



Bachelor of Industrial Technology

Program in Computer Technology

(Amended Program B.E. 2554)

Faculty of Technical Education

Rajamangala University of Technology Krungthep

Ministry of Education

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PREFACE

The mission of Faculty of Technical Education, Rajamangala University of Technology Krungthep is to produce graduates who possess knowledge of technology that is needed in the industry. Their abilities will meet professional standards. They will be able to complete work virtuously and keep pace with change.

The Bachelor of Industrial Technology Program in Computer Technology (Amended Program B.E. 2554) takes into account the Thai Qualifications Framework for Higher Education B.E. 2552 (computer concentration), the Eleventh National Economic and Social Development Plan B.E. 2555 - 2559, and the National Information and Communication Technology Policy Framework B.E. 2554-2563. It offers four areas of specialization: Hardware and Embedded System, Enterprise Software Development, Network and Security, and Internet Application. Graduates will be well-equipped with required knowledge and skills as well as their applications in workplaces particularly those production, service and creative industries.

Faculty of Technical Education
Rajamangala University of Technology Krungthep

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Bachelor of Industrial Technology
Program in Computer Technology
(Amended Program B.E. 2554)

Name of Institution Rajamangala University of Technology Krungthep

1. Faculty and Department Faculty of Technical Education
 Department of Industrial Technology

2. Name of Program Bachelor of Industrial Technology
 Program in Computer Technology

3. Name of Degree

3.1 Full Name in English : Bachelor of Industrial Technology (Computer Technology)

3.2 Abbreviation in English : B.Ind.Tech. (Computer Technology)

4. Objectives of the Program

The program aims to produce graduates who demonstrate the knowledge, abilities, skills and qualities.

4.1 Knowledge and abilities in computer technology focusing on Hardware and Embedded System, Enterprise Software Development, Network and Security, and Internet Application.

4.2 Knowledge of industrial technology and management.

4.3 Self-discipline, procedural thinking working methods and sense of virtue and morality.

4.4 Abilities in written and spoken communication in Thai as well as foreign languages.

4.5 Self-study skills in learning new knowledge, keeping pace with technology, and skills in making use of technology for learning.

5. Specifications

5.1 Total Credits Required for Graduation	133	Credits
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5.2 Structure of Program

1. General Education Courses	30	Credits
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A. Social Sciences	3	Credits
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B. Humanities	3	Credits
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C. Languages	12	Credits
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D. Sciences and Mathematics	6	Credits
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E. Physical Education and Recreation	1	Credit
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F. General Education Elective	5	Credits
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2. Specialization Courses	97	Credits
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A. Professional Foundation	20	Credits
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B. Major Required	46	Credits
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C. Major Elective	24	Credits
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D. Professional Experience	7	Credits
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3. Free Elective Courses	6	Credits
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5.3 Courses and Credits

1. General Education Courses 30 Credits

A. 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)
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.

B. Humanities 3 Credits

Students may select one of the following courses.

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)

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

C. Languages 12 Credits

● Thai 3 Credits

Students may select one 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)

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

● English 9 Credits

Students may select three of the following courses.

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)
1-211-008	English for Presentations	3(3-0-6)
1-211-009	English for Professional Purposes	3(3-0-6)

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

D. Sciences and Mathematics 6 Credits

Students may select two of the following courses.

2-110-106	Science and Technology for Modern Life Style	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)
2-210-003	Mathematics for Cognitive Skill	3(3-0-6)
2-210-004	General Mathematics	3(3-0-6)

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

E. 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)
1-141-013	Social Dance	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.

F. General Education Elective 5 Credits

Students may select any courses in the General Education category offered by Rajamangala University of Technology Krungthep.

2. Specialization Courses 97 Credits**A. 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)

B. Major Required 46 Credits

Students are required to take the following courses.

3-230-103	Fundamentals of Electric Circuits	2(2-0-4)
3-230-105	Electronics Materials	3(2-2-5)
3-230-106	Basic Electronics in Computer	3(2-3-5)
3-230-204	Principles of Electricity	3(2-2-5)
3-230-207	Computer Mathematics	2(2-0-4)
3-231-201	Digital System	3(2-3-5)
3-231-202	Introduction to Embedded System	3(2-3-5)
3-232-101	Basic Mathematic Problem Solving using Computer	3(1-4-4)
3-232-102	Computer Programming	3(2-2-5)
3-232-203	Advanced Computer Programming	3(2-2-5)
3-232-204	Database System	3(2-2-5)
3-233-101	Principles of Communications Technology	3(2-2-5)
3-233-202	Computer Networks	3(2-3-5)
3-233-203	TCP/IP Design and Implementation	3(2-3-5)
3-234-201	Multimedia Technology	3(2-2-5)
3-234-302	Web Programming	3(2-2-5)

C. Major Elective**24 Credits**

Students may select the following courses.

● Hardware and Embedded System

3-231-303	Data Structure	3(2-2-5)
3-231-304	Microprocessor Architecture	3(2-3-5)
3-231-305	Interface Circuit Design	3(2-3-5)
3-231-306	Digital System Design	3(2-3-5)
3-231-307	Basic Robotics	3(2-3-5)
3-231-308	Mechatronics	3(2-3-5)
3-231-309	Real Time OS Application Development	3(2-2-5)
3-231-310	Mobile Application Development	3(2-2-5)
3-231-311	Basic Image Processing	3(2-2-5)
3-231-412	Selected Topics in Hardware Technology	3(3-0-6)

● Enterprise Software Development

3-232-305	Database System Design	3(3-0-6)
3-232-306	Object-Oriented System Analysis and Design	3(3-0-6)
3-232-307	Object-Oriented Application Development	3(2-2-5)
3-232-308	Information System Development with Modern Tools	3(2-2-5)
3-232-309	Information System Development with Open Sources	3(2-2-5)
3-232-310	Software Development Training Camp	1(0-3-1)
3-232-311	Business Intelligence System	3(3-0-6)
3-232-312	Chief Information Officer	3(3-0-6)
3-232-313	Service-Oriented Architecture	3(3-0-6)
3-232-414	Selected Topics in Software Development	3(2-2-5)

● Network and Security

3-233-304	IP Telephony	3(2-2-5)
3-233-305	Wireless and Mobile Networks	3(2-2-5)
3-233-306	Network Programming	3(2-2-5)
3-233-307	Computer Network Security	3(3-0-6)
3-233-308	Network Design and Management	3(2-2-5)
3-233-309	Linux Programming	3(2-2-5)
3-233-310	Advanced Linux	3(2-3-5)

3-233-311	Network and System Administrator	3(2-3-5)
3-233-412	Selected Topics in Network Technology	3(2-2-5)

● **Internet Application**

3-234-303	Human and Computer Interaction	3(3-0-6)
3-234-304	Electronics Commerce	3(2-2-5)
3-234-305	Web Service	3(2-2-5)
3-234-306	Internet Application Development	3(2-2-5)
3-234-307	Online Media Development	3(2-2-5)
3-234-308	Online Learning System Development	3(2-2-5)
3-234-309	Computer Graphic and Animation Application Development	3(2-2-5)
3-234-410	Selected Topics in Internet Technology	3(2-2-5)

D. Professional Experience 7 Credits

Students may select the Cooperative Education or the Field Experience courses.

3-005-301	Pre-Cooperative Education	1(1-0-2)
3-005-402	Cooperative Education for Computer Technology	6(0-40-0)
3-005-403	Field Experience in Computer Technology	3(0-40-0)

In case students cannot take Cooperative Education in Computer Technology, they may select Field Experience in Computer Technology plus another three-credits Major Elective course as a substitution.

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. 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.

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.

B. Humanities

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 as it pertains to 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 moral value and religious ethics, and the obtainment of desirable attributes.

C. 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.
- 1-211-001 General English 3(3-0-6)**
Conversations related to greetings and introductions, making requests, 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)**
Conversations related to invitations, appointments, making telephone calls, expressing opinions, reading tables, short reports, general advertisements, job advertisements and biographies. Writing will include resumes, job application letters, completing job application forms and participating in job interviews.
- 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.
- 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.

D. Sciences and Mathematics

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.

2-120-102 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.

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

The meaning 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 advances in space.

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.

E. 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 singles and doubles, 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.

1-141-013 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.

1-142-004 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.

2. Specialization Courses

A. Professional Foundation

3-011-301 Seminar 1(0-2-1)

Preparations and seminar organizations, presentations and circulations of reports, follow-up and evaluation, topics of interest.

3-001-302 Pre-Project 1(1-0-2)

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.

B. Major Required

3-230-103 Fundamentals of Electric Circuits 2(2-0-4)

Introduction to electrical elements, DC and AC sources, relationship between voltage current and electrical power, resistance circuits, Ohm's law, Kirchhoff's law and their applications.

3-230-105 Electronics Materials 3(2-2-5)

Atoms, molecules, the periodic table, properties of elements and heat, thermal conductivity, convection, electrical properties of elements, insulators, conductors, semiconductors, basic knowledge of electronics devices, resistors, capacitors, transformers, diodes and basic electronic kits.

3-230-106 Basic Electronics in Computer 3(2-3-5)

Prerequisite : 3-230-105 Electronics Materials

Bipolar junction transistors: FET and MOSFET, introduction to thyristor devices, rectifiers, clippers, driver and amplifier circuits, Op-Amp.

3-230-204 Principles of Electricity 3(2-2-5)

Prerequisite : 3-230-103 Fundamentals of Electric Circuits

Theories focusing on mesh nodes, Thevenin and Norton, alternating circuits, measuring instruments, electrical signals.

- 3-230-207 Computer Mathematics** **2(2-0-4)**
 Sets, relations, functions, logic and proving, analysis of algorithm, basics of automata theory.
- 3-231-201 Digital System** **3(2-3-5)**
 Number systems, Boolean algebra, basic logic gates, combination logic circuits, the Karnaugh map method, flip-flops, registers, counter circuits, sequential circuits.
- 3-231-202 Introduction to Embedded System** **3(2-3-5)**
Prerequisite : 3-232-102 Computer programming
 Introduction to embedded system, microcontroller and basic application, C programming language for embedded system development, basic I/O port management and control, interrupt system, interrupt handler, LED, LCD, serial peripheral communication.
- 3-232-101 Basic Mathematic Problem Solving using Computer** **3(1-4-4)**
 Basic mathematical problem solving using programs in general computer, writing flowcharts to solve basic mathematical problems such as prime number, greatest common divisor, least common multiple, arithmetic series, summing, function, ordered pairs, graphs.
- 3-232-102 Computer Programming** **3(2-2-5)**
 Algorithms, flowcharts, programming structures, variables, expressions, data processing, subroutines, and program design.
- 3-232-203 Advanced Computer Programming** **3(2-2-5)**
Prerequisite : 3-232-102 Computer programming
 Programming paradigms, basic data structures, basic recursion, event programming, object-oriented programming, the use of API.
- 3-232-204 Database System** **3(2-2-5)**
 Elements of data, data relation, relational database management, basic database design, SQL, database programming.

3-233-101 Principles of Communication Technology 3(2-2-5)

Principles and theories of communication technology, waves, communication waves, sound waves, radio waves, wave properties, operating principles of communication equipments including radio, television, radio communication, microwave communication, satellite communication, telephone, mobile phone, communication problems.

3-233-202 Computer Networks 3(2-3-5)

Introduction to computer network, network architecture, topology, protocol, network devices, computer network standards, local area networks, network operating systems and network protocol suites, computer networks use Microsoft operating system, resource management, policy making, simple installation design of computer network system.

3-233-203 TCP/IP Design and Implementation 3(2-3-5)

Prerequisite : 3-233-202 Computer Networks

TCP/IP protocol architecture, open system interconnection architecture, IPv4, IPv6, IP address manipulation, routing techniques, routing protocols, IP datagram, TCP/UDP mechanism, TCP/IP protocols, installation of servers including DNS, SMTP, Telnet, ssh, http.

3-234-201 Multimedia Technology 3(2-2-5)

Physical properties of light and sound, color theory, principles of computer graphics, printing, imaging and animation technologies, techniques and application programs for manipulating still images, motion images and sound, computer storage, creation of interactive multimedia.

3-234-302 Web Programming 3(2-2-5)

Web application programs using server side script including Perl, PHP, ASP, JSP, database connection.

C. Major Elective

3-231-303 Data Structure 3(2-2-5)

Basic data structures including arrays, link lists, queues, stacks, graphs and trees, sorting and searching algorithms, application in hardware control.

3-231-304 Microprocessor Architecture **3(2-3-5)**

Structures and compositions of microprocessors, control signals, interrupt systems, bus systems, control signals for memory interface, input/output interfacing, direct memory access, instruction set architecture, assembly programming.

3-231-305	Interface Circuit Design	3(2-3-5)
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Current drive circuits, voltage drive circuits, microcontroller interface with electric equipment, motors, microcontroller interface with sensors, control methods, extended capacity of microcontroller using add-on accessories via a standard bus system such as I²C, SPI, RS232 and CANBUS.

3-231-306 Digital System Design 3(2-3-5)

Prerequisite : 3-231-201 Digital System

Logic design processing, combination circuits, asynchronous and synchronous sequential circuits, basic VHDL, FPGA devices and CPLD.

3-231-307 Basic Robotics	3(2-3-5)
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Prerequisite : 3-231-202 Introduction to Embedded System

Robotic systems, electrical machines for robotic drive, sensing devices, programs for controlling robots, designing and applications of the programs.

3-231-308	Mechatronics	3(2-3-5)
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Prerequisite : 3-231-202 Introduction to Embedded System

Electrical machines, electrical and electronic circuits, sensors and data loggers, pneumatics, hydraulics, PLC, CAD/CAM.

3-231-309 Real Time OS Application Development 3(2-2-5)

Introduction to RTOS, its architecture and structures, selection and application, device drivers, system calls, software development kit, build-in controlling mechanism, low level control techniques.

3-231-310	Mobile Application Development	3(2-2-5)
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Introduction to mobile, smart device architecture and platforms, software development kit, basics of application program development, build-in device control, construction of user interface API classes and library for program development.

3-231-311	Basic Image Processing	3(2-2-5)
	Image storage, compression and quality improvement, edge detection and image object search.	
3-231-412	Selected Topics in Hardware Technology	3(3-0-6)
	New knowledge of hardware technology.	
3-232-305	Database System Design	3(3-0-6)
	Good database design, database administration, defining rights, application monitoring system, database management systems and appropriate hardware.	
3-232-306	Object-Oriented System Analysis and Design	3(3-0-6)
	Object-oriented concepts, architecture, data models and technology, tools used in object-oriented development, object-related processing, analysis, design and programming, object-oriented applications in business organizations.	
3-232-307	Object-Oriented Application Development	3(2-2-5)
	Programs and applications, commands for structure control, arrays, classes and objects, inheritance, polymorphism, exception handling, graphical user interface, database programs and collection classes.	
3-232-308	Information System Development with Modern Tools	3(2-2-5)
	Information systems in organizations, information presentation for decision making, modern tools in information system development.	
3-232-309	Information System Development with Open Sources	3(2-2-5)
	Information systems in organizations, information presentation for decision making, open-sources in information system development.	
3-232-310	Software Development Training Camp	1(0-3-1)
	Development and promotion of learning networks, software development skills, a training camp in software development, academic and social skills.	
3-232-311	Business Intelligence System	3(3-0-6)
	Data mart, data warehouses, analysis of business data, requirements gathering, decision support systems and planning, reporting.	
3-232-312	Chief Information Officer	3(3-0-6)
	Budget strategies, selection of technology, standards for information systems security, plans for employees training in technology, strategic plans on safety, communication skills and presentations to executives.	

- 3-232-313 Service-Oriented Architecture 3(3-0-6)**
 Silo-oriented architecture, service-oriented systems, business processes, intra networks, business service management, business process management.
- 3-232-414 Selected Topics in Software Development 3(2-2-5)**
 New knowledge of software development.
- 3-233-304 IP Telephony 3(2-2-5)**
 Infrastructure of home/office telephone and mobile phone communications, sound communication on the TCP/IP network, IP PBX system, protocols for sound communication on IP, IP box system installation design, connection with home/office telephone, configuration and application of IP box system program.
- 3-233-305 Wireless and Mobile Networks 3(2-2-5)**
 Structures and architecture of wireless networks, services, protocols, devices.
- 3-233-306 Network Programming 3(2-2-5)**
 Network programming, communication over the TCP/IP network through Winsock API, application layer protocols, programming through a standard protocol such as http or ftp.
- 3-233-307 Computer Network Security 3(3-0-6)**
 Computer network security, threats and prevention, cryptography techniques, digital signature, authentication, firewall recognition, fundamental protocols for security.
- 3-233-308 Network Design and Management 3(2-2-5)**
Prerequisite : 3-233-202 Computer Networks
 Network systems for large enterprises, resource management on large networks, directory services, network equipment, vigilance and management of network equipment via control protocols, efficiency of network systems, design of high availability networks, techniques for installation and maintenance of equipment on large networks.

- 3-233-309 Linux Programming 3(2-2-5)**
Structures and architecture of Linux operating system, processes, threads, connections using graphic user interface, system calls, shells, shell scripts, shell programming, Linux program development kit, programming using advanced languages.
- 3-233-310 Advanced Linux 3(2-3-5)**
Start up and shutdown processes, process fork and kill, adding devices, driver installation, kernel configuration, background process control, Linux server implementation and configuration, performance tuning, system hardening.
- 3-233-311 Network and System Administrator 3(2-3-5)**
Tools and equipment used in a network, SMNP and RMON protocols, configuration of the operating system, installation of additional programs, driver installation, kernel configuration, vulnerability, network performance, laws related to computer networking.
- 3-233-412 Selected Topics in Network Technology 3(2-2-5)**
New Knowledge of network technology.
- 3-234-303 Human and Computer Interaction 3(3-0-6)**
Basic principles of connecting computer users with computer systems, design, evaluation, development of connection methods, selection of equipment and technology.
- 3-234-304 Electronics Commerce 3(2-2-5)**
Methods and modern enterprise management making use of electronics equipment, processes in electronic commerce and business, intellectual properties, rights of consumers, e-commerce network security.
- 3-234-305 Web Service 3(2-2-5)**
Prerequisite : 3-234-302 Web Programming
Web service architecture, HTTP and XML structures, web-based services and applications, web design languages and web design.
- 3-234-306 Internet Application Development 3(2-2-5)**
Prerequisite : 3-234-302 Web Programming
Internet network architecture, operation of application program, connection with databases in the network, program development for various applications.

- 3-234-307 Online Media Development 3(2-2-5)**
Online media development, content management system, learning management system, applications of software including Mambo, Joomla, XOOP, Moodle, PostNuke.
- 3-234-308 Online Learning System Development 3(2-2-5)**
Development of e-learning lessons, learning management system, e-learning standards.
- 3-234-309 Computer Graphic and Animation Application Development 3(2-2-5)**
Prerequisite : 3-234-201 Multimedia Technology
Application, analysis, design and development of multimedia using application programs, programming techniques.
- 3-234-410 Selected Topics in Internet Technology 3(2-2-5)**
New knowledge of internet technology.

D. Professional Experience

- 3-005-301 Pre-Cooperative Education 1(1-0-2)**
Principles, procedures and regulations related to cooperative education, selection of workplaces, application letters and interviews, personality development, quality management, health and safety at work, morality and professional ethics, report writing and presentation.
- 3-005-402 Cooperative Education for Computer Technology 6(0-40-0)**
Prerequisite : 3-005-301 Pre-Cooperative Education
Cooperative education focusing on industrial and computer technology, supervision by a university's lecturer and a workplace's employee, one-semester duration equivalent to 17 weeks, report writing, work records, presentation after completion.
- 3-005-403 Field Experience in Computer Technology 3(0-40-0)**
Prerequisite : 3-005-301 Pre-Cooperative Education
Job training in an area related to computer technology in an industrial sector, a period of 280 hours as a minimum, or one summer semester.