



Bachelor of Science in Technical Education

Program in Mechanical Engineering

(Amended Program B.E. 2555)

Faculty of Technical Education

Rajamangala University of Technology Krungthep

Ministry of Education

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PREFACE

The Bachelor of Science in Technical Education, Program in Mechanical 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 responsibilities for oneself, the profession, the society, and they will uphold professional ethics.

Information will be given in this program regarding the overall curriculum management, teaching and learning organizations to ensure target learning outcomes. Learners 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 for a five-year progression 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 Mechanical 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 Mechanical Engineering

3. Name of Degree

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

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

4. Objectives of the Program

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

4.1 A person with virtue and morality who can co-exist with others as good citizens, take responsibility for oneself, the profession, the society, and who uphold professional ethics

4.2 A full knowledge of the focused field, an ability to integrate and apply the knowledge obtained from two strands of the profession – teaching and mechanical engineering – to future careers and continuous self-development

4.3 An ability to initiate creative ideas, put the ideas into action, process through 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 responsibilities 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

5.1 Required Total Credits **171 Credits**

5.2 Structure of Program

1. General Education Courses **31 Credits**

A. Languages 12 Credits

B. Social Sciences 3 Credits

C. Humanities 3 Credits

D. Physical Education and Recreation 1 Credit

E. Sciences and Mathematics 12 Credits

2. Specialization Courses **134 Credits**

A. Teacher Education 50 Credits

Teacher Education Foundation 27 Credits

Applied Education 5 Credits

Professional Experience 14 Credits

Teacher Education Elective 4 Credits

B. Major 84 Credits

Mechanical Engineering 74 Credits

Teaching 6 Credits

Major Elective 4 Credits

3. Free Elective Courses **6 Credits**

5.3 Courses and Credits

1. General Education Courses 31 Credits

A. Languages 12 Credits

Students may select four of the following courses.

| | | |
|-----------|----------------------------------|----------|
| 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) |
| 1-211-003 | 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) |

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

B. 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) |
| 1-125-002 | Labor Law | 3 (3-0-6) |

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

C. 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) |
| 1-131-002 | Personality Development Techniques | 3(3-0-6) |

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

D. Physical Education and Recreation 1 Credit

Students may select one of the following courses.

| | | |
|-----------|----------------------|----------|
| 1-141-001 | Physical Education | 1(0-2-1) |
| 1-141-005 | Football | 1(0-2-1) |
| 1-141-008 | Golf | 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.

E. Sciences and Mathematics 12 Credits

Students may select four of the following courses.

| | | |
|-----------|--|----------|
| 2-110-104 | Chemistry for Everyday Use | 3(3-0-6) |
| 2-110-106 | Science and Technology for Modern Life Style | 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) |
| 2-210-001 | 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) |

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

2. Specialization Courses 134 Credits**A. Teacher Education 50 Credits****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) |

| | |
|--------------------------|------------------|
| 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) |

| | | |
|------------------------------|-----------|----------------|
| Profession 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) |

Teacher Education Elective **4 Credits**

Students are required to take 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) |

B. Major **84 Credits**

| | | |
|-------------------------------|-----------|----------------|
| Mechanical Engineering | 74 | Credits |
|-------------------------------|-----------|----------------|

Professional 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) |

Major Required **54 Credits**

Students are required to take the following courses.

| | | |
|-----------|--|-----------|
| 2-212-103 | Calculus 1 | 3(3-0-6) |
| 3-005-403 | Professional Experience in Industrial | 3(0-40-0) |
| 3-122-101 | Engineering Materials | 3(3-0-6) |
| 3-122-102 | Engineering Statics | 3(3-0-6) |
| 3-122-114 | Gasoline Engine and Diesel Engine | 3(1-6-4) |
| 3-122-115 | Automotive Suspension and Transmission System | 3(1-6-4) |
| 3-122-204 | Mechanics of Solid 1 | 3(3-0-6) |
| 3-122-206 | Computer Aided Drafting and Design | 2(1-4-3) |
| 3-122-207 | Fluid Mechanics | 3(3-0-6) |
| 3-122-208 | Thermodynamics 1 | 3(3-0-6) |
| 3-122-213 | Hydraulics and Pneumatics | 3(2-3-5) |
| 3-122-216 | Automotive Electric System and Electronic System | 3(1-6-4) |
| 3-122-303 | Engineering Dynamics | 3(3-0-6) |
| 3-122-305 | Mechanical Design | 3(3-0-6) |
| 3-122-309 | Mechanical Engineering Laboratory | 2(0-4-2) |
| 3-122-310 | Refrigeration and Air Conditioning | 3(3-0-6) |
| 3-122-311 | Refrigeration and Air Conditioning Practice | 2(0-6-2) |
| 3-122-312 | Industrial Boiler | 3(2-3-5) |
| 3-122-417 | Internal Combustion Engines | 3(3-0-6) |

Teaching 6 Credits

Students are required to take the following courses.

| | | |
|-----------|--|----------|
| 3-126-401 | Specific Teaching Methods for Mechanical Engineering | 3(1-4-4) |
| 3-126-402 | Workshop Teaching for Mechanical Engineering | 3(1-4-4) |

Major Elective **4 Credits**

Students are required to take four credits from the following courses.

| | | |
|-----------|------------|----------|
| 2-212-204 | Calculus 2 | 3(3-0-6) |
|-----------|------------|----------|

| | | |
|-----------|-------------------------------------|----------|
| 3-123-301 | Mechanical Mathematics | 2(2-0-4) |
| 3-123-302 | Mechanics of Machinery | 3(3-0-6) |
| 3-123-305 | Automotive Engineering | 3(3-0-6) |
| 3-123-306 | Vehicle Instrument and Testing | 2(0-6-2) |
| 3-123-307 | Gas Engine System | 3(2-3-5) |
| 3-123-308 | Maintenance Technology | 3(3-0-6) |
| 3-123-309 | Energy Conservation and Environment | 3(3-0-6) |
| 3-123-403 | Mechanics of Solid 2 | 3(3-0-6) |
| 3-123-404 | Thermodynamics 2 | 3(3-0-6) |

3. Free Elective Courses

6 Credits

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

5.4 Course Descriptions

1. General Education Courses

A. 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.

1-211-003 English for Everyday Use 3 (3-0-6)

Using English in greetings, introductions, giving directions, making telephone calls, appointments, reservations and shopping. Reading and listening to everyday matters such 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.

B. 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.

1-125-002 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.

C. 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.

1-131-002 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 as it pertains to personality, mental health and adjustment, and the complete personality development.

D. 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.

1-141-005 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.

1-142-001 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.

E. Sciences and Mathematics

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

Chemicals in daily use, contaminants in food, drinking and consumption water,

washing compounds, cosmetics, medicines, polymers, and substances that cause harm.

2-110-106 Science and Technology for Modern Life Style 3 (3-0-6)

Development of science and technology, the advancement of technology and their benefits to humans, and the impact of technology on the environment; the development of technologies for the life style of the new era e.g. material science, nanotechnology, fuel technologies and energy, food, beverage and pharmaceutical technology, and cosmetics and beauty technology.

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. A 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 pollution and disposal of scientific pollutants, environmental impact assessment, and administration for the integrated environmental development.

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, ordered pair, relations and functions, exponent, logarithm, trigonometric, matrices, and determinant.

2. Specialization Courses

A. Teacher Education

Teacher Education Foundation

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.

Applied Education

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.

Professional Experience

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.

Teacher Education Elective

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.

| | | |
|------------------|--|------------------|
| 3-134-423 | Educational Quality Assurance | 2 (2-0-4) |
| | Educational quality assurance inside and outside Thailand, quality indicators, self-assessment reports, preparations for evaluation, evaluation methods in vocational education. | |

B. Major

Mechanical Engineering

Professional Foundation

| | | |
|------------------|--|-----------------|
| 3-001-301 | Seminar | 1(0-2-1) |
| | Preparations and seminar organisations, presentations and circulations of reports, follow-up and evaluation, topics of interest. | |
| 3-001-302 | Pre-Project | 1(0-3-1) |
| | Procedures and requirements for a project, a focused topic, objectives, scope, planning, report writing, a required format and presentation methods for a completed project. | |
| 3-001-403 | Project | 3(1-6-4) |

Prerequisite : 3-001-302 Pre-Project

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.

| | | |
|------------------|--|-----------------|
| 3-111-104 | Technical Drawing | 3(2-3-5) |
| | Lettering, symbols, shapes, sizes, drawing standards, sketching, two-dimensional drawings, three-dimensional drawings, analysis, orthographic drawings, section views and manufacturing drawings. | |
| 3-111-105 | Engineering Skills | 3(1-6-4) |
| | 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. | |
| 3-111-106 | Industrial Safety | 3(3-0-6) |
| | 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.

Major Required

2-212-103 Calculus 1 3 (3-0-6)

Functions, limits, continuity, derivatives of algebraic and transcendental functions, applications of derivatives, integrations, techniques of integrations, definite integral and applications.

3-005-403 Professional Experience in Industrial 3 (0-40-0)

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

3-122-101 Engineering Materials 3 (3-0-6)

Engineering materials including metals, plastics, wood, concrete, asphalt, synthetic materials in industry, material standards, properties of materials, testing, application, basic production processes in engineering, limitations of materials.

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.

3-122-114 Gasoline Engine and Diesel Engine 3 (1-6-4)

Skill practice using principles of engines, engine systems, repairing engine parts and systems with suitable measuring and special tools, carrying out troubleshooting steps,

modifying engines using manuals, maintaining gasoline and diesel engines.

3-122-115 Automotive Suspension and Transmission System 3 (1-6-4)

Skill practice focusing on structures and principles of clutch transmission, automatic clutches, differential gears, driving systems, suspension systems, steering systems, brakes and anti-lock brake systems, analyzing, resolving, and maintaining automotive transmission and suspension systems.

3-122-204 Mechanics of Solids 1 3 (3-0-6)

Stress, strain and their relationship, stress caused by temperature, pressure vessels and welded joints, torsion of shafts and hollow shafts, shear force and bending moment diagrams, calculation of stress, shear stress and deflection in beams.

3-122-206 Computer Aided Drafting and Design 2 (1-4-3)

Skill practice using computers in drafting and mechanical engineering designs, two dimensions and three dimensions, standard parts, section drawing, assembly drawing, and parts drawing using state-of the-art software packages.

3-122-207 Fluid Mechanics 3 (3-0-6)

Properties of fluid, fluid pressure, hydrostatic forces on solid surfaces, types of flow, forces and moments caused by fluid flow, analysis of dimensions and similarities, calculation of internal loss in pipes, measurement and flow rate instruments, and incompressible fluid flows.

3-122-208 Thermodynamics 1 3 (3-0-6)

Thermodynamic properties, the first and the second laws of thermodynamics, work and heat energy, energy and its relationship with close and open systems carrying a steady and consistent flow and state, heat engines, heat pumps, entropy air conditioners, change of energy forms, ideal gas, thermodynamic processes, basics of heat transfer.

3-122-213 Hydraulics and Pneumatics 3 (2-3-5)

Hydraulic and pneumatic parts and equipment, working systems, connection methods, circuits, analysis of circuits and operating systems, circuit design.

3-122-216 Automotive Electric System and Electronic System 3 (1-6-4)

Skill practice in using measuring and testing tools to analyze problems in charging, ignition and lighting systems, facilities, control systems, fuel injection, and transmission control system, practice related to basic structures, equipment and circuits of automotive electronic systems, electronic circuits, using devices to analyze and

correct malfunctions in electronic control circuits.

3-122-303 Engineering Dynamics 3 (3-0-6)

Prerequisite : 3-122-102 Engineering Statics

Basic principles of thermodynamics, Newton's law, measuring velocity and acceleration of particles and rigid bodies, measuring forces caused by acceleration of particles and rigid bodies, measuring momentum and impact in particles and rigid bodies, using the energy equation to solve motion problems.

3-122-305 Mechanical Design 3 (3-0-6)

Prerequisite : 3-122-204 Mechanics of Solid 1

Fundamentals of machine design, theories of failures, theories of fatigue failures, design of machine elements, shafts, screws, spring, journal bearings, ball and rolling bearings, gears, brakes and clutches, belts, and chains and slings, a case study and a design project.

3-122-309 Mechanical Engineering Laboratory 2 (0-4-2)

Laboratory experiments focusing on principles of mechanical engineering, dynamics of statics, strength of materials, material properties, thermal properties of fluid power and air cooling, performance testing of engines.

3-122-310 Refrigeration and Air Conditioning 3 (3-0-6)

Prerequisite : 3-122-208 Thermodynamics 1

Basic principles of refrigeration, thermo-dynamic cycles of cooling, cooling systems, compressors, condensers, evaporators, control systems, refrigerants and piping, determination of the cooling load, air-conditioning systems, load of air conditioning, moisture in the air, ventilation and air distribution.

3-122-311 Refrigeration and Air Conditioning Practice 2 (0-6-2)

Prerequisite : 3-122-310 Refrigeration and Air Conditioning

Skill practice focusing on refrigerant pipes, vacuuming, cooling lubricants, checking for leaks, electricity, control systems, services on refrigeration and air conditioning, the cooling cycle, air conditioning systems and chiller systems.

3-122-312 Industrial Boiler 3 (2-3-5)

Prerequisite : 3-122-208 Thermodynamics 1

Steam generator systems, industrial operations requiring steam, types of steam engines, burner characteristics, water treatment, control equipment, steam traps, piping and

insulation, maintenance, safety precautions and laws.

3-122-417 Internal Combustion Engines 3 (3-0-6)

Prerequisite : 3-122-208 Thermodynamics 1

Basic engine types and their operations, thermodynamics of air standard cycles, fuel-air cycles, actual cycles, combustion in spark-ignition engines, combustion in compression-ignition engines.

Teaching

3-126-401 Specific Teaching Methods for Mechanical Engineering 3 (1-4-4)

Prerequisite : 3-134-415 Didactics for Technician

Analysis of curriculum documents, subject content, preparations of lessons and materials, aiding equipment, micro training, development of lesson plans focusing on theories in mechanical engineering using information systems to manage the lessons.

3-126-402 Workshop Teaching for Mechanical Engineering 3 (1-4-4)

Prerequisite : 3-134-415 Didactics for Technician

Analysis of curriculum documents, subject content, preparations of lessons and materials, aiding equipment, development lesson plans focusing on practice in mechanical engineering, teaching techniques and methods, micro teaching, evaluation, using information systems to manage the lessons.

Major Elective

2-212-204 Calculus 2 3 (3-0-6)

Prerequisite : 2-212-103 Calculus 1

Functions of several variables, graphs of functions of two variables, limits, continuity, partial derivatives and applications, multiple integrals and applications, first order ordinary differential equations, second order linear differential equations with constant coefficients.

3-123-301 Mechanical Mathematics 2 (2-0-4)

Rules and definitions: unit of measurement, area, volume, weight and corner, calculation of forces, moments, pressure, heat and stress, measuring efficiency, coordinate systems for shafts, screws, pulleys and belts, calculation of engine performances, transmission and brake systems.

3-123-302 Mechanics of Machinery 3 (3-0-6)

Prerequisite : 3-122-102 Engineering Statics

Linkages, gear trains, displacements, velocity and acceleration in machines, statics and dynamics force analysis, balances of rotating and reciprocating masses.

3-123-305 Automotive Engineering 3 (3-0-6)

Analysis of forces in automotive parts, driving forces, the resistance movement, performances and characteristics of motor vehicles, stability of motor vehicles in curve driving and one-direction driving, characteristics of the rubber brake system, transmission systems through the clutch and the transmission fluid, automatic gears, overdrives.

3-123-306 Vehicle Instrument and Testing 2 (0-6-2)

Skill practice focusing on modifications with tools including those used in analysis, testing electronic, transmission, brake and load handling systems, gasoline and diesel engine tune up using modern tools and testing equipment.

3-123-307 Gas Engine System **3 (2-3-5)**

Operating principles of vehicle gas systems, components installation, gas vehicle tune up, repairs and maintenance, analysis of malfunctions, estimation of gas price.

3-123-308 Maintenance Technology 3 (3-0-6)

Principles of machine maintenance, causes of deterioration, machine checks-up, repairing plans and monitoring, security in repairing jobs, evaluation of maintenance.

3-123-309 Energy Conservation and Environment 3 (3-0-6)

Processes in changing natural resources and environment into goods or services, pollution in factories, systematic environmental management, classifications of energy and energy utilization, conservation of energy, natural resources and environment, related laws and standards.

3-123-403 **Mechanics of Solid 2** 3 (3-0-6)

Prerequisite : 3-122-204 Mechanics of Solid 1

Statistically indeterminate beam types such as one-end fixed beams, beams with one fixed end and one rotating end, continuous beams, poles, analysis of stress and strain, a strain energy theory, composite beams, beam bending and curving beams.

3-123-404 Thermodynamics 2

3 (3-0-6)

Prerequisite : 3-122-208 Thermodynamics 1

The gas cycle, the power steam cycle, the reversible cycle, refrigerants, gas equations, air charts, principles of air conditioning, basic principles of fuel combustion, operating principles of nozzles.