51000003 Energy and Environment	2(2-0-4)	(*Moved to Specialized Courses CERCC111 Energy and Environment)	
51000004 Materials Science	2(2-0-4)	(*Moved to Specialized Courses CERCC105 Materials Science)	
51000005 Earth and Universe	2(2-0-4)		
51000006 Ecology and Genetic	2(2-0-4)		
51000007 Systematic Biology	2(2-0-4)		
Information Technology Courses	6		
51002101 Information Technology and Computer	2(1-3-3)	(*Moved to Specialized Courses CERCC108 Computer and Information Technology)	

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
51002202 Basic Computer and Maintenance	2(1-3-3)		
51023303 Data Communications System and Networking	2(1-3-3)	(* Moved to Specialized Courses CERCC109 Data Communication System and Networking)	
Specialized Vocational Courses	**59**		
Basic Vocational Courses	**21**	**1. Basic Vocational Competency Courses**	**26**
51020101 Fundamental Electrics and Electronics	2(1-3-3)	(* Moved to Specialized Courses CERCC106 Fundamental Electrics and Electronics)	
51020102 Bench Work	3(1-6-4)	(* Moved to Specialized Courses CERCC101 Basic Engineering Training)	
51020103 Technical Drawing	2(1-3-3)	(* Moved to Specialized Courses CERCC102 Technical Drawing for Engineering)	
51020204 Basic Machine Tools	2(0-6-2)	(* Moved to Specialized Courses CEREN402 Basic Machine Tools)	
51020205 Metal Sheet Welding	2(0-6-2)	(* Moved to Specialized Courses CERCC107 Metal Sheet Welding)	

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
51020106 Basic Woodworking	2(1-3-3)	(* Moved to Specialized Courses CERCC103 Basic Construction)	
51020107 Mechanics for Pre-Engineering 1	2(2-0-4)		
51020108 Mechanics for Pre-Engineering 2	2(2-0-4)		
51020109 Introduction to Thermo-fluid	2(2-0-4)	(* Moved to Specialized Courses GECSC103 Fundamental Thermo-fluid*)	
51020310 Electrics and Electronics Fundamentals	2(2-0-4)		
		1.1 Vocational-based English Courses	4
		GECLC205 English for Engineering 1	1(0-2-1)
		GECLC206 English for Engineering 2	1(0-2-1)
		GECLC211 English for Listening and Speaking	2(1-2-3)
		1.2 Vocational-based Science and Mathematics Courses	**18**
		1.2.1 Physics Courses	
		GECSC104 Wave lights and Sounds in Physics	2(1-2-3)
		GECSC105 Fundamental Electrical and Electronics	2(1-2-3)
		1.2.2 Chemistry Courses	

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		GECSC108 Principles of Chemistry 2	2(2-0-4)
		GECSC109 Principles of Chemistry 3	2(1-2-3)
		GECSC110 Chemistry 4	2(1-2-3)
		1.2.3 Biology Courses	
		GECSC111 Fundamental Biology	2(1-2-3)
		1.2.4 Mathematics Courses	
		GECSC203 Mathematics for Career 1	3(3-0-6)
		GECSC204 Mathematics for Career 2	3(3-0-6)
		GECSC105 Basic Electrical and Electronics	2(1-2-3)
		1.2.2 Chemistry Courses	
		Principles of Chemistry 2	2(2-0-4)
		Principles of Chemistry 3	2(1-2-3)
		Principles of Chemistry 4	2(1-2-3)
		1.2.3 Biology Courses	
		GECSC111 Basic Biology	2(1-2-3)
		1.2.4 Mathematics Courses	
		GECSC203 1 Mathematics for Career 1	3(3-0-6)
		GECSC204 Mathematics for Career 2	3(3-0-6)
		1.3 Basic Vocational Management Courses	4

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		CERCC501 Occupational Health and Safety	2(2-0-4)
		CERCC502 Entrepreneurship	2(1-2-3)
Specialized Vocational Programs	20		
Mechanical Program			
51021001 Industrial Electrical	3(1-6-4)		
51021002 Machine Drawing	2(1-3-3)	(*Moved to Elective Vocational-based Courses CEREN204 Machine Drawing)	
51021003 Mechanical Drawing	2(1-3-3)		
51021004 Mechanics and Machinery	2(1-3-3)	(*Moved to Elective Vocational-based Courses CEREN208 Mechanics and Machinery)	
51021005 Machine Tools	3(1-6-4)		
51021006 Computer-Aided Design and Drafting	2(1-3-3)	(*Moved to Elective Vocational-based Courses CEREN207 Computer-Aided Design and Drafting*)	
51021007 Welding and Joining	3(1-6-4)		
51021008 Gasoline and Diesel Engine	3(1-6-4)		
51021009 Refrigerator and Air Conditioning	2(1-3-3)	(*Moved to Elective Vocational-based Courses CEREN213 Refrigeration and Air Conditioning*)	

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
51021010 Fan Pump Compressor and Piping System	2(1-3-3)	(* Moved to Elective Vocational Program CEREN214 Fan Pump Compressor and Piping System)	
51021011 Metal Sheet and Piping	3(1-6-4)		
51021012 Automotive Technology	3(1-6-4)		
Electrical and Electronic Technology			
51022001 DC Electrical Circuits	3(2-3-5)		
51022002 AC Electrical Circuits	3(2-3-5)		
51022003 Electronics Circuits	3(2-3-5)		
51022004 Electronics Circuit Application	3(2-3-5)		
51022005 Digital Circuits	3(2-3-5)		
1022006 Electrical Drawing	3(2-3-5)		
1022007 DC Electrical Machines	3(2-3-5)		
1022008 DC Electrical Machines	3(2-3-5)		
51022009 Practice Wiring	2(0-6-2)		
51022010 Microprocessors and Interface	3(2-3-5)		
51022011 Electrical Instruments	3(2-3-5)		

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
51022012 Basic Robot	2(1-3-3)	(* Moved to Elective Vocational Program CEREN405 Basic Robot)	
51022013 Sensor and Transducers	2(1-3-3)		
51022014 Power Plant	2(2-0-4)		
51022015 Radios and Televisions	2(1-3-3)		
51022016 Software Development	2(1-3-3)		
51022017 Basic Mechatronics	2(1-3-3)		
Civil Program			
51023001 Construction and Woodworking Materials	3(1-6-4)		
51023002 Cost Estimation	2(2-0-4)	(* Moved to Elective Vocational Program CEREN109 Cost Estimation)	
51023003 Construction Techniques	3(1-6-4)		
51023004 Concrete Technology	2(2-0-4)	(* Moved to Elective Vocational Program CEREN106 Concrete Technology)	
51023005 Sanitary System	3(1-6-4)		
51023006 Basic Structures	3(1-6-4)		
51023007 Surveying	3(1-6-4)		
51023008 Woodworking Machine	3(1-6-4)		
51023009 Construction Drawing	2(0-6-2)		

Remarks : (*) Revised Course Code and Group

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
51021006 Computer-Aided Design and Drafting	3(2-3-5)		
		2. Specialized Courses	**25**
		CERCC101 Basic Engineering Training	3(1-6-4)
		CERCC102 Technical Drawing for Engineering	2(1-2-3)
		CERCC103 Basic Construction Engineering	2(1-3-3)
		CERCC104 Introduction to Engineering Profession	2(1-2-3)
		CERCC105 Materials Science	2(2-0-4)
		CERCC106 Basic Electrics and Electronics	2(1-3-3)
		CERCC107 Sheet Metal Welding	2(1-3-3)
		CERCC108 Computer and Information Technology	2(1-2-3)
		CERCC109 Data Communication System and Networking	2(1-2-3)
		CERCC110 Computer Programming	2(1-2-3)
		CERCC111 Energy and environment	2(2-0-4)
		CECSC103 Introduction to Thermo-fluid	2(1-2-3)
		GECSC205 Calculus for Career	3(3-0-6)
		GECSC206 Basic Statistics	3(3-0-6)
		3. Free Elective Vocational-based Courses	**36**

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		Projects	
		CERCC112 Scientific Project-based Learning 1	3(2-3-5)
		CERCC113 Scientific Project-based Learning 2	3(2-3-5)
		CERCC114 Engineering Project-based Learning 1	3(2-3-5)
		CERCC115 Engineering Project-based Learning 2	3(2-3-5)
		3.1 Programs	
		(1) Civil Technology	**24**
		CEREN101 Construction Materials	2(2-0-4)
		CEREN102 Construction Drawing	2(1-3-3)
		CEREN103 Structure Model	2(1-3-3)
		CEREN104 Construction Techniques	2(1-3-3)
		CEREN105 Computer-Aided Design and Drawing	2(1-3-3)
		CEREN106 Concrete Technology	2(1-3-3)
		CEREN107 Surveying	2(1-3-3)
		CEREN108 Fundamental Structures	2(2-0-4)
		CEREN109 Cost Estimation	2(2-0-4)
		CEREN110 Sanitary System	2(1-3-3)
		CEREN111 Construction Law	2(2-0-4)
		CEREN112 Building Electrical	2(1-3-3)

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		(2) Mechanical Technology	24
		CEREN201 Manufacturing Process	2(2-0-4)
		CEREN202 Detailed Measurement Work	2(1-3-3)
		CEREN203 Engineering Materials	2(2-0-4)
		CEREN204 Machine Drawing	2(1-3-3)
		CEREN205 Mechanical Parts	2(2-0-4)
		CEREN206 Machine Tools	2(0-6-2)
		CEREN207 Computer-Aided Design and Drafting	2(1-3-3)
		CEREN208 Mechanics and Machinery	2(1-3-3)
		CEREN209 Industrial Electrical	2(1-3-3)
		CEREN210 Pneumatics and Hydraulics	2(1-3-3)
		CEREN211 CNC Machine Tool	2(0-6-2)
		CEREN212 Machine Tool and Maintenance	2(1-3-3)
		CEREN213 Refrigeration and Air Conditioning	2(1-3-3)
		CEREN214 Fan Pump Compressor and Piping System	2(1-3-3)
		CEREN215 Automotive Technology	2(1-3-3)
		CEREN216 Sheet and Mental Piping	2(1-3-3)
		(3) Electrical Technology	24

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		CEREN301 Electronic Devices and Circuits	2(1-3-3)
		CEREN302 AC Electrical Circuits	2(1-3-3)
		CEREN303 Practice Wiring and Transformers	2(1-3-3)
		CEREN304 DC Circuits	2(1-3-3)
		CEREN305 Digital Circuits	2(1-3-3)
		CEREN306 Fundamental and Application of Photovoltaic Systems	2(1-3-3)
		CEREN307 Microcontroller and Sensor	2(1-3-3)
		CEREN308 D.C. Electrical Machine	2(1-3-3)
		CEREN309 Fundamental of Telecommunication Systems	2(2-0-4)
		CEREN310 A.C. Electrical Machine	2(1-3-3)
		CEREN311 Programmable Logic Controller	2(1-3-3)
		CEREN312 Basic Automatic Controls	2(1-3-3)
		CEREN313 Electrical Drawing	2(1-3-3)
		(4) Mechatronics Technology	**24**
		CEREN301 Electronic Devices and Circuits	2(1-3-3)
		CEREN305 Digital Circuits	2(1-3-3)
		CEREN307 Microcontroller and Sensor	2(1-3-3)

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		CEREN207 Computer-Aided Design and Drafting	2(1-3-3)
		CEREN208 Mechanics and Machinery	2(1-3-3)
		CEREN209 Industrial Electrical	2(1-3-3)
		CEREN401 Electrical Circuits	2(1-3-3)
		CEREN402 Basic Machine Tools	2(1-3-3)
		CEREN403 Basic Mechatronics	2(1-3-3)
		CEREN404 Electrical Machine and Control	2(1-3-3)
		CEREN405 Basic Robot	2(1-3-3)
		CEREN406 Computer-Aided for Engineering Analysis	2(1-3-3)
		CEREN407 Internet of Things	2(1-3-3)
Projects	6	**3.2 Vocational-based Projects**	4
51024101 Pre-Engineering Project 1	1(1-0-2)		
51024102 Pre-Engineering Project 2	2(1-3-3)		
51024103 Pre-Engineering Project 3	3(1-6-4)		
		CERCC119 Pre-Engineering Project	4(0-12-4)
		CERCC120 Pre-Engineering Project 1	2(1-3-3)
		CERCC121 Pre-Engineering Project 2	2(0-6-2)
Job training (Atleast 320 hours)		**3.3 Job training**	4

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
Students in this program must pass internships with establishments that match the field of study, which is to apply the knowledge that one has learned in the program in a practical work.		CERCC116 Job training	4(0-40-0)
		CERCC117 Job training 1	2(0-20-0)
		CERCC118 Job training 2	2(0-20-0)
Free Elective Courses	6	**Free Elective Courses**	10
Programs available for Free Elective Foreign Language Courses			
13136009 Basic Chinese	3(2-2-5)		
13136010 Intermediate Chinese	3(2-2-5)		
13136011 Basic Japanese	3(2-2-5)		
13136012 Intermediate Japanese	3(2-2-5)		
13126013 Principles of English Writing	3(2-2-5)		
13126014 Principles of English Pronunciation	3(2-2-5)		
Students can choose to study courses offered under a Certificate in Vocational Education Program by College of Integrated Science and Technology.		Students can choose to study according to their aptitudes and interests from courses offered in core courses under a Certificate in Vocational Education Program 2022.	

Certificate in Vocational Education Engineering Preparation Program Year 2008		Certificate in Vocational Education Engineering Preparation Program Year 2022	
		However, the institutes can develop, adjust, change free elective courses to meet their contexts and community requirements.	
Extracurricular Activities 2 Hours/Week		**Extracurricular Activities 2 Hours/Week**	
51001001 Activity for Intelligent Creation	0(0-2-4)		
51001002 Activity for Emotional Quotient and Ethics	0(0-2-4)		
51001003 Activity for Holistic Health	0(0-2-4)		
51001004 Activity for Community Wisdom	0(0-2-4)		
51001005 Activity for Learning Innovation	0(0-2-4)		
51001006 Activity for Volunteer Mind	0(0-2-4)		
		CERCC503 Art of Living	0(0-2-1)
		CERCC504 Happiness in Lifelong Learning	0(0-2-1)
		CERCC505 Health for Life	0(0-2-1)
		CERCC506 Wisdom and Way of Live Value	0(0-2-1)
		CERCC507 Social Innovation	0(0-2-1)
		CERCC508 Leadership of Happiness	0(0-2-1)

Appendix B

Conformity Analysis Table between Professional Competencies and Courses

Certificate in Vocational Education 2022 Engineering Preparation Program

Vocational-based Competencies	Course		
	Code	Course	Credits
1. Knowledge in areas :			
1) General principles of specific occupations and their preliminary analysis.	CERCC104	Introduction to Engineering Profession	2(1-2-3)
2) Decision making principles, planning, and problem solving.	CERCC115	Scientific Project-based Learning 2	3(2-3-5)
3) Principles of tools and equipment selection for career.	CERCC105	Materials Science	2(2-0-4)
4) Principles of using information technology.	CERCC108	Computer and Information Technology	2(1-2-3)
5) Principles of career management.	CERCC502	Entrepreneurship	2(1-2-3)
2. Skills in areas :			
1) Select and apply basic methods, tools, and materials in work operations.	CERCC101	Basic Engineering Training	3(1-6-4)
	CERCC102	Technical Drawing for Engineering	2(1-2-3)
	CERCC103	Basic construction Engineering	2(1-3-3)
	CERCC106	Basic Electric and Electronics	2(1-3-3)
2) Basic occupational skills and specific tasks according to the established scheme.	CERCC107	Sheet Metal Welding	2(1-3-3)
3) Thinking skills, analytical thinking, and problem solving in work operations.	CERCC112	Scientific Project-based Learning 1	3(2-3-5)

Vocational-based Competencies	Course		
	Code	Course	Credits
4) Skills in using computer and information technology for lifelong learning.	CERCC109	Data Communication System and Networking	2(1-2-3)
5) Skills in occupational health and safety in work operations.	CERCC501	Occupational Health and Safety	2(2-0-4)
3. The ability to apply responsibility in areas :			
1) Plan, operate works according to work principles and processes concerning standards management, environment preservation, occupational health, safety, and related laws.	CERCC111	Energy and Environment	2(2-0-4)
	CERCC501	Occupational Health and Safety	2(2-0-4)
	CERCC115	Scientific Project-based Learning 1	3(2-3-5)
2) Perform basic work operations in the field of industrial technicians in accordance with principles and processes.	CECSC105	Basic Electrics and Electronics	2(1-2-3)
	CERCC107	Sheet Metal Welding	2(1-3-3)
3) Select and maintain tools, materials, equipment in work operations according to principles and processes concerning the economy and safety.	CERCC105	Materials Sciences	2(2-0-4)
	CERCC113	Scientific Project-based Learning 2	3(2-3-5)
4) Apply computer technology and information for career development and support.	CERCC110	Computer Programming	2(1-2-3)
Civil Technology			
1) Select materials and equipment for civil construction correctly and appropriate to the nature of the work.	CEREN101	Construction Materials	2(2-0-4)

Vocational-based Competencies	Course		
	Code	Course	Credits
2) Read and write drawings by applying computer knowledge in civil drawings.	CEREN102	Construction Drawing	2(1-3-3)
	CEREN105	Computer-Aided Design and Drafting	2(1-3-3)
3) Work on woodworks, masonry works, steel works and civil work surveys.	CEREN104	Construction Techniques	2(1-3-3)
	CEREN106	Concrete Technology	2(1-3-3)
	CEREN107	Surveying	2(1-3-3)
4) Make decisions, plan, and solve problems in civil works.	CEREN108	Fundamental Structures	2(2-0-4)
	CEREN109	Cost estimation	2(2-0-4)
	CEREN111	construction Law	2(2-0-4)
5) Integrate knowledge and skills in civil works in the production of a piece or invention.	CEREN103	Structure Model	2(1-3-3)
	CEREN110	Sanitary System	2(1-3-3)
	CEREN112	Building Electrical	2(1-3-3)
Mechanical Technology			
1) Select materials and tools associated to mechanical technology appropriately according to work nature.	CEREN210	Pneumatics and Hydraulics	2(1-3-3)
	CEREN208	Mechanics and Machinery	2(1-3-3)
	CEREN215	Automotive Technology	2(1-3-3)
2) Inspect, maintain, and store tools and equipment correctly.	CEREN212	Machine Tools Maintenance	2(1-3-3)
	CEREN209	Industrial Electrical	2(1-3-3)
	CEREN213	Refrigeration and Air conditioning	2(1-3-3)
	CEREN214	Fan Pump Compressor and Piping System	2(1-3-3)
3) Calibrate the measuring instruments to the standards.	CEREN202	Detailed Measurement work	2(1-3-3)

Vocational-based Competencies	Course		
	Code	Course	Credits
4) Read mechanical drawings and standard symbols in accordance with principles.	CEREN207	Computer-Aided Design and Drafting	2(1-3-3)
	CEREN204	Machine Drawing	2(1-3-3)
5) Adjust, process, and form workpieces with machine tools.	CEREN206	Machine Tools	2(0-6-2)
	CEREN201	Manufacturing Process	2(2-0-4)
6) Write basic NC and CNC programs.	CEREN211	CNC Machine Tools	2(0-6-2)
7) Inspect workpieces using measuring tools and the maintenance of machinery.	CEREN205	Mechanical Parts	2(2-0-4)
8) Integrate knowledge and skills related to industrial mechanics for the production of workpieces and inventions.	CEREN203	Engineering Materials	2(2-0-4)
	CEREN216	Sheet Metal and Piping	2(1-3-3)
Electrical Technology			
1) Make decisions, plan, and solve problems in occupations that are out of control.	CERCC119	Engineering Project	4(0-12-4)
	CERCC120	Engineering Project 1	2(1-3-3)
	CERCC121	Engineering Project 2	2(0-6-2)
2) Apply knowledge and skills in the professions, technology, information and communication for problem-solving and electrical operations.	CEREN309	Fundamental of Telecommunication Systems	2(2-0-4)
3) Provide basic advice for decision making and work operation for colleagues.	CEREN401	Electrical Circuits	2(1-3-3)
4) Appropriately select materials, tools, and equipment for electrical operations.	CEREN302	DC circuits	2(1-3-3)
	CEREN301	Electronic Devices and Circuits	2(1-3-3)
	CEREN304	AC Circuits	2(1-3-3)
	CEREN305	Digital Circuits	2(1-3-3)

Vocational-based Competencies	Course		
	Code	Course	Credits
5) Read and write drawings and estimate the cost for standard electrical installment.	CEREN313	Electrical Drawing	2(1-3-3)
	CEREN306	Fundamental and Application of Photovoltaic Systems	2(1-3-3)
6) Operate wiring according to the specified design.	CEREN303	Practice Wiring and Transformers	2(1-3-3)
7) Install, test, and maintain electrical devices according to standards.	CEREN209	Industrial Electrical	2(1-3-3)
	CEREN308	D.C. Electrical Machine	2(1-3-3)
	CEREN310	A.C. Electrical Machine	2(1-3-3)
8) Integrate knowledge and skills in electrical for the production of workpieces or inventions.	CEREN306	Fundamentals and Applications of Photovoltaic Systems	2(1-3-3)
	CEREN307	Microcontroller and Sensor	2(1-3-3)
	CEREN311	Programable Logic Control	2(1-3-3)
	CEREN312	Basic Automatic Controls	2(1-3-3)
	CEREN210	Pneumatics and Hydraulics	2(1-3-3)
Mechatronics Technology			
1) Apply knowledge and skills in computer for drawings and analyzing mechatronics works.	CEREN207	Computer-Aided Designing and Drafting	2(1-3-3)
	CEREN406	Computer-Aided for Engineering Analysis	2(1-3-3)
	CEREN407	Internet of Things	2(1-3-3)
2) Apply knowledge of electrical and electronics in the control of mechatronic systems.	CEREN209	Industrial Electrical	2(1-3-3)
	CEREN401	Electrical Circuits	2(1-3-3)
	CEREN311	Programmable Logic Control	2(1-3-3)

Vocational-based Competencies	Course		
	Code	Course	Credits
	CEREN210	Pneumatics and Hydraulics	2(1-3-3)
	CEREN301	Electronics Devices and Circuits	2(1-3-3)
	CEREN305	Digital Circuits	2(1-3-3)
	CEREN307	Microcontroller and Sensor	2(1-3-3)
3) Select materials, tools, and equipment to create workpieces with automatic machines according to the nature of work.	CEREN208	Mechanics and Machinery	2(1-3-3)
	CEREN402	Basic Machine Tools	2(1-3-3)
	CEREN404	Electrical Machine and Control	2(1-3-3)
	CEREN205	Mechanical Parts	2(2-0-4)
	CEREN206	Machine Tools	2(0-6-2)
	CEREN211	CNC Machine Tool	2(0-6-2)
	CEREN312	Basic Automatic Controls	2(1-3-3)
4) Make decisions, plan, and solve problems in mechatronics.	CEREN201	Manufacturing Processes	2(2-0-4)
5) Integrate knowledge and skills in mechatronics in the production of workpieces or inventions.	CEREN405	Basic Robot	2(1-3-3)

Appendix C

College of Integrated Science and Technology Order No. 004/2564 on the Appointment of the Committee for Development and Improvement of Vocational Certificate Programs

คำสั่ง วิทยาลัยเทคโนโลยีและสหวิทยาการ
มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ที่ ๐๐๔/๒๕๖๔
เรื่อง แต่งตั้งคณะกรรมการพัฒนาและปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.)

ด้วย วิทยาลัยเทคโนโลยีและสหวิยาการ จะดำเนินการพัฒนาและปรับปรุงหลักสูตรระดับประกาศนียบัตรวิชาชีพ จำนวน ๓ หลักสูตร คือ ปวช.เตรียมวิศวกรรมศาสตร์ ปวช.เตรียมบริหารธุรกิจ และ ปวช.เตรียมสถาปัตยกรรมศาสตร์ ตามประกาศคณะกรรมการการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ เพื่อใช้ในปีการศึกษา ๒๕๖๔

ดังนั้น เพื่อให้การดำเนินการพัฒนาและปรับปรุงรายละเอียดของหลักสูตรระดับประกาศนียบัตรวิชาชีพ หลักสูตร พ.ศ.๒๕๖๔ เป็นไปด้วยความเรียบร้อย มีประสิทธิภาพและ บรรลุตามวัตถุประสงค์ของมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ฉะนั้น อาศัยอำนาจตามความในมาตรา ๔๒ แห่งพระราชบัญญัติมหาวิทยาลัยเทคโนโลยีราชมงคล พ.ศ. ๒๕๔๘ จึงแต่งตั้งคณะกรรมการพัฒนาหลักสูตรตามกรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒ และเกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ จึงขอแต่งตั้งคณะกรรมการดำเนินงาน ดังต่อไปนี้

๑. **คณะกรรมการอำนวยการ**

๑.	ผู้อำนวยการวิทยาลัยเทคโนโลยีและสหวิทยาการ	ประธานกรรมการ
๒.	รองผู้อำนวยการวิทยาลัยเทคโนโลยีและสหวิทยาการ	กรรมการ
๓.	หัวหน้าหลักสูตร ปวช.เตรียมวิศวกรรมศาสตร์	กรรมการ
๔.	หัวหน้าหลักสูตร ปวช.เตรียมบริหารธุรกิจ	กรรมการ
๕.	หัวหน้าหลักสูตร ปวช.เตรียมสถาปัตยกรรมศาสตร์	กรรมการ
๖.	หัวหน้ากลุ่มวิชาศึกษาทั่วไป	กรรมการ
๗.	นักวิชาการศึกษา รับผิดชอบงานพัฒนาหลักสูตร	กรรมการและเลขานุการ

<u>หน้าที่รับผิดชอบ</u>

๑) กำหนดนโยบายแผนการดำเนินงานการจัดทำหลักสูตร

๒) อำนวยการ และให้คำปรึกษาด้านต่าง ๆ เพื่อให้การจัดทำหลักสูตรดำเนินไปด้วยความเรียบร้อยและสำเร็จลุล่วงตามวัตถุประสงค์ที่ตั้งไว้

/๓) กำกับติดตาม.....

๓) กำกับติดตามการดำเนินงานการจัดทำหลักสูตรให้เป็นไปตามกรอบมาตรฐานคุณวุฒิอาชีวศึกษาแห่งชาติ และนโยบายที่มหาวิทยาลัย และวิทยาลัยฯ กำหนด

๔) ควบคุมดูแลและกำกับติดตามการดำเนินงานของคณะกรรมการดำเนินงานให้เป็นไปตามแผนที่กำหนด

๒. คณะกรรมการที่ปรึกษาและผู้ทรงคุณวุฒิวิพากษ์หลักสูตร

ปวช.เตรียมวิศวกรรมศาสตร์

๑. รองศาสตราจารย์ณฐา	คุปตัษเฐียร	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. นายอิศราพงศ์	สินันตา	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. นายอรรถการ	ตฤษณารังสี	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายศักดิ์ชัย	ทองพันชั่ง	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

ปวช.เตรียมบริหารธุรกิจ

๑. นายศฐา	วรุณกูล	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. ผู้ช่วยศาสตราจารย์ภูษณิศา	เตชะเถกิง	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. นายวรวิทย์	เลาหะเมฆนี	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายฉัตรชัย	วีไลรัตนสุวรรณ	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

ปวช.เตรียมสถาปัตยกรรมศาสตร์

๑. ผู้ช่วยศาสตราจารย์กานต์	คำแก้ว	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. ผู้ช่วยศาสตราจารย์สิทธิโรจน์	เลิศอนันต์พิพัฒน์	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. ผู้ช่วยศาสตราจารย์วิทยา	ดวงธิมา	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายชวัญชัย	สุธรรมชาว	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

หน้าที่รับผิดชอบ

๑) ให้คำปรึกษาด้านต่าง ๆ เพื่อให้การจัดทำหลักสูตรดำเนินไปด้วยความเรียบร้อย และสำเร็จลุล่วงตามวัตถุประสงค์ที่ตั้งไว้

๒) พัฒนาหลักสูตรให้เป็นไปตามกรอบมาตรฐานคุณวุฒิอาชีวศึกษาแห่งชาติ และนโยบายที่มหาวิทยาลัย และวิทยาลัยฯ กำหนด

๓) วิพากษ์ ปรับปรุง และให้ข้อเสนอแนะสำหรับการจัดทำและพัฒนาหลักสูตร

/๓. คณะกรรมการดำเนินงาน.....

๓) กำกับติดตามการดำเนินงานการจัดทำหลักสูตรให้เป็นไปตามกรอบมาตรฐานคุณวุฒิอาชีวศึกษาแห่งชาติ และนโยบายที่มหาวิทยาลัย และวิทยาลัยฯ กำหนด

๔) ควบคุมดูแลและกำกับติดตามการดำเนินงานของคณะกรรมการดำเนินงานให้เป็นไปตามแผนที่กำหนด

๒. คณะกรรมการที่ปรึกษาและผู้ทรงคุณวุฒิวิพากษ์หลักสูตร

ปวช.เตรียมวิศวกรรมศาสตร์

๑. รองศาสตราจารย์เณฐา	คุปตัษเฐียร	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. นายอิศราพงศ์	สินันตา	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. นายอรรถการ	ดฤษณารังสี	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายศักดิ์ชัย	ทองพันชั่ง	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

ปวช.เตรียมบริหารธุรกิจ

๑. นายศุฐา	วรุณกูล	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. ผู้ช่วยศาสตราจารย์ภูษณิศา	เตชะเถกิง	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. นายวรวิทย์	เสาหะแมทนี	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายฉัตรชัย	วิไลรัตนสุวรรณ	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

ปวช.เตรียมสถาปัตยกรรมศาสตร์

๑. ผู้ช่วยศาสตราจารย์กานต์	คำแก้ว	กรรมการผู้ทรงคุณวุฒิด้านวิชาการ
๒. ผู้ช่วยศาสตราจารย์สิทธิโรจน์	เลิศอนันต์พิพัฒน์	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๓. ผู้ช่วยศาสตราจารย์วิทยา	ดวงธิมา	กรรมการผู้ทรงคุณวุฒิด้านผู้ใช้ผู้สำเร็จการศึกษา
๔. นายชวัญชัย	สุธรรมชาว	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ
๕. นายณัฐพงศ์	แดงหล้า	กรรมการผู้ทรงคุณวุฒิด้านวิชาชีพ

หน้าที่รับผิดชอบ

๑) ให้คำปรึกษาด้านต่าง ๆ เพื่อให้การจัดทำหลักสูตรดำเนินไปด้วยความเรียบร้อย และสำเร็จลุล่วงตามวัตถุประสงค์ที่ตั้งไว้

๒) พัฒนาหลักสูตรให้เป็นไปตามกรอบมาตรฐานคุณวุฒิอาชีวศึกษาแห่งชาติ และนโยบายที่มหาวิทยาลัย และวิทยาลัยฯ กำหนด

๓) วิพากษ์ ปรับปรุง และให้ข้อเสนอแนะสำหรับการจัดทำและพัฒนาหลักสูตร

/๓. คณะกรรมการดำเนินงาน.....

๓. คณะกรรมการดำเนินงาน

ปวช.เตรียมวิศวกรรมศาสตร์

๑. นายสิทธิศักดิ์	ยี่ยวน	ประธานกรรมการ
๒. ผู้ช่วยศาสตราจารย์อดิศร	กวาวสิบสาม	รองประธานกรรมการ
๓. ผู้ช่วยศาสตราจารย์วิสูตร	อาสนวิจิตร	กรรมการ
๔. นายพิเชษฐ์	โค้วตระกูล	กรรมการ
๕. นายกิตติ	เอี่ยมเปรมจิต	กรรมการ
๖. นายวัชรพงศ์	โพธา	กรรมการ
๗. นายศิขรินทร์	มัลลิกาวงศ์	กรรมการ
๘. นายบวรศักดิ์	สมเคราะห์	กรรมการ
๙. นายกัมปนาท	แสงสุวรรณ	กรรมการ
๑๐.นางสาวทิพยภาวรรณ	ต้นอ้วน	กรรมการและเลขานุการ

ปวช.เตรียมบริหารธุรกิจ

๑. นายต้นวงศ์	ปรีชานนท์	ประธานกรรมการ
๒. นางสาววนัลลุดา	คำพุฒ	รองประธานกรรมการ
๓. นางสาวกาญจนา	ใบวุฒิ	กรรมการ
๔. นางสาวช่อทิพย์	นิมิตรกุล	กรรมการ
๕. นางสาวปวียา	รักนิ่ม	กรรมการ
๖. นายคทาชา	ศรีฟ้าเลื่อน	กรรมการและเลขานุการ

ปวช.เตรียมสถาปัตยกรรมศาสตร์

๑. นายวีระศักดิ์	สวนจันทร์	ประธานกรรกรรมการ
๒. นายกอปรพร	นุกูลคาม	รองประธานกรรมการ
๓. นายนัฐพงษ์	ไชยสารพุ่น	กรรมการ
๔. นายธัชพล	เปียทิพย์	กรรมการ
๕ นางสาวพรพิมล	ช่วงชัย	กรรมการและเลขานุการ

หน้าที่รับผิดชอบ

๑) วางแผนในการจัดทำหลักสูตรให้บรรลุตามวัตถุประสงค์ที่ตั้งไว้

๒) จัดทำข้อมูลรายวิชาและร่างหลักสูตรให้เป็นไปตามกรอบมาตรฐานคุณวุฒิอาชีวศึกษาแห่งชาติ และนโยบายที่มหาวิทยาลัย และวิทยาลัยฯ กำหนด

๓) งานอื่น ๆ ตามที่ได้รับมอบหมาย

/๔. คณะกรรมการบรรณาธิการกิจ.....

๔. คณะกรรมการบรรณาธิการกิจและประสานงาน

๑. หัวหน้าสาขาโรงเรียนเตรียมอุดมศึกษาเทคโนโลยี		ประธานกรรมการ
๒. นายนิพนธ์	เชื้อนแก้ว	กรรมการ
๓. นางสาววรรณนิพา	มหาไม้	กรรมการ
๔. นายธนากร	นาเมืองรักษ์	กรรมการ
๕. นางสาววีรินทร์ภัทร์	สมพมิตร	กรรมการ
๖. นางสาวคศิรดี	พานชาตรี	กรรมการ
๗. นางสาวอรพรรณ	บามพิชัย	กรรมการและเลขานุการ

หน้าที่รับผิดชอบ

๑) รวบรวมข้อมูลเพื่อจัดทำเล่มหลักสูตรตามแบบฟอร์มของมหาวิทยาลัย
๒) ติดต่อประสานงานกับฝ่ายต่าง ๆ ที่เกี่ยวข้อง
๓) ตรวจสอบความถูกต้องของข้อมูลและอักขระในเล่มหลักสูตร
๔) งานอื่น ๆ ตามที่ได้รับมอบหมาย

สั่ง ณ วันที่ ๒๔ มกราคม ๒๕๖๔

(นายนพดล มณีเขียร)
ผู้อำนวยการวิทยาลัยเทคโนโลยีและสหวิทยาการ

Appendix D

The Resolution of College of Integrated Science and Technology's Executive Committee in its special meeting no. 2, May 2021. on May 14, 2021.

มติคณะกรรมการบริหารวิทยาลัยเทคโนโลยีและสหวิทยาการ
วาระพิเศษ ครั้งที่ ๒ เดือนพฤษภาคม ๒๕๖๔ (วันที่ ๑๔ พฤษภาคม พ.ศ. ๒๕๖๔)

ระเบียบวาระ ที่ ๕ เรื่องเสนอเพื่อพิจารณา
๕.๒ การแก้ไขเล่มหลักสูตรระดับประกาศนียบัตรวิชาชีพ (ปวช.) ตามข้อเสนอแนะจากกรรมการสภาวิชาการ มทร.ล้านนา ครั้งที่ ๑๖๒ (พ.ค.๖๔)

ตามที่ คณะกรรมการจัดทำหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมบริหารธุรกิจ สาขาวิชาเตรียมวิศวกรรมศาสตร์ และสาขาวิชาเตรียมสถาปัตยกรรมศาสตร์ ได้แก้ไขตามข้อเสนอแนะของกรรมการสภาวิชาการเป็นที่เรียบร้อยแล้ว ดังตารางแนบท้าย

ทั้งนี้ นายดันวงศ์ ปรีชานนท์ หัวหน้าสาขาโรงเรียนเตรียมอุดมศึกษาเทคโนโลยี ได้นัดหมายหัวหน้าหลักสูตรระดับประกาศนียบัตรวิชาชีพ (ปวช.) เพื่อหารือในการแก้ไขเล่มหลักสูตรตามข้อเสนอแนะจากกรรมการอีกครั้ง และนายนพดล มณีเทียร ผู้อำนวยการวิทยาลัยฯ ได้นัดหมาย ดร.จิรพร วิทยศักดิ์พันธุ์ กรรมการสภาวิชาการผู้ทรงคุณวุฒิ มทร.ล้านนา เพื่อขอข้อแนะนำในการแก้ไขและเป็นที่ปรึกษาในเรื่องของคำอธิบายรายวิชาภาษาอังกฤษ ร่วมกับอาจารย์ประจำกลุ่มภาษาอังกฤษและอาจารย์ผู้จัดทำหลักสูตรระดับ ปวช.

มติที่ประชุม

เห็นชอบ และมอบหมาย ดังนี้

๑. ให้แต่ละหลักสูตรปรับแก้ตามข้อเสนอแนะของคณะกรรมการสภาวิชาการ มทร.ล้านนา
๒. หลังจากที่มีการปรับแก้ตามข้อเสนอแนะของคณะกรรมการสภาวิชาการ มทร.ล้านนาแล้ว ให้แต่ละหลักสูตรนำเล่มหลักสูตรมาดำเนินการตรวจสอบอีกครั้ง ก่อนนำเสนอที่ประชุมสภาวิชาการ ครั้งที่ ๑๖๓ (มิ.ย. ๖๔)
๓. มอบหมายอาจารย์ประจำกลุ่มวิชาศึกษาทั่วไป (ภาษาต่างประเทศ) ตรวจสอบคำอธิบายรายวิชาภาษาอังกฤษให้มีความถูกต้องตามหลักไวยกรณ์ และชัดเจนมากยิ่งขึ้น
๔. มอบงานวิชาการเสนอเรื่องเพื่อบรรจุเข้าระเบียบวาระประชุมสภาวิชาการ ครั้งที่ ๑๖๓ (มิ.ย.๖๔)

(นางสาวธมนวรรณ จิตบาล)
ผู้ช่วยเลขานุการคณะกรรมการบริหารวิทยาลัยฯ
ผู้บันทึกรายงานการประชุม

(นายพงศกร สงวนศักดิ์)
เลขานุการคณะกรรมการบริหารวิทยาลัยฯ
ผู้ตรวจรายงานการประชุม

Appendix D (Continued)

The resolution of Rajamangala University of Technology Lanna's Academic Council no. 163 on 10 June 2021.

มติสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ครั้งที่ ๑๖๓ (มิ.ย. ๖๔)
วันพฤหัสบดีที่ ๑๐ มิถุนายน ๒๕๖๔
ณ ประชุมผ่านสื่ออิเล็กทรอนิกส์ (Microsoft Teams)

ระเบียบวาระที่ ๓ เรื่องสืบเนื่อง

๓.๒ <u>พิจารณาให้ความเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) วิทยาลัยเทคโนโลยีและสหวิทยาการ</u>

สืบเนื่องจากการประชุมสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ครั้งที่ ๑๖๒ (พ.ศ. ๖๔) ในวันพฤหัสบดีที่ ๖ พฤษภาคม ๒๕๖๔ ว่าด้วยเรื่อง พิจารณาให้ความเห็นชอบหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) ทั้งนี้ วิทยาลัยเทคโนโลยีและสหวิทยาการ ได้ดำเนินการปรับปรุงแก้ไขตามข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ นั้น

ทั้งนี้ การพัฒนาหลักสูตรให้สอดคล้องกับยุทธศาสตร์มหาวิทยาลัย ควรมีการปฏิบัติรูปการเรียนการสอนให้มีลักษณะบูรณาการเพื่อการเรียนรู้ และมีนวัตกรรมการเรียนการสอนที่ดี ดังนั้น วิทยาลัยและเทคโนโลยีสหวิทยาการ จึงมีความจำเป็นที่จะต้องมีการพัฒนารายวิชาและกิจกรรมเสริมหลักสูตรเพื่อให้นักศึกษาสามารถเรียนรู้ด้วยตนเอง เป็นผู้มีคุณธรรม จริยธรรม ใฝ่รู้ และรับผิดชอบต่อสังคม รวมไปถึงการพัฒนาหลักสูตรในการเสริมสร้างความรู้และทักษะของนักศึกษาให้เป็นผู้ประกอบการที่ทันต่อสถานการณ์ที่เปลี่ยนแปลงในปัจจุบัน และเป็นไปตามประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒

วิทยาลัยเทคโนโลยีและสหวิทยาการ หลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ จึงได้ดำเนินการพัฒนาและปรับปรุงหลักสูตรฯ เพื่อพัฒนาการจัดการศึกษาวิชาชีพด้านวิทยาศาสตร์และเทคโนโลยี และมุ่งเน้นผลิตผู้สำเร็จการศึกษาที่มีทักษะ คุณธรรม จริยธรรม พึ่งพาตนเองได้ และเป็นที่พึ่งทางวิชาการให้กับสังคมและท้องถิ่น อีกทั้งเป็นการปรับปรุงหลักสูตรให้มีเนื้อหาที่ทันสมัย เป็นไปตามแนวนโยบายการจัดการอาชีวศึกษาของประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒ และประกาศคณะกรรมการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ ในการตอบสนองความต้องการของสถานประกอบการ ตลาดแรงงาน ชุมชนและท้องถิ่น ตลอดจนสอดคล้องกับคุณลักษณะของบัณฑิตที่พึงประสงค์ของมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

ข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ

๑. ปรับปรุงปรัชญาของหลักสูตร ให้สอดคล้องกับวัตถุประสงค์ของหลักสูตร โดยให้มีความโดดเด่นและเป็นเอกลักษณ์ เพื่อเป็นการยกระดับของหลักสูตรให้มีประสิทธิภาพ และนำไปสู่การผลิตบัณฑิตที่มีคุณภาพตรงกับความต้องการของตลาดแรงงานได้

ปรับปรุงวัตถุประสงค์ของหลักสูตร ในข้อที่ (๓) ให้มีความโดดเด่นและเป็นเอกลักษณ์ รวมไปถึงการยกระดับของหลักสูตรให้มีประสิทธิภาพ และนำไปสู่การผลิตบัณฑิตที่มีคุณภาพตรงกับความต้องการของตลาดแรงงานได้ อาทิเช่น

จากเดิม ความรู้ ความเข้าใจเกี่ยวกับสังคม สิ่งแวดล้อม วัฒนธรรม ภูมิปัญญาท้องถิ่น เกิดการบูรณาการศาสตร์ **เพื่อการสร้าง** สิ่งประดิษฐ์และการนำเสนอผลงาน

เปลี่ยนเป็น ความรู้ ความเข้าใจเกี่ยวกับสังคม สิ่งแวดล้อม วัฒนธรรม ภูมิปัญญาท้องถิ่น เกิดการบูรณาการศาสตร์ **เพื่อการสรรค์สร้าง** สิ่งประดิษฐ์และการนำเสนอผลงาน

๒. ปรับปรุงวิธีการคัดเลือกผู้เข้าศึกษา ระบบการศึกษา การคิดหน่วยกิตและการสำเร็จการศึกษาให้เป็นไปในทิศทางเดียวกันทั้ง ๓ หลักสูตร ของการเปิดสอนหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.)

๓. ทบทวนการปรับปรุงการเขียนชื่อรายวิชาภาษาอังกฤษ ให้สอดคล้องกับชื่อรายวิชาภาษาไทย อาทิเช่น

๓.๑ รายวิชา CEREN๑๐๓ การฝึกพื้นฐานทางวิศวกรรม

๓.๒ รายวิชา CEREN๑๐๔ พื้นฐานการเขียนแบบวิศวกรรม

๔. ทบทวนการปรับปรุงชื่อรายวิชา จุดประสงค์รายวิชา สมรรถนะรายวิชา และคำอธิบายรายวิชา GECSC๒๐๓ คณิตศาสตร์เพื่องานอาชีพ ๑ และ GECSC๒๐๓ คณิตศาสตร์เพื่องานอาชีพ ๒

๕. ทบทวนการกำหนดชื่อรายวิชาภาษาอังกฤษให้สอดคล้องภาษาไทย ของรายวิชา CEREN๑๔๖ ชิ้นส่วนเครื่องจักรกล

๖. ปรับปรุงวัตถุประสงค์ สมรรถนะรายวิชา และคำอธิบายรายวิชา ในการจัดการเรียนการสอนรายวิชา GECSC๑๐๓ เทอร์โมฟลูอิดเบื้องต้น อาทิเช่น

จากเดิม

คำอธิบายรายวิชา ศึกษาและปฏิบัติเกี่ยวกับสมบัติของของไหลและ**พลศาสตร์ของไหล** สมการเบอร์นูลี พลังงานความร้อน การถ่ายโอนความร้อน การขยายตัวของวัตถุ เนื่องจากความร้อน พลังงานภายในระบบ กฎข้อที่ศูนย์และหนึ่งของเทอร์โมไดนามิกส์

เปลี่ยนเป็น คำอธิบายรายวิชา ศึกษาและปฏิบัติเกี่ยวกับสมบัติของของไหล **สถิศาสตร์ของไหล พลศาสตร์ของไหล** สมการเบอร์นูลี พลังงานความร้อน การถ่ายโอนความร้อน การขยายตัวของวัตถุเนื่องจากความร้อน พลังงานภายในระบบ สมดุลความร้อน

๗. ปรับปรุงข้อมูล ข้อ ๑๗.๒ (หน้า ๔๑) ข้อ ๑) กลุ่มวิชาภาษาไทย โดยตรวจสอบการเขียนจำนวนหน่วยกิต เนื่องจาก เป็นข้อมูลที่ไม่ตรงกัน

๘. ปรับปรุงรายวิชา CEREN๑๑๗ การเรียนรู้โดยใช้โครงงานเป็นฐาน ด้านวิศวกรรมศาสตร์ ๒ ดังนี้

๘.๑ ตรวจสอบการเขียนชื่อรายวิชาภาษาอังกฤษ

จากเดิม การเรียนรู้โดยใช้โครงงานเป็นฐาน ด้านวิศวกรรมศาสตร์ ๒ (Engineering Project – Based Learning ๒)

เปลี่ยนเป็น การเรียนรู้โดยใช้โครงงานเป็นฐาน ด้านวิศวกรรมศาสตร์ ๒ (Engineering Project – Based Learning ๒)

๘.๒ ปรับปรุงการเขียนคำอธิบายรายวิชาให้มีความชัดเจน รวมทั้งคำอธิบายรายวิชาภาษาอังกฤษให้ถูกต้องตามหลักไวยากรณ์

๙. ทบทวนการปรับปรุงคำอธิบายรายวิชา CEREN๑๑๙ การเขียนแบบโยธา ดังนี้

จากเดิม **ศึกษา**เกี่ยวกับเครื่องมือและอุปกรณ์ในงานเขียนแบบโยธา หลักการและขั้นตอนการเขียนแบบโยธา สัญลักษณ์ของวัสดุและเครื่องหมายที่ใช้ในการเขียนแบบ วิธีการและหลักการเขียนแบบสถาปัตยกรรมอาคารพักอาศัยชั้นเดียว วิธีการและหลักการเขียนแบบวิศวกรรมอาคารพักอาศัยชั้นเดียว วิธีการและหลักการเขียนแบบไฟฟ้าและสุขาภิบาลอาคารพักอาศัยชั้นเดียว รายการประกอบแบบก่อสร้างอาคารพักอาศัยชั้นเดียว

เปลี่ยนเป็น **ให้เรียนรู้**เกี่ยวกับเครื่องมือและอุปกรณ์ในงานเขียนแบบโยธา หลักการและขั้นตอนการเขียนแบบโยธา สัญลักษณ์ของวัสดุและเครื่องหมายที่ใช้ในการเขียนแบบ วิธีการและหลักการเขียนแบบสถาปัตยกรรมอาคารพักอาศัยชั้นเดียว วิธีการและหลักการเขียนแบบวิศวกรรมอาคารพักอาศัยชั้นเดียว วิธีการและหลักการเขียนแบบไฟฟ้าและสุขาภิบาลอาคารพักอาศัยชั้นเดียว รายการประกอบแบบก่อสร้างอาคารพักอาศัยชั้นเดียว

๑๐. ทบทวนการปรับปรุงสมรรถนะรายวิชา โดยเพิ่มเติมทักษะและความรู้ให้มีความสอดคล้องกับการจัดการการเรียนการสอน อาทิเช่น

จากเดิม เลือกเครื่องมือ

เปลี่ยนเป็น เลือกและใช้เครื่องมือ

๑๑. กรณีการกำหนดชื่อรายวิชาไม่ควรให้มีคำว่า "งาน" มาเป็นส่วนประกอบ

๑๒. ตรวจทานแบบฟอร์มและรูปแบบการเขียนในการจัดทำข้อมูลของเล่มหลักสูตรให้เป็นไปในทิศทางเดียวกันทั้ง ๓ หลักสูตร ของการเปิดสอนหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) และเป็นไปตามที่มหาวิทยาลัยกำหนด

๑๓. ทบทวนกระบวนการคิด กระบวนการทำงาน และการเรียบเรียงการเขียนคำอธิบายรายวิชาให้มีความสอดคล้องกัน

๑๔. <u>ทบทวนการเขียนชื่อรายวิชาภาษาอังกฤษ คำอธิบายรายวิชาภาษาไทยและคำอธิบายรายวิชาภาษาอังกฤษให้มีความถูกต้องตามหลักไวยกรณ์ และให้เกิดความชัดเจนมากยิ่งขึ้น รวมไปถึงควรมีการตรวจทานความถูกต้องจากผู้เชี่ยวชาญอีกครั้ง</u>

๑๕. ทบทวนการประมาณการค่าใช้จ่ายงบประมาณ โดยให้มีการวิเคราะห์ต้นทุนต่อหน่วยให้มีความสอดคล้องกับความเป็นจริง

มติสภาวิชาการ มทร. ล้านนา ที่ประชุมเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) โดยมอบหมายให้วิทยาลัยเทคโนโลยีและสหวิทยาการดำเนินการปรับปรุงแก้ไขตามข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ และนำเสนอต่อคณะอนุกรรมการเกี่ยวกับวิชาการการส่งเสริมและพัฒนางานวิจัยต่อไป

ว่าที่ร้อยโท

(ผู้ช่วยศาสตราจารย์ ณัฐรัตน์ ปาณานนท์)

เลขานุการสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

Appendix D (Continued)

The resolution of Rajamangala University of Technology Lanna's academic and research development subcommittee in its meeting no. 5/ 2011 on 8 July 2011.

มติคณะอนุกรรมการเกี่ยวกับวิชาการ การส่งเสริมการวิจัยและพัฒนางานวิจัย
มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ครั้งที่ ๕/๒๕๖๔
วันพฤหัสบดีที่ ๘ กรกฎาคม ๒๕๖๔ เวลา ๑๓.๓๐ – ๑๖.๓๐ น.
ณ การประชุมผ่านสื่ออิเล็กทรอนิกส์ Zoom

ระเบียบวาระที่ ๕
เรื่อง เสนอเพื่อพิจารณา
๕.๔ พิจารณาให้ความเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) วิทยาลัยเทคโนโลยีและสหวิทยาการ

สืบเนื่องจากการประชุมสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ครั้งที่ ๓/๖๒ (พ.ค. ๖๔) ในวันพฤหัสบดีที่ ๖ พฤษภาคม ๒๕๖๔ ว่าด้วยเรื่อง พิจารณาให้ความเห็นชอบหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) ทั้งนี้ วิทยาลัยเทคโนโลยีและสหวิทยาการ ได้ดำเนินการปรับปรุงแก้ไขตามข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ นั้น

ทั้งนี้ การพัฒนาหลักสูตรให้สอดคล้องกับยุทธศาสตร์มหาวิทยาลัย ควรมีการปฏิบัติรูปการเรียนการสอนให้มีลักษณะบูรณาการเพื่อการเรียนรู้ และมีนวัตกรรมการเรียนการสอนที่ดี ดังนั้น วิทยาลัยและเทคโนโลยีสหวิทยาการ จึงมีความจำเป็นที่จะต้องมีการพัฒนารายวิชาและกิจกรรมเสริมหลักสูตรเพื่อให้นักศึกษาสามารถเรียนรู้ด้วยตนเอง เป็นผู้มีคุณธรรม จริยธรรม ใฝ่รู้ และรับผิดชอบต่อสังคม รวมไปถึงการพัฒนาหลักสูตรในการเสริมสร้างความรู้และทักษะของนักศึกษาให้เป็นผู้ประกอบการที่ทันต่อสถานการณ์ที่เปลี่ยนแปลงในปัจจุบัน และเป็นไปตามประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒

วิทยาลัยเทคโนโลยีและสหวิทยาการ หลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ จึงได้ดำเนินการพัฒนาและปรับปรุงหลักสูตรฯ เพื่อพัฒนาการจัดการศึกษาวิชาชีพด้านวิทยาศาสตร์และเทคโนโลยี และมุ่งเน้นผลิตผู้สำเร็จการศึกษาที่มีทักษะ คุณธรรม จริยธรรม พึ่งพาตนเองได้ และเป็นที่พึ่งทางวิชาการให้กับสังคมและท้องถิ่น อีกทั้งเป็นการปรับปรุงหลักสูตรให้มีเนื้อหาที่ทันสมัย เป็นไปตามแนวนโยบายการจัดการอาชีวศึกษาของประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒ และประกาศคณะกรรมการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ ในการตอบสนองความต้องการของสถานประกอบการ ตลาดแรงงาน ชุมชนและท้องถิ่น ตลอดจนสอดคล้องกับคุณลักษณะของบัณฑิตที่พึงประสงค์ของมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

วิทยาลัยเทคโนโลยีและสหวิทยาการ จึงขอพิจารณาให้ความเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) ให้เป็นไปตามเกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ รายละเอียดดังนี้

๑. ดำเนินการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ เพื่อรองรับการรับนักศึกษาเข้าศึกษาต่อในปีการศึกษา ๒๕๖๕

๒. ดำเนินการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ โดยจัดโครงสร้างหลักสูตร ระยะเวลาการจัดการเรียนการสอนและอื่น ๆ ให้เป็นไปตามประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒

๓. ดำเนินการปรับปรุงรูปแบบและการจัดทำเอกสาร หลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ ให้เป็นไปตามคำแนะนำของกรรมการสภาวิชาการ

การพิจารณาและข้อสังเกตของกรรมการ

๑. ควรแต่งตั้งคณะกรรมการเพื่อตรวจสอบความถูกต้องของเล่มหลักสูตรทั้งเล่ม โดยเฉพาะอย่างยิ่ง รหัสวิชา ชื่อวิชา และคำอธิบายรายวิชา ทั้งภาษาไทยและภาษาอังกฤษให้ปราศจากข้อบกพร่อง สารณมารถเป็นตัวอย่างที่ดีให้กับหลักสูตรอื่นได้

๒. ปรับแบบฟอร์มให้เป็นไปตามข้อกำหนดของ สำนักมาตรฐานการอาชีวศึกษาและวิชาชีพ สำนักงานคณะกรรมการการอาชีวศึกษา (สอศ.)

มติที่ประชุม เห็นชอบในหลักการการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมบริหารธุรกิจ (หลักสูตรปรับปรุง พ.ศ. ....) มอบวิทยาลัยเทคโนโลยีและสหวิทยาการ ดำเนินการปรับปรุงตามข้อพิจารณาและข้อสังเกตกรรมการ ประสานงานกับสำนักส่งเสริมวิชาการและงานทะเบียน และนำเสนอสภามหาวิทยาลัยต่อไป

(ผู้ช่วยศาสตราจารย์สมเกียรติ วงษ์พานิช)
เลขานุการคณะอนุกรรมการเกี่ยวกับวิชาการ การส่งเสริมการวิจัยและพัฒนางานวิจัย
มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

Appendix D (Continued)

The resolution of Rajamangala University of Technology Lanna's University Council in its meeting no. 50 (11/2011) on 12 September 2021.

มติการประชุม
คณะบุคคลปฏิบัติหน้าที่แทนสภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา
ครั้งที่ ๕๐(๑๑/๒๕๖๔) (ผ่านสื่ออิเล็กทรอนิกส์)
วันอาทิตย์ที่ ๑๒ กันยายน ๒๕๖๔

ระเบียบวาระที่ ๕.๑๔ พิจารณาการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ๒๕๖๕) วิทยาลัยเทคโนโลยีและสหวิทยาการ

สรุปเรื่อง

วิทยาลัยเทคโนโลยีและสหวิทยาการ ได้ดำเนินการพัฒนา/ปรับปรุงหลักสูตรระดับประกาศนียบัตรวิชาชีพ (ปวช.) เพื่อพัฒนาการจัดการศึกษาวิชาชีพด้านวิทยาศาสตร์และเทคโนโลยี และมุ่งเน้นผลิตผู้สำเร็จการศึกษาที่มีทักษะ คุณธรรม จริยธรรม พึ่งพาตนเองได้ และเป็นที่พึ่งทางวิชาการให้กับสังคมและท้องถิ่น อีกทั้งเพื่อปรับปรุงหลักสูตรให้มีเนื้อหาที่ทันสมัย สอดคล้องเป็นไปตามแนวนโยบายการจัดการอาชีวศึกษาของประกาศกระทรวงศึกษาธิการ เรื่อง กรอบคุณวุฒิอาชีวศึกษาแห่งชาติ พ.ศ. ๒๕๖๒ และประกาศคณะกรรมการการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานคุณวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒ เพื่อตอบสนองความต้องการของสถานประกอบการ ตลาดแรงงาน ชุมชน และท้องถิ่น ตลอดจนสอดคล้องกับคุณลักษณะของบัณฑิตที่พึงประสงค์ของมหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา

โดยได้ดำเนินการปรับปรุงแก้ไขตามข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ และคณะอนุกรรมการเกี่ยวกับวิชาการ การส่งเสริมการวิจัยและพัฒนางานวิจัยเป็นที่เรียบร้อยแล้ว ซึ่งมีความสอดคล้องกับวัตถุประสงค์ของหลักสูตรที่มีความโดดเด่นและเป็นเอกลักษณ์ เพื่อเป็นการยกระดับของหลักสูตรให้มีประสิทธิภาพ และนำไปสู่การผลิตบัณฑิตที่มีคุณภาพตรงกับความต้องการของตลาดแรงงานได้

ผลการดำเนินงาน

๑. ผ่านการพิจารณาจากคณะกรรมการบริหารวิทยาลัยเทคโนโลยีและสหวิทยาการ ในการประชุมวาระพิเศษ ครั้งที่ ๒ เมื่อวันที่ ๓๕ พฤษภาคม ๒๕๖๔ ที่ประชุมมีมติเห็นชอบดังนี้ (๑) ให้แต่ละหลักสูตรปรับแก้ตามข้อเสนอแนะของคณะกรรมการสภาวิชาการ มทร.ล้านนา (๒) หลังจากที่มีการปรับแก้ตามข้อเสนอแนะของคณะกรรมการสภาวิชาการแล้วให้แต่ละหลักสูตรนำเล่มหลักสูตรมาดำเนินการตรวจสอบอีกครั้ง ก่อนนำเสนอที่ประชุมสภาวิชาการ ครั้งที่ ๑๖๒ (มิ.ย.๖๔) (๓) มอบหมายอาจารย์ประจำกลุ่มวิชาศึกษาทั่วไป (ภาษาต่างประเทศ) ตรวจสอบคำอธิบายรายวิชาภาษาอังกฤษให้มีความถูกต้องตามหลักไวยกรณ์ และจัดเรียงภาคยิ่งขึ้น (๔) มอบงานวิชาการเสนอเรื่องเพื่อบรรจุเข้าระเบียบวาระประชุมสภาวิชาการ ครั้งที่ ๑๖๓ (มิ.ย.๖๔)

๒. ผ่านการพิจารณาจากสภาวิชาการ มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ในการประชุมครั้งที่ ๑๖๓ เมื่อวันที่ ๑๐ มิถุนายน ๒๕๖๔ ที่ประชุมมีมติเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) โดยมอบหมายวิทยาลัยเทคโนโลยีและสหวิทยาการดำเนินการปรับปรุงแก้ไขตามข้อเสนอแนะและข้อสังเกตของกรรมการสภาวิชาการ และนำเสนอต่อคณะอนุกรรมการเกี่ยวกับวิชาการ การส่งเสริมการวิจัยและพัฒนางานวิจัย ต่อไป

๓. ผ่านการพิจารณาจากคณะอนุกรรมการเกี่ยวกับวิชาการ การส่งเสริมการวิจัยและพัฒนางานวิจัย มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา เมื่อการประชุม ครั้งที่ ๕/๒๕๖๔ วันที่ ๘ กรกฎาคม ๒๕๖๔ ที่ประชุมมีมติเห็นชอบในหลักการการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชา

เตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ....) มอบวิทยาลัยเทคโนโลยีและสหวิทยาการดำเนินการปรับปรุงตามข้อพิจารณาและข้อสังเกตกรรมการ ประสานกับสำนักส่งเสริมวิชาการและงานทะเบียน และนำเสนอสภามหาวิทยาลัย ต่อไป

กฎหมายที่เกี่ยวข้อง

๑. ประกาศคณะกรรมการการอาชีวศึกษา เรื่อง เกณฑ์มาตรฐานอุดมวุฒิอาชีวศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๖๒

๒. หลักสูตรประกาศนียบัตรวิชาชีพ สำนักงานคณะกรรมการการอาชีวศึกษา พ.ศ. ๒๕๖๒

๓. ข้อบังคับ มทร.ล้านนา ว่าด้วย การจัดการศึกษาระดับประกาศนียบัตรวิชาชีพ พ.ศ. ๒๕๕๑

จึงเสนอต่อคณะบุคคลปฏิบัติหน้าที่แทนสภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา เพื่อโปรดพิจารณาเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ๒๕๖๕) วิทยาลัยเทคโนโลยีและสหวิทยาการ

การพิจารณา

ที่ประชุมได้ร่วมกันพิจารณาและข้อเสนอแนะดังนี้

๑. มอบวิทยาลัยเทคโนโลยีและสหวิทยาการปรับชื่อสาขาวิชาภาษาอังกฤษให้ถูกต้องตามหลักสากล

๒. ควรมีการศึกษาและวิจัยเกี่ยวกับเส้นทางอาชีพ (Career Path) และประสิทธิภาพของผู้สำเร็จการศึกษาในหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์

มติที่ประชุม

ที่ประชุมเห็นชอบการปรับปรุงหลักสูตรประกาศนียบัตรวิชาชีพ (ปวช.) สาขาวิชาเตรียมวิศวกรรมศาสตร์ (หลักสูตรปรับปรุง พ.ศ. ๒๕๖๕) วิทยาลัยเทคโนโลยีและสหวิทยาการ และมอบวิทยาลัยเทคโนโลยีและสหวิทยาการ ดำเนินการตามข้อเสนอแนะ

(รองศาสตราจารย์ธีระศักดิ์ อุรัจนานนท์)
เลขานุการคณะบุคคลปฏิบัติหน้าที่แทน
สภามหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา