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Learning Content

EP-M.5

EN30103 Foundation English 3

Study foundation English about recommendations, explanation, directions, descriptions, news, announcements, poems, skits, diagrams, graphs, initials, non-fictions, fictions, personal information, various local, social, and global situations and events, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, information related to other learning content groups. Demonstrate listening, speaking, reading, and writing skills using process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and understanding to create knowledge and understanding, communicative ability, thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness and 9) Be an AC gentleman

EN30104 Foundation English 4

Study foundation English about recommendations, explanation, directions, descriptions, news, announcements, poems, skits, diagrams, graphs, initials, non-fictions, fictions, personal information, various local, social, and global situations and events, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, information related to other learning content groups. Demonstrate listening, speaking, reading, and writing skills using process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and understanding to create knowledge and understanding, communicative ability,

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thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thai-ness 8) Have a sense of public consciousness and 9) Be an AC gentleman.

EN30203 English Reading-Writing 3

Study English about statements, news, announcements, poems, skits, pictures, fictions, non-fictions, non-text media such as diagrams, graphs, and initials, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, information related to other learning content groups. Use the process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and understanding to create knowledge and understanding, communicative ability, thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness and 9) Be an AC gentleman.

EN30204 English Reading-Writing 4

Study English about statements, news, announcements, poems, skits, pictures, fictions, non-fictions, non-text media such as diagrams, graphs, and initials, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, information related to other learning content groups. Use the process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and

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understanding to create knowledge and understanding, communicative ability, thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness and 9) Be an AC gentleman.

EN30209 English for Academic Achievement 3

Study English about statements, news, announcements, poems, skits, pictures, fictions, non-fictions, non-text media such as diagrams, graphs, and initials, personal experience, various events, main ideas from the stories, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, and information related to other learning content groups. Use the process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and understanding to create knowledge and understanding, communicative ability, thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness and 9) Be an AC gentleman.

EN30210 English for Academic Achievement 4

Study English about statements, news, announcements, poems, skits, pictures, fictions, non-fictions, non-text media such as diagrams, graphs, and initials, personal experience, various events, main ideas from the stories, languages, voices, social manners and cultures, custom, traditions, festivals, language structures, idioms, proverbs, poems, ways of life, beliefs, and cultures of native speakers, and information related to other learning content groups. Use the

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process of establishing knowledge and understanding, reading process, process of establishing practical skills, working process, process of language skills, process of establishing attitudes, process of conceptualization, process of analysis, process of establishing realization, and process of establishing communicative knowledge and understanding to create knowledge and understanding, communicative ability, thinking ability, problem-solving ability, life skills, and ability to use technology. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness and 9) Be an AC gentleman.

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Learning Content

EP-M.5

HP30103 Foundation Health Studies and Physical Education 3

Students will study the following topics: team sports, creative movements, concepts about movements in different kinds of sports, defense and offense principles, cooperation in team, sports competition, right, rules, regulations, safety, tactics while playing, competing with others, responsibility when participating in physical activities, playing in team, exercises, physical fitness test, individual and team sports. Students will also learn to accept and see values of doing physical exercise and playing sports regularly. They will choose types of sports suitable to places and locality such as football, futsal, Sepak takraw, etc.

Students are expected to have sporting spirit and true competitive spirit as well as appreciate the aesthetics of sports when playing, watching and competing.

Students will additionally use many skills in this course: critical thinking skill; problem-solving skill; creative and innovative thinking skill; collaborative, teamwork and leadership skills; information communication and media literacy skill; flexibility and adaptability; creativity and self-confidence; social and cross-cultural skill; leadership and responsibility. They will learn to be a creator or producer and be reliable.

The following abilities will subsequently be formed: communicative ability, thinking ability, life skill ability, problem solving ability and technological ability.

Students will also be supported to have the following desired characteristics: love of nation, religion and king; honesty and integrity; self-discipline; avidity for learning; observance of self-sufficiency; dedication and commitment to work; cherishing Thai-ness; public-mindedness; and attributes of an AC gentleman.

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HP30104 Foundation Health Studies and Physical Education 4

Study the development of methods to promote physical and motor fitness, realize the value of the promotion of physical and motor fitness, apply the plan for practicing, improving, and developing physical fitness for health and motor fitness to analyze risky situations leading to the occurrence of accidents by taking part in promoting awareness and cooperation in solving problems from personal risky behaviors affecting community using knowledge and understanding in Community Safety Laws by developing methods for preventing injuries from accidents such as project presentation to promote the strength of community security, understand the development of various kinds of drug use including personal roles in solving problems of addictive substances by recognizing various sectors giving advices and treatment for drug addicted persons, analyze negative media with provocative presenting leading to violence in the society, find methods for preventing and solving problems of violence in the society by distinguishing between creative media and negative media, and recognize principles and process of correct rescue methods.

Study foundation physical education on the topics of the concept about different types of movements when playing sports, use of one's ability to increase team capacity, and play at least one type of Thai sports and international sports both individuals and teams. At the same time, students have to show movements creatively, participate in recreation activities outside schools, and use this idea to improve and develop ways of personal life and society including doing exercise and playing sports regularly and using personal ability to increase team capability, reduce ego, consider effects on other people, sport competition with other people by practicing rights, rules, regulations, and various tactics during the competitions, showing good manners of watching, and playing sports, sportsmanship, good personalities, playing sports happily, and admiring values and beauty of sports. Use process of establishing knowledge and understanding, practical skills, problem-solving skills, decision-making skills, value to create knowledge, understanding, and apply the knowledge to real-life situations with morality, ethics, honesty, disciplines, responsibility, being free from addictive substances and allurements, democracy and justice.

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Learning Content

EP-M.5

MA30103 Foundation Mathematics 3

Study the fundamental knowledge of mathematics about the following topics: the basics of statistics – data collection, central tendency of data, finding position of data, and measure of dispersion. To gain knowledge, students will use mathematical process skills. The course is aimed for students to be able to solve problems, communicate and convey the mathematical meaning, connect, give reasons and think creatively. Students will then have the following competencies: communicative ability, thinking ability, problem solving ability, ability to use life skills and technological ability. The students will also be equipped with the following desired characteristics: love of nation, religion and the king, honesty and integrity, self-discipline, avidity for learning, self-sufficiency, dedication and commitment to work, cherishing Thai-ness and public-mindedness. Students will, in addition, develop the 21st century learning skill in arithmetic, critical thinking and problem solving.

MA30104 Foundation Mathematics 4

Study fundamental knowledge of mathematics about 1) Finite sequences and finite series: sequences and finding of general terms of finite sequences; arithmetic sequence and geometric sequence; arithmetic series and geometric series, 2) Interests and value of money: interests; value of money; annuity, 3) Probability: basic counting rules, permutation, combination, random experiment and events, probability of an event, and some important rules of probability. Students will use mathematical process skills to acquire the above mentioned knowledge and the abilities in terms of problem solving, communication, mathematical representations, connection, reasoning and creativity development. Students will then gain competencies in communicative ability, thinking ability, problem solving ability, ability to use life skills, and technological ability.

Students will also be equipped with the following characteristics: having love for the nation, religion and the king, having honesty and integrity, having avidity for learning, having value for self-sufficiency, demonstrating dedication to work, being proud to be Thai, and having

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public-mindedness. The course will, in addition, increase the 21st century learning skill in arithmetic, critical thinking and problem solving.

MA30215 Universal Mathematics 3

Study and practice skills/process in the following content:

Trigonometric functions and applications Function sine, cosine and other trigonometric functions, graph of trigonometric functions, trigonometric functions of sums and differences of real numbers/angles, inverse trigonometric functions, sine and cosine rules.

Three dimensional vectors Vectors and equalities, vector addition and subtraction, vector multiplication by scalar, outcomes of scalar and vector multiplication.

Exponential functions and logarithmic functions Exponential functions, logarithmic functions, graph of exponential functions and logarithmic functions, estimation of value by applying logarithms, solve of exponential and logarithmic equations.

Along with learning the contents, students apply skills in solving problems and building concepts so that they will have knowledge, understanding and the ability to communicate, think, and solve problems. Embedded in the learning process, students are enhanced to possess desired characters – 1) Love for the country and the king, faith in the religion 2) Be honest and upright 3) Possess discipline 4) Eager to learn 5) Be self-sufficient 6) Dedicated to work 7) Love for Thainess 8) Have a sense of public consciousness.

MA30216 Universal Mathematics 4

Study supplementary mathematics on the topics of complex numbers, graphs and absolute values of complex numbers, complex numbers in polar form, polynomial equations, basic principles of counting, permutation, and combination, binomial theorem, probability, and some important rules of probability, graphs, Euler graphs, and graph applications, and derivatives of functions. Use the process of problem solving and conceptualization to create knowledge, understanding, communicative ability, thinking ability, and problem-solving ability. At the same time, students will have the following intended qualities which are nationalism, religiosity, loyalty, honesty, disciplines, studiousness, self-sufficiency, endeavor, love of being Thai, and public mind.

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Learning Content

EP-M.5

OC30105 Foundation Occupational Works 2

Students will study about methods of working for a living and work collaboratively to create work and solve problem with creativity. Students will have a chance to practice managerial skills, and knowledge seeking skill for the basics of a quality living. Morality and desirable characteristics for work will also be cultivated. In this course, students will learn the following contents: meaning and objectives of accounting; benefits of accounting data; accounting assumptions, meaning of asset, liability, and owner's equity; accounting equation and balance sheet; transaction analysis, recording transactions based on double entry system of the service business owned by one owner in a daily journal; post the journal entries to the ledger related. In terms of careers, students are expected to have understanding, necessary skills, experience and proper perception towards future careers. They will be able to use technology to aid their work in future career and have morality and positive attitude towards professions.

Students will apply different learning processes: critical thinking process, problem-solving process, practice process, group work process and attitude development process. They will acquire abilities to communicate, think, solve problem, use life skill and apply technological skills. In addition, students will gain learning and innovative skills: think creatively, show interest in innovation, have critical thinking, be able to solve problem, communicate effectively and be collaborative. Students should also have information and technological media skill: stay up-to-date with the news, have media literacy, have information technology-related knowledge and skills and communicate wisely. They are expected to gain life and careers skills which include the following: stay flexible and adaptive, be initiative, take a good care of oneself, and have social skills. Other than all the learning skills, students will be equipped with a set of characteristics – honesty, self-discipline, avidity for learning, dedication to work, and public-mindedness.

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OC30106 Foundation Occupational Works 3

Students will **study** about methods of working for a living and work collaboratively to create work and solve problem with creativity. Students will have a chance to practice managerial skills, and knowledge seeking skill for the basics of a quality living. Morality and desirable characteristics for work will also be cultivated. In this course, students will learn the following contents: meaning and objectives of accounting; benefits of accounting data; accounting assumptions, meaning of asset, liability, and owner's equity; accounting equation and balance sheet; transaction analysis, recording transactions based on double entry system of the service business owned by one owner in a daily journal; post the journal entries to the ledger related. In terms of careers, students are expected to have understanding, necessary skills, experience and proper perception towards future careers. They will be able to use technology to aid their work in future career and have morality and positive attitude towards professions.

Students will apply different **learning processes**: critical thinking process, problem-solving process, practice process, group work process and attitude development process. They will **acquire abilities to communicate, think, solve problem, use life skill and apply technological skills**. In addition, students will **gain learning and innovative skills**: think creatively, show interest in innovation, have critical thinking, be able to solve problem, communicate effectively and be collaborative. Students should also have information and technological media skill: stay up-to-date with the news, have media literacy, have information technology-related knowledge and skills and communicate wisely. They are expected to gain life and careers skills which include the following: stay flexible and adaptive, be initiative, take a good care of oneself, and have social skills. Other than all the learning skills, students will be equipped with a set of characteristics – honesty, self-discipline, avidity for learning, dedication to work, and public-mindedness.

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ST30275 Multimedia Creation

Study of basic concepts, elements and technologies related to multimedia, creating a slide animation, recording and editing including development of multimedia project by using understanding process, thinking process, technological process, and group dynamics to gain knowledge and understanding and to be able to apply knowledge to apply in everyday life, as well as disciplined pursuit learning and commitment to work.

SC30276 Integrated Computing

Study the knowledge for creating projects from problems or topics of interest, analyze working patterns or methods for conducting the projects, methods for applying computers with projects, making projects using computers as tools with knowledge, ideas, imagination, skills, logics, technological process along with integrating computer experiences to solve various problems to create new related knowledge. Use process to create knowledge and understanding and technological process to create communicative skills, thinking ability, problem-solving ability, and ability to use technology along with possessing honesty, disciplines, diligence, and endeavor.

OC30222 Business Management

Students will **study** about the principles on how to operate the information services organizations; important components of the information services organizations; operations of organization; policy making and planning, human resource management, document management; budgeting and finance; buildings and sites; standards and quality assurance; evaluation and report; partnership with other organizations. Students will learn through the analytic thinking process, problem solving process, practices, group work, and attitude building process. **Students are expected to subsequently develop the ability to communicate, to think, and to solve problems. Life skills and the use of technology are also to be enhanced. Students will additionally be developed learning skills and skills to create innovation -- think creatively, demonstrate innovation, use critical thinking, solve problems wisely, communicate effectively, and be willing to work with others.** Information-related skills will also be included in this course. Students are expected to

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learn about technological media, to keep themselves updated with news and information, to have good judgement on media, to be a well-rounded individual in the field of information technology and to communicate wisely. Another skill that will be fostered is life and career skills which cover flexibility, adaptability, creativity, self-responsibility and social skills. As for the students' desired characteristics, the course will focus on honesty, discipline, avidity for learning, dedication for work and public-mindedness.

OC30223 Financial and Accounting

Students will **study** the following topics: meaning, objectives and benefits of accounting; accounting concept; definition of asset, dept. and owner's equity in accounting framework; accounting equation; transaction analysis; recording accounting transactions following the Generally Accepted Accounting Principles for a sole proprietorship in general journal and two column cash book; posting; trial balance; the six-column worksheet; the financial statement; adjusting entries; closing the book; and summary of the accounting cycle. In learning, students will **use a range of process skills**: critical thinking, problem-solving, practicing, group work, and attitude building. **Students will be able to communicate, solve the problems, use life skills, and use technology.** Additionally, they will learn to be an innovative thinker and have opportunities to practice learning skills. They will be creative, initiative, collaborative, think critically, solve problems systematically, and communicate effectively. The course will also develop information literacy skills, media literacy skills, and technological skills. Life and career skills are also embedded in this course. Students will learn to be resilient, build adaptability, have self-responsibility, and gain social skills. Finally, as part of the desirable characteristics, the course will develop honesty, discipline, avidity for learning, dedication and commitment to work, and public-mindedness.

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ST30106 Data Analysis Technology

Students will **learn** to write a program for data analysis. They will develop understanding about syntax, grammars, structured programming, file management, error detection, and programming for an application that works with database.

Students will **apply** the knowledge and understanding development process and problem-based learning in order to gain knowledge and understanding in the subject area and to have abilities in thinking, solving problem, and using technology.

In addition, the course objective is to **form** the following set of characteristics in students: honesty and integrity, self-discipline, avidity for learning and commitment to work. Students are also expected to develop **the 21st century learning skills: learning and innovation skill** (think creatively, interested in innovation, have problem solving skill, and communicate effectively), **information, media and technology skill** (stay up-to-date with the news, have media literacy, and have information technology knowledge and skills), and **life and careers skill** (stay flexible, be initiative, have responsibility, be enthusiastic to learn across different areas of knowledge and have leadership skills).

ST30107 Technology for Presentation

Students will study the following topics: use of information technology to present work appropriately based on the objectives of work, analyzing changes of information technology, selecting appropriate software for presentation. Students will also learn to search for information on the internet and to be able to give references sources.

In this course, students will apply the knowledge and understanding development process, engineering design process, and skill practicing process. Subsequently, students are expected to develop the 21st century learning skills: learning and innovation skill (think creatively, interested in innovation, have problem solving skill, and communicate effectively), information, media and technology skill (stay up-to-date with the news, have media literacy, and have information technology knowledge and skills), and life and careers skill (stay flexible, be initiative, have responsibility, be enthusiastic to learn across different areas of knowledge and have leadership skills).

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The following set of characteristics will additionally be enhanced in students: honesty and integrity, self-discipline, avidity for learning and commitment to work.

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Learning Content

EP-M.5

ST30212 Universal Physics 2

Study, experiment, discuss, and analyze circular movements in horizontal, vertical, circular motion, conical base and the motion on the curve, angular velocity, angular acceleration composition of rotational motion with linear motion, Torque and rotation Angular Momentum and Angular Momentum Preservation Rules and kinetic energy, rotation and energy conservation rules, simple harmonic motion, motion and vibration of particle in rope and surface. Explain and analyze the properties of waves, refraction, interference, and diffraction, including calculations. From a related situation Experiment on static waves and summarize the characteristics of stationary waves in the rope. Explain the nature of with respect to the source of movement and the speed of light in vacuum describes, analyzes and experiments on the geometrical properties of light, namely the reflection and refraction properties of light. As well as calculate the various quantities. From a given situation, explain, analyze and calculate the light intensity, and the brightness of the light relative to the origin, including the knowledge of lighting to use in lighting to suit various places. Properly retrieve, explain, test, and analyze airborne velocity data, wave's properties of beats and resonance including the use of sound knowledge to prevent noise pollution. Search data and discussion on sound power. Sound intensity and sound intensity levels affect hearing and the environment, including calculation of related quantities. Discuss and analyze shock waves, and the Doppler phenomenon. Include the use of sound knowledge to prevent noise pollution, explore, examine, discuss and calculate the forces acting between chargeable charged particles, investigate, analyze and discuss the electric potential energy of charges in the electric field. Inside and outside the conductor, conductor investigates, discusses, and analyzes the capacitor characteristics and functions. Compare capacitance when the capacitor is connected in series and parallel Include the accumulated power available in the capacitor.

By using the knowledge generation process, and scientific process skills, including observation, information query, experimentation, information feedback, information interpretation, conclusions, analysis, explanations, discussions for knowledge understanding and can bring knowledge to apply in daily life Have the ability to communicate. Ability to think and

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be able to solve problems. And can follow the agreement, rules, regulations, family rules, school and society and love justice and peace.

ST30213 Universal Physics 3

Study the formation of electrical current in wires, definition of resistivity, resistance, electric resistance, Ohm's Law, finding of total resistance and electric force in a electric cell, **electromotive force**, circuit resistance, finding of potential difference, Kirchhoff's Current Law, force acting on charged particles and wires that have electric current flowing in magnetic field, moment of couple acting on wires that have electric current flowing through a motor, **induced electromotive force**, transformers, AC electrical potential difference (voltage) and effective values of an electric current and potential difference, writing Phasors Diagram of potential difference and electric current, electromagnetic spectrum, and physical properties of light which are interference and diffraction. Use the process of establishing knowledge and understanding, scientific skills and process which are observation, data exploration, experiment, making judgments from data, data implication, data interpretation and drawing conclusion, analysis, explanation, and discussion to create knowledge, understanding, and ability to apply the knowledge to real-life situations with honesty, diligence, endeavor, and disciplines.

ST30232 Universal Chemistry 2

Study and analyze systems and environment of substances, law of conservation of mass, law of definite proportions, definition of mass of one atom of an element, calculation of molecular size and molecular mass of substances, relationship between number of moles, number of particles, mass of substances and volumes of gas at standard condition, ratio of number of moles of equally well reacting substances, write equations and balance equations of chemical reactions, solutions and some properties of solution, concentration of solution, Gay-Lussac's Law, Avogadro's Law, calculation of empirical formula and molecular formulas of substances, chemical equilibrium and different types of equilibrium, reversible reactions and irreversible reactions, reaction rate, Le Chatelier's Principles, and calculation of equilibrium constant of reactions. Use the process of establishing knowledge and understanding, analytical process, scientific skills and process which are data exploration, discussion, analysis, comparison,

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exploration, investigation, prediction, and experiment to create knowledge, ideas, understanding, and ability to apply the knowledge to real-life situations along with scientific mind, ethics, morality, and proper values.

ST30233 Universal Chemistry 3

Study and analyze properties of each type of hydrocarbon compounds, properties of functional groups or groups of atoms expressing specific properties of each type of hydrocarbon compounds, chemical reactions from each type of hydrocarbon compounds, process and products from natural gas separation, fractional distillation of crude oil, benefits of various products obtained from fractional distillation of crude oil, hazards or pollutions from the products before and after their use, formation and properties of polymer, the proper use of polymer, composition, properties, benefits, and reactions of carbohydrate, fat, fatty acid, protein, amino acid, and nucleic acid. Use the process of establishing knowledge and understanding, analytical process, and scientific skills and process which are data exploration, discussion, analysis, comparison, exploration, and investigation to create knowledge, ideas, understanding, and ability to apply the knowledge to real-life situations along with having scientific mind, ethics, morality, and proper values.

ST30257 Universal Biology 2

Study respiration, gas exchange structure, reactions of aerobic respiration and anaerobic respiration, transport in the body, blood composition, immune system, reproduction of living organisms, growth of living organisms and animal behaviors, and animal communication. Use the process of establishing knowledge and understanding, analytical process, and scientific skills and process which are observation, data exploration, experimentation, making judgments from data, data interpretation, and drawing conclusion to create knowledge, ideas, understanding, ability of knowledge communication, decision-making ability, and ability to apply knowledge to real-life situations along with having honesty, diligence, endeavor, public mind, proper values, and self-sufficiency.

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ST30258 Universal Biology 3

Study foundation science on the topics of structure and functions of transport process and transpiration of flowering plants, photosynthesis and other factors affecting photosynthesis, growing process and gametogenesis in flowering plants, seed composition and apply knowledge to use in agriculture, factors affecting seed germination, seed vigor test, effects of fertilizer on plant growth, substances produced by plants which affect physiology and response of flowering plants, and use the knowledge for further study and apply it to daily life situations, classify inherited behaviors and learning behaviors, and compare various types of animal communication. Use the process of establishing knowledge and understanding, and scientific skills and process which are observation, data exploration, experimentation, making judgments from data, classification, data interpretation, drawing conclusion, explanation, discussion, and group process to create knowledge, understanding, and ability to apply knowledge to real-life situations along with having honesty, diligence, endeavor, public mind, religiosity, love of being Thai, self-sufficiency, and disciplines.

ST30202 Periodic Motion and Static Electricity

Students will **study** the following topics: parts of wave, speed rate of water wave, reflection of surface wave, refraction of surface wave and Snell's law, interference of surface wave, diffraction of surface wave, nature of light and speed of light, reflection properties of light, plane mirror, concave mirror, convex mirror, properties of refraction of light, real depth, apparent depth, concave lens, convex lens, refraction of light, light intensity, brightness of light, natural phenomena, color and light vision, effect of temperature on light speed in the air, reflection of sound wave, interference of sound wave, beats and standing wave, resonance of sound, intensity of sound, levels of sound intensity, Doppler effect, shock waves, electrical charges, and Conservation of Charge, forces between charges, Coulomb's Law, line of force, electric field between a point charge and spherical conductor, electric potential between a point charge and spherical conductor, work in the movement of charge, relationship between potential difference and a constant electric field, capacitor, capacitance, and the total capacitance in capacitor.

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Students are expected to **use the scientific process skills** including observing, searching for information, performing experiments, giving informed opinion, presenting information, interpreting information, making a conclusion, analyzing, explaining, and discussing. Students are also **expected to acquire** the ability to solve problems, to think, and to use technology. The course is additionally **aimed** for students to demonstrate the following characteristics: being honest, having discipline, being dedicated for work, and having learning skills and skills to create innovation.

ST30203 Electricity and Magnets

Students will study the following topics: production of electric current and electric current through a conducting wire, electrical resistance and Ohm's law, electrical resistivity and conductivity, calculation to find various kinds of the total resistance, electric cell, electromotive force and the direct current circuit, calculation to find potential difference between 2 points, Kirchoff's law, ammeter, voltmeter and ohmmeter, electric energy, electric power and calculation to find electricity cost, efficiency and losses, magnetic flux and the magnetic field, force acting on electrical charge in the magnetic field, force acting on a current-carrying wire located in the magnetic field, moment of wire in the magnetic field, force acting on two current-carrying wires placed in parallel, electromotive force and induced electric current, transformer, potential difference and electric current in an AC circuit, meter used to measure electricity, AC potential difference, and the effective value, AC circuit, resonance of parallel and series RLC circuits, electromagnetic wave and polarization of light and electromagnet.

Students are expected to use the scientific process skills including searching for information, performing experiments, giving informed opinion, presenting information, interpreting information, making a conclusion, analyzing, explaining, and discussing. Students are also expected to acquire the ability to solve problems, to think, and to use technology. The course is additionally aimed for students to demonstrate the following characteristics: being honest, having discipline, being dedicated for work, and having learning skills and skills to create innovation.

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ST30247 Animal Physiology

Students will study the following topics: Functions responsible for gas exchange among sponge, hydra, planaria, earthworm, insect, fish, frog and bird, the structure of lung in mammals, the structure used for gas exchanging and the process of gas exchanging in humans, the functions of lung and the experiment to measure the air quantity of exhalation in humans, the process of cellular respiration in the conditions that oxygen supply is sufficient and insufficient, the open and closed blood circulatory system, the flowing direction of blood and the movement of blood cells in the fish tail, summary of the relationship between size of blood vein and speed of blood circulation, the structure and the functions of heart and blood vein in humans, heart structure of mammals, the direction of blood flow through human heart, blood circulation in humans, the difference of red blood cell, white blood cell, platelet and plasma, blood type and the principles of blood transfusion in ABO and Rh systems.

Students will also study the components and the functions of lymph as well as the structure and functions of lymphatic vessel and lymph node, comparison of the mechanism of non-specific immunity with specific immunity, comparison of the active immunity with the passive immunity, immune system disorder that leads to AIDS, allergies and autoimmune disorders.

Students will additionally learn about asexual and sexual reproduction in animals, structures and functions of male and female sexual organs, the process of spermatozoa production, egg cell creation and fertilization in human, the embryonic growth and post embryonic phase in frogs, chickens, and humans.

Students are expected to **use the scientific process skills** including observing, searching for information, categorizing types of data, interpreting information, making a conclusion, analyzing, explaining, and discussing. Students are also **expected to acquire** knowledge and understanding as well as the ability to make the decision, solve problems, have competency in communicating what learned, have the 21st century learning skills and be able to apply knowledge gained in everyday situations. The course is additionally **aimed for** students to demonstrate the following characteristics: being responsible, being honest, having avidity for learning, being dedicated for work, having discipline, having social responsibility, showing love of

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Thainess, showing proper social values, having value for self-sufficiency principle, and presenting the characteristics of AC gentleman.

ST30248 Plant Physiology

Students will study the following topics:

- Types and characteristics of plant tissue; the internal structure of monocotyledonous roots (monocot) and dicotyledon (dicot) roots; the internal structure of the monocot stem and of the dicot stem; the internal structure of leaf blade from a cross section.
- Gas exchange and transpiration in plants; the mechanism of the conduction of water and nutrients in plants; the importance of nutrients; examples of important nutrients that affect growth of plants; the mechanism of transport of nutrients in plants.
- The experiments about the photosynthesis conducted by scientists in the past; the steps in the photosynthesis process of C₃ plants; the mechanism of the carbon dioxide fixation occurred in C₃, C₄ and CAM plants; the factors relative to light intensity, carbon dioxide intensity and temperature that affect the photosynthesis of plants.
- The life cycle with alternation of generations of the flowering plants; the production process of male and female reproductive cells in the flowering plants and their fertilization.
- The formation of seeds and fruit in flowering plants; structure of seed and fruit; examples of uses of different structures of seed and fruit; various factors affecting the sprouting of seed and seed dormancy and methods used to overcome the seed dormancy.
- Roles and functions of auxin, cytokinin, gibberellin, ethylene and abscisic acid; application of this knowledge for agricultural use; the external stimuli that affect growth in plants.
- The innate behavior and the learned behavior of animals; the relationship between behavior and the evolution of nervous system; the communication between animals that cause their behaviors.

Students are expected to use the scientific process skills including observing, searching for information, presenting information, categorizing types of data, interpreting, making a conclusion, analyzing, explaining, and discussing. Students are also expected to acquire knowledge and understanding as well as the ability to make the decision, solve problems, have competency in communicating what learned, have the 21st century learning skills and be able

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to apply knowledge gained in everyday situations. The course is additionally aimed for students to demonstrate the following characteristics: being responsible, being honest, having avidity for learning, being dedicated for work, having discipline, having social responsibility, showing love of Thainess, showing proper social values, having value for self-sufficiency principle, and presenting the characteristics of AC gentleman.

ST30261 Earth, Stars and Universe

Students will study the following topics: relative age, absolute age, the formation process of fossils, types of fossils, stratification, the chemical structure of minerals, physical properties of minerals, examination of minerals using the chemical composition, rock forming mineral, cycle of rock, igneous rock, sedimentary rock, metamorphic rock, coal resources, petroleum resource, atmospheric layers map divided by variations in temperature, atmospheric layers based on height, formation of clouds, types of clouds, formation of storm, types of storm, formation of monsoon, celestial sphere, horizontal coordinates, equatorial coordinates, ecliptic coordinates, world time setting, solar system model, apparent motion of the planets, elongation and orbital path of the planets, Kepler's laws, gravitational force between the Sun and planetary orbits.

Students are expected to use the scientific process skills including observing, searching for information, performing experiments, giving informed opinion, presenting information, interpreting information, making a conclusion, analyzing, explaining, and discussing. Students are also expected to acquire the ability to solve problems, to think, and to use technology. The course is additionally aimed for students to demonstrate the following characteristics: being honest, having discipline, being dedicated for work, and having learning skills and skills to create innovation.

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ST30283 Innovation Project

Searching for information, analyzing and selecting important points from the academic documents and developing the selected points to be the student's own science project topic. Planning and designing the experiment to outline personalized science project. Presenting the outline or draft of the student's personalized science project in a creative and reliable way. Carrying out the student's own science project and writing up the complete report with the teacher advisor's guidance. Students are expected to **use** the scientific skills, critical thinking and problem solving skills, creative and innovative thinking skills, as well as collaborative, teamwork and leadership skills. This is **for students to** gain knowledge and understanding, to possess the scientific skills and to be able to apply knowledge in solving problems and obstacles by creating their own innovation. In addition, students will **gain competencies** in thinking, communicating, and using technology efficiently. Students will also learn to avoid performing any behaviors that will lead to negative interpersonal relationships. The course is additionally **aimed for** students to demonstrate the following characteristics: having self-discipline, having avidity for learning, having value for self-sufficiency principle, being dedicated for work, being honest, and having social responsibility.

ST30288 Biology Laboratory

Studying, searching for information and performing experiment for the study of fundamental biology about equipment and tools used in the fundamental biology studies, osmosis, transportation of substance through cell membrane, active transport type, plant respiration and photosynthesis, cellular respiration in yeast, calculation of vapor pressure and latent heat of vaporization, cell division, behaviors of insects, techniques for preparing culture media, simple streak, and basic gram staining. Students are expected to use the scientific skills, critical thinking and problem solving skills, creative and innovative thinking skills, as well as collaborative, teamwork and leadership skills. This is for students to gain knowledge and understanding, to possess the scientific skills and to be able to apply knowledge in solving problems and obstacles by creating their own innovation. In addition, students will gain competencies in thinking, communicating, and using technology efficiently. Students will also learn to avoid performing any behaviors that will lead to negative interpersonal relationships.

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The course is additionally aimed for students to demonstrate the following characteristics: having self-discipline, having avidity for learning, having value for self-sufficiency principle, being dedicated for work, being honest, and having social responsibility.

ST30292 Health Science 2

Students will learn about asexual and sexual reproduction in animals, structures and functions of male and female sexual organs, the process of spermatozoa production, egg cell creation and fertilization in human, the embryonic growth and post embryonic phase in frogs, chickens, and humans.

Use the process of establishing knowledge and understanding, analytical process, and scientific skills and process which are observation, data exploration, experimentation, making judgments from data, data interpretation, and drawing conclusion to create knowledge, ideas, understanding, ability of knowledge communication, decision-making ability, and ability to apply knowledge to real-life situations along with having honesty, diligence, endeavor, public mind, proper values, and self-sufficiency.

ST30293 Health Science 3

Students will also study the components and the functions of lymph as well as the structure and functions of lymphatic vessel and lymph node, comparison of the mechanism of non-specific immunity with specific immunity, comparison of the active immunity with the passive immunity, immune system disorder that leads to AIDS, allergies and autoimmune disorders. Understand the concept of negative feedback. Understand type 1 and type 2 diabetes, and how type 1 diabetes can be treated.

Use the process of establishing knowledge and understanding, analytical process, and scientific skills and process which are observation, data exploration, experimentation, making judgments from data, data interpretation, and drawing conclusion to create knowledge, ideas, understanding, ability of knowledge communication, decision-making ability, and ability to apply knowledge to real-life situations along with having honesty, diligence, endeavor, public mind, proper values, and self-sufficiency.