



# **Bachelor of Science in Technical Education**

**Program in Industrial Engineering**

**(Amended Program B.E. 2555)**

**Faculty of Technical Education**

**Rajamangala University of Technology Krungthep**

**Ministry of Education**

**Bachelor of Science in Technical Education**

**Program in Industrial Engineering**

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## **PREFACE**

The Bachelor of Science in Technical Education, Program in Industrial Engineering (Amended Program B.E. 2555) is offered by Department of Industrial Education and Technical Studies, Faculty of Technical Education, Rajamangala University of Technology Krungthep. It aims to produce graduates whose knowledge and performances meet requirements of educational and industrial job markets. Graduates will demonstrate a sense of virtue and morality, co-exist with others as good citizens, take responsibility for oneself, the profession, the society, and uphold professional ethics.

Information will be given in this program regarding the overall curriculum management, teaching and learning organizations to ensure target learning outcomes. Students can learn about required courses as well as teaching, learning and evaluation methods. Employers can make decisions regarding recruiting new employees from this program. This program takes into account the Thai Qualifications Framework for Higher Education B.E. 2552 – teacher education concentration and the Council of Thailand’s professional teaching standards B.E. 2549.

Faculty of Technical Education

Rajamangala University of Technology Krungthep

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**Bachelor of Science in Technical Education**  
**Program in Industrial Engineering**  
**(Amended Program B.E. 2555)**

**Name of Institution** Rajamangala University of Technology Krungthep

**1. Faculty and Department** Faculty of Technical Education  
Department of Industrial Education and Technical Studies

**2. Name of Program** Bachelor of Science in Technical Education  
Program in Industrial Engineering

**3. Name of Program**

3.1 Full Name in English: Bachelor of Science in Technical Education (Industrial Engineering)

3.2 Abbreviation in English: B.S. Tech Ed. (Industrial Engineering)

**4. Objectives of the program**

The objectives of the program are to develop the following qualities, areas of knowledge, abilities and skills in learners.

- 4.1 A person with a sense of virtue and morality, who can act as good citizens, take responsibility for oneself, the profession, the society and uphold professional ethics.
- 4.2 A full knowledge of the focused field, an ability to integrate and apply the knowledge obtained from the two strands of the profession – teaching and industrial engineering – to future careers and continuous self-development
- 4.3 An ability to initiate creative ideas, put the ideas into action, use critical thinking to solve problems in a systematic manner
- 4.4 An ability to function on a team as a leader or a member, be well-aware of individual differences, take responsibility and live in harmony with other people. A person who has faith and a sense of pride in the teaching profession
- 4.5 An ability in numerical analysis, communication in Thai and foreign languages as well as making use of technology
- 4.6 A skill in the teaching profession, an ability to deliver both theoretical and practical knowledge, but be adaptive to change and alternative mechanical engineering careers

## 5. Specifications

<b>5.1 Required Total Credits</b>	<b>175</b>	<b>Credits</b>
<b>5.2 Structure of Program</b>		
<b>1. General Education Courses</b>	<b>31</b>	<b>Credits</b>
1.1 Languages	12	Credits
1.2 Social Sciences	3	Credits
1.3 Humanities	3	Credits
1.4 Physical Education and Recreation	1	Credit
1.5 Sciences and Mathematics	12	Credits
<b>2. Specialization Courses</b>	<b>138</b>	<b>Credits</b>
2.1 Teacher Education	50	Credits
2.1.1 Teacher Education Foundation	27	Credits
2.1.2 Applied Education	5	Credits
2.1.3 Professional Experience	14	Credits
2.1.4 Teacher Education Elective	4	Credits
2.2 Major	88	Credits
2.2.1 Industrial Engineering Foundation	20	Credits
2.2.2 Compulsory	56	Credits
2.2.3 Teaching	6	Credits
2.2.4 Major Elective	6	Credits
<b>3. Free Elective Courses</b>	<b>6</b>	<b>Credits</b>

### 5.3 Courses and Credits

#### 1. General Education Courses 31 Credits

##### 1.1 Languages 12 Credits

Students may select the following courses.

##### ● Thai Languages 3 Credits

1-110-101	Thai Usage	3 (3-0-6)
1-110-102	Thai for Communication	3 (3-0-6)
1-111-206	Speaking and Writing for Careers	3 (3-0-6)
1-112-313	Creative Writing	3 (3-0-6)

##### ● English Languages 9 Credits

1-211-001	General English	3 (3-0-6)
1-211-002	English for Work	3 (3-0-6)
1-211-003	English for Everyday Use	3 (3-0-6)
1-211-004	English for Communication	3 (3-0-6)
1-211-005	English Conversation	3 (3-0-6)
1-211-006	General Reading	3 (3-0-6)
1-211-007	General Writing	3 (3-0-6)
1-211-008	English for Presentations	3 (3-0-6)
1-211-009	English for Professional Purposes	3 (3-0-6)

Or other Languages courses in the General Education category offered by Rajamangala University of Technology Krungthep.

##### 1.2 Social Sciences 3 Credits

Students may select one of the following courses.

1-121-003	Human Relations	3(3-0-6)
1-122-003	The Philosophy of Sufficiency Economy	3(3-0-6)
1-123-004	Economics for Everyday Use	3(3-0-6)
1-124-002	Thai Politics and Government	3(3-0-6)
1-125-002	Labor Law	3(3-0-6)
1-125-003	Intellectual Properties Law	3(3-0-6)

Or another Social Sciences course in the General Education category offered by Rajamangala University of Technology Krungthep.

**1.3 Humanities****3 Credits**

Students may select one of the following courses.

1-130-001	Library and Information for Education	3(3-0-6)
1-130-002	Information Resources for Academic Presentation	3(3-0-6)
1-130-003	Information Retrieval Technique	3(3-0-6)
1-131-001	General Psychology	3(3-0-6)
1-131-002	Personality Development Techniques	3(3-0-6)
1-132-001	Man and Ethics of Living	3(3-0-6)
1-132-002	Buddhist Religion	3(3-0-6)
1-132-003	Religion and Way of Life	3(3-0-6)
1-133-001	Thai Studies	3(3-0-6)
1-133-002	Thai Culture	3(3-0-6)
1-134-001	Man and Arts	3(3-0-6)

Or another Humanities course in the General Education category offered by Rajamangala University of Technology Krungthep.

**1.4 Physical Education and Recreation 1 Credit**

Students may select one of the following courses.

1-141-001	Physical Education	1(0-2-1)
1-141-002	Badminton	1(0-2-1)
1-141-003	Tennis	1(0-2-1)
1-141-005	Football	1(0-2-1)
1-141-008	Golf	1(0-2-1)
1-141-011	Muay Thai	1(0-2-1)
1-141-013	Social Dance	1(0-2-1)
1-142-001	Recreation	1(0-2-1)
1-142-004	Games for Recreation	1(0-2-1)

Or another Physical Education and Recreation course in the General Education category offered by Rajamangala University of Technology Krungthep.



**1.5 Sciences and Mathematics 12 Credits**

Students may select four of the following courses.

2-110-104	Chemistry for Everyday Use	3 (3-0-6)
2-110-107	Science and Technology for Local Wisdom	3 (3-0-6)
2-120-102	Environment and Resources Management	3 (3-0-6)
2-130-102	Science for Everyday Use	3 (3-0-6)
2-130-103	Science and Technology	3 (3-0-6)
2-210-001	Mathematics for Everyday Use	3 (3-0-6)
2-210-002	Mathematics for Decision Making	3 (3-0-6)
2-210-003	Mathematics for Cognitive Skill	3 (3-0-6)
2-210-004	General Mathematics	3 (3-0-6)
2-230-103	Introduction to Computer Assisted Instruction	3 (2-2-5)
2-230-104	Internet Technology and Applications	3 (2-2-5)
2-230-107	Package Program	3 (2-2-5)

Or other Sciences and Mathematics courses in the General Education category offered by Rajamangala University of Technology Krungthep.

**2. Specialization Courses 138 Credits****2.1 Teacher Education 50 Credits****2.1.1 Teacher Education Foundation 27 Credits**

Students are required to take the following courses.

3-134-101	Self-Actualization for Teachers	2 (2-0-4)
3-134-202	Educational Psychology	3 (3-0-6)
3-134-203	Guidance and Learning Development	2 (2-0-4)
3-134-204	Innovation and Educational Technology 1	2 (2-0-4)
3-134-205	Innovation and Educational Technology 2	1 (0-3-1)
3-134-206	Learning and Teaching Management	3 (2-3-5)
3-134-208	Principles of Vocational and Technical Education	2 (2-0-4)
3-134-307	Educational Measurement and Assessment	3 (3-0-6)
3-134-309	Curriculum Development	3 (3-0-6)
3-134-410	Education Administrative Management	3 (3-0-6)
3-134-411	Educational Research	3 (3-0-6)

### **2.1.2 Applied Education 5 Credits**

Students are required to take the following courses.

3-134-414	Instructional Material Development	2 (1-3-3)
3-134-415	Didactics for Technician	3 (1-4-4)

### **2.1.3 Professional Experience 14 Credits**

Students are required to take the following courses.

3-134-312	Practicum 1	1 (0-6-6)
3-134-313	Practicum 2	1 (0-6-6)
3-134-516	Professional Experience 1	6 (0-40-0)
3-134-517	Professional Experience 2	6 (0-40-0)

### **2.1.4 Teacher Education Elective 4 Credits**

Students may select two of the following courses.

3-134-318	Computer for Education and Training	2 (1-3-3)
3-134-419	Classroom Action Research	2 (2-0-4)
3-134-420	Special Education	2 (2-0-4)
3-134-421	Instruction Package Production	2 (1-3-3)
3-134-422	Workshop and Training Center Organization and Management	2 (2-0-4)
3-134-423	Educational Quality Assurance	2 (2-0-4)

## **2.2 Major 88 Credits**

### **2.2.1 Industrial Engineering Foundation 20 Credits**

Students are required to take the following courses.

3-001-301	Seminar	1 (0-2-1)
3-001-302	Pre-Project	1 (1-0-2)
3-001-403	Project	3 (1-6-4)
3-111-104	Technical Drawing	3 (2-3-5)
3-111-105	Engineering Skills	3 (1-6-4)
3-111-106	Industrial Safety	3 (3-0-6)
3-230-101	Electricity Technology	3 (2-3-5)
3-230-102	Information and Communication Technology	3 (1-4-4)

### 2.2.2 Compulsory 56 Credits

Students are required to take the following courses.

2-221-202	Statistic 1	3 (3-0-6)
3-005-405	Professional Experience in Industrial	3 (0-40-0)
3-012-102	Engineering Materials	3 (3-0-6)
3-012-104	Engineering Drawing for Industrial	3 (1-6-4)
3-012-205	Work Study	3 (3-0-6)
3-012-206	Machine Tools 1	3 (1-6-4)
3-012-207	Manufacturing Process	3 (3-0-6)
3-012-208	Welding Engineering 1	3 (1-6-4)
3-012-309	Quality Control	3 (3-0-6)
3-012-310	Computer Aided Design and Manufacturing	3 (2-3-5)
3-012-311	Jig and Fixture	3 (1-6-4)
3-012-312	Press Tool and Die	3 (1-6-4)
3-012-313	Plastic Mold	3 (1-6-4)
3-112-101	Industrial Mathematics	2 (2-0-4)
3-112-201	Computer Drawing	3 (1-6-4)
3-112-207	Machine Tools 2	3 (1-6-4)
3-112-310	Foundry Engineering 1	3 (1-6-4)
3-122-102	Engineering Statics	3 (3-0-6)
3-212-301	Engineering Metallurgy	3 (2-3-5)

### 2.2.3 Teaching 6 Credits

Students are required to take the following courses.

3-136-401	Specific Teaching Methods for Industrial Engineering	3 (1-4-4)
3-136-402	Workshop Teaching for Industrial Engineering	3 (1-4-4)

### 2.2.4 Major Elective 6 Credits

Students may select two of the following courses.

3-012-103	Tools Engineering	3 (2-3-5)
3-013-301	Welding Engineering 2	3 (1-6-4)
3-013-302	Foundry Engineering 2	3 (1-6-4)
3-013-303	Quality Assurance for Industrial	3 (3-0-6)
3-013-304	Production Planning and Control	3 (3-0-6)

3-013-305	Non-Destructive Materials Inspector	3 (2-3-5)
3-013-306	Pattern Design and Construction	3 (1-6-4)
3-013-307	Maintenance Engineering	3 (2-2-5)
3-013-308	Industrial Plant Design	3 (3-0-6)
3-013-417	Basic Logistics Engineering	3 (2-3-5)
3-212-304	Automatic Machines Engineering	3 (2-3-5)
3-213-309	Welding Inspection	3 (2-3-5)

### **3. Free Elective Courses**

### **6 Credits**

Student may select any undergraduate courses offered by Faculty of Technical Education or other faculties.

## **5.4 Course Descriptions**

### **1. General Education Courses**

#### **1.1 Languages**

#### **1-110-101 Thai Usage 3(3-0-6)**

Basic knowledge of Thai usage including listening, reading, writing, and speaking; comprehensive listening, critical listening, comprehensive reading, and analytical reading; writing of academic reports, official correspondence, application letters, projects, and report statements; and speaking during discussions, meetings and different occasions.

#### **1-110-102 Thai for Communication 3(3-0-6)**

Usage of Thai language in communication, characteristics of Thai language, communication theory and culture; the practice of 4 skills; listening, reading, speaking, and writing of Thai language for communication.

#### **1-111-206 Speaking and Writing for Careers 3(3-0-6)**

Speaking and writing for presentations, public relations, and career contacts.

#### **1-112-313 Creative Writing 3(3-0-6)**

Thai words usage, the meaning of the words, phraseology, text editing, and creative writing such as slogans, articles, short stories, and poetry.

- 1-211-001 General English 3(3-0-6)**  
Holding conversations related to greetings and introductions, requesting, asking for permission, thanking and apologizing, reading and writing instructions, describing everyday items, describing past, present, and future events.
- 1-211-002 English for Work 3(3-0-6)**  
Holding conversations related to invitations and appointments, making telephone calls, expressing opinions, reading tables, short reports, general advertisements, job advertisements and biographies, writing resumes and job application letters, completing job application forms and participating in job interviews.
- 1-211-003 English for Every Use 3(3-0-6)**  
Using English in greetings, introductions and giving directions, making telephone calls, appointments, reservations, and to do shopping; reading and listening to such everyday matters as news, announcements, and advertisements.
- 1-211-004 English for Communication 3(3-0-6)**  
Translating and expressing ideas in all four communication skills - listening, speaking, reading, and writing.
- 1-211-005 English Conversation 3(3-0-6)**  
Listening and speaking in everyday life contexts, skills focusing on pronunciation and precise communications.
- 1-211-006 General Reading 3 (3-0-6)**  
Reading newspapers, articles, magazines, textbooks; using dictionaries, predicting; using background and general knowledge, finding main ideas, topic sentences, supporting details; speed reading techniques, skimming, and scanning.
- 1-211-007 General Writing 3 (3-0-6)**  
Similarities and differences between spoken and written languages, writing sentences and paragraphs, filling in forms, writing personal letters and diaries, errors and correction.
- 1-211-008 English for Presentations 3(3-0-6)**  
Writing product details and instructions for using the products, writing reports and projects, presenting work to the public.

**1-211-009 English for Professional Purposes 3(3-0-6)**

Reading articles, documents, periodicals, textbooks that are related to learners' specialized area of study; holding conversations in the target discipline, listening and reading for comprehension, interpretation and summarization, writing descriptions, delivering oral presentations on topics related to the profession.

**1.2 Social Sciences**

**1-121-003 Human Relations 3(3-0-6)**

Preliminary knowledge of human relations, psychological theory related to human behavior and demand, self-development for human relations, human relations establishing techniques for family, society, and organization, and training for human relations.

**1-122-003 The Philosophy of Sufficiency Economy 3(3-0-6)**

Origin, definitions, and fundamental concept of the philosophy of sufficiency economy; the concept and theories concerning this philosophy and the application of this philosophy to lifestyles at individual, family, community, organization, and national levels; relevant case studies as well as the Royal Projects.

**1-123-004 Economics for Everyday Use 3(3-0-6)**

Basic principle in the economic activities of society e.g. economy, market and pricing mechanism, finance and banking, and international trade; the understanding of economic changes that affect the living and are the basis for application in daily life including inflation, deflation, unemployment, finance, national income, etc.

**1-124-002 Thai Politics and Government 3 (3-0-6)**

Evolution of Thai's governments, institutions, and political processes; the democratic government with the King as the head of the state including constitution, parliament, ministry, judge, political parties, and benefit groups; the legislative processes, elections, government administrative regulations for central, regional, and local authority, and major political issues.

**1-125-002 Labor Law 3(3-0-6)**

Concepts and meanings of labor law, employment, minimum wage rates setting, and principles of law relating to labor e.g. labor protection law, labor relation law, social security law, compensation law, labor court law, and labor cases procedures.

**1-125-003 Intellectual Properties Law 3(3-0-6)**

Concepts and reasons for the protection of intellectual properties, meanings and types of intellectual properties, laws and features of intellectual properties e.g. copyright, patent, trademark, and other rights focusing on meanings and characteristics of protected right, guideline, terms of right acquisition, right protection, right violation, intellectual properties disputing and settlement, process to resolve disputes, and arbitration process; the power of adjudication of the court case for intellectual properties and international trade, conversion of intellectual properties to capital, and other related laws; home protection agreement or relevant international treaties.

**1.3 Humanities**

**1-130-001 Library and Information for Education 3 (3-0-6)**

Library information, other information sources, and information resources including storing, searching, and utilizing; writing of academic reports, bibliographies, and citations.

**1-130-002 Information Resources for Academic Presentation 3 (3-0-6)**

Information resources in terms of categories, sources, organizations, services, accessing to information, and presentation of academic work.

**1-130-003 Information Retrieval Technique 3(3-0-6)**

Techniques for information retrieval, information retrieval in a library, information retrieval in scientific field and social science, electronic information retrieval, information management, citation and bibliography formats.

**1-131-001 General Psychology 3(3-0-6)**

Meanings and scope of psychology, the influence of genetics and the environment, human development, various human organ systems in brief, intelligence, perception, learning, motivation, personality and adjustment, mental health and social behavior.

**1-131-002 Personality Development Techniques 3(3-0-6)**

Basic knowledge in personality development, personality theory, factors that influence personality, personality improvement techniques, self-perceptions, the effects of human relationship toward personality, mental health and adjustment, and the complete personality development.

**1-132-001 Man and Ethics of Living 3(3-0-6)**

Theories and basic concepts of morality and ethics, the importance of ethics in everyday life, criteria for judging the moral value and religious ethics, and having desirable attributes.

<b>1-132-002</b>	<b>Buddhist Religion</b>	<b>3(3-0-6)</b>
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Lord Buddha's biography, the history of Buddhist in Thailand, Buddhist principles applied in everyday life, practices to manage mental intelligence, religious ceremony, and roles and values of Buddhism in Thai society.

**1-132-003 Religion and Way of Life 3(3-0-6)**

Background knowledge of the origin of religion, the social development led to ideology, beliefs and religion, doctrine and goals of world religions, the importance of religions to social development and the application of religious doctrine in everyday life.

**1-133-001 Thai Studies 3(3-0-6)**

Background of Thai race, Thai social, economy, government, Buddhism, tradition, language and literature, visual arts, craft, acting art, music, culinary, and intellectual heritage.

**1-133-002 Thai Culture 3(3-0-6)**

Meanings and factors related to culture, and the background of Thai race and society; factors that influence diversity of Thai culture, important Thai cultures, cultural change, conservation and promotion of Thai culture in line with the current way of life.

<b>1-134-001</b>	<b>Man and Arts</b>	<b>3(3-0-6)</b>
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Foundation of arts, and the necessity of art creation; the important factors influencing arts in each culture, different types of arts, different artistic expressions, visual arts and other arts. It also includes the relationship between man and arts, and the values of arts in relation to human development.

## 1.4 Physical Education and Recreation

**1-141-001 Physical Education 1(0-2-1)**

Basic principles and necessary practical skills of physical activities, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of each sport which to be selected by students.



**1-141-002 Badminton 1(0-2-1)**

Basic principles and necessary practical skills of playing Badminton for single and double, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-141-003 Tennis 1(0-2-1)**

Basic principles and necessary practical skills of playing tennis for single and double, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-141-005 Football 1(0-2-1)**

Basic principles and necessary practical skills of playing football, to develop team spirit as well as physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-141-008 Golf 1 (0-2-1)**

Basic principles and necessary practical skills of playing Golf, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-141-011 Muay Thai 1 (0-2-1)**

Basic principles and necessary practical skills of Muay Thai, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-141-013 Social Dance 1(0-2-1)**

Basic principles and necessary practical skills of social dance, training in various social dances, to develop physical fitness, safety, and to provide practical knowledge and understanding of rules and etiquette of playing the game.

**1-142-001 Recreation 1 (0-2-1)**

Basic principles about recreation activities, organization, and selection of appropriate recreation activities.

**1-142-004 Games for Recreation 1(0-2-1)**

Basic principles and practices about the management of games for recreation, creating games for use in recreation activities, and principles and techniques for creating games for recreation.

## **1.5 Sciences and Mathematics**

### **2-110-104 Chemistry for Everyday Use 3 (3-0-6)**

Chemical in daily use, contaminants in food, drinking and consumption water, washing compounds, cosmetics, medicines, polymers, and substances that cause harm.

### **2-110-107 Science and Technology for Local Wisdom 3 (3-0-6)**

Meaning and analysis of significances, types, and applications of Thai local wisdom; how to apply science and technology knowledge to explain what appears in the local wisdom, and using local wisdom based on science and technology for sustainable development. The field trip is included.

### **2-120-102 Environment and Resources Management 3(3-0-6)**

Basic knowledge of environment and resource management, principles of ecology and natural balance, and natural resources and conservation; the environmental pollutions and disposal of scientific pollutants, environmental impact assessment, and administration for the integrated environmental development.

### **2-130-102 Science for Everyday Use 3(3-0-6)**

Meanings of science, scientific processes, measurements and units of measurement, evolutionary theory, heredity, nature of the wave, and electromagnetic wave; the utilization of electrical and nuclear energy, chemicals in daily life, basic electronics, and basic principles of computer.

### **2-130-103 Science and Technology 3(3-0-6)**

Scientific methods, computer and computing technology, communication technology and the Internet, and office equipments and home appliances; the synthetic substances and chemicals in daily life, environmental technology, future renewable energy, astronomy, and advance in space.

### **2-210-001 Mathematics for Everyday Use 3 (3-0-6)**

Preliminary calculation, introduction to financial mathematics, problem solving principles and methods of reasoning, and counting principles and basic probability of events; the creation of problems modeling in daily life and solutions, and data collection and presentation with the application of technology.

### **2-210-002 Mathematics for Decision Making 3 (3-0-6)**

Basic logic and reasoning, introduction to statistics and data analysis, and data interpretation and presentation.

**2-210-003 Mathematics for Cognitive Skill 3 (3-0-6)**

Set of numbers, factors, highest common factor, least common factor, and equations and inequations.

**2-210-004 General Mathematics 3(3-0-6)**

Sets, orders pair, relations and functions, exponent, logarithm, trigonometric, matrices, and determinant.

**2-230-103 Introduction to Computer Assisted Instruction 3 (2-2-5)**

Importance and role of computers in teaching and learning; design principles, processes of creating instruction media with computer, characteristics of computer assisted instruction program, use of application packages to create computer assisted instruction lessons, and finding the effectiveness of the developed teaching materials.

**2-230-104 Internet Technology and Applications 3 (2-2-5)**

Basic knowledge about Internet technology, and sending and receiving information on the network; the web pages designing and building, Internet security, and applications of Internet technology in the profession.

**2-230-107 Package Program 3 (2-2-5)**

Study and practice about the application software packages commonly used nowadays e.g. business processing, basic homepage preparation, and presenting information in multimedia formats.

**2. Specialization Courses 138 Credits**

**2.1 Teacher Education 50 Credits**

**2.1.1 Teacher Education Foundation 27 Credits**

**3-134-101 Self-Actualization for Teachers 2 (2-0-4)**

The meaning of being a teacher, the importance, roles, duties, tasks of teachers, origins of teaching as a profession, characteristics of a good teacher, ways to build good attitudes towards the profession, teachers' professional development, learning and academic leadership in teachers, professional standards and ethics, laws related to teachers and educational personnel, taking parts in activities for improving teachers' characteristics.

**3-134-202 Educational Psychology 3 (3-0-6)**

Psychological concepts, theories and principles related to education management, human development, individual differences, emotion and personality, mental health, intelligence, motivation, learning, learning transfer, memory, application of psychological findings to instruction.

**3-134-203 Guidance and Learning Development 2 (2-0-4)**

Definitions, objectives, philosophy and principles of guidance, local and international history of guidance, skills for peer guidance focusing on risks related to sexual relationships, problems and effects concerning sexual relationship, factors and behaviors connecting with drug addiction and violence, types of guidance and counseling, offering guidance services.

**3-134-204 Innovation and Educational Technology 1 2 (2-0-4)**

Concepts, theories, educational innovation and technology that promote learning quality development, information technology, analysis of problems arising from using innovation and technology, learning sources and networks, innovative design, construction, implementation, evaluation and improving.

**3-134-205 Innovation and Educational Technology 2 1 (0-3-1)**

**Prerequisite : 3-134-204 Innovation and Educational Technology 1**

Production and development of educational innovation and technology, information technology and communication, selection, design, and improving to achieve good results, learning sources that promote learning.

**3-134-206 Learning and Teaching Management 3 (2-3-5)**

Basic knowledge of curriculum and instruction, theories of learning and teaching, learning styles, learner-centered learning, integration of knowledge, teaching methods, instructional approaches, development of approaches, cooperative learning, learning management theories and techniques, development of learning innovation, learning experience management, basic teaching skills.

**3-134-208 Principles of Vocational and Technical Education 2 (2-0-4)**

Definitions, scope and importance of vocational and technical education, educational philosophy, principles and theories of vocational and technical education, evolution and trends inside and outside Thailand, vocational education policy, cooperation of public and private sectors in vocational education and training, the national framework for vocational education, development of competency-based curriculum, teacher development.

**3-134-307 Educational Measurement and Assessment 3 (3-0-6)**

Principles and techniques in educational evaluation, creation, use of measurement instruments and evaluation, authentic evaluation, assessment of portfolios, performance assessments, formative and summative evaluation.

**3-134-309 Curriculum Development 3 (3-0-6)**

The philosophy of Thai education, concepts, educational management and development plans, definitions and importance of a curriculum, curriculum elements, processes in curriculum development, curriculum models, competency-based curricula, characteristics of a good curriculum, short-term courses, local courses, evaluation of a curriculum, problems and trends in curriculum development, curriculum design for training.

**3-134-410 Education Administrative Management 3 (3-0-6)**

Theories and principles of administration and management, educational leadership, systematic thinking, organization cultures, human relations and communication, classroom management, educational quality assurance, team works, organizing academic and vocational training projects, projects and activities for development purposes, information system for educational management, community education.

**3-134-411 Educational Research 3 (3-0-6)**

Research theory, models, design and procedures, statistics for research, studies on educational development, research methods in problem solving, research proposals, conducting a research study and presenting results.

### **2.1.2 Applied Education 5 Credits**

**3-134-414 Instructional Material Development 2 (1-3-3)**

Principles of instructional materials employed in industrial education, job analysis for teacher development, scheduling and execution of instruction, preparing handouts, assessment and evaluation of performances, learning progress records.

**3-134-415 Didactics for Technician 3 (1-4-4)**

Skills in teaching and supervision, contents on technical theory, lesson plans and preparations, micro-teaching in laboratories and workshops, evaluation focusing on integration of knowledge, new ways of technical studies, group assignments.

### **2.1.3 Professional Experience 14 Credits**

**3-134-312 Practicum 1 1 (0-6-6)**

Study visits to public and private educational institutions and/or training centers in industrial sectors, focusing on the specialized field, observation of educational resources management and curricula in action, interviews and data gathering, practice focusing on planning for learning experiences, reports and presentation of the visits.

**3-134-313 Practicum 2 1 (0-6-6)**

**Prerequisite : 3-134-312 Practicum 1**

Implementation of the learning experiences planned in Practicum 1, working in cooperation with the institutions designing lessons and organizing activities related to learning experiences, reports and presentation of the visits.

**3-134-516 Professional Experience 1 6 (0-40-0)**

**Prerequisite : 3-134-313 Practicum 2**

Teaching practice integrating theoretical knowledge obtained from classes, completing learner-centered lesson plans, organizing learning experiences, selecting or constructing instructional materials, using a variety of techniques and strategies, evaluating the outcomes, conducting classroom-based research, applying evaluation results to further development, recording and reporting the professional experience in educational seminars.

**3-134-517 Professional Experience 2** **6 (0-40-0)**

**Prerequisite : 3-134-516 Professional Experience 1**

Teaching practice as in Practical Experience 1, recording and reporting the professional experience in educational seminars, organizing academic projects in schools.

**2.1.4 Teacher Education Elective 4 Credits**

**3-134-318 Computer for Education and Training** **2 (1-3-3)**

Fundamentals of computer knowledge including those related to hardware and software, application programs for paperwork and presentations, information presentations, computer networks, e-mails, computer security, roles of computer in the present time, computer technology in the future, application of information technology in organizations, practice focusing on using modern program packages.

**3-134-419 Classroom Action Research** **2 (2-0-4)**

Concepts and principles of action research, models, research procedures, planning, data gathering and analysis, writing classroom-based action research projects, evaluation of the research, synthesizing the results, presentation of research findings.

**3-134-420 Special Education** **2 (2-0-4)**

The type and characteristics of students with special needs, principles and methods of teaching, psychology and basic teaching and learning techniques, suitable materials and technology, special education inside and outside Thailand.

**3-134-421 Instruction Package Production** **2 (1-3-3)**

Definitions and evolution of instruction packages, models and components, related psychology, planning, designing, techniques and processes in instruction package production, producing instruction packages, implementing to find efficiency, evaluating and improving.

**3-134-422 Workshop and Training Center Organization and Management** **2 (2-0-4)**

Career goals, labour force in industrial professions, physical conditions, workshop and training centers, tools, machinery and equipment, safety management, management of tools, machinery and equipment maintenance, management of learners, practical jobs and facilities available in workshops and training centers.

<b>3-134-423</b>	<b>Educational Quality Assurance</b>	<b>2 (2-0-4)</b>
	Educational quality assurance inside and outside Thailand, quality indicators, self-assessment reports, preparations for evaluation, evaluation methods in vocational education.	
	<b>2.2 Major</b>	
	<b>2.2.1 Industrial Engineering Foundation 20 Credits</b>	
<b>3-001-301</b>	<b>Seminar</b>	<b>1 (0-2-1)</b>
	Preparation and seminar organisation, presentations and circulations of reports, follow-up and evaluation, topics of interest.	
<b>3-001-302</b>	<b>Pre-Project</b>	<b>1 (1-0-2)</b>
	Procedures and requirements for a project, a focused topic, objectives, scope, planning, report writing, a required format and presentation methods for a completed project.	
<b>3-001-403</b>	<b>Project</b>	<b>3(1-6-4)</b>
	<b>Prerequisite : 3-001-302 Pre-Project</b>	
	Integration of knowledge gained from the focused field to carry a project work, scheduling, operating, monitoring, problem analysis and solving, progress reports, documenting, and presentation of the completed project.	
<b>3-111-104</b>	<b>Technical Drawing</b>	<b>3 (2-3-5)</b>
	Lettering, symbols, shapes, sizes, drawing standards, sketching, two-dimensional drawings, three-dimensional drawings, analysis, orthographic drawings, section views and manufacturing drawings.	
<b>3-111-105</b>	<b>Engineering Skills</b>	<b>3 (1-6-4)</b>
	Using layout tools, basic measuring tools and small tools, adjusting and threading jobs, using basic machines including lathes, sawing, drilling and welding machines, turning operation, drilling and welding jobs, machine maintenance and safety at work.	
<b>3-111-106</b>	<b>Industrial Safety</b>	<b>3 (3-0-6)</b>
	General knowledge of industry-based operations, safety rules, safety organizations, analysis, investigation, safety and accident reports, prevention, control, fire precautions, activities promoting safety, laws related to safety and health at work.	



**3-230-101 Electricity Technology 3 (2-3-5)**

Standards and safety in electricity, electrical system design, electricity measuring instruments, power system protection devices, lighting circuits, electrical mechanics, monitoring of selection and maintenance of power system, single-phase and three-phase electrical systems in industry.

**3-230-102 Information and Communication Technology 3 (1-4-4)**

Advantages of information and communication technology, basic computer maintenance, operating system programs, documentation and presentation programs, the Internet and online networks, information searching, application of information and communication technology in everyday life, virtue and morality in employing information and communication technology, computer related acts.

**2.2.2 Compulsory 56 Credits**

**2-221-202 Statistics 1 3 (3-0-6)**

Descriptive statistics, probability, random variables and their distributions, random sampling, sampling distribution, parameter estimation, hypotheses testing of one population mean, and the chi-square testing.

**3-005-405 Professional Experience in Industrial 3 (0-40-0)**

Job training in an area related to industrial engineering in a private company, a state enterprise or a government body for at least 270 hours for real-life work experience

**3-012-102 Engineering Materials 3 (3-0-6)**

Engineering materials including metals, ceramics, polymers, semi-conductor materials, new composite materials, atomic and crystal structures, codification, mechanical properties and testing, plastic deformation and mechanism of a strength increase, phase diagrams, ferrous materials, non-ferrous materials, heat treatment, polymer materials, ceramics, alloys, corrosion.

**3-012-104 Engineering Drawing for Industrial 3 (1-6-4)**

**Prerequisite : 3-111-104 Technical Drawing**

Practice focusing on industrial engineering drawing, tolerance systems, clearance systems, shape coordinates, manufacturing standards, part assembly, welding, development drawing, working drawings.

- 3-012-205 Work Study 3 (3-0-6)**  
Principles of productivity, working time components, data recording and questioning techniques, production and operation charts, motion charts, string charts and two-hand charts, principles of motion efficiency, work sampling and standard time calculations, incentive payment and principles of ergonomics.
- 3-012-206 Machine Tools 1 3 (1-6-4)**  
Working principles and safety in parts production, using lathes, shaping, milling, cutting tools, grinding machines, practice focusing on lathe tools and drill bit sharpening, facing, turning, slotting, cutting-off, drilling, boring, flat milling, stepping milling, flat shaping, maintenance of machine tools.
- 3-012-207 Manufacturing Process 3 (3-0-6)**  
Manufacturing processes, deformation methods, deformation cutting by machines, joint assembly, surface decoration, producing by metal press and plastic mold tools, advanced machine tools such as CNC, EDM and Wire Cut.
- 3-012-208 Welding Engineering 1 3 (1-6-4)**  
Theory and practice focusing on welding processes, effects of welding parameters, welding metallurgy, heat effects of welding, inspection and defect analysis, welding electrode standards, welding symbols and welding cost estimation.
- 3-012-309 Quality Control 3 (3-0-6)**  
Principles of quality control in production systems, suitable selection of seven QC tools such as Pareto charts, fishbone diagrams, brainstorming, QC circle techniques, and control charts, QC planning, sampling, scheduling, cost estimating for the quality system, reliability and QA of products.
- 3-012-310 Computer Aided Design and Manufacturing 3 (2-3-5)**  
**Prerequisite : 3-012-104 Engineering Drawing for Industrial**  
**3-012-206 Machine Tools 1**  
Theory and practice focusing on computer-aided design (CAD) using modern computer-aided manufacturing (CAM) software, 2-dimensional and 3-dimensional drafting and modeling, computer-aided manufacturing using tools operating with modern computer programs and using CNC machines.

**3-012-311 Jig and Fixture 3 (1-6-4)**

**Prerequisite : 3-012-206 Machine Tools 1**

Theory and practice focusing on jig and fixture design including modular systems, selection of materials, standard parts, problem analysis and solving in using jigs and fixtures in manufacturing.

**3-012-312 Press Tool and Die 3 (1-6-4)**

**Prerequisite : 3-012-206 Machine Tools 1**

Theory and practice focusing on press tool and die design, shearing and forming process, types of blanking dies, forming dies, materials selection, standard parts, and press machines. Calculating forces, analysis of blanking and forming parts characteristics to find a correct approach to press tool and die design.

**3-012-313 Plastic Mold 3 (1-6-4)**

Theory and practice focusing on plastic thermoforming mold design, plastic properties, plastic manufacturing, selection of materials, machines, standard parts for thermoforming mold making, preventive maintenance and problem analysis in plastic thermoforming.

**3-112-101 Industrial Mathematics 2 (2-0-4)**

Tolerance systems, calculation of circumference, area, capacity, weight, stress in beams and moment, pressure, heat and transmission systems, taper turning, stress-strain in machines, calculation of efficiency on screws, pulleys, hydraulics and pneumatics, calculation of manufacturing time using machines.

**3-112-201 Computer Drawing 3 (1-6-4)**

**Prerequisite : 3-012-104 Engineering Drawing for Industrial**

Using computer programs for drawing , using commands for making 2-dimensional and 3-dimensional shapes, specific dimension, detail drawing, assembly drawing, working drawing presentation.

**3-112-207 Machine Tools 2 3 (1-6-4)**

**Prerequisite: 3-012-206 Machine Tools 1**

Using lathes, milling, shaping, and grinding equipment, external and internal thread cutting, taper turning, offsetting tail stock center turning, stepping shaping, milling with indexing heads, spur gear milling, flat grinding, and cylindrical grinding, work safety and maintenance of machines.

**3-112-310 Foundry Engineering 1 3 (1-6-4)**

Principles of casting processes, cavity molds for casting, the importance of sand molds, sand testing for creating the mold cavity, metal water feed systems, hardness of metals in the mold cavity, metal water filling systems, Heron's casting, metal casting furnaces, defect prevention and repair.

**3-122-102 Engineering Statics 3 (3-0-6)**

Principles of mechanics, forces and moments, forces systems, results of forces systems, equilibrium, free body diagram writing, forces analysis in the structure and machine parts, friction, center of gravity, center of mass, moment of area and principles of virtual work.

**3-212-301 Engineering Metallurgy 3 (2-3-5)**

Metallurgy tools, structure and crystallization, metal deformation, recovery, recrystallization and grain growth, solidification of metal, equilibrium diagram of binary system, iron-iron carbide equilibrium diagram heat treatment of metals, micro structure inspection.

**2.2.3 Major Elective 6 Credits**

**3-012-103 Tools Engineering 3 (2-3-5)**

Basic principles of tools engineering such as standards of engineering drawing, material tools, tolerance in fabrication and manufacturing for engineering, tools design in manufacturing engineering such as cutting tools, jigs, fixtures, press tools and dies, plastic molds and advanced machine tools, economics in tools engineering.

**3-013-301 Welding Engineering 2 3 (1-6-4)**

**Prerequisite : 3-012-208 Welding Engineering 1**

Welding steels, alloy steels, iron, aluminum and other metal alloys, surfacing welding, welding improved properties, the automatic welding, calculation to determine the shape of weld joints and weld types, bending behaviors of welding metals, requirements and standards for welding quality control, planning and monitoring welding procedures, accreditation of qualifications and personnel involved in welding according to international standards.

**3-013-302 Foundry Engineering 2 3 (1-6-4)**

**Prerequisite : 3-112-310 Foundry Engineering 1**

Investment casting definition, permanent molds, metal casting design, furnaces for metal casting, inspection and analysis of alloy steel casting, finishing, repairing and maintenance.

**3-013-303 Quality Assurance for Industrial 3 (3-0-6)**

Principles of international quality assurance, industrial quality assurance in Thailand, quality management system, quality costing, quality teams and quality control cycles, the overall quality administration of organizations.

**3-013-304 Production Planning and Control 3 (3-0-6)**

Principles of production management, demand forecasting techniques, production and manufacturing resource planning, inventory management, production sequencing, production control and project controlling by PERT/CPM techniques.

**3-013-305 Non-Destructive Materials Inspector 3 (2-3-5)**

Principles of non-destructive material testing and inspection, visual testing, penetration testing, ultrasonic testing, magnetic testing, testing method and decision criterion, special techniques, translation of testing results.

**3-013-306 Pattern Design and Construction 3 (1-6-4)**

Basic knowledge of patterns in casting processes, the definition and scope of patterns, important elements, drawing and pattern allowances, pattern testing, safety in using tools, equipment and machines, pattern making materials.

**3-013-307 Maintenance Engineering 3 (2-2-5)**

Principles of machinery maintenance, causes of deteriorations, machine inspection, lubrication in maintenance, planning, repairing, safety control in repair jobs, evaluation of machine maintenance.

**3-013-308 Industrial Plant Design 3 (3-0-6)**

Basic principles of industrial plant design, product analysis, design procedures, necessary facilities for the layout, location selection, machines and installation, materials and project handling, model developing, decision makings, computer-aided design, laws and regulations related to plant design.

**3-013-417 Basic Logistics Engineering 3 (2-3-5)**

Logistic engineering concepts, customer demand forecasting, balancing in production system, material and inventory management, transportation planning and distribution, decision criteria, efficiency measurement of logistic systems and supply chain management, relationship between logistics, supply chain management and other production strategies, application of logistics, supply chain management, industrial purchasing.

**3-212-304 Automatic Machines Engineering 3 (2-3-5)**

**Prerequisite: 3-012-310 Computer Aided Design and Manufacturing**

Automatic machines operating with computer numerical control (CNC), principles and systems of lathe and milling CNC machines, electrical discharge machines (E.D.M) controlled by numerical control systems, G code, M code, planning and writing programs, controlling turning and milling automatic machines, the CAD/CAM system, maintenance and safety in using CNC machines.

**3-213-309 Welding Inspection 3 (2-3-5)**

Methods and procedures for welding inspection, principles and guidelines for quality assurance standards in destructive and non-destructive testing, conclusion making and recording inspection results.

**2.2.4 Teaching 6 Credits**

**3-136-401 Specific Teaching Methods for Industrial Engineering 3(1-4-4)**

**Prerequisite : 3-134-415 Didactics for Technician**

Curriculum analysis, teaching content, preparation of lessons, instructional materials and aids, micro teaching practice, development of teaching plans focusing on theories in industrial engineering, using the information system prepared for effective management.

**3-136-402 Workshop Teaching for Industrial Engineering 3 (1-4-4)**

Course specifications analysis, teaching content, preparation of lessons, instructional materials and aids, development of workshop teaching plans for industrial engineering, instructional techniques and methods, micro-teaching practice, evaluation, using the information system prepared for effective management.