# Prospectus

## Bachelor of Engineering Program in Digital Engineering (International Program)

---

1. **Degree Title**
   - ✓ Full Name: Bachelor of Engineering (Digital Engineering)
   - ✓ Abbreviated Name: B.E. (Digital Engineering)

2. **Program Director**
   - ✓ Kittasil Silanon

   - ✓ COLLEGE OF COMPUTING, Prince of Songkla University Phuket Campus
     80 M.1 Vichitsongkram Road, Kathu, Phuket 83120
     Email: kittasil.s@phuket.psu.ac.th

3. **Duration of Study**
   2 semesters/Year (4 Years)

4. **Program Overview**
   a) Objectives

   Principles of artificial intelligence and software engineering are the fundamental keys of which student' s acquisition is assured. Realistic project- and scenario- based learning, alongside a practical company internship are well selected to propel student's abilities in many dimensions and lead our students to be able to develop their own automation systems and Internet of Things (IoTs) in conjunction with cloud computing and cybersecurity.

   b) Learning Outcomes
   - Problem Solving and Critical Thinking
   - Digital Literacy and Software Literacy
   - Communication and Interpersonal Relation
   - Technical and Creative Skills
   - Social Awareness and Responsibility
   - Life Long Learning Skills

   c) Career Opportunities
   - Digital Engineer/Computer Engineer
   - Software Engineer/Developer
   - Embedded System Engineer/IoT Engineer

- Artificial Intelligence Engineer
- Network and Data Communication Engineer
- Cybersecurity Analyst and Designer

**5. Admission Requirements**

- A copy of your transcript: Grade 12, M6, Year 13 or the result of an approved equivalency examination (with English translation)
- Either one of the certified copy of the following certificates:
  ** your high school diploma (with English translation)
  ** one of the following certificates: IGCSE, GED, or IB
- English proficiency test result (TOEIC, TOEFL or IELTS) with at least 2 years' validity.
- Additional requirements might be requested by the Admissions Committee.

**6. Tuition + Enrollment Fees**

48,000 Baht (+ entrance fee 15,000 Baht)

**7. Curriculum Structure and Components**

The students must complete a minimum requirement of 120 credits to graduate. The curriculum is comprised of General Education Courses (24 credits), Specific Education Courses (90 credits), and Free Elective Courses (6 credits).

| Courses | Credits |
|---|---|
| 1. General Education (GE) Courses | **24** |
| 1.Compulsory GE Courses | 18 |
| 2.Elective GE Courses | 6 |
| 2. Specific Education Courses | **90** |
| 1.Mathematics Courses | 10 |
| 2.Basic Digital Engineering Courses | 53 |
| - Core Courses | 17 |
| - Module Course | 36 |
| 3.Advance Digital Engineering Courses | 15 |
| - Compulsory Specialized Module Courses | 9 |
| ***** Network and Security Engineering** | |
| ***** Intelligent Object** | |

| | |
|---|---|
| ***** Software Engineering** | |
| - Elective Specialized Courses | 6 |
| 4.Cooperative Education Courses | 12 |
| 3. Free Elective Courses | **6** |
| **TOTAL** | **120** |

## 8. Study Plan

| First Year | Semester 1 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 4 ((X)-Y-Z) |
| 977-110 | Introduction to Digital Engineering | 1 ((1)-0-2) |
| 977-100 | Calculus for Engineering | 3 ((3)-0-6) |
| 977-120 | Module : Computer Programming | 9 ((6)-6-15) |
| | TOTAL | 17 (X-Y-Z) |

| First Year | Semester 2 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 4 ((X)-Y-Z) |
| 977-111 | Computer Ethics and Laws | 1 ((1)-0-2) |
| 977-112 | Design Thinking and UI/UX | 2 ((2)-0-4) |
| 977-101 | Discrete Mathematics | 2 ((2)-0-4) |
| 977-121 | Module: Website Design and Development | 9 ((6)-6-15) |
| | TOTAL | 18 (X-Y-Z) |

| Second Year | Semester 1 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 4 ((X)-Y-Z) |
| 977-210 | Computer Architecture and Operation Systems | 2 ((2)-0-4) |
| 977-200 | Linear Algebra for Engineering | 2 ((2)-0-4) |
| 977-220 | Module: Electronics and Internet of Things | 9 ((6)-6-15) |
| | TOTAL | 17 (X-Y-Z) |

| Second Year | Semester 2 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 6 ((X)-Y-Z) |
| 977-203 | Statistics and Probability | 3 ((2)-2-5) |
| 977-221 | Module: Network and Security | 9 ((6)-6-15) |
| | TOTAL | 18 (X-Y-Z) |

| Third Year | Semester 1 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 4 ((X)-Y-Z) |
| xxx-xxx | Free Elective Courses 1 | 3 ((x)-y-z) |
| 977-310 | Seminar | 1 (0-2-1) |
| 977-311 | Project Management and Quality Assurance | 3 ((3)-0-6) |
| 977-3xx | Compulsory Specialized Module Courses (*Select 1 Module)<br>* Module: Network Engineering and Cyber Security<br>* Module: Intelligence Object Engineering<br>* Module: Software Engineering | 9 ((6)-6-15) |
| | TOTAL | 20 (X-Y-Z) |

| Third Year | Semester 2 | |
|---|---|---|
| Course Code | Course Title | Credits |
| xxx-xxx | General Education | 2 ((X)-Y-Z) |
| xxx-xxx | Free Elective Courses 2 | 3 ((x)-y-z) |
| 977-312 | Pre Cooperative Education | 1 (0-3-0) |
| 977-313 | Business Process Design and Innovation | 3 ((2)-2-5) |
| 977-314 | Project in Digital Engineering 1 | 3 (0-9-0) |
| 977-xxx | Compulsory Specialized course 1 | 3 ((x)-y-z) |
| 977-xxx | Compulsory Specialized course 2 | 3 ((x)-y-z) |
| | TOTAL | 18 (X-Y-Z) |

***1 Year Cooperative Education plan**

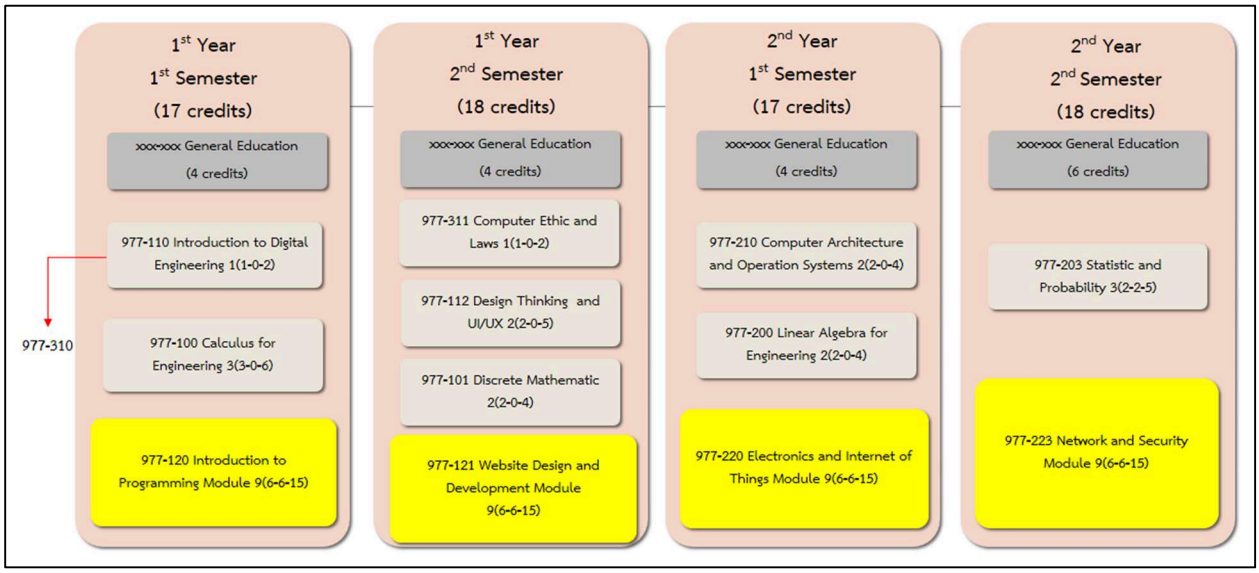
| Fourth Year | Semester 1 | |
|---|---|---|
| Course Code | Course Title | Credits |
| 977-470 | Cooperative Education 1 | 6(0-36-0) |
| | TOTAL | 6 (0-36-0) |

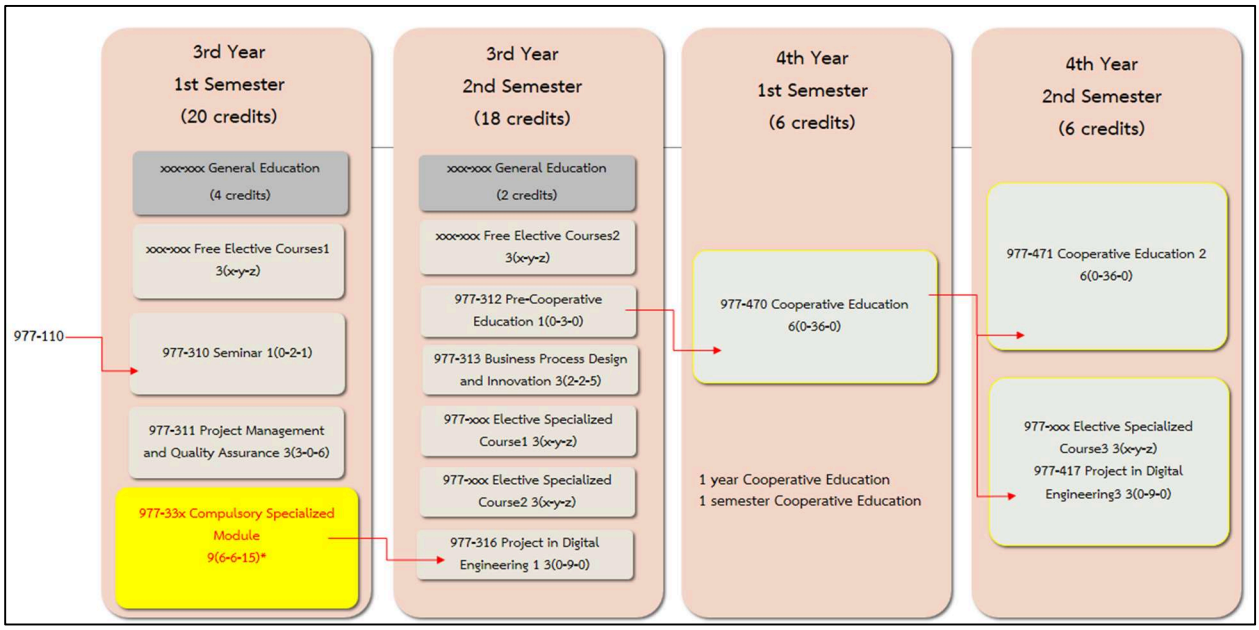
| Fourth Year | Semester 2 | |
|---|---|---|
| Course Code | Course Title | Credits |
| 977-471 | Cooperative Education 2 | 6(0-36-0) |
| | TOTAL | 6(0-36-0) |

***1 Semester Cooperative Education plan**

| Fourth Year | Semester 1 | |
|---|---|---|
| Course Code | Course Title | Credits |
| 977-470 | Cooperative Education 1 | 6(0-36-0) |
| | TOTAL | 6 (0-36-0) |

| Fourth Year | Semester 2 | |
|---|---|---|
| Course Code | Course Title | Credits |
| 977-417 | Project in Digital Engineering 2 | 3 (0-9-0) |
| 977-xxx | Compulsory Specialized course 3 | 3 ((x)-y-z) |
| | TOTAL | 6 (X-Y-Z) |



## 9. Course Descriptions

**805-011G1 English for Fundamental Listening & Speaking (4-0-(2))2**

**Prerequisite courses: -**

Reinforcement of listening and speaking skills; development of effective communication in both daily life and academic settings; an approach to self-studying and the application of knowledge for the development of learning academic context

**805-012G1 English for fundamental reading and writing (4-0-(2))2**

**Prerequisite courses: -**

Reinforcement of reading and writing skills, development of understanding authentic text, and basic academic text, an approach to the self-study and application of knowledge for development to learning academic context, paragraph writing

**805-013G1 English for Intermediate Listening and Speaking 2((2)-0-4)**

**Prerequisite courses: -**

Reinforcement of reading and writing skills, development of understanding authentic text, and basic academic text, an approach to the self-study and application of knowledge for development to learning academic context

**805-014G1 English for Intermediate Reading and Writing 2((2)-0-4)**

**Prerequisite courses: -**

Reinforcement of intermediate listening and speaking skills; intermediate-level development of effective communication in both daily life and academic settings; an approach to self-studying and the application of knowledge for the development of learning academic context at an intermediate level

**805-015G1 English for Upper Intermediate Listening and Speaking 2((2)-0-4)**

**Prerequisite courses: -**

Consolidation on exchanging ideas and expressing on self related to academic issues; writing process with an emphasis on answering essay questions; reading literature and writing academic essays, citation and reference; developing an autonomous process approach to writing

**805-016G1 English for Upper Intermediate Reading and Writing 2((2)-0-4)**

**Prerequisite courses: -**

Reinforcement of advanced listening and speaking skills; academic level development of effective communication in both daily life and advanced settings; an approach to self-studying and the application of knowledge for the development of learning academic context at an advanced level

**805-017G1 Basic Thai Listening and Speaking for Daily and Campus Life 2((2)-0-4)**

**Prerequisite courses: -**

Simple conversations in daily life; chat language and slang; socializing with Thai students; communication with different people on campus; Etiquette of using the Thai language

**805-018G1 Thai Language and Culture 2((2)-0-4)**

**Prerequisite courses: -**

Overview of characteristics of Thai Language; Thai language communication in the digital era; Thai culture and traditions; concepts and values in Thai society; Thai ways of life; Thai language usage in socio-cultural contexts

**969-021G2A Financial Management 2((2)-0-4)**

**Prerequisite courses: -**

Introduction to financial management; type of financial statement, balance sheet, profit-loss statement, cash flow statement; Financial markets; Financial instruments; Investment decision process; Risk tolerance; Asset allocation; Basic portfolio management; Personal income tax planning and tax calculation tools, case studies

**988-021G2A Mathematics in Daily Life 2((2)-0-4)**

**Prerequisite courses: -**

Ratios, percentage, financial mathematics, basic statistics and their applications for everyday life.

**810-021G2B Keys to Success** **2((2)-0-4)**

**Prerequisite courses: -**

Goals setting; time management; critical and creative thinking in problem solving; knowledge acquisition; communication strategies; money management

**969-022G2B Change Your Thoughts, Change Your Life** **2((2)-0-4)**

**Prerequisite courses: -**

Importance of systematic thinking Systematic thinking framework Thinking process development System thinking techniques Task priority management Task scheduling and management Tools for systematic thinking Application of systematic thinking in real-life

**969-023G2B CrOM Thinking: Creative and Open Minded Thinking** **2((2)-0-4)**

**Prerequisite courses: -**

Thinking under principles of reasons and logic Thinking under multidisciplinary of creativity Inspiration and motivation for creative thinking Mechanics and process for creative thinking in differences and your style Creative adaptation and problem solving in daily life Creative for changing and improvement yourself

**969-024G2B Systematic Solving** **2((2)-0-4)**

**Prerequisite courses: -**

Lifelong learning skills, pursuit of knowledge and management, positive thinking, problem solving and decision making skills in a systematic way, critical thinking, emotional intelligence, practices of systematic solving skills

**969-025G2B Growth Mindset** **2((2)-0-4)**

**Prerequisite courses: -**

Growth mindset concept, self-assessment, practices of growth mindset skills, application of growth mindset in real-life

**810-031G3 Entrepreneurial Ideas for Young Blood** **2((2)-0-4)**

**Prerequisite courses: -**

Introduction to new entrepreneur creation; entrepreneurship appraisal; business opportunity analysis; Business model canvas; market survey and research; marketing strategy for new business; production management; financial planning; investment funding sources; introduction to investing; the risk-return relationship

**810-033G3 Innovative Thinking in Business** **2((2)-0-4)**

**Prerequisite courses: -**

Innovative thinking; creativity, basic business knowledge, and earnestness; turning problems into opportunities through the process of using various

tools by doing something different or creating new ideas for problem solving and product/service development based on customer co-creation

**969-031G3 Digital Entrepreneurship 2((2)-0-4)**

**Prerequisite courses: -**

Leaning and understanding the importance of the transformation caused by digital disruption, Analysis of sustainable economic models, Using technology to improve competitiveness, Defining company strategy, goals, vision and mission, competitive factor, company function, Define internal and external digital driving factors, Organizational structure planning, Demonstrating entrepreneurial attitudes towards opportunities in the new economy.

**969-032G3 Product or Service Development for Becoming an Entrepreneur 2((2)-0-4)**

**Prerequisite courses: -**

Product or service development for becoming an entrepreneur starting with the understanding on how your customers plan their personal finances for buying a product or a service. Selection criteria of your customers for that product or service; Analysis of features, strengths, weaknesses and target groups of that product or service; Risk and opportunity analysis of that product or service from the impact of changes in the environment, economy, politics, and society; Taking the analyzed information to develop or create a new product or a new service that align to global changes in a timely manner; Identifying the strengths, weaknesses and customer groups of that new product or service; Gathering support information and designing

the new product or service; Creating a simple financial management, investment and marketing business plan for that product or service

**041-969G4 Global Digital Literacy (4-0-(2))2**

**Prerequisite courses: -**

Basic knowledge and usage of digital technology; usage of searching tools and accessibility of digital content; digital content creation and presentation; digital communication; data and collaboration sharing; digital commerce; digital security; digital ethics and laws

**969-042G4 Uses of Artificial Intelligence in Daily Life 2((2)-0-4)**

**Prerequisite courses: -**

Basic knowledge, mechanism of artificial intelligence; artificial intelligence technology; use of artificial intelligence concepts and tools in daily life and work; application of artificial intelligence to work through case studies; ethics of artificial intelligence

**051-810G5 Beauty from Inner (4-0-(2))2**

**Prerequisite courses: -**

Importance of positive attitude for daily lives and career; guidelines of professional development including how to motivate oneself and how to convert problems and setbacks into encouragement; health, nutrition and exercise tips and practice; techniques of weight control; appropriate dress code and personality for careers; guidelines of skin care

**810-052G5 Living in a Diverse Society** **2((2)-0-4)**

**Prerequisite courses: -**

Concepts and elements of diversity in society including social diversity and value diversity; identity, and equality of opportunity in organizations; the benefits, challenges of diversity and the strategies of successfully managing diversity in a workplace

**805-052G5 Positive Psychology** **2((2)-0-4)**

**Prerequisite courses: -**

Positive psychology and well-being; creating self-confidence and self-esteem; resilience; fear and anxiety management; growth mindset;

positive relationship in personal life and at work; adjustment to changing society

**969-051G5 Wellness Experience Enhancement** **2((2)-0-4)**

**Prerequisite courses: -**

Definition of wellness, body treatment, mind treatment, intellectual development, social management, wellness experience enhancement, wellness events, alternative medicine for wellness, technology for wellness

**988-051G5 Participatory public policy for well-being** **2((2)-0-4)**

**Prerequisite courses: -**

Knowledge, policies and good governance and of reproductive health of emerging diseases, re-emerging diseases, non-communicable diseases,

human trafficking, and children/women and domestic violence; participation of policy making"

**061-980G6 PSU Volunteer and Sustainable Development Goals (4-0-(2))2**

**Prerequisite courses: -**

understand concept, principles, goal of the Philosophy of sufficiency and Sustainable Development Goals; thinking, analyzing, planning an applying the Philosophy of sufficiency in volunteer projects including individual, business or community sectors in local and national level; The volunteer projects follow Sustainable Development Goals for the benefit of mankind

**07-8101G7 Sustainable Future (4-0-(2))2**

**Prerequisite courses: -**

Concepts and definition of sustainability; sustainable development goals; major sustainability challenges in a global context such as environmental changes, pollutions, and disasters; drivers for a sustainable future including economic, social, technology, and environmental aspects; links between innovation and sustainability

**071-988G7 Global Citizenship for the Environment (4-0-(2))2**

**Prerequisite courses: -**

Knowledge and understanding about ecological systems, natural resources, relationships between human and the environment, global environmental changes and related factors; water management, renewable energy, conservation of marine resources, soil, forest and biodiversity; analyzing the

connections between the environment in the past and present, their impacts and measures to manage global environmental changes; responsibilities and participation in reducing impacts from human activities on natural resources and environmental solutions at community, national and international levels.

**988-072G7 SDGs Go Green (4-0-(2))2**

**Prerequisite courses: -**

Sustainable Development Goals (SDGs) for management of natural resources and the environment such as Water Resources, Terrestrial Resources, Marine Resources, Urban Environment, Clean Energy, Green Industry, Responsible Consumption, Global warming and Climate change

**810-002G8 Social Psychology 2((2)-0-4)**

**Prerequisite courses: -**

The examination of human social systems and behavior with an emphasis on cultures, societies, social orders, basic human needs, human behavior regarding reinforcement, learning, perception, motivation, intelligence and ability to adapt to changing circumstances

**805-083G8 Social Awareness** **2((2)-0-4)**

**Prerequisite courses: -**

Social and environmental awareness; the relationship between people and society; acceptance of social differences to adjust and live in the society and culture; resolving problem facing according to Sustainable Development Goals (SDGs) for the benefit of society and community

**969-001G8 Art Creation using Touch Typing** **2((2)-0-4)**

**Prerequisite courses: -**

Type of computer keyboards; basic ergonomics, touch-typing skills; touch-typing techniques; touch-typing practice with edutainment-based learning; speed typing contest, art creation using touch typing skills

**969-002G8 Office Tools Usage for Students** **2((2)-0-4)**

**Prerequisite courses: -**

Using Internet searching tool safely and legally, basic computer skills for office tools, fundamental laws and ethics of copyrighted and open-source tools, using online platforms for group work, using an online appointment and calendar tools, using a tool to create a poster media, resume writing with tools or templates, and Personal Data Protection Act

**988-001G8 Wisdom of Living** **2((2)-0-4)**

**Prerequisite courses: -**

Thinking, life administration and management in accordance with changes in Thai and global society, technology and environment; mingling the Thai ways of life with multi-cultural ways of living, public mind and environmental conservation, living happily based on morality and ethics

**988-002G8 Contemporary Scientific Innovation** **2((2)-0-4)**

**Prerequisite courses: -**

Scientific basis of discovery, invention and innovation, emphasizing on knowledge integration, case study analysis, creative thinking, problem solving and intellectual property awareness

**988-003G8 Science and the Sea** **2((2)-0-4)**

**Prerequisite courses: -**

Oceanography; marine science; marine and coastal resources; wave of the ocean; sea surface temperature; climate change; sea level rising; ocean circulation; ocean acidification

**988-005G8 Sufficient Communities** **2((2)-0-4)**

**Prerequisite courses: -**

Concept and theory of sustainable development; case study; deployment in various areas

**988-007G8 Life in the Oceans** **2((2)-0-4)**

**Prerequisite courses: -**

The ocean as a habitat; the origin of life in the ocean; diversity, life history, and benefits of significant groups of marine organisms; potential threats to human health posed by marine organisms and first aids, the sustainable use of marine biological resources; field trips

**805-085G8 Thai Civilization and Global Citizen** **2((2)-0-4)**

**Prerequisite courses: -**

Concepts and processes of Thai civilization, covering dimensions of politics, economy, society, and culture from the past to the present; Topics reflect the origins of social identity within Thai civilization; Concepts of global citizen development; Global values such as Human Rights, Human Dignity, and Human Equality, including respect for individual differences, social diversity, principles of good governance and peaceful coexistence; Connections between Thai civilization and its role in the development of a global citizen

**805-084G8 Indonesian Angklung** **2((1)-2-3)**

**Prerequisite courses: -**

Developing emotional and social skills for living together among different diversities. It is based on working together with others in a team to create responsibility, effective communication, listening to each other, self-

awareness, sympathy and self-control through the Indonesian Angklung activities

**810-003G8 Social Responsibility Organizations** **2((2)-0-4)**

**Prerequisite courses: -**

Concepts, theories, and best practice of corporate social responsibility of public and private organizations, sustainable management and development, green business operations, fair operations, ethics of private and public organizations

**969-003G8 Dealing with Technostress** **2((2)-0-4)**

**Prerequisite courses: -**

Definition of technostress, types of technostress, technostress symptoms, technostress management, technostress diagnosis, practices to reduce technostress, technology for dealing with technostress

**969-004G8 Exercises for Working Society** **2((2)-0-2)**

**Prerequisite courses: -**

The importance of sports in organizational development; selection of sports for health and personality improvement; human relation and leadership in sports; planning and implementing sporting activities; technology for exercises

**969-005G8 E-Sport** **2((2)-0-4)**

**Prerequisite courses: -**

History, development, operations, and management of e-sport; current situations and trends in game industry; discussion on elements relevant in e-sport; discussion, debate and organizing on e-sport competition; numerous concerns and considerations of playing game

**988-009G8 Camping** **2((2)-0-4)**

**Prerequisite courses: -**

how to plan a camping trip (principles and procedures); basics of first aid; Camping tools and equipment; camp activities; recreation; trekking; campfire; photography techniques; pitching tents; boating; stargazing; acts, rules, and regulations

**988-010G8 Swimming** **2((2)-0-4)**

**Prerequisite courses: -**

Basic knowledge, rules, swimming skill practice

**988-011G8 Scuba Diving** **2((2)-0-4)**

**Prerequisite courses: -**

Principles, equipment and methods for diving; science for diving; planning, recording and problem solving in diving; sample and data collecting techniques; diving practice in both swimming pool and sea

**988-012G8 Snorkeling** **2((2)-0-4)**

**Prerequisite courses: -**

Principle of snorkeling; use of snorkeling equipment; protection of danger and accident that might occur while snorkeling; practice of snorkeling in swimming pool and outside

**805-087G8 Thai Arts for Happiness** **2((2)-0-4)**

**Prerequisite courses: -**

Fundamental knowledge about Thai arts; the science and art of Thai music and Thai dance application and creation of Thai arts to create aesthetics for physical and mental well-being; understanding and acceptance of cultural differences; adapting to a changing society; living happily in society

**805-001G8 ENGLISH FOR PRONUNCIATION** **2((2)-0-4)**

**Prerequisite courses: -**

Provide teaching and (English)learning interactions for the production of spoken English texts focusing on pronunciation, speed of speech, and intonation

**805-008G8 English for Effective Communication 2((2)-0-4)**

**Prerequisite courses: -**

Provide teaching and learning interactions that increase student's capacity to plan and deliver effective communication in a variety of work related contexts

**805-002G8 ENGLISH FOR CREATIVE WRITING 2((2)-0-4)**

**Prerequisite courses: -**

Evaluate the processes and techniques of creative writing, critique various writing styles and discuss how they are used in literature plus the development of written English and creative thinking through critical reading

**805-007G8 ENGLISH FOR TOURISM 2((2)-0-4)**

**Prerequisite courses: -**

Particular characteristics and topics related to tourism, explaining and giving information about tourism

**805-004G8 ENGLISH FOR JOB APPLICATION 2((2)-0-4)**

**Prerequisite courses: -**

Practicing English communicative skills relating to job applications, reading job openings from various sources, writing application letters and résumés, practicing job interviews, enlarging vocabulary, and expressions used in job application

**805-005G8 English for Presentation and Discussion 2((2)-0-4)**

**Prerequisite courses: -**

Theories and general characteristics of English for discussion and presentation; practice in academic and general discussion; learning how to make points and answer questions in discussions and presentations

**805-080G8 Basic Japanese for Life in Japan 2((2)-0-4)**

**Prerequisite courses: -**

Reading and writing Japanese characters; basic Japanese communication skills for daily life in Japan; greetings in different occasions; self-introduction; basic Japanese for the situations in the restaurant

**805-081G8 Basic Japanese for Working Life in Japan 2((2)-0-4)**

**Prerequisite courses: -**

Basic Japanese communication skills in daily life and at work in Japan; communication skills for speaking and interacting with surrounding people and coworker; basic Japanese for inviting and joining an event

**805-082G8 Basic Thai Listening and Speaking for Travelling 2((2)-0-4)**

**Prerequisite courses: -**

Festivals and tourist destinations in Thailand; basic Thai conversations for traveling; dos' and don'ts; booking services and tour packages; booking

accommodation and transportation; shopping and bargaining; impressive socializing with Thai people; talking about travel experience in Thailand

**988-004G8 Nutritional and Toxicology** **2((2)-0-4)**

**Prerequisite courses: -**

A foundation of nutritional knowledge to develop a sustainable pattern of healthy eating; overview of digestion, function, and metabolism pathways of nutrients; the principles of toxicology and their applications in evaluating the safety of foods; evaluation of human exposure to chemicals, and qualitative and quantitative health risk assessment

**988-008G8 Climate crisis** **2((2)-0-4)**

**Prerequisite courses: -**

Greenhouse gases; Global warming and changes in the climate system; Impact on life and property from climate change-related disasters; Greenhouse mitigation; Low carbon development; Climate change adaptation

**988-006G8 Earth System and Environment** **2((2)-0-4)**

**Prerequisite courses: -**

Geology and Hydrology of the earth ; Water resource of the earth ; national disaster and human risk ;Climate changes and human impacts ; Human with natural disaster ; Ecosystem and Environment cycle with human existence;

Environmental pollution and problem from human ; Environmental problem in daily and processes solve problem

**805-003G8 English for Business** **2((2)-0-4)**

**Prerequisite courses: -**

Particular characteristics of English in business context; making suitable intercultural business communication through listening, speaking, reading and writing; learning to write business memoranda, business letters and business reports

**805-009G8 English through Films** **2((2)-0-4)**

**Prerequisite courses: -**

Practicing language skills of listening, speaking, reading and writing skills through films; developing critical thinking; discussing intercultural differences; analyzing characters, reading and writing film reviews

**805-086G8 Introduction to Thai Political and Economy in the World Dynamics** **2((2)-0-4)**

**Prerequisite courses: -**

An introduction to the various and current political regimes and economic system of Thailand; Political and economic developments since the Second World War; The discussion of connections between prominent political and economic issues of Thailand and Thai adjustment in the world dynamics

**Specific Education Courses**

**1) Mathematics Courses**

**977-100 Calculus for Engineering 3((3)-0-6)**

**Prerequisite courses: -**

Relations; functions and graphs of relations; limits and continuity; derivatives and applications; integrals and application

**977-101 Discrete Mathematics 2((2)-0-4)**

**Prerequisite courses: -**

Logic; sets; relations; functions, basic proof theory; counting; graph theory; tree theory; recursion relations; theory of computation; finite automata

**977-200 Linear Algebra for Engineering 2((2)-0-4)**

**Prerequisite courses: -**

Matrices and linear systems; determinants; solution to system of linear equations; vector spaces; vector subspaces; rank; dimension; basis; orthogonality; projection; eigenvalues and eigenvectors

**977-201 Statistics and Probability 3((2)-2-5)**

**Prerequisite courses: -**

Set and probability theories; random variables; discrete probability distributions; continuous probability distribution; sampling distribution; estimation; hypothesis testing; linear regression and correlation

2) **Basic Digital Engineering Courses**

- **Core Courses**

**977-110 Introduction to Digital Engineering 1((1)-0-2)**

**Prerequisite courses: -**

Introduction to various fields of engineering; some related engineering professional organizations; engineering ethics; evolution of computer engineering; introduction to digital engineering; introduction to network and security engineering; introduction to intelligent objects; introduction to software engineering; systematic problem analysis and solving techniques; presentation techniques

**977-111 Computer Ethics and Laws 1((1)-0-2)**

**Prerequisite courses: -**

Important of ethical, legal and social issues on computer; public policy; impact of computers towards works and societies; methods and tools of analysis; professional and ethical responsibilities; intellectual property; privacy and civil; computer crime; case studies; problem analysis and solutions

**977-112 Design Thinking and UI/UX 2((2)-0-4)**

**Prerequisite courses: -**

The concept of design thinking and the distinctions between design and design thinking; applying design thinking process to solve business problem; developing design thinking skills for individual and for

organizations; practicing design thinking skills; user interface (UI) and User Experience (UX) patterns and components; practices for creating UI/UX components within design application; Design technique for digital application such as pixel perfect design, replication and cross-platform compatibility; responsive Design

**210-977 Computer Architecture and Operation Systems 2((2)-0-4)**

**Prerequisite courses: -**

Computer architecture; data representation; instruction set and design; operation of CPU, ALU; input/output system; parallel and vector processing; RISC; super-scalar processor; batch processing and time-sharing processing; real-time control operating system; processes and synchronization; memory management; input/output management; interrupt structure; resource allocation in multiprogramming system

**977-310 Seminar 1(0-2-1)**

**Prerequisite courses: 977-110 Introduction to Digital Engineering**

Seminar in current issues, case studies in information and communication technology; specific content of the seminar changes each time it is offered

**977-311 Project Management and Quality Assurance 3((3)-0-6)**

**Prerequisite courses: -**

Principles of project management and risks; various types of project and their management, project management limitation, planning and project development techniques; selection of project leaders and management, their responsibilities, functions, monitoring, reporting and

communications; basic requirement and principles of quality management (QM); planning and controlling/monitoring for quality, in-house participative QM

**977-312 Pre-cooperative Education 1(0-3-0)**

**Prerequisite courses: -**

Concepts of cooperative education; process of cooperative education and; regulations and permissions related to cooperative education; basic knowledge and techniques in job application e.g., company selection, writing the job application, interviewing; basic knowledge and techniques for apprentice e.g., presentation and report writing techniques, personality in working place, social psychology

**977-313 Business Process Design and Innovation 3((2)-2-5)**

**Prerequisite courses: -**

Business development processes such as production processes, logistics, sales, accounting and finance; concepts and principles of process innovation, vision on process, process design, process integration, application of information system and communication in organization workflow and information management, measurement of process efficiency; organization process innovation and redesign; development of new business models, organization change management; case studies from government organizations and business units

**977-314 Digital Engineering Project I 3(0-9-0)**

**Prerequisite courses :**

**977-330 Module:** Module: Network Engineering and Cyber Security **or**

**977-331 Module:** Module: Intelligence Object Engineering **or**

**977-222 Module:** Module: Software Engineering

Digital engineering project development under the adviser supervision

**977-411 Digital Engineering Project II 3(0-9-0)**

**Prerequisite courses:977-316 Digital Engineering Project I**

Continuing of 977-302 for developing the project until finish; an oral presentation and demonstration of the project must be given; a final written report must be submitted

**- Module Course**

**120-977 Module: Computer Programming Module 9((6)-6-15)**

**Prerequisite courses: -**

Computer components; programming paradigms; structure programming concept; data types; operators; condition; repetition; arrays; function and parameter passing process; fundamental concepts of data structures; array; linked lists; stack; queue; trees, binary tree; binary search tree; trie self-balancing binary search tree; heap; complexity analysis; searching and sorting; concepts of recursion; algorithmic strategies; greedy algorithms; divide-and-conquer techniques; dynamic programming; graph problems; shortest path; NP-complete problems; object-oriented programming

concept; basic components of class and object; abstract data type; information hiding; inheritance; polymorphism; event- driven programming; application programming interface (API); programming practice; software project

**121-977 Module: Website Design and Development** **9((6)-6-15)**

**Prerequisite courses :-**

Introduction to software engineering; software development process; requirement engineering; software requirement and specifications; software requirement engineering; software design; software testing and validation; concept of language translation; the concept of project management; software quality assurance; Database concepts; data independence; entities and relationships; data models; relational database design; normalizations; database query language; development and database life cycle; physical database design; transaction processing; distributed database systems Concepts of web programming; web structure and procedures. Design and develop web applications using software development process, relational database and API.

**977-220 Module: Electronics and Internet of Things** **9((6)-6-15)**

**Prerequisite courses :-**

Introduction to Resistor-Inductor-Capacitor; ohm's law, Kirchoff's Law; Basic DC & AC circuit analysis; Physics of Semiconductor components; Electronic circuit- Diode & transistor; Electronic circuit- Opamp; Introduction to Sensor and Sampling&hold concept; Boolean algebra;

combinational logic circuits; sequence circuits; FPGA applications; IoT Concepts and Design; Developing IoT End-nodes; IoT Platforms and Device Connectivity ; IoT Application Development

**977-221 Module: Network and Security** **9((6)-6-15)**

**Prerequisite courses :-**

Overview of protocols and architecture of OSI model and TCP/ IP; data transmissions and communications; encoding and decoding; analog and digital signal; signal modulations; packet switching; LAN and WAN technologies; wireless networks; mobile ad hoc networks; mobile networking; virtual network and overlay network; network cabling; IP addressing and subnetting; basic network security; basic network troubleshooting; case studies Basic concepts of operating systems; processes and concurrency; process management and scheduling; input/ output management; memory management; file systems; device management; system performance evaluation Basic cryptography; public key, symmetric key; integrity, hash function; steganography; authentication, password, biometric; authorization, access control mechanisms

3) **Advance Digital Engineering Courses**

**- Compulsory Specialized Module Courses**

**330-977 Module: Network Engineering and Cyber Security** **9((6)-6-15)**

**Prerequisite courses :-**

Network architecture and protocols; network layers; domain system; transport layer; TCP and UDP protocol; error control of ICMP protocol; fragment and defragment; security in IP networks; DHCP; network management of SNMP; real-time networking and quality of service (QoS); functions of internet protocol Design and implementation of protocols; applications for wireless and mobile networking; techniques for using signal channels; transport layers of wireless network; wireless network problems; device constraints; node mobility; cloud computing architecture; cloud computing services; cloud computing application in IT industries; cloud security; Network security; Spoofing; Distributed Denial of Service; Firewall attack; Port Security; Current state of security in web applications. Key security mechanisms for web applications. Client and server side controls. Common vulnerabilities of web-based applications and how to protect against the attacks; Cybercrimes; digital forensics procedures; memory forensics; data layers; related laws; case studies in digital forensics

**977-331 Module: Intelligence Object Engineering** **9((6)-6-15)**

**Prerequisite courses :-**

Introduction and overview of intelligent object; Fourier transformation; Laplace transformation; coordinate system; Sensor & Signal; digital-analog conversion; microcontroller architecture; input/output interfacing between microcontroller and sensor; Embedded system and programming & Real time system; Connectivity & communication; IoT network& Cloud computing; Image processing; Computer vision; Spatial Description& Relationships; Basics component of robot; Automation systems; Integration systems

**977-332 Module: Software Engineering** **9((6)-6-15)**

**Prerequisite courses :-**

Introduction to software development process; software life cycle; project management; principles of project management and risks; requirement engineering process; software modelling; requirement elicitation; requirement analysis; requirement negotiation; requirement specification; requirement validation; software design process; software architectural styles; application of architecture styles and design pattern in software detailed design; basic design patterns for software design; object-oriented analysis and design; unified modeling language (UML); fundamental concepts and methods for verification and validation of software work products; software reviews; software inspection, software testing; software problem analysis and reporting; quality and quality factors; quality measurement; quality assurance; software development

standards; quality and process improvement; techniques for software changeability; forward engineering and backward engineering version management; change management; impact analysis; software migration; software refactoring; reverse engineering; software work product integrity control; application of tools and environments for work product development, audits and traces

- **Elective Specialized Courses**

**Elective Specialized Courses** (Network and Security Engineering)

**977-340** **Mobile and Wireless Networks** **3((2)-2-5)**

**Prerequisite courses: 977-233 Module : Network and Security**

Design and implementation of protocols; applications for wireless and mobile networking; techniques for using signal channels; transport layers of wireless network; wireless network problems; device constraints; node mobility

**977-341** **Internet Protocols and Implementation** **3((2)-2-5)**

**Prerequisite courses: 977-233 Module : Network and Security**

Network architecture and protocols; network layers; domain system; transport layer; TCP and UDP protocol; error control of ICMP protocol; fragment and defragment; security in IP networks; DHCP; network management of SNMP; real-time networking and quality of service (QoS); functions of internet protocol

**977-342 Hacking and Penetration Security Testing 3(2-2-5)**

**Prerequisite courses: 977-233 Module : Network and Security**

Analysis and risk assessment of information technology system; vulnerability check; white-box and black-box penetration testing; problem process and report; web security; kinds of attacking; system hardening; network infrastructure; case studies

**977-343 Trusted Computing 3((2)-2-5)**

**Prerequisite courses: 977-233 Module : Network and Security**

Secure Boot; Trusted Platform Module (TPM); Remote Attestation; Memory Management Unit; TrustZone; Intel SGX

**977-344 Cyber Crime and Digital Forensics 3((2)-2-5)**

**Prerequisite courses: -**

Cybercrimes; digital forensics procedures; memory forensics; data layers; related laws; case studies in digital forensics

**977-345 Network Programming and Simulation 3((2)-2-5)**

**Prerequisite courses: 977-233 Module : Network and Security**

Principles of TCP/IP socket programming; introduction of computer simulation technologies; computer network simulation, design and data analysis; network simulation tools; case studies in network programming and simulation

**977-440 Special Topics in Network and Security Engineering I 3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies related to network and security engineering

**977-441 Special Topics in Network and Security Engineering II 3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies in networking and security engineering

**Elective Specialized Courses** (Intelligent Objects)

**977-350 High Performance Computing 3((2)-2-5)**

**Prerequisite courses: 977-120 Module: Computer Programming**

Parallel patterns; master-worker and message-Passing; parallel algorithm design; collective communication patterns; complexity; benchmarks and formal models; MPI process groups; parallel matrix multiplication; advanced MPI topics; patterns in Pthreads; mutual exclusion in Pthreads; basic patterns in OpenMP; mutual exclusion in OpenMP; hybrid architectures; MPI+OpenMP; GPU computing; OpenCL; OpenACC

**977-351 Cyber-physical Systems 3((2)-2-5)**

**Prerequisite courses: 977-331 Module: Intelligence Objects**

Introduction to Cyber-physical systems (CPSs); combination of cyber capabilities with physical capabilities; discrete computerized control algorithms; sensing and control systems design; prototyping systems;

software and hardware implementation; designing project incorporating infrastructure systems

**977-352 Embedded Computing and Real-time Operating Systems 3((2)-2-5)**

**Prerequisite courses: 977-331 Module: Intelligence Objects**

Introduces the issues challenges and methods for designing embedded computing systems; examples of embedded systems include mobile phones, game consoles, home appliances, and automobiles; design aspects of embedded systems; software and system-level design; power management; program analysis; real-time operating systems; task scheduling; wireless sensors; project on real embedded computing systems

**977-353 Robotics and Automation Systems 3((2)-2-5)**

**Prerequisite courses: 977-120 Module : Computer Engineering**

The basics of industrial automation systems and flexible manufacturing; industrial robotics technology; basics of industrial robot, sensors and sensor systems, mechanical structure, drives, precision, repeatability; the use of industrial robots; programming of industrial robots; simulation tools for offline programming of industrial robots; integration in production systems; production within industrial networks

**977-354 Pattern Recognition for Machine Vision 3((2)-2-5)**

**Prerequisite courses: 977-202 Linear Algebra for Engineering**

Overview of problems of machine vision and pattern classification; image formation and processing; feature extraction from images; biological object recognition; Bayesian decision theory; clustering; classification

**977-355 Connected Devices Programing 3((2)-2-5)**

**Prerequisite courses: 977-120 Module : Computer Engineering**

Introduction to programming for the mobile devices; using software development kits (SDKs); mobile application development; anatomy of a mobile; the characteristics of a mobile; model-view-controller (MVC); android OS; android software; user interface (UI) and intents; user interface (UI) design patterns; building a dashboard; the basis services of mobile data; content providers; touch-based Interaction

**977-356 Mulit-Core Architecture and Programing 3((2)-2-5)**

**Prerequisite courses: 977-331 Module : Intelligence Objects**

Introduction to multi-core architecture; concept of parallel programming; thread-level parallelism; design patterns for parallel programming; debugging parallel programs; performance analysis and optimization; development tool for parallel programming

**977-357 Introduction to Machine Learning 3((2)-2-5)**

**Prerequisite courses: -**

Learning and the general-to-specific ordering; decision tree learning; artificial neural networks; hypotheses evaluation; Bayesian learning;

computational learning theory; instance-based learning; genetic algorithms; sets of rules learning; analytical learning

**977-358 Deep Learning for Vision Systems 3((2)-2-5)**

**Prerequisite courses: -**

Introduction to intelligent systems; problem solving by searching; uninformed and informed search; local search; machine learning concepts; data preparation; data quality; classification techniques; decision tree learning, artificial neural networks; Bayes' theorem; model evaluation; problem analysis; feature selection; clustering; reinforcement learning ; deep learning; application of machine learning

**359-977 Sensors and their Interfacing Applications 3((2)-2-5)**

**Prerequisite courses: -**

Sensors and signals; types of analogue and digital sensors; analog-to-digital and digital-to-analog conversion; op-amp amplification; typical op-amp filters; microcontroller architecture; peripheral interfacing; serial communication; programming technique; memory mapped input/output; microcontroller applications with sensor interfaces

**977-450 Special Topics in Intelligent Objects I 3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies related to intelligent objects

977-451 **Special Topics in Intelligent Objects II** **3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies related to intelligent objects

**Elective Specialized Courses** (Software Engineering)

977-360 **Software Project Management and Estimation** **3((2)-2-5)**

**Prerequisite courses: 332-977 Module : Software Engineering**

Software project planning; software cost estimation; software price estimation; software development scheduling; risk management; software risk identification; risk analysis; risk prioritization; risk management planning; risk resolution; risk monitoring; software project monitoring and control; software metrics; methods for data collection; data interpretation and evaluation

977-361 **Advanced Database Systems** **3((2)-2-5)**

**Prerequisite courses: 977-121 Module:** Module: Website Design and Development

Relational database management system components; installation and configuration of database management system; database system management for multi-user; database integrity and security; database recovery; applying relational database via web; modern database system technologies

**977-362** **Component-based Software Development** **3((2)-2-5)**

**Prerequisite courses: 977-120 Module : Computer Programming**

Concepts and techniques of component-based software development; component-oriented tools and languages; component-based software development approaches; system designing and building; reusing components, including component-of-the-shelf and in-house software components

**977-363** **Advanced Object Oriented Programming** **3((2)-2-5)**

**Prerequisite courses: 977-120 Module : Computer Programming**

Advanced object oriented programming techniques; GUI programming; 2D and 3D visualization programming; database connection; transaction management; form and report; network connection with various protocols; socket and remote method invocation

**977-364** **Advanced Software Modeling and Development** **3((2)-2-5)**

**Prerequisite courses: 977-332 Module : Software Engineering**

Reflection programming technique; aspect-oriented software development; model-driven software development; modelling languages; techniques for meta-modelling; model transformation approaches; analysis techniques on models

**977-365** **Formal Methods in Software Engineering** **3((2)-2-5)**

**Prerequisite courses: 977-332 Module : Software Engineering**

Formal methods; formal specification; mathematical notation; schema calculus generic constructions; rigorous software development; semi-

formal specification; cleanroom software engineering; test generation from specification; formal method tools; case studies

**977-366 Alternative Software Development 3((2)-2-5)**

**Prerequisite courses: 977-332 Module : Software Engineering**

Principle of adaptive software development; basic characteristics of an adaptive software development life cycle; collaborative approach; agile methodologies; engineering practice in agile software development such as scrum, Kanban, lean, test driven development (TDD), feature driven development (FDD), automated acceptance testing, extreme programming (XP); software specification by example; continuous integration

**977-367 Best Practice in Software Engineering 3((2)-2-5)**

**Prerequisite courses: 977-332 Module : Software Engineering**

Introduction and definitions of software engineering best practices; best practices for software architecture and design; best practices for project planning; best practices for programming and coding; best practices for software changes and control; best practices for software quality assurance; best practices for security; best practices for international software standards; best practices for legacy applications; best practices for software metrics

**977-460 Special Topics in Software Engineering I 3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies related to software engineering

**977-461 Special Topics in Software Engineering II 3((x)-y-z)**

**Prerequisite courses: -**

Special topics; novel theories or technologies related to software engineering

**4) Cooperative Education Courses**

**977-470 Cooperative Education I 6(0-36-0)**

**Prerequisite courses: -**

On the job training as a full-time staff of an approved workplace for a period not less than 16 weeks or 640 hours including oral presentation and final report submission to the entrepreneur

**977-471 Cooperative Education II 6(0-36-0)**

**Prerequisite courses: 977- 471 Cooperative Education I**

On the job training as a full-time staff of an approved workplace for a period not less than 16 weeks or 640 hours including oral presentation and final report submission to the entrepreneur