

## Course Description of Biological Sciences Program

### Foundation Courses

ICMA 100	Foundation Mathematics	0
Prerequisites: Placement test Expressions and equations; linear functions; polynomials and nonlinear functions; radical and rational functions; the data analysis		
ICMA 101	Precalculus	0
Prerequisites: Placement test Functions and graphs; polynomial functions; rational functions; exponential functions; logarithmic functions; trigonometry; unit circle; trigonometric identities; complex numbers		
ICME 101	Foundation English: Communication Skills	0
Prerequisites: Placement test A remedial course preparing students to use communicative and academic English at a level suitable for entering the English Studies I: The Writer's Toolkit course		

  
**Mahidol University**  
**International College**  
**General Education Courses**

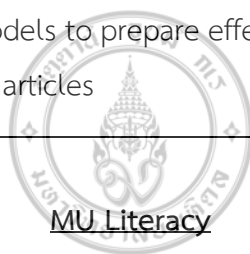
### English Communication

ICGC 104	English Studies I: The Writer's Toolkit	4
Prerequisites: Placement Writing Test An introduction to the academic writing process through the development of the writer's voice through sentencings, structure, and rhetorical devices; focus on strategies for using and integrating researched sources; methods to compose well-structured essays based on themes relevant to the world today		
ICGC 105	English Studies II: The Writer's Voice	4
Prerequisites: Placement Writing Test or ICGC 104 English Studies I: The Writer's Toolkit		

The integration of skills in academic research and writing to analyze and create persuasive compositions; techniques to identify strengths and weaknesses in argument; development of students' knowledge and preconceptions of global issues through a progressive series of essays and journal assignments		
ICGC 106	English Studies III: Public Speaking	4
Prerequisites: ICGC 105 English Studies II: The Writer's Voice Fundamentals of key skills for confident and effective public speaking through a series of prepared and unprepared speeches; introduction and application of techniques to inform/persuade audiences; utilization of the Writer's Toolkit (English Studies I) and the Writer's Voice (English Studies II) to create and deliver speeches to a professional standard		
ICGC 221	English Studies IV: The World of English - Global Realities	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An exploration and a critical analysis of key texts on poetry, literature, and legislative documents in order to understand the complexity and challenges of the world we live in; themes encouraging students to consider values, human rights and government; class discussions, journal writing, and presentation activities to demonstrate how students can contribute to the betterment of society		
ICGC 222	English Studies IV: The World of English - Literary Analysis	2
Prerequisites: ICGC 106 English Studies III: Public Speaking A review of literary works from selected literary genres; an exploration of how literature informs our perceptions of the world by way of analytical and critical thinking; utilising scaffolding of strategies for students to understand the function of a variety of literary forms		
ICGC 223	English Studies IV: The World of English - Creative Writing	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An examination of fiction, poetry, drama, and media production through readings, speeches, and films; comparisons of writing in different genres; creation of a work of publishable quality by means of the consideration of audience and genre		
ICGC 224	English Studies IV: The World of English - Advanced Oral Communication	2
Prerequisites: ICGC 106 English Studies III: Public Speaking Theories of persuasion, non-verbal techniques, and voice control for advanced presenters; strategies to develop high levels of voice control and expressions; activities including debates,		

presentations, and occasional speeches; the development of students' abilities to express themselves confidently in a variety of academic and professional environments through impromptu and prepared speeches		
ICGC 226	English Studies IV: The World of English - Literature Into Film	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An examination of the technical aspects of translating literature into film; an exploration of the interplay between literature and films through an analysis of literary works in their film versions; an exploration of the challenges merging both mediums		
ICGC 228	English Studies IV: The World of English - Language and Culture	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An examination of the interplay between language and culture; a critical exploration of the global spread of the English language with a focus on the English culture coming out of the Global South		
ICGC 230	English Studies IV: The World of English - First and Second Language Acquisition	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An exploration of how children develop their first language; comparing and contrasting of the second language development; theories of language development from behaviorism to more recent cognitive and functional approaches; the implications and applications of theories		
ICGC 231	English Studies IV: The World of English - Poetry	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An in-depth study of poetry, including metrics, forms, themes, ethnic voices, throughout history; an evaluation of poetry from different genres through discussions, workshops and research		
ICGC 232	English Studies IV: The World of English - The Short Story and the Novel	2
Prerequisites: ICGC 106 English Studies III: Public Speaking A study of elements of fictions in short stories and novels through class workshops on characters, dialogue, plot and atmosphere; class discussions to analyze the effect of historical and social developments on selected themes		
ICGC 233	English Studies IV: The World of English - Drama	2
Prerequisites: ICGC 106 English Studies III: Public Speaking		

An exploration of ways to understand and appreciate drama by reading, watching, and analyzing theatrical performances; fundamentals of theatrical production and stage performance		
ICGC 234	English Studies IV: The World of English - Literary Non-fiction	2
Prerequisites: ICGC 106 English Studies III: Public Speaking An exploration of literary nonfiction, a flourishing genre of writing a step away from academic work; reading of compelling, informative, and insightful but also entertaining, imaginative, and risky nonfiction work; overview of various techniques utilized within this field of writing and media; analysis and response to a variety of texts		
ICGC 235	English Studies IV: The World of English - Writing for Research	2
Prerequisites: ICGC 106 English Studies III: Public Speaking A student-centric approach to developing research writing skills; an overview of the conventions of the world of research with an emphasis on academic honesty and academic style; use of sample papers to provide students with models to prepare effective abstracts, literature reviews, research paper outlines and short academic articles		



ICGB 101	Project Management for Impacts	2
Prerequisites: None Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; the application of the Project Management Bodies of Knowledge (PMBOK) and skills; the management of social service projects; Social impact assessments aligning with Sustainable Development Goals (SDGs) and other frameworks		
ICGB 108	Event for Good	2
Prerequisites: None Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; exploration of various methods and strategies for organizing events that drive positive impact for communities; organizing an event focusing on community engagement, fundraising, or others with a focus on social outcomes or community-focused objective		
ICGN 139	Scientific Inquiry and the Community	2

Prerequisites: None		
Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; applying process of science discovery to authentic issues in the local community through observation or experiment; collaborate with peers in findings; summarizing and reporting to local stakeholders		
ICGS 169	Learning by Doing	2
Prerequisites: None		
Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; social work, ethical principles and values in social work, roles and settings in social work practice, collaborative approaches in social work, SDGs and their interconnectedness, analyzing global challenges addressed by the SDGs, partnerships with local communities for SDG initiatives		
ICGS 171	Digital Campaign for Gender Issues	2
Prerequisites: None		
Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; gender inequalities and gender-based violence in society; gender activism & technologies; working with local communities to raise awareness of gender violence and abuse; use of social media to condemn violent acts; raising awareness of human rights & equality; organizing collaborative work and discovering creative solution to gender issues; use of social media to offer solutions to the needs of the community		
ICGS 172	Service Learning - Making Change	4
Prerequisites: None		
Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; exploring the nature of change and resistance in human society and across several disciplines such as philosophy, psychology, political science, sociology, and business; reviewing case studies about how change is initiated, implemented, resisted, and achieved; challenging students through projects to identify a need for change, and to devise a plan and implement it		
ICGS 173	Service Learning - Campaigning for a Cause	4
Prerequisites: None		

Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; research, analyse, evaluate, present and produce media campaigns for selected community / Non-Governmental Organizations / Charitable Organization(s)		
ICGS 175	Social Innovation and Sustainability	2
<p>Prerequisites: None</p> <p>Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; exploring social innovation and sustainability principles, focusing on sustainable ecosystems, ethical decision-making, effective communication, and collaboration. Engaging in project-based learning to address global challenges, promoting responsible citizenship and leadership skills. Applying the 4Cs of 21st-century education: Critical thinking, Communication, Collaboration, and Creativity. Analyzing ethical theories and frameworks, such as utilitarianism and deontological ethics, for moral decision-making. Utilizing communication theories and models, like the Shannon-Weaver model and Monroe's Motivated Sequence, for clear and persuasive communication. Highlighting team dynamics and conflict resolution for effective collaboration. Encouraging creative problem-solving aligned with the Sustainable Development Goals (SDGs). Preparing purposeful presentations and working as cohesive team members for sustainable development</p>		
ICGS 176	Sustainable Cooking	2
<p>Prerequisites: None</p> <p>Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; student-led community projects promoting importance of sustainability in the food system; sustainable food choices and cooking; fundamental science in cooking; collaborative work to identify sustainable issues in culinary food production; students design creative solutions aligning with needs of the community; promote sustainable cooking and food consumption</p>		
ICGS 177	Social Innovation: Empowering Sustainable Communities	2
<p>Prerequisites: None</p> <p>Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; exploring the dynamics of social change through innovation, based on frameworks like Asset-Based Community Development and the Social Capital</p>		

theory, focusing on ethical decision-making, human rights, and community empowerment. Engaging with local communities to co-create sustainable solutions using Participatory Action Research, fostering responsible citizenship and ethical leadership. Integrating critical thinking and communication to address social challenges, promoting collaboration and creativity in line with the Sustainable Development Goals (SDGs)

ICGT 107	Innovation: Inside Out	2
Prerequisites: None Develop self-awareness as a MAHIDOL person; application of the university's motto, philosophy, and core values to benefit the community; community-based projects course incorporating fundamentals of design thinking; empathy-building techniques; user-centered problem statements formulation; innovative solutions, design thinking tools; concept-to-prototype		

#### Health Literacy

ICGH 136	Sound & Soul: A Journey of Music, Emotion, and Well-being	2
Prerequisites: None Discovering how music can guide emotional states, fostering relaxation, motivation, and creativity; exploring how music interacts with our emotions and sound's power in emotional expression and regulation; extending to the cultural influences that shape our perceptions of beauty in music as well as discussing techniques for incorporating music into our lives to cultivate emotional well-being and navigating different genres and styles for a richer experience of ourselves and our environment		
ICGH 143	Flowers and Fragrances for Health	2
Prerequisites: None Introduction to the scientific and cultural aspects of floral fragrances for health benefits; exploring sustainable perfume industry and traditional essential oil extraction for medicinal purposes; significance of flowers in human society; floral composition, floral aesthetics, aromatherapy and how these relate to human mental and physical health		
ICGN 135	Personal Health and Well being	2
Prerequisites: None		

Understanding the health as a continuous process and can be changed at any time depending on the choices we make; exploring the current challenges facing young people of today; evaluating on how they affect health and healthful behavior; what individuals can do to navigate these challenges to arrive at their goals for the future		
ICGP 101	American Flag Football	1
Prerequisites: None A ball based sport course emphasizing techniques, non-contact game play, including dodging, throwing, and catching and development of teamwork management, communication, and terminology		
ICGP 102	Badminton	1
Prerequisites: None A racket based sport course stressing technique, strategies, grip, serving, positioning and movement, game play in both singles and doubles		
ICGP 103	Basketball	1
Prerequisites: None A ball based sport course emphasizing attentiveness, dribbling, passing, shooting, rebounding, ball control, game play, and development of game strategies		
ICGP 104	Body Fitness	1
Prerequisites: None A comprehensive course in one or more exercise techniques: strength/resistance, cardio, plyometric, stretching, high-intensity interval training, and calisthenics; to maintain health and wellness		
ICGP 105	Cycling	1
Prerequisites: None A course designed on cycling instruction for safety, fitness, riding techniques, posture, communication, knowledge of equipment and hazards, for recreational and commuter cycling		
ICGP 106	Discover Dance	1
Prerequisites: None A dance based course of current forms and techniques in one or more categories: African/Jazz, Worldwide Dances/Latin Dances, Professional Performance Dance, Modern Dance, Hip-hop/Funk		



ICGP 107	Golf	1
Prerequisites: None A club based game course designed on developing correct grip, stance, posture, swing, and knowledge of equipment, rules, regulations, and etiquette		
ICGP 108	Mind and Body	1
Prerequisites: None A course stressing meditation postures, techniques, movement, and breathing to achieve positive mental state		
ICGP 109	Selected Topics in Sports	1
Prerequisites: None Learning concepts, rules and strategies through planned and structured movements by way of sport or activity to enhance a healthy lifestyle		
ICGP 110	Self Defense (Striking)	1
Prerequisites: None External martial arts (striking) course emphasizing hard physical impact and exertion, muscular strength and tension, maximizing speed and power, through body coordination		
ICGP 111	Self Defense (Grappling)	1
Prerequisites: None Internal martial arts (grappling) course stressing timing, awareness, precision, and techniques, using body leverage for throws, take downs, pins, and submissions		
ICGP 112	Soccer	1
Prerequisites: None A ball based sport course stressing alertness, ball control, including dribbling, passing, trapping, shooting, ball movement, game play, and development of strategies through drills and competitive play		
ICGP 113	Social Dance	1
Prerequisites: None A dance based social sport or activity course of choreographed movements, styles and regulations from International Ballroom (Standard) and International Latin dances		
ICGP 114	Swimming	1

Prerequisites: None A water based sport course stressing swimming techniques, breathing, and knowledge of buoyancy, propulsion, and water safety		
ICGP 115	Tennis	1
Prerequisites: None A racket based sport course of techniques, strategy, grip, serve, game play, ball tracking, timing, shot control, through drills, live ball hitting sessions, and competition		
ICGP 116	Volleyball	1
Prerequisites: None A ball sport course emphasizing passing, setting, serving, developing strategies, positions, game play, teamwork management, and communication		
ICGP 118	Health and Wellness	2
Prerequisites: None Wellness design for a lifelong healthy lifestyles; basic principles of achieving physical, emotional, intellectual, environmental, social and spiritual well being		
ICGP 119	Mindful Food and Well-being	2
Prerequisites: None Explore food and culinary trends, food choices, and the concept of mindful food and eating; fundamental relationships between food and well-being; food products and services for consumers in various demographics; food products and food service features that emphasise the concept of mindful food and eating		
ICGP 120	Mind and Body: Navigating the Interplay of Brain, Behavior, and Well-being	2
Prerequisites: None The relationship between psychology and health; the influence of psychological factors on physical well-being; Exploration of how brain, thoughts, emotions, and behaviours impact overall health outcomes; Current knowledge in sleep, gut-brain connection on health and well-being; The integration of theory, research, and practical applications of psychological principles to promote health and wellness		
ICGS 121	Abnormal Colleagues: how do I make this work?	4

Prerequisites: None The stigma of psychological issues; the fear of the workplace gossips and job security; an avoidance of getting treatment and counseling; a recognition of various disorders and devising strategies to effectively communicate and work with people; improving the workplace productivity and relationships		
ICGS 126	Introduction to Psychology	4
Prerequisites: None Human behaviour and mental functioning; the nervous system; consciousness; sensation and perception; psychogenetic, life-span development; thinking, memory, language, conditioning and learning, motivation, personality, and stress		
ICGS 155	Pathway to Purpose: Life Design and Self-Exploration	4
Prerequisites: None Assessment of personal strengths, weaknesses, and areas for improvement; individual values, beliefs, and life goals; goal setting; self-awareness and emotional intelligence; life design		
ICGS 164	Positive Psychology	2
Prerequisites: None A practical introduction to the study of human flourishing and well-being; help students thrive using Positive Psychology principles including the PERMA model of well-being; develop a greater understanding of positive emotions, engagement and flow, positive relationships, meaning and achievement; individual application of research findings via well-being project		
ICGS 178	Unmasking Human Behaviour: Exploring Psychological Truths about Behaviour	2
Prerequisites: None Introduction to the psychological principles and the importance of evidence-based thinking; Examination of current research on memory, perception, personality, mental illness, stereotype, prejudice, and social behaviour to debunk common myths and misconceptions about human behaviour		
ICGS 179	Health and Society	2
Prerequisites: None		

Exploring the concept of health across the historical periods; history of disease and origins of medicine; epidemics in the ancient societies; social welfare and the state; contemporary epidemics and the impact on society, state, and people, WHO and the role in the promotion of health		
ICLL 100	Self Development	2
Prerequisites: None Life skills for 21st century workplace through learning or training activities in various topics including creativity, growth mindset, leadership, and emotional intelligence or other selected personal development activities approved by the academic advisor and Curriculum Administrative Committee		

### Science & Environment Literacy

ICGH 131	Unraveling the Anthropocene: A Philosophical Critique of Earth's Shifts and Humanity's Roles	2
Prerequisites: None Exploring the Anthropocene through the lens of philosophy of science and technology, scrutinizing the profound transformations on our planet and within societies; analyzing scientific advancements and technological innovations' roles in propelling this epochal shift, delving into the intricate interplay between human agency and environmental consequences; challenging conventional paradigms of development and progress through critical analysis, interrogating underlying assumptions that led to this critical juncture		
ICGH 142	Fantasy Literature's Environmental Message	2
Prerequisites: None An overview of the science of ecology; fiction analysis; an overview of the fantasy fiction subgenre; close reading of fantasy novels and short stories to recognize ecological realities and environmental messages; applying through personal reflection, through activities that promote the health of the environment, and through creative work		
ICGH 144	A Candle in the Dark: How to Tell Fact from Fiction	2
Prerequisites: None		

Rationalism and the scientific method; scientific awareness for decision-making; science vs. pseudoscience; supernaturalism and creationism; charlatanism and quackery; magical thinking and superstitions; conspiracy theories and fake news; fact-checking and logical fallacies		
ICGN 105	Ecology, Ecosystems and Socio-Economics in Southeast Asia	4
Prerequisites: None Human impacts on Southeast Asian ecology; human impacts on Southeast Asian's biodiversity and natural resources; fundamental ecological and resource management principles; current sustainable development issues; sustainable development practices for Southeast Asia		
ICGN 107	The Chemistry of Everyday Life	4
Prerequisites: None Portable electronics; the air we breathe; radiation from the sun; climate change; energy from combustion; energy from alternative sources; water; polymers and plastics; nutrition; health and medicine; genes and life		
ICGN 108	Essentials of Culinary Science for Food Business	4
Prerequisites: None Changes during preparation, heating, and storage of raw materials and of finished products, foodservice and commercial packaged food industries; chemical, sensory, and nutritional natures of food, food safety concepts, changing trends and interests, legal requirements of food establishment		
ICGN 111	Physics for CEO	4
Prerequisites: None Basic concepts of physics impacting individuals and society on a daily basis: physical quantities, Newtonian mechanics and dynamics, energy and heat, electricity and magnetism, light and sound, and the electromagnetic spectrum		
ICGN 113	Plants, People and Poisons	4
Prerequisites: None The plant world; the way plants grow and reproduce; modern technologies used for improving agricultural methods; the basics of plant biology; the distinctions among major groups of plants; the social implications of plant use and abuse		
ICGN 114	The Scientific Approach and Society	4

Prerequisites: None Scientific literacy; the process of science discovery; verification, its limitation, and the influence in various disciplines; human and animal research ethics; the critical analysis of current scientific articles; the life cycle of scientific knowledge; modeling in science		
ICGN 115	Human Evolution, Diversity and Health	4
Prerequisites: None Changing modern society; human ability; human body; human distinctiveness; human diversity; human evolution; human health; human origins; primate diversity; scientific advancements		
ICGN 116	Understanding and Visualizing Data	4
Prerequisites: None An introduction to data analytics; roles and examples of the data-driven decision making; technology landscape; data kinds and types; data sources and collection techniques; data storage and standard formats; data processing workflow; summary from data; different types of visualization; data visualization tools		
ICGN 119	Computer Essentials	4
Prerequisites: None Developing the digital literacy relating to the computer literacy and the information literacy; the computer hardware and its general functions; the operating systems; software packages and their daily use; computer security; the ethical use of the intellectual property		
ICGN 123	The Earth's Dynamic Structure	4
Prerequisites: None Introducing fundamental concepts and applying general geology at the beginning level; basic concepts of physical geology, emphasizing on surficial and deep earth processes, including minerals; rocks and their formations, crustal deformation, plate tectonics; weathering and erosion, formation of landscapes, geological resources and environmental geology		
ICGN 124	Climate Change and Human Society	4
Prerequisites: None Human activities and the global climate; consequences for human society; consequences for the essential life support systems; perspectives on human health and diseases; adapting to global climate change; mitigating global climate change; an optional field visit included		

ICGN 126	Plant Society	2
Prerequisites: None People interacting with the plant and fungal worlds; differences among cultures and the indigenous uses of medicinal, textile and food plants; the benefits, problems and social implications of their use; hands-on experiences with techniques and methods used by field scientists		
ICGN 127	Practical Mathematics	2
Prerequisites: None Fibonacci numbers and the golden ratio, voting and election, data interpretation, probability, cryptography, financial mathematics		
ICGN 128	Climate Emergency, Biodiversity Crisis, and Humanity at Risk	2
Prerequisites: None Anthropogenic activities; biodiversity crisis; biodiversity loss; biological diversity; climate change; climate crisis; climate emergency; ecosystem functions; harmful and unsustainable practices; humanity at risk; mitigation and adaptation; threats, impacts and consequences		
ICGN 129	Programming for Problem Solving	4
Prerequisites: None Influence and impact of computer science on everyday life and society; the problem solving process in programming: abstraction, problem decomposition, algorithms; programming basic; privacy, ethical, and legal issues related to the software development		
ICGN 130	Cryptography: The Science of Making and Breaking Codes	2
Prerequisites: None Classical cryptography; cryptosystems; the shift cipher, the substitution cipher, the Hill cipher, the permutation cipher, the stream ciphers; the RSA encryption; cryptanalysis		
ICGN 134	Introduction to Artificial Intelligence	2
Prerequisites: None The artificial intelligence terminology; machine learning types and techniques; guidelines for building the machine learning model; neural networks; an evaluation in the AI system; the real-world artificial intelligence; the future trends of the artificial intelligence; dangers and threats of the artificial intelligence		

ICGN 136	Creator Workshop	2
Prerequisites: None Sustainable energy usage and responsible production, Design thinking and problem-solving with 3D designing and fabrication, Finite Element Analysis, Community engagement via I-fix-it project to restore broken appliances obtained from communities		
ICGN 137	Star Wanderer	2
Prerequisites: None Basic ideas of sky observations since the ancient time of humanity; motion of the sky; cycles of the Sun and Moon; development of tools used in sky observations; the progress of human understanding of the universe; the impact of the scientific method on astronomical observation; the Earth & Moon; the Solar System; the lifecycle of stars; the Milky way; modern sky survey		
ICGN 138	Cosmetics Chemistry	2
Prerequisites: None Chemistry of cosmetics products; basic science behind cosmetics and aesthetic medical procedures; basic biochemistry of human skins; basic function of aesthetic medical equipment such as HIFU, IPL, Lasers, and RF		
ICGN 140	Food Energy for Health	2
Prerequisites: None Basic chemistry and functions of energy yielding nutrients; Understand food labels and portion sizes. Estimate daily energy from food; Balance energy intake and expenditure		
ICGN 141	Life in the Sea	2
Prerequisites: None Fundamental structures and functions of marine and freshwater life; cell to underwater ecosystem levels of organization; underwater life processes for energy, nutrients, reproduction, growth and development; evolution and biodiversity of underwater life; marine and freshwater biomes; current health and environmental issues under SDG 14 life in the sea; field trip included		
ICGN 142	Energy and the Environment	2
Prerequisites: None		



Various forms of energy and their conversion processes, fossil fuels and renewable energy sources, Environmental consequences associated with each energy source, Energy efficiency and conservation, Future energy technologies		
ICGN 143	Gaia: Life on Earth	2
Prerequisites: None Fundamental structures and functions of life; cell to biosphere levels of organization; life processes for energy, nutrients, reproduction, growth and development, evolution and biodiversity; service learning and field trip opportunities to participate in mitigating current environmental, health or development issues through life science-based solutions		
ICGT 101	Technology-Enhanced Learning: Harnessing AI & Digital Tools for Academic Success	2
Prerequisites: None AI principles and educational impacts, Technology-enhanced creative learning methods, Ethical use and bias awareness in AI applications, Educational technology tool exploration, AI-driven content analysis techniques, AI tool selection and evaluation, Critical assessment of AI-generated materials, Learning personalization with technology		
ICGT 102	Digital Document Management	2
Prerequisites: None Demonstrate formatting and applying consistent styles in a variety of online platforms; preparing and including digital content; construct file management systems for organizing, storing, and searching materials through metadata; Integrating data from spreadsheets, database to create reports		
ICGT 103	Computational Thinking	2
Prerequisites: None Solving problems in a systematic manner; breaking down a problem into a manageable size; extracting the most important elements of the problem; identifying recurring behaviors in the problem; developing solutions; articulating solutions in a way that is simple yet accurate enough for a computer or even a human to follow		
ICGT 104	Tell a Great Story with Data	2
Prerequisites: None		

Influence decision with compelling narratives constructed from data; the power of storytelling; determining the purpose; understanding the audience; planning plotlines; creating narrative structures; developing the data story; ethical considerations in data storytelling		
ICGT 105	No-Code Application Development	2
Prerequisites: None Creating software applications without needing to write code; common features of no-code platforms; strategies for choosing no-code platforms; basics of user-friendly interface design, workflow logic, and data storage; using templates and plugins to simplify the development, testing and revising applications; online resources and support communities for further learning outside the classroom		
ICGT 106	Data and Spreadsheets	2
Prerequisites: None Demonstrating proficiency in using lists, function, formulas, filters; importing and transforming socio-economic and/or science-related data from the internet or other databases; providing information to other programs through embedded or link objects; illustrating findings through charts, map charts, conditional formatting, and sparklines		
ICLL 102	Skills for a Digital World	2
Prerequisites: None Twenty-first century skills for digital economy through learning or training activities in various topics including e-Commerce, Blockchain technology, and data science, or other selected activities approved by the academic advisor and Curriculum Administrative Committee		

### Intercultural & Global Awareness Literacy

ICGH 107	Contemporary Art and Visual Culture	4
Prerequisites: None Focusing on current issues in society as reflected in the new media utilized in art today; an analysis of images and group discussions regarding social and historical contexts of contemporary art; creative thinking skills; effects of globalization on the visual world; connections between global and local issues; an investigation of broader social and cultural matters such as ideology, gender, race, and ethnicity		

ICGH 109	Creative Thinking Through Art and Design	4
Prerequisites: None Combining hands-on studio experiences with demonstrations, lectures and discussions; developing creativity and gaining confidence in communicating one's own unique vision; exploring a variety of art and design mediums; understanding the elements of the visual language; implementing the creative process and creative thinking to develop individual solutions to open-ended problems		
ICGH 110	Drawing as Visual Analysis	4
Prerequisites: None Developing creativity and cognitive learning skills; utilizing visual communication, design and art principles; mark making; observation, analysis, record, representational plant and still life forms; practice, application, techniques for conventional pencil drawing tools: shape, form, perspective, lines, shading, value, negative space, texture, composition; observation; scientific illustration, realistic representational observation		
ICGH 115	Cinematic Language and Applications	4
Prerequisites: None An introduction, practice and an application of languages to critical thinking and analysis; examining key film languages and textual examples, including narrative theories; genre, film theories; an analysis of key film texts; the development of skills in research, writing and analytical thinking; applied knowledge to creative works; the presentation of original ideas and reflection on the craft approach		
ICGH 116	World Cinemas	4
Prerequisites: None An introduction, practice and an application of languages to critical thinking and analysis of key world cinema texts; principal critical methods and theoretical debates of film theory; theoretical perspectives including structuralism, semiology, Marxism, feminism, psychoanalysis, post-structuralism, and cultural studies; questions of narrative and narration, realism, formalism, modernism, postmodernism, postcolonialism, gender, sexuality, and ideology		
ICGH 117	Drawing as Creative Expression	4
Prerequisites: None Develop creativity and cognitive learning; utilize visual communication, design and art principles; experience multiple tools, techniques, medium, experimental mark making; research, analysis,		

observation, gesture, principles and elements of design and composition; examine, analyze, observe and reinterpret the human figure, plant and still life forms; research, interpret, evaluate, analyses contemporary artists; personal evaluation; personal expression		
ICGH 118	Photography Visualizing in the Digital Age	4
Prerequisites: None Basic skills and aesthetic principles of photography, how the camera works, types of cameras and digital image capture, techniques in taking pictures, in camera editing, specialized forms of photography, simple editing adjustments, the aesthetics of picture taking		
ICGH 120	Thai and ASEAN Cinema	4
Prerequisites: None An introduction, practice and an application of languages to critical thinking and analysis of Thai and ASEAN film texts; examine key film languages and textual examples, including narrative theories; genre, film theories; an analysis of key film texts; the development of skills in research, writing and analytical thinking		
ICGH 124	Life Drawing and Anatomy	4
Prerequisites: None An introduction, practice and application of observation drawing to record the human form; including key principles of composition, gesture and observation drawing techniques and design skills for static, gesture and motion poses; understanding record and identifying the anatomical make-up of the human form in muscles and skeletons; technical proficiency with suitable media for observation drawing; studio practice; hand-drawing from observations		
ICGH 128	Internet Celebrity, Culture and the Media	4
Prerequisites: None An examination of the Internet Celebrity phenomenon and the emerging online culture; focusing on the circulation of social media texts and images associated with the Internet Celebrity; i.e. bloggers, influencers, content creators, the construction of their practices, self-branding techniques, emphasizing on the discourse of labour, the impacts, the influences of cultural trends, and the ethical issues; encouraging students to draw on an online creative work in contemporary media culture		
ICGH 130	The Logic Lab: Crafting Coherent Arguments	2
Prerequisites: None		

Introducing comprehensively formal and symbolic logic, by focusing primarily on categorical logic and truth functions, fundamental principles of logical reasoning with the goal of gaining a solid understanding of analyzing basic arguments, translating propositions, and evaluating truth-values		
ICGH 132	The Rise and Fall of Ancient Athens	2
Prerequisites: None Inquiring into the historical, philosophical and social circumstances involving the establishment, rapid growth, and eventual demise of the city state of Athens in the Archaic and Classical Periods of Ancient Greece		
ICGH 135	The Horror Film	2
Prerequisites: None Investigating the horror film as one of the earliest and most notable cinematic genres, by considering its historical development with examples from both Western and International cinema and by examining the most iconic themes of horror across the ages		
ICGH 137	Apocalypse Now, or Never, or Maybe?	2
Prerequisites: None Pondering the changes of the past two hundred years, especially when it comes to life expectancy, health, and standards of living, and examining in this light the evidence we have for thinking that we are living on the brink of disaster; considering the psychological dimension to our dissatisfactions; discussing the major demographical changes we are currently undergoing; exploring questions around resource shortages, and food supplies; reflecting on our energy needs and realistic ways of meeting them, as well as the uses, dangers, and fears around artificial materials like plastics; exploring the complex questions we face around global warming		
ICGH 139	Spirituality, Sustainability, Ecosystems	2
Prerequisites: None Spirituality's Sustainability Implications for Ecosystems: Bio-diversity, eco-justice, environmental ethics, environmental justice, faiths, spirituality, religious diversity, social equity, social justice, ecosystems, ecosystemic balance, (non-)anthropocentrism		
ICGH 141	SPQR—Glimpses of Rome	2
Prerequisites: None Imagining Rome as it came to be in its “golden age” under the emperors Trajan and Hadrian; reflecting on slavery in Rome, the meaning of bread and games, charioteers and gladiators;		

contemplating the ways of traditional Roman religion; returning to the founding of the city, to understand how it all began; surveying the end of Roman monarchy and the conflicts between the social classes (Secession of the Plebs); examining Rome's wars with invading Gauls and with the Carthaginians; reviewing the Roman constitution in its heyday, as described by Polybius; tracing the descent into social turmoil and civil war from the Gracchi brothers to the permanent dictatorship of Julius Caesar; sketching out the transition to the principate under Augustus and the Roman imperial period

ICGH 145	Essentials to Photography, Skills and Practices	2
----------	---	---

Prerequisites: None

An introduction to major genres of photography including documentary, art, journalism, portraiture, still life, fashion, and landscape; exploring the ethics of publishing photography on the World Wide Web, emphasizing creative collaboration, problem-solving in engaging with real-world issues and communities, utilising the photographic abilities and visual storytelling narratives to contribute positively to society and promoting sustainable practices and social change

ICGH 146	Acting for Self-Discovery and Empathizing with Others	2
----------	---	---

Prerequisites: None

Exploring basic acting principles; leading to self-discovery, and empathy with others; studying breathing, body, voice, movement, mind; understanding strength, weakness, fear in oneself; approaching cognitive empathy, emotional empathy, compassion, sympathy through role play, scenework so as to understand others who are different; fostering authentic connection with self, relationships with others, and how to live in the world of various identities and beings

ICGH 147	Myth and the Masks of the Divine	2
----------	----------------------------------	---

Prerequisites: None

Delving into the ancient Greek mythology as it has come down to us through Hesiod and Homer, and by many more recent retellings, as well as the Nordic tradition codified in the Eddas; reflecting upon the meaning and relevance of such tales about gods and heroes through classic commentaries by Thomas Carlisle, James George Frazer, Joseph Campbell, and other more recent thinkers

ICGH 148	Quest for Global Justice: A Philosophical Inquiry	2
----------	---	---

Prerequisites: None

Embarking on a philosophical journey, delving into the question: Is global justice possible? Engaging in critical analysis with an eye on case studies by examining the structural barriers and systemic inequalities that hinder the realization of global justice; through the lens of political theory and moral philosophy, confronting pressing questions about power dynamics, distribution of resources, and cultural diversity		
ICGL 101	Elementary German I	4
Prerequisites: Placement Test Greetings, introducing oneself or others, German alphabet and phonemes, personal information, numbers from 1 – 100 and price quotations, expressing wishes, telling the time and making appointments, quality of items, measurements; verb forms, pronouns, sentence structure, gender of nouns, accusative case and plural forms, negation		
ICGL 102	Elementary German II	4
Prerequisites: Placement Test or ICGL 101 Elementary German I Ordering and paying for meals in a restaurant, preferences of food and drinks, giving and asking for directions, reading a map, preferences of work conditions, job advertisements; essay writing, yes/no questions, imperative forms, compound verbs, preposition with dative case, modal verbs I, German sentence bracket		
ICGL 103	Elementary German III	4
Prerequisites: Placement Test or ICGL 102 Elementary German II Health advice and problems, healthy and unhealthy lifestyles, events and accidents, travel reports, curriculum vitae (CV); possessive articles in nominative, accusative and dative case, perfect tense, connectors, modal verbs II		
ICGL 111	Elementary Japanese I	4
Prerequisites: Placement Test Hiragana and Katakana characters; fundamentals of basic Japanese grammar (noun-ending sentences, particles, demonstratives, verb-ending sentences, non-past and past tenses); scaffolding of basic vocabulary; basic communication about personal topics (self and others); description of Japan; designing written products in the target language; expressing existence, preferences, and agreement; comparing cultures		
ICGL 112	Elementary Japanese II	4
Prerequisites: Placement Test or ICGL 111 Elementary Japanese I		

<p>Kanji characters (approximately 50); fundamentals of basic Japanese grammar concepts (particles, verbs of giving and receiving, na-adjective-ending sentences, i-adjectives-ending sentences, non-past and past tenses, and classifiers); scaffolding of basic vocabulary; basic communication about daily life topics; designing written products in the target language; expressing simply points of view, describing people and daily life activities; comparing cultures</p>		
ICGL 113	Elementary Japanese III	4
<p>Prerequisites: Placement Test or ICGL 112 Elementary Japanese II</p> <p>Kanji characters (approximately 50); fundamentals of basic Japanese grammar concepts (verb conjugation (masu-form, te-form, nai-form, and dictionary form), and related sentence patterns; polite style of speech, and plain style of speech, particles); scaffolding of basic vocabulary; basic communication about various topics; designing written products in the target language; expressing points of view, describing people and various activities; comparing cultures</p>		
ICGL 121	Elementary French I	4
<p>Prerequisites: Placement Test</p> <p>Fundamentals of basic French grammar (pronouns, present tense conjugation, gender/number, adjectives, prepositions); scaffolding of basic vocabulary; basic communication about personal topics (self and others); identifying and describing French speaking countries; designing written products in the target language; expressing existence, preferences and agreement; comparing cultures</p>		
ICGL 122	Elementary French II	4
<p>Prerequisites: Placement Test or ICGL 121 Elementary French I</p> <p>Fundamentals of basic French grammar (present and future tense, adjective gender, place &amp; agreement, more complex prepositions, more complex questions); scaffolding of simple vocabulary; simple communication about daily life topics (in France and in their country); designing written products in the target language; expressing simply point of view, describing people and daily life activities; comparing cultures</p>		
ICGL 123	Elementary French III	4
<p>Prerequisites: Placement Test or ICGL 122 Elementary French II</p> <p>Fundamentals of more complex French grammar (present and future tense, adjective gender, place &amp; agreement, more complex prepositions, questions and past tense notions); scaffolding of more complex vocabulary; longer communication about daily life topics (in France and in their</p>		



country); designing written products in the target language; expressing point of view, describing people and daily life activities; comparing cultures		
ICGL 131	Elementary Chinese I	4
Prerequisites: Placement Test The Chinese phonetic system (Pinyin); the Chinese basic writing system (Stroke order); Chinese characters (approximately 100); fundamentals of basic Chinese grammar (interrogative pronouns, the 的 particle, yes/no questions with 吗, demonstrative pronouns, classifiers, adverbs 也, 都); scaffolding of basic vocabulary; basic communication about personal topics (self and others); describing China; designing written products in the target language; expressing existence, preferences and agreement; comparing cultures		
ICGL 132	Elementary Chinese II	4
Prerequisites: Placement Test or ICGL 131 Elementary Chinese I The Chinese phonetic system (Pinyin); the Chinese writing system; Chinese characters (approximately 100); fundamental Chinese grammar concepts (interrogative pronouns, classifiers, the “的” particle, “的” phrases, adverbials, continuous action sentence structures and reduplication of verbs); scaffolding of basic vocabulary; basic communication about daily life topics; designing written products in the target language; expressing simply points of view, describing people and daily life activities; comparing cultures		
ICGL 133	Elementary Chinese III	4
Prerequisites: Placement Test or ICGL 132 Elementary Chinese II The Chinese phonetics (Pinyin); Chinese characters (approximately 150) ; Fundamentals of basic Chinese grammar concepts (interrogative pronouns, modal verbs, complex sentences, the modal particle “le” (了), complements of state, complements of result, complements of duration); scaffolding of basic vocabulary; basic communication about various topics; designing written products in the target language; expressing points of view; telling directions; describing oneself and other people’s abilities; comparing cultures		
ICGL 141	Elementary Spanish I	4
Prerequisites: Placement Test Fundamentals of basic Spanish grammar (pronouns, present tense conjugation, gender/number, adjectives, prepositions); scaffolding of basic vocabulary; basic communication about personal		

topics (self and others); identifying and describing Spanish speaking countries; designing written products in the target language; expressing existence, preferences and agreement; comparing cultures		
ICGL 142	Elementary Spanish II	4
Prerequisites: Placement Test or ICGL 141 Elementary Spanish I Fundamentals of basic Spanish grammar (pronouns, present tense conjugation, reflexive verbs, gender/number, adjectives, prepositions); scaffolding of basic vocabulary; basic communication about personal topics (self and others); identifying and describing Spanish speaking countries; designing written products in the target language; expressing existence, preferences and agreement; talking about daily habits		
ICGL 143	Elementary Spanish III	4
Prerequisites: Placement Test or ICGL 142 Elementary Spanish II Towns, quarters and cities; directions; past experiences; present perfect tense, past tense indefinido; verbs ser, estar and hay; vocabulary of places; time markers for past tense; verbs empezar a+ infinitive; verbs ir / irse		
ICGL 160	Introduction to Thai Language and Culture	4
Prerequisites: None Fundamental vocabularies and structures for various communicative situations in everyday use and introduce basic aspects of Thai culture		
ICGL 161	Elementary Thai I	4
Prerequisites: Placement Test Listening and speaking skills on the following topics: introducing oneself one's friend and family, basic food and drink ordering, places, directions, transportation, buying tickets, clothing items, colours, and sizes, bargaining, counting and using classifiers, reading and writing Thai consonants, vowels placed after, before, above, and below the consonants, Thai numbers, live and dead syllables		
ICGL 162	Elementary Thai II	4
Prerequisites: Placement Test or ICGL 161 Elementary Thai I Listening and speaking skills on the following topics: one's schedule, making appointments, favorite leisure activities, ordering food, drinks and desserts with special requests, presentation of one's plan for activities during school break, continuation of Elementary Thai I in reading and		

writing skills, consonant clusters, tone marks, words with special spelling rules, reading short paragraphs		
ICGL 163	Elementary Thai III	4
Prerequisites: Placement Test or ICGL 162 Elementary Thai II Listening and speaking skills on the following topics: going to see the doctor, looking for a house for rent, seasons, travel and festivals		
ICGL 164	Thai Writing for Specific Purposes in Workplace *for native Thai students	2
Prerequisites: None Thai writing for specific workplace purposes: blend of theoretical insights and practical exercises; composing emails, reports, proposals, and business documents; proficiency in clear, coherent, precise Thai communication		
ICGL 171	Diversities in Multilingual Societies	2
Prerequisites: None Multilingual societies; Cultural diversities; Cross-cultural communication; Chinese-, German-, French-, Japanese, and Spanish-speaking cultures; Chinese-, German-, French-, Japanese, and Spanish languages; Cultural conflicts; Cultural gaps; Cultural shocks; Cultural discoveries; Cultural awareness; Cultural harmonies		
ICGL 172	Chinese Influence in Thai Society	2
Prerequisites: None Cultural Exchange, Cultural Awareness; Overview of Chinese Ethnicity and community in Thailand: Exploring the historical, cultural, economic, and political dimensions of Chinese influence in Thailand; Examining Chinese immigration waves have shaped Thai identity, language, cuisine, and religious practices		
ICGL 173	Introduction to Japanese Societies	2
Prerequisites: None Japanese societies; Cultural diversities; Ethnic minorities; Gender gaps; Discriminations against minorities; Gender role expectations; Aging populations; Japanese universities; Japanese school systems; Working in Japan; Working with Japanese people; Living in Japan; Punctuality		

ICGL 174	From Siesta to Fiesta: Introduction to Spanish and Latin American Culture	2
Prerequisites: None Introduction to Hispanic cultures: Spain, Mexico, Central America, South America, Caribbean; main cultural features; magic and colors of lands and people; cultural varieties; Spanish and indigenous languages; cultural legacy		
ICGL 201	Pre-Intermediate German I	4
Prerequisites: Placement Test or ICGL 103 Elementary German III Clothing and accessory, appearance, shopping for clothes and accessory family members, present and past families, statistics, festivities and culture, dates, presents; comparative forms of adjectives, modal verbs past tense, dependent clauses (cause and condition), personal pronouns, accusative and dative cases		
ICGL 202	Pre-Intermediate German II	4
Prerequisites: Placement Test or ICGL 201 Pre-Intermediate German I Media usage and Internet-shopping, advertisement, expressing surprise, meeting someone for the first time, country and city life, cultural capitals in Europe; direct and indirect questions, adjective without article, relative clause and pronoun, modal verb in simple past, sub-clause with als		
ICGL 203	Pre-Intermediate German III	4
Prerequisites: Placement Test or ICGL 202 Pre-Intermediate German II Professional biographies, job announcements, festivities and customs, emotions, movie synopsis, products and inventions; reasons with weil and denn, nominalization, preposition with dative, sub-clause with wenn and um zu, passive voice		
ICGL 211	Pre-Intermediate Japanese I	4
Prerequisites: Placement Test or ICGL 113 Elementary Japanese III Kanji characters (approximately 50); fundamentals of basic Japanese grammar concepts (verb conjugation (masu-form, te-form, nai-form, and dictionary form), and related sentence patterns; polite style of speech, and plain style of speech, particles); scaffolding of basic vocabulary; basic communication about various topics; design of written products in the target language; expressing points of view, describing people and various activities; comparing cultures		
ICGL 212	Pre-Intermediate Japanese II	4
Prerequisites: Placement Test or ICGL 211 Pre-Intermediate Japanese I		

50 Kanji characters; explaining the state of things; describing necessary things to do in advance as preparations for the future; expressing own intentions, plans, and schedule; expressing own guess and inference; asking someone to take a message or conveying a message; stating standards or norms, when one explains the manner of doing a certain action or work; explaining a condition in which a certain action is performed; stating everyday habitual actions		
ICGL 213	Pre-Intermediate Japanese III	4
Prerequisites: Placement Test or ICGL 212 Pre-Intermediate Japanese II 50 Kanji characters; expressing judgments under certain conditions; stating a purpose or an aim; describing changes in human ability and conditions; describing an action performed by a third person, or an action when one feels annoyed or troubled, using passive verbs; expressing something with the most important information emphasized; describing natural phenomena, happenings, and events, together with their causes; clearly telling what speakers consider as questions, by using a question with an interrogative as a component of a sentence; using appropriate expressions for giving and receiving of things and actions, depending on the relationship between the giver and the receiver, in terms of social status; telling usage, evaluation, necessary time, expense, etc		
ICGL 221	Pre-intermediate French I	4
Prerequisites: Placement Test or ICGL 123 Elementary French III Developing further knowledge of French grammar at the pre-intermediate level (present, past and future, more complex interrogative sentence, negative sentence, comparative and pronouns); scaffolding of more complex vocabulary; more complex and longer communication about personal needs, solving simple problems; interacting in predictable context topics in French; designing written products in the target language; expressing points of view, giving simple advices and interacting in daily life activities; comparing cultures		
ICGL 222	Pre-intermediate French II	4
Prerequisites: Placement Test or ICGL 221 Pre-Intermediate French I Extending further knowledge of French grammar at the pre-intermediate level (hypotheses and conditions, future, conditional, pronouns, direct and indirect speech, imperative and gerundive); scaffolding of more complex vocabulary; longer communication about solving problems and expressing feelings; commenting on attitudes and justifying actions in predictable context topics in French; comparing cultures		

ICGL 223	Pre-intermediate French III	4
<p>Prerequisites: Placement Test or ICGL 222 Pre-Intermediate French II</p> <p>Developing further knowledge of French grammar at the pre-intermediate level (comparative, complex interrogative sentence, gerundive, subjunctive present in regular and irregular forms, passive voice); scaffolding of more complex vocabulary; longer communication about personal feelings, wishes and hopes; complaining and talking about difficulties, suggesting solutions; comparing cultures</p>		
ICGL 231	Pre-Intermediate Chinese I	4
<p>Prerequisites: Placement Test or ICGL 133 Elementary Chinese III</p> <p>Chinese characters (approximately 300); identifying pre-intermediate level Chinese grammar concepts (complements of duration, expressing approximate numbers, comparative sentences, complements of quantity, exclamatory sentences); developing listening, speaking, reading and writing skills through an integrated approach; communication about various topics; comparing two cities in various aspects; comparing the seasons in China and Thailand; activities and festivals in each season; organizing a trip</p>		
ICGL 232	Pre-Intermediate Chinese II	4
<p>Prerequisites: Placement Test or ICGL 231 Pre-Intermediate Chinese I</p> <p>Chinese characters (approximately 300); identifying pre-intermediate level Chinese grammar concepts (past experiences, complements of frequency, the structure of 是.....的, reduplication of adjectives, S-P phrases, complements of result II, simple passive sentences); developing listening, speaking, reading and writing skills through an integrated approach communication about various topics; sports or entertainment; expressing unlucky stories; describing appearance and clothes; Chinese style weddings (1)</p>		
ICGL 233	Pre-Intermediate Chinese III	4
<p>Prerequisites: Placement Test or ICGL 232 Pre-Intermediate Chinese II</p> <p>Chinese characters (approximately 300); identifying pre-intermediate level Chinese grammar concepts (continuous actions or states, Chinese style weddings, Chinese construction quadrangles, existence emergence sentences, “把” sentence I, “把” sentence II, “被” sentence, adverb “又”) ; developing listening, speaking, reading and writing skills through an integrated approach; communication about various topics; travelling by airplane; Beijing Opera performances; outdoor activities; reunions with old friends</p>		

ICGL 241	Pre-Intermediate Spanish I	4
Prerequisites: Placement Test or ICGL 143 Elementary Spanish III Habits; pronominal verbs; porque/para; furniture and parts of the house; appearance; family, irregular verbs in present tense; present progressive		
ICGL 242	Pre-Intermediate Spanish II	4
Prerequisites: Placement Test or ICGL 241 Pre-Intermediate Spanish I Leisure activities; intentions and projects; pain, discomfort and symptoms; parts of the body; vocabulary of food; ir a+ infinitive; present perfect; differences between ser and estar; personal pronouns for objects; verb gustar		
ICGL 243	Pre-Intermediate Spanish III	4
Prerequisites: Placement Test or ICGL 242 Pre-Intermediate Spanish II Past habits, customs and circumstances; past and present actions; advice, instructions (imperative); future situations and actions, conditions, hypotheses; past experience; imperfect verb tense; indefinido verb tense; present perfect verb tense; contrast of past tenses		
ICGN 125	Games and Learning	2
Prerequisites: None History of games, combinatorial games, games of chance, game theory		
ICGS 112	Geography of Human Activities	4
Prerequisites: None Global Learning Initiative class; a systematic study of patterns and processes of geography; understanding human perceptions of surroundings and alterations of the earth's surface; diversity of cultures, beliefs, and ways of life; establishing global unity and harmony; recognition of equality and respect between persons in diverse regional geographical settings; raising awareness of one's own humanity and human responsibilities; the interrelationship between humans and the spaces they create; human activity as interdisciplinary by nature; the physical and socially created environment people live in; human interactions shaping the human understanding of the environment; the utility of resources; phenomena on the earth's surface relating to human actions; concepts and geographical methodologies; examination of social organizations and environmental consequences; a broad dynamic domain reflecting such developments and issues as social bias, discrimination, and stereotyping in the contemporary world; associating a critical geographical perspective on the past, present and future achievement of the social world		

ICGS 128	Global Gastronomy and Cuisines	4
Prerequisites: None Understanding the interconnection between gastronomy, culture, society, and local and global food systems; highlighting the global food production and consumption trends; examining diverse cultures through the food and food preparation; emphasis on multicultural context in cooking practices; understanding the current trend in various healthy diets and cuisines		
ICGS 131	Introduction to International Studies	4
Prerequisites: None The field of international studies; interdisciplinary approaches; economic globalization; the Bretton Woods system and neoliberalism; political globalization; the United Nations system, the International Court of Justice, and Human Rights; cultural globalization; migration diaspora and transnationalism; the internet and global media; development; modernization and dependency; Global North and Global South; traditional and human security; food; health; energy; environment		
ICGS 132	Career Preparation in a Globalized World	4
Prerequisites: None Trends in national, regional and international job markets; self-assessment on career options; career plan creation; principles in business communication; job search process and tools; resume, cover letters; interview preparation and simulation; dimensions of culture		
ICGS 133	Foundation of Mediterranean Cultures	4
Prerequisites: None The Mediterranean as a source of Western culture; Egypt and the Fertile Crescent; Mohammed and the Muslim World; the Promised Land: Moses' Israel; Jesus and the birth of Christianity; Greek history and civilization; Ancient Italy; arts in Florence and Venice; Modern Italy history; Italian food; the World of Fashion in modern Italy; Italian film; Italian music		
ICGS 137	Witchcraft and Gender Representation	4
Prerequisites: None The term "witch" used to suppress women: accusations of witchcraft to eliminate strong, assertive women; accusations of demonic or magic sources demeaning to women; European, American and African use of witch accusations to stifle women; other forms of oppression of women: the Chinese foot binding, the Indian Suttee, the African genital mutilation; the meaning of gender; gender vs sex; marginalization of women in patriarchal societies; women's rights in the contemporary world;		



differing concepts of women's rights; global and national enforcement of women's rights; organizations concerned with gender and women's issues: UN, ILO, etc; an application of gender rights to other genders like LGBTQ

ICGS 143	Introduction to Air Transport and Tourism	4
Prerequisites: None Basic overview and knowledge of air transport, travel and tourism and the interconnections amongst these elements; the history of air transportation, both airlines and airports; the role of air transport for today's travellers and tourists; relationship between airport and airline, airport business model, airline business model, the nature of air travellers, the nature of demands, air transport journey and experience, passengers/tourist decision makings on air travel, current global issues (e.g., economic, environmental and ethics) of the air transport and tourism		
ICGS 156	Fashion and Society	2
Prerequisites: None What is fashion, History of fashion since the 20th Century, Fashion reflects its temporal and spatial context, fashion and culture, sub-cultural fashion (street fashion), Fashion and Art development, Fashion as an art form, Fashion and business, Fast fashion, Fashion victims		
ICGS 157	Asian Religious Traditions	2
Prerequisites: None Overview of major religious traditions in Asia, including Hinduism, Buddhism, Sikhism, Taoism, Confucianism, and Shintoism; Historical evolution of Asian religious traditions; Significance of rituals, symbols, and sacred texts; Key philosophical and ethical concepts such as karma, dharma, nirvana, and the Tao		
ICGS 159	The Self and Modern Media	2
Prerequisites: None A sociological approach to understanding the disintegration of old social structures and reintegration based on contemporary technology and social media; the new non-geographical communities and the lack of norms; development of a global culture; the role of media and advertising in the new global culture; the generational theory of culture and constructionist theory or reality; the new global self		
ICGS 161	Skills in Dealing with People Across Cultures	2
Prerequisites: None		

Development of skills in dealing with people across cultures through a psychological approach, covering identity formation and conflict, values and communication across culture, culture and tourism, work motivation, and culture in educational institutions		
ICGS 162	Arts, Culture and Tourism Development	2
Prerequisites: None Artistic categories and roles of arts in society, community arts activities and events - processes and outcomes, arts-led urban regeneration, current trends in cultural tourism, online travel platform, creative tourism and designing visitor experiences		
ICGS 165	Tea Studies	2
Prerequisites: None What is tea, main tea varieties, main tea types, climatic condition for sustainable growth of tea, important tea growing countries and regions, tea processing, tea and health, tea evaluation, tea utensils and preparation, tea and food pairing		
ICGS 167	Coffee Studies	2
Prerequisites: None Coffee, an introduction; The journey of Coffee - a journey of love, tears, sweats and blood; Three waves of coffee; Terroir of coffee; Main and sub-varieties of coffee; The world of coffee; Coffee drinking culture, coffee cupping; From harvesting to shipment; From roasting to brewing; Coffee and health; Ethical and environmental issues		
ICGS 168	Faith a Lifestyle	2
Prerequisites: None Faith, spirituality, and interaction in the modern world, spirituality and its economy, spirituality and faith marketing, modern forms of spirituality, spirituality, pop culture, and the soft power		
ICGS 180	Cafe Story and Slow food	2
Prerequisites: None Café concept: historically integral coffeehouse in café culture and social/economic position; slow food in sustainability business concept, specialty food and beverage evolution, new business trends		
ICGS 181	Cuisine and Culture	2
Prerequisites: None		

Exploration of how food shapes and is shaped by culture, Food as a cultural symbol, Historical evolution of culinary practices, Spices in cultural identity and economy, Food in celebrations and rituals, Festival foods around the world, Food Ethics and Sustainability, The phenomenon of culinary fusion and its impact on traditional cuisines, The Language of Food, Religious and cultural influences on dietary practices, The Art of Dining Etiquette, Food in Literature and Film, The Future of Food, Culinary Tourism

ICGS 182

Humor Horizons

2

Prerequisites: None

Introduction to Cultural Humor; Language and Wordplay; Stereotypes and Satire; Historical Perspectives; Regional Comedy Traditions; Social Commentary Jokes; Comedy in Film and TV; Cross-Cultural Comedy Challenges; Humor and Identity; Humor in Business; The Future of Cultural Humor

### Civic Literacy

ICGH 126

Behavioral Ethics: Why Good People Do Bad Things

2

Prerequisites: None

Foundations of behavioral ethics, assumptions of ethical decision making, process of ethical decision making, cognitive errors in ethical decision making: incrementalism, self-serving bias, tangible and abstract, loss aversion, framing, and overconfidence, social and organizational pressures in ethical decision making, situational factors in ethical decision making

ICGH 129

Searching for Meaning

2

Prerequisites: None

Starting from Socrates' quest for wisdom as described in the Apology, and the difficulties he encountered as a consequence, leading up to his trial and death sentence; connecting the Apology to Plato's Allegory of the Cave, and the dialectical method of ascent towards the truth; wondering whether Marcus Aurelius may qualify as a philosopher-kind, and exploring the connections with Stoicism as taught by Epictetus; reflecting on Montaigne's contemplations of death; connecting such ancient models to strains of thought in Thoreau and Emerson, Schopenhauer and Nietzsche, Freud and William James, Albert Camus and Viktor Frankl

ICGH 133

Socrates, His Predecessors and Successors

2

Prerequisites: None Surveying the major philosophical movements in Ancient Greece, including the Presocratics, Socrates, Plato and Aristotle, and the various Hellenistic schools, by focusing on themes related to knowledge, truth, art, psychology, justice and the good life, and considering their relevance to life today		
ICGH 134	Digital Media Literacy: Skills for 21st Century Learning	2
Prerequisites: None Integration of media literacy, media production, and media ethics; accessing, analyzing, evaluating, questioning, and producing media texts; social, cultural, and political implications of media; representations in media; media as political economy; media aesthetics; media and influence; audiences negotiating meaning		
ICGH 138	The Philosophies of Asia	2
Prerequisites: None Exploring the major schools in Asian Philosophy, including Buddhism, Hinduism, Confucianism, Taoism, Jainism, among others, through a survey of foundational concepts and themes and an analysis of the implications that they have on ethics and culture as well as contemporary political, economic and legal frameworks		
ICGH 140	Ethics and Evolution	2
Prerequisites: None Scrutinizing the relationship between the theory of natural selection and ethics, through an examination of the implications of Darwinian evolution on the status of moral claims, the significance of our evolutionary history on moral theory and practice, and the relevance of these intersections on the development of morally justifiable policies and individual decision-making		
ICGH 149	Law, Technology, and Society	2
Prerequisites: None Foundations of the relationship between law, technology, and societal values, how laws evolve with technological innovation, the ethical considerations at play, and the role of law in shaping and responding to societal changes. Current and emerging issues in technology law, including intellectual property, privacy, cybersecurity, and regulation of AI		
ICGH 150	Global Perspectives on Free Expression in the Digital Age	2
Prerequisites: None		

Delving into the intricate dimensions of free expression on a global scale, particularly in the digital realm, tracing the evolution of free speech and contemplating its philosophical foundations and historical context. Examining pivotal case studies and real-world examples, exploring the complexities of free expression, from its role in fostering democracy to its challenges in relation to the notion of Human Rights and navigating a contemporary culture of feeling 'offended'		
ICGN 131	Digital Search Literacy	2
Prerequisites: None The Information literacy relating to search term, the evaluation of the internet site and the quality of data; use of information; the ethical use of the intellectual property; the use of computer platforms; software, online services		
ICGN 132	Digital Security and Privacy	2
Prerequisites: None Privacy rights of data and safeguarding personal information by the protection organizations, anonymizing of data, computer security relating to computer platforms, network, internet and smart devices; password managements and shortcomings, authentication factors and technology		
ICGN 144	Environmental Ethics	2
Prerequisites: None Foundations of Environmental Values, Anthropocentrism vs Ecocentrism, Deep Ecology, Eco-Feminism, Land Ethics, Energy Ethics, Wilderness vs Built Environments, Radical Environmentalism and its Societal, Economic and Policy Implications		
ICGN 145	Food Integrity and Food Fraud: When a Food Product Is Not What It Seems	2
Prerequisites: None Understand the food integrity matrix, recognise common types of fraudulence in food products, their factors and effects on public health and society, prevention, ethical responsibilities and roles of food business and consumers in the food system with food integrity		
ICGS 134	Is Democracy Good?	4
Prerequisites: None Democracy as a political system and a 'normal' form of governance throughout the world, especially since the transitional Third Wave of democratization ending in the 1990's; democracy as a highly contested term; forms of governance; contestations in Thailand; arguments of Thai		

Style Democracy; defining democracy; different forms of democracy; local perception of democracy; critical debate on the merits of democracy; functionality; theoretical and in pragmatic situations; qualitative and quantitative analysis; democratic performance		
ICGS 136	Social and Health Issues in Thailand	4
Prerequisites: None Social and health issues in Thailand; experiential learning approach; site visits to various government and non-governmental organizations; small groups work; identification of issues and characterize the factors affecting the issues; prioritization of the urgency of the issues and determination of the possible solutions; proposing action plans addressing the issues		
ICGS 140	Fake News, Censorship and the Politics of Truth	4
Prerequisites: None Internet and hyper news flows; patterns of information consumption; knowledge of information authenticity; socio-political effects of 'fake news'; impacts and methods of data collection; censorship and contested 'digital space', fact-checking, source evaluation and trust-building online; social power of algorithms, quantification and profiling; citizens journalism and the traditional media		
ICGS 147	Women in Leadership	4
Prerequisites: None Prominent female leaders around the world from the past to present; cross-cultural challenges female leaders encounter; heroines and women warriors in folklores and myths; the perception and sins of matriarchal societies; political roles and suffragette movements around the world; the Modern Girl and consumerism; women's rights movement, glass-ceiling and female career advancement, female attributes and leadership qualities		
ICGS 158	Contemporary Issues in Thailand	2
Prerequisites: None Prevailing ideological issues; contemporary political economy; legal affairs and the judicial system; religious institutions; provincial politics; land rights and other community movements, education and reform; environmental groups; media affairs		
ICGS 160	Self and Society	2
Prerequisites: None		

A sociological approach to understanding the nature of societies, cultures and institutions; the development of the self through the socialization process from Social Interactionist and Critical Theory perspectives; cultural norms and geographical influence on culture: social class and gender structures; the influence of individualism and non-conformity in society		
ICGS 163	Popular Media and Conflicts	2
Prerequisites: None The role of popular media during the war-time and conflicts; the evolution of media and its employment by the state; printed propaganda; the age of radio and its political agenda; newsreels during the wartime; televised wars and public opinions; the emergence of social movement caused by the popular media		
ICGS 166	Power and Politics	2
Prerequisites: None The understanding of politics and political systems of the current world; interactions and connections of different ideas; systems of thought and conflict in contemporary society; analysis of political phenomenon. To collect information, organize information, organize in groups, analyze information, present clearly and concisely on political phenomenon, state typology, political taxonomy, ideological persuasion, voting systems and outcomes		
ICGS 170	Civic Action in Thailand	2
Prerequisites: None Local community organisations and institutions; effective social media and other promotional campaigns on behalf of independent social organisations; funding drives on behalf of independent social organisations; project planning and development		
ICGS 183	Media and Community	2
Prerequisites: None Application of media practices and techniques used as a means for empowerment and communication supporting community and social change; Application of assessment practices to support community goals and development; Application of project-based learning in a real community		

## Finance & Management Literacy

ICGB 102	Navigating the Market Landscape	2
<p>Prerequisites: None</p> <p>Exploration of the dynamic interplay between consumer behavior and firm strategy across industries, guided by the supply-demand framework; practical insights into market dynamics, tool navigation through diverse market landscapes (degree of competition, digital economy, sharing economy), and impact on key stakeholders</p>		
ICGB 103	Decoding Economic News	2
<p>Prerequisites: None</p> <p>Uncovering of economic news mysteries, deciphering of the big picture, and exploration of how economic forces shape our world through key macroeconomic indicators and the aggregate supply-aggregate demand framework; acquisition of practical skills for analyzing current economic events with clarity and insight, empowering navigation of global economic complexities with confidence</p>		
ICGB 104	Entrepreneurship in a Disruptive Environment	2
<p>Prerequisites: None</p> <p>Understand how entrepreneurs create new businesses, capture new markets, and enhance organizational effectiveness so the economy could benefit. Applying disruptive innovation due to new technologies and innovation to deal with the disruptive changes as the new generation entrepreneurs</p>		
ICGB 105	Personal Finance Literacy	2
<p>Prerequisites: None</p> <p>Personal finance literacy includes: financial planning process, life goals and financial goals, tax preparation, consumer credits, investment and retirement planning, investment fundamentals, its techniques and investment assets, making loan and debt decisions, life and property insurance, and estate planning</p>		
ICGB 106	The Business of Fashion	2
<p>Prerequisites: None</p> <p>The fashion world, categorisation of fashion, glossary of fashion, fashion trend interpretation, fashion and creativity, brand image, understanding customers: national culture influences the</p>		



choice of fashion, understanding customers: motivations for buying fashion, total shopping experiences, extension of the fashion business, consumerism		
ICGB 107	Tourism Management Perspectives	2
Prerequisites: None Overview of the tourism industry and its significance, factors shaping the future of tourism and hospitality, opportunities and challenges of tourism development in Thailand, tourism supply chains, key stakeholders and their roles in the tourism ecosystems, and innovative and promising practices in sustainable tourism development		
ICGB 109	Business Event Essentials	2
Prerequisites: None Event as a global strategic and management tool; introduce different types of business events to achieve various objectives including Meetings, Incentive Travels, Conventions, Exhibitions and Special Events; Event strategies		
ICGB 110	Management Styles of Effective Leaders	2
Prerequisites: None Overview of management; evolution of Management theories and thoughts; changing environment of organizations, social responsibility, organizational culture and change		
ICGB 111	Leadership in a Global Society	2
Prerequisites: None Concepts and practices for leadership development; developing leadership skills and challenges of change in a global society; the need, vision, initiation for change, teamwork and collaboration		
ICGB 112	The Art of Pricing	2
Prerequisites: None Rationales and conditions required for sellers to apply different prices to different groups, in order to maximize profits; benefits of first-, second-, and third-degree price discrimination; examples of the use of consumers' demographics and characteristics in buyers' classification; evaluation of certain complex pricing namely, bundling and versioning; which are invented by sellers as a means to price discriminate; assessment of pros and cons of algorithm pricing; the cost of profit-maximizing strategy particularly buyers' perception and fairness		
ICGB 113	Crisis Management in Service Businesses	2

Prerequisites: None Basics of crisis management, crisis preparedness and risk management, methods of analysis and prognosis, strategic measures of crisis management applied in service businesses, crisis planning and organizational measures applied in service businesses, crisis communication		
ICGB 114	Cultural Strategies for Success: Unveiling Eastern Business Dynamics	2
Prerequisites: None Introduce theories (change theories, cultural theories) and frameworks governing Eastern societies in the context of business; Eastern cultural practices and behaviors shaping strategies in competitive markets; Complexities of Asia's diverse business environment; Comparative analysis of strategies and behaviors		
ICGB 115	Money: Deciphering Currencies of Value	2
Prerequisites: None Navigating the intricate realm where money transcends tangible forms, from paper bills to digital transactions; unveiling the essence and construction of value inherent in these mediums, exploring their societal significance and evolving role in contemporary economies		
ICGB 116	Managing Self and Working with Others	2
Prerequisites: None Personal goal setting, personality models and profiling, self awareness and management, social awareness and interaction, techniques in working with others through the lens of diversity, equity, and inclusion, conflict resolution, people management, personal development plan		
ICGH 101	Biotechnology: from Science to Business	4
Prerequisites: None Biotechnology, bioethics, and the law, biotechnology and the regulatory framework, genetic testing, patenting life, biobanks and modern genomics research, genetically modified organisms, human and animal testing; bioterrorism, biological weapons laws, bio-prospecting, pharmaceutical pricing, the future of the human beings and post-humanism		
ICGS 102	Business Sustainability and the Global Climate Change	4
Prerequisites: None Study on the role of business in the society; the basic concept of sustainability; global governance; sustainable development; social inequalities and social inclusion; environment sustainability;		

climate change; climate change mitigation; climate change adaptation; green marketing; business sustainability		
ICGS 135	Entrepreneurial Accounting	4
Prerequisites: None Fundamental accounting concepts; financial statements for small enterprises; financial statement analysis; cost-volume-profit analysis; management decision making; business taxation		
ICGS 153	Social Media Management for Service Sector	2
Prerequisites: None Introduction to digital business transformation in service sector, social consumers and social communities, social media landscape and ecosystem; social media strategy for service sector; digital tools for social media management; social commerce; social media analytical tools and measurement		
ICGS 174	The Art of Leadership in Practice: Inspiration	2
Prerequisites: None Virtue ethics and practical philosophy; driving change through personal development and action directives; managing ethical leadership goals and challenges; climbing Mount Impossible and the power to change the world; what is and what can be in the context of SDGs; finding inspiration and inspiring others; inspirational leaders in History and fiction		
ICGS 184	Healthy Habits, Happy Shoppers: Exploring Health Literacy in Consumer Decisions	2
Prerequisites: None Exploration of the impact of health literacy on shopping behavior; coverage of health literacy principles, consumer psychology, and marketing's role; learning through stimulus case studies to promote informed consumer choices		
ICLL 101	Professional Development	2
Prerequisites: None Professional skills for 21st century workplace through learning or training activities in various topics including innovation management, start-up business, agile workplace or other selected professional development activities approved by the academic advisor and Curriculum Administrative Committee		

## Specific Courses

### Core Courses

ICBI 110	Quantitative Reasoning in Biological Sciences	4
Prerequisite: None Essential mathematical and statistical concepts in biology; applications of quantitative reasoning in biological sciences; quantitative analysis, mathematical modeling of biological processes, data interpretation, and numerical-based problem-solving through real-world examples from biology, ecology, genetics, and other biological science disciplines		
ICCH 101	General Chemistry I	4
Prerequisites: None Concepts of general chemistry; matters, atoms, compounds, reactions, gases, thermodynamics, electrons in atoms, periodic table, chemical bonding; intermolecular forces, and spontaneous changes		
ICCH 102	General Chemistry II	4
Prerequisites: ICCH 101 General Chemistry I Comprehensive general concepts and principles of chemistry; solutions, equilibria, acids and bases, solubility, electrochemistry, chemical kinetics, chemistry of main-group and transition elements, coordination compound, nuclear chemistry and selected topics in chemistry		
ICCH 103	Integrated Laboratory in Chemistry	2
Prerequisites: MU LabPass Laboratory practicals for general chemistry: measurements; stoichiometry; solids, liquids and solutions; gases; thermochemistry; equilibrium; acids and bases; electrochemistry; kinetics; chemical safety practice and regulations		
ICCS 102	Coding for All	4
Prerequisites: None Introduction to Python programming; basic syntax and data types; control structures; functions; basic data structures: lists, tuples, sets, dictionaries; strings and string operations; file handling; error handling and debugging; working with data from APIs; using external packages		

ICMA 151	Statistics for Science I	4
Prerequisites: Placement test or ICMA 101 Precalculus Statistical ideas and concepts; probability, conditional probability; distribution functions; expected value; estimators, good estimators; hypothesis testing		

### Major Core Courses

ICBI 105	Molecules to Living Cells	4
Prerequisites: None Properties of life, classification, and scientific process; chemistry of life; cells and metabolism; genetics; molecular biology; practical exercises are included		
ICBI 106	Organisms to Ecosystems	2
Prerequisites: None The diversity of life; plant forms and functions; animal forms and functions; mechanism of evolution; ecology and behavior		
ICBI 207	Ethics for Bioscience	4
Prerequisite: ICBI 105 Molecules to Living Cells Ethical issues in research in various fields of biology; publications and plagiarism; experiments and research involving human volunteers and experimental animals; medical practices, the design of field and clinical trials		
ICBI 219	Design Thinking in Biological Sciences	2
Prerequisite: ICBI 105 Molecules to Living Cells Principles and practices of design thinking as applied to biological sciences; creative problem-solving and innovation; structured approach to identifying, analyzing, and addressing complex biological challenges; stages of design thinking—empathize, define, ideate, prototype, and test; concepts to real-world biological problems		
ICBI 253	Biological Statistics and Analytics	4
Prerequisite: ICCS 102 Coding for All, ICMA 151 Statistics for Science I		

Statistical software; descriptive statistics; data manipulation, data visualization; probability; distribution model; hypothesis testing; ANOVA; non-parametric statistics; correlation; simple linear regression; categorical data analysis; goodness of fit tests		
ICBI 263	Practical Sustainability and Biodiversity	4
Prerequisite: ICBI 106 Organisms to Ecosystems, ICMA 151 Statistics for Science I Exploration of sustainability and biodiversity through hands-on fieldwork and research; review sustainability and biodiversity literature, develop research questions, and design investigations focused on real-world environmental challenges; assessing and conserving biodiversity across various ecosystems; sampling strategies; field work included		
ICBI 334	Biological Research Methodology	4
Prerequisite: ICBI 253 Biological Statistics and Analytics Principles of scientific inquiry; methodologies employed in biological research; the scientific process, including hypothesis development, experimental design, and data collection and interpretation; critical analysis and the practical application of research techniques in biological sciences; critical reading and analysis of scientific literature; professional conduct at scientific conferences		
ICBI 463	From Ideas to Actions	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Translate innovative ideas into practical actions within the field of biological sciences; turning research findings, creative concepts, and theoretical knowledge into tangible prototypes such as products or processes that address real-world biological and environmental challenges		
ICBI 468	Scientific Writing	2
Prerequisite: ICBI 334 Biological Research Methodology Essential components of scientific communication, including scientific reports and presentations, grant proposals, review articles, and scientific posters; techniques in effective literature search, data presentation, and critical analysis of scientific literature; clear, concise, and accurate formal and informal writing that meet the standards of professional publications; publishing process, including submission, peer review, revision, and acceptance.		

### Major Required Courses

ICCH 221	Organic Chemistry I	4
Prerequisites: ICCH 102 General Chemistry II Concepts and mechanistic considerations of organic chemistry; molecular structures and properties; methane and alkane chemistries; stereochemistry; acyclic compounds; alkyl halides; alkenes; conjugation and resonance; alcohols; ethers and epoxides; alkynes		
ICCH 231	Biochemistry	4
Prerequisites: ICBI 105 Molecules to Living Cells, ICCH 221 Organic Chemistry I or lecturer permission Structure and function of biomolecules, including proteins, carbohydrates, lipids, and nucleic acids; enzyme kinetics and catalysis; metabolism; regulations at the cellular and molecular levels		
ICBI 213	Genetics	4
Prerequisite: ICBI 105 Molecules to Living Cells DNA as genetic material, Mendelian genetics, chromosomal basis of heredity, complex traits, evolutionary genetics, molecular genetics, formulation of genetic hypotheses		
ICBI 214	General Microbiology	4
Prerequisite: ICBI 105 Molecules to Living Cells Structures, physiology and ecology of viruses, bacteria, protozoa and fungi especially bacteria, aspects of microbiology importance in health, sanitation, food processing and industry		
ICBI 218	Cellular Systems	4
Prerequisite: ICBI 105 Molecules to Living Cells Structures and functions of cellular organelles, focusing on their roles within the broader context of cellular systems; analysis of key cellular activities, including metabolism, signal transduction, and the cell cycle; examination of how cells interact with each other and communicate with their environment; integration of cellular components, organelle dynamics, intracellular transport, and the molecular mechanisms underlying cell-to-cell interactions; cellular homeostasis and adaptation to external stimuli		
ICBI 350	Techniques in Molecular Science	4

Prerequisite: ICBI 232 Biochemistry Laboratory Comprehensive introduction to the fundamental techniques and tools used in molecular biology combining theoretical lectures with hands-on laboratory practices; DNA cloning, gel electrophoresis, polymerase chain reaction (PCR), and molecular sequence analysis; practical applications and in-depth discussions		
ICBI 492	Research Internship in Biological Sciences	8
Prerequisite: ICBI 334 Biological Research Methodology Internship specific to research, which learners can practice; integrating and applying the knowledge and skills to conduct an independent research project under the supervision		
ICBI 493	Internship in the Industrial/Commercial and Applied Life Sciences	8
Prerequisite: ICBI 334 Biological Research Methodology Internship specific to industry, which learners can practice; integrating and applying the knowledge and skills to complete tasks under the supervision		

Major Elective Courses

ICBI 213	Genetics	4
Prerequisite: ICBI 105 Molecules to Living Cells DNA as genetic material, Mendelian genetics, chromosomal basis of heredity, complex traits, evolutionary genetics, molecular genetics, formulation of genetic hypotheses		
ICBI 214	General Microbiology	4
Prerequisite: ICBI 105 Molecules to Living Cells Structures, physiology and ecology of viruses, bacteria, protozoa and fungi especially bacteria, aspects of microbiology importance in health, sanitation, food processing and industry		
ICBI 218	Cellular Systems	4
Prerequisite: ICBI 105 Molecules to Living Cells Structures and functions of cellular organelles, focusing on their roles within the broader context of cellular systems; analysis of key cellular activities, including metabolism, signal transduction, and the cell cycle; examination of how cells interact with each other and communicate with their		



environment; integration of cellular components, organelle dynamics, intracellular transport, and the molecular mechanisms underlying cell-to-cell interactions; cellular homeostasis and adaptation to external stimuli		
ICBI 232	Comparative Anatomy and Physiology of Animals and Plants	4
Prerequisite: ICBI 106 Organisms to Ecosystems Comparative anatomy and physiology of animals and plants; evolutionary adaptations and functional relationships across diverse taxa; structural and physiological similarities and differences in systems; practical exercises included		
ICBI 271	General Microbiology Laboratory	2
Prerequisite: ICBI 105 Molecules to Living Cells Basic techniques in microbiological experiments; the microscopic examination of microbial cells and spores; simple staining; Gram staining; colony morphology; viable cells count; hemacytometer; cultivation on liquid and solid media; the bacterial identification using selective and differential media		
ICBI 302	Mechanisms of Gene Expression	2
Prerequisites: ICBI 213 Genetics In-depth exploration of the molecular processes that govern gene expression in both prokaryotic and eukaryotic systems; bacterial transcription and its regulatory mechanisms; eukaryotic transcription and translation; mRNA maturation and processing; role of chromatin structure in regulating gene expression		
ICBI 303	Basic Immunology	4
Prerequisite: ICBI 214 General Microbiology Current understanding of the cellular and molecular interactions in the inductions, expression, and regulation of the cellular and humeral immune responses; recent knowledge and applications concerning immunity to various microbial infections as well as antigen-antibody interactions; serodiagnosis and detection of cell-mediated immune response		
ICBI 305	Human Anatomy I	4
Prerequisite: ICBI 106 Organisms to Ecosystems		

Human anatomy and function; laboratory exercises dissections of human cadavers: head, neck, back, anterior chest wall and upper limb		
ICBI 306	Human Anatomy II	4
Prerequisite: ICBI 106 Organisms to Ecosystems Human anatomy and function; laboratory exercises dissections of human cadavers: thorax, abdomen, pelvis, perineum and lower limb		
ICBI 307	Nutrition and Dietetics	4
Prerequisite: ICCH 231 Biochemistry Importance of food and nutrients for good health; significance of physiological, biochemical and sociological factors of nutritional requirements; practical application of food and nutrition to diet planning and implementation suited to vulnerable groups and individual therapeutic needs		
ICBI 309	Pathobiology	4
Prerequisite: ICBI 218 Cellular Systems Pathophysiological mechanism of diseases; cell injury and cell death; inflammation and repair; bacterial, viral, fungal and parasitic infections; disturbances of minerals and pigments; disorders of immune response; disturbance of body fluid and blood flow; fever and hypothermia; cellular differentiation and neoplasia; practical exercises included		
ICBI 311	Human Physiology	4
Prerequisite: ICBI 106 Organisms to Ecosystems Function and control mechanisms of nervous, muscular, circulatory, respiratory, excretory, digestive, endocrine and reproductive systems; their interrelationships in homeostasis; demonstration and practical exercise included		
ICBI 314	Genetics of Bacteria and Viruses	2
Prerequisite: ICBI 214 General Microbiology Principles of microbial genetics, including the organization, regulation, and evolution of bacterial and viral genomes; gene expression, genetic recombination, mutation, and horizontal gene transfer in bacteria, as well as the life cycles, genetic diversity, and evolution of viruses		
ICBI 324	Introduction to Medical Toxicology	4

Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry The process of illness and disease pertaining to the human exposure to drugs, chemicals, gases and heavy metal in non-therapeutic situations, both accidental and intentional and the biotransformation of drugs and chemicals during these situations; basics of life support measures in poisoned patients, skin and gastric decontamination procedures; indications and mechanism of action of specific antidote; enhance elimination; management of chemical hazardous material incidents and mass casualty events involving toxic chemicals		
ICBI 325	Special Topics in Bioinformatics and Molecular Genetics	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Exploration of specific topics in bioinformatics and molecular genetics and/or a specific sub discipline in bioinformatics; class/group discussion on peer-review articles		
ICBI 328	Essential Pharmacology	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Basic knowledge regarding the use of drugs and chemicals to treat diseases; drug metabolism; mechanisms of drug actions in the body; indications, contraindications, and cautions in using drugs to treat diseases; adverse drug reactions; drug interactions; pharmacokinetics and pharmacodynamics; basics of how drugs are used to treat diseases of the nervous system, respiratory system, cardiovascular system, and endocrine system integrated with basic knowledge in physiology, immunology, bacteriology, virology, biochemistry, molecular biology, metabolic and biotransformation both in normal and diseased states		
ICBI 329	Animal and Plant Behavior	4
Prerequisite: ICBI 106 Organisms to Ecosystems Theories of animal and plant behavior from various biological disciplines, including ecology, evolution, physiology, neurobiology, and genetics; mechanisms of animal behavior and plant behavior; interactions between organisms		
ICBI 332	Medical Microbiology	4
Prerequisite: ICBI 214 General Microbiology		

Nature and epidemiology of infectious disease and the role of microorganisms in health and disease; clinical effects of microbial infection on the human host; microorganisms commonly encountered by physician assistants in clinical practice		
ICBI 341	Neurobiology	4
Prerequisite: ICBI 106 Organisms to Ecosystems Developmental neurobiology, neuroanatomy, and neurophysiology; some clinical aspects as the results of neuropathological defects or lesions; practical exercises included		
ICBI 342	Science of Ageing	2
Prerequisite: ICBI 213 Genetics, ICCH 231 Biochemistry Biological processes and mechanisms underlying aging in humans and other organism; aspects of aging, including the molecular, cellular, and physiological changes that occur over time; decline in function and the onset of age-related diseases; genetic and epigenetic regulation of aging, the role of cellular senescence, oxidative stress, and mitochondrial dysfunction, and the impact of lifestyle and environmental factors on aging		
ICBI 344	Environmental Science	4
Prerequisite: ICBI 263 Practical Sustainability and Biodiversity Ecological concepts related to the problems of pollution and their impact on agriculture and wildlife communities, natural resources, sustainable development and maintenance of clean environment		
ICBI 350	Techniques in Molecular Science	4
Prerequisite: ICBI 232 Biochemistry Laboratory Comprehensive introduction to the fundamental techniques and tools used in molecular biology combining theoretical lectures with hands-on laboratory practices; DNA cloning, gel electrophoresis, polymerase chain reaction (PCR), and molecular sequence analysis; practical applications and in-depth discussions		
ICBI 378	Bioinformatics	4
Prerequisite: ICCS 102 Coding for All, ICBI 218 Cellular Systems		

An introduction to computational approaches in biological systems; biological database; high throughput technologies in biology; the analysis of sequencing data including genomic, transcriptomics, and proteomics; phylogenetics, the analysis of protein structure		
ICBI 379	Introduction to Systems and Structural Biology	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Holistic perspective for biological systems; interactions and regulatory networks; the principles of structural biology, including nucleic acid structure, protein structure and function, and macromolecule complex; the principles of techniques used in the study of structural biology; computational and statistical methods for analyzing biological data		
ICBI 381	Evolutionary Biology	4
Prerequisite: ICBI 106 Organisms to Ecosystems Natural selection; molecular evolution; evolutionary genomics; species and speciation; taxonomy and phylogeny; macroevolution; evolution, coevolution and radiation; biogeography; evolutionary biology and ecology; evolutionary biology and conservation		
ICBI 383	Systematic Biology and Biodiversity	2
Prerequisite: ICBI 106 Organisms to Ecosystems Theory and procedures of classical and modern systematic analysis in botanical or zoological systems, based on either morphological or molecular characters; introduction to phylogenetic construction and analysis; character construction and weighting; characters in molecular systematics; ways of evaluating the quality of systematic results in morphological and molecular data; the comparative method; cladistic biogeography; coevolution; species concepts; classification and the nomenclatorial codes		
ICBI 385	Freshwater Ecology and Conservation	4
Prerequisite: ICBI 106 Organisms to Ecosystems Adaptations; behavior; diversity; physiology; ecological roles; trophic interactions; diversity and productivity; influence of catchment; human activities; significance of global climate changes; increasing competition for water resources; sustainable management; conservation measures		
ICBI 386	Practical Freshwater Ecology and Conservation	2
Prerequisite: ICBI 106 Organisms to Ecosystems		

Laboratory procedures; field techniques; measuring abiotic conditions; surveying biotic communities; assessing trophic interactions; headwater streams; floodplains; standing waters; evaluating anthropogenic impacts; rehabilitation & restoration; water resource conservation		
ICBI 387	Terrestrial Ecology and Conservation	4
Prerequisite: ICBI 106 Organisms to Ecosystems Adaptations; behaviour; diversity & productivity; physiology; ecological roles; trophic interactions; ecosystems and resources; land-use change; anthropogenic activities; sustainable management; significance of global climate change; conservation measures		
ICBI 388	Practical Terrestrial Ecology and Conservation	2
Prerequisite: ICBI 106 Organisms to Ecosystems Laboratory and field procedures; experimental design; mapping habitats; measuring abiotic conditions; analysing biotic communities; diversity indices; similarity indices; biotic interactions; behaviour; evaluating anthropogenic impacts; a habitat reconstruction; conservation		
ICBI 389	Infectious Disease Ecology	4
Prerequisite: ICBI 214 General Microbiology, ICCH 231 Biochemistry An ecological exploration of the changes in human biology, culture, and surrounding environments that have influenced patterns of health and disease; ecology and infectious disease (e.g., zoonotic and emerging), urbanization, global climate change, stratospheric ozone depletion and innovations in public health and medicine		
ICBI 391	Health Psychology	4
Prerequisite: ICCH 231 Biochemistry Individual psychology and the ways it affects adjustment to illness; prevention of illness through health promotion		
ICBI 403	Introduction to Tropical Medicine	4
Prerequisite: ICBI 214 General Microbiology, ICCH 231 Biochemistry Environmental factors in tropical countries facilitating endemic diseases; geographical distribution and transmission of commonly found diseases caused by microbes, protozoa, and helminthes with special reference to Southeast Asia; non-infectious diseases existing in the region such as nutritional		

disorders, food poisoning, snake and other venomous bites and stings; prevention of the tropical diseases		
ICBI 407	Occupational Health and Safety	4
Prerequisite: ICBI 207 Ethics in Bioscience Environmental factors at work regarding workers' health and safety, such as air, water, food, chemical or biological materials handled in the production line, including waste and waste disposal; evaluation harmful effects of such factors for controlling them; prevention of dissatisfaction and risk assessment in the workplace		
ICBI 410	Epidemiology	4
Prerequisite: ICBI 253 Biological Statistics and Analytics Prevalence of endemic health problems caused by infectious diseases or non-infectious disorders; diseases of Southeast Asia in comparison with those occur in tropical Africa and America; field studies included		
ICBI 411	Psychopathology	4
Prerequisite: ICCH 231 Biochemistry An introduction / overview to the definition, assessment, and classification of abnormal behavior as well as historical approaches to the understanding and treatment of abnormal behavior; selected forms of psychopathology; major orientations; clinical assessment; psychotherapies and biological treatments; cross-cultural issues dealing with abnormality		
ICBI 412	Biomedical parasitology	4
Prerequisite: ICBI 214 General Microbiology Biology, ecology, and physiology of parasites and their effects on human and animal health; cutting-edge research in control and diagnosis of parasitic infections; demonstration and laboratory exercises included		
ICBI 415	Biotechnology	4
Prerequisite: ICBI 214 General Microbiology, ICCH 231 Biochemistry Technology and the applications of scientific principles in relation to animals, plants, microorganisms; production of cellular compounds in public health, agriculture and industry		

ICBI 416	Community Health Innovation	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Survey of community health status; primary health care concept; health system analysis and health manpower development; biodesign; needs identifications; product and/or process to address health problems; health innovations and prototyping		
ICBI 417	Design Thinking in Health Innovation	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Designing idea thinking ideas; customers' problems related to biodesigning solutions for healthcare and wellness models; the intellectual property; customers and customers' problem validation; the Customer Journey Map; the Stakeholder Map; the Lean Canvas; showcases with entrepreneurial experts		
ICBI 418	Case Studies in Health Innovation	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Case studies in health; problem identification; stakeholder and SWOT analyses; problem solving in health; knowledge transfer and innovative solutions in health; innovation gaps and alternative solutions; translation and commercialization of ideas		
ICBI 419	Cutting-Edge Technology for Biodesign	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Specific skills for bio innovation and prototype designs in health		
ICBI 420	Entrepreneurship and Innovation in Science	4
Prerequisite: ICBI 219 Design Thinking in Biological Sciences Developing the entrepreneur mindset through life science and innovation; from academia to entrepreneur, current trends in biomedical industry; how to do a startup project; find opportunities and passion driving innovation; considering factors for successful entrepreneurship, including business plans, finding funds, regulatory requirements, market needs; ethics and professionalism; intellectual property and risks		
ICBI 422	Insects Biology and Ecology	4
Prerequisite: ICBI 106 Organisms to Ecosystems		



Insect morphology, physiology, systematics, natural history, and relationships with human; field survey with laboratory exercises are included.		
ICBI 443	Fungal Ecology	4
Prerequisite: ICBI 214 General Microbiology Ecology of fungi and fungi-like microorganisms (slime molds and water molds); importance in food chains; nutrient recycling; morphology and physiology; nutrition and metabolism; growth and differentiation; reproduction and life cycles; classification; ecological roles; culture collection; advantages of fungi and fungal products		
ICBI 440	Marine Ecology and Conservation	4
Prerequisite: ICBI 263 Practical Sustainability and Biodiversity Adaptations; behaviour; diversity; physiology; ecological roles; marine ecosystems; marine resources; trophic interactions; human activities; sustainable management; significance of global climate change; coral reef bleaching; reef rehabilitation & restoration; mangrove deforestation & reforestation; conservation measures		
ICBI 442	Practical Marine Ecology and Conservation	2
Prerequisite: ICBI 263 Practical Sustainability and Biodiversity Laboratory and field procedures; analyzing abiotic conditions; surveying biotic communities; assessing productivity; evaluating anthropogenic threats		
ICBI 461	Cell Technology	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry The principle of cell culture; cell culture and aseptic techniques; cellular experiments including cell viability, cell migration, flow cytometry; stem cells; cells engineering; introduction to standard operation procedures in laboratory		
ICBI 462	Advanced Cancer Biology	2
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Molecular basis of cancer; tumor microenvironment; cancer signaling pathways; cancer Immunology; cancer genomics and precision medicine; emerging cancer therapeutics		
ICBI 471	Special Topics in Biological Sciences A	4

Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Experience and knowledge equivalent to 4-trimester credits from biological sciences and related courses taken at other qualified universities and institutions; subject to approval by the Program Director of Biological Sciences		
ICBI 472	Special Topics in Biological Sciences B	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Experience and knowledge equivalent to 4-trimester credits from biological sciences and related courses taken at other qualified universities and institutions; subject to approval by the Program Director of Biological Sciences		
ICBI 473	Special Topics in Biological Sciences C	4
Prerequisite: ICBI 218 Cellular Systems, ICCH 231 Biochemistry Experience and knowledge equivalent to 4-trimester credits from biological sciences and related courses taken at other qualified universities and institutions; subject to approval by the Program Director of Biological Sciences		
ICBI 476	Undergraduate Research A	2
Prerequisite: Approval by the Program Director of Biological Sciences Part-time undergraduate research in biological sciences under supervision, involving no more than 10 hours per week		
ICBI 477	Undergraduate Research B	4
Prerequisite: Approval by the Program Director of Biological Sciences Part-time undergraduate research in biological sciences under supervision, involving no more than 20 hours per week		
ICBI 478	Undergraduate Research C	8
Prerequisite: Approval by the Program Director of Biological Sciences Full-time undergraduate research in biological sciences under supervision (i.e., 40 hours per week)		
ICBI 480	Current Issues in Health and Wellness	2
Prerequisite: ICCH 231 Biochemistry		

Latest trends, challenges, and innovations in health sciences, with a focus on how biological research informs public health policies, practices, and personal well-being; lectures, case studies, guest speakers, and discussions; critical analysis of current health issues		
ICBI 481	Current Issues in Biological Sciences A	2
Prerequisite: ICCH 231 Biochemistry Experience and knowledge equivalent to 2-trimester credits from biological sciences and related courses taken at other qualified universities and institutions; subject to approval by the Program Director of Biological Sciences		
ICBI 492	Research Internship in Biological Sciences	8
Prerequisite: ICBI 334 Biological Research Methodology Internship specific to research, which learners can practice; integrating and applying the knowledge and skills to conduct an independent research project under the supervision		
ICBI 493	Internship in the Industrial/Commercial and Applied Life Sciences	8
Prerequisite: ICBI 334 Biological Research Methodology Internship specific to industry, which learners can practice; integrating and applying the knowledge and skills to complete tasks under the supervision		
ICSP 113	General Psychology	4
Prerequisites: None Introduction to various topics, theories, and approaches in the scientific study of behaviour and mental processes; Important psychological principles within the major subfield of psychology; Biological bases of behaviour, cognition, intelligence, emotions, learning, human development, health, psychological disorders, and psychotherapy; Application of various aspects of psychology to different contexts		
ICMB 257	Business Finance for Entrepreneurs	4
Prerequisite: ICMB 256 Principles of Financial Accounting An overview of the principles and practices of business finance including time value of money, the valuation of financial assets, capital budgeting techniques, risk and return calculations, methodologies for determining the cost of capital, an estimation and forecasting of cash flows, and the project evaluation		

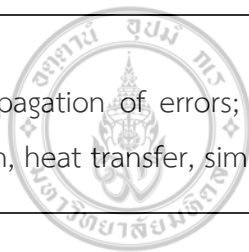
ICMB 259	Principles of Marketing	4
Prerequisites: None Marketing concepts, the role of marketing in organization, creating-communicating-delivering-exchanging product and services that having value to customers and the society; customer needs and wants, consumer decision making process, marketing information and research, market segmentation-targeting-positioning, product development and life cycle management; pricing, channel management, marketing communication, customer relationship management		
ICMB 260	Management and Organizational Behavior	4
Prerequisites: None A study on the role of manager in an organization, emphasis on the understanding of behavioral and administrative theories and concepts needed to succeed in the modern organization. Topics includes organization structure, organizational changes, motivations, leadership, managing work and team, effective communication, principal conflict resolution management and environment, social and governance (ESG) for business sustainability growth		
ICMB 262	International Business Management	4
Prerequisite: ICMB 260 Management and Organizational Behavior An examination of International business operations, organization structure, finance and accounting systems, taxation systems, marketing strategy, culture differences, global trade, capital markets and economic growth, the impact of regional trading blocs, corporate global competitiveness, and global strategies		
ICMB 351	Business Ethics and Sustainability	4
Prerequisite: ICMB 260 Management and Organizational Behavior, ICMB 350 Business Law An understanding, analysis of ethical concepts, and the implications of ethics in business decisions under different social and other business-related environments, an application of ethical principles to ethical issues within the organization and the external environment		
ICTB 202	Principles of Management	4
Prerequisites: None Overview of management and organizational behavior; evolution of management theories and thoughts; changing environment of organizations; foundation of individual behaviors; motivation; stress and work-life balance; decision making and problem solving; teamwork; communication;		

leadership; organization structure; ethics and social responsibility; service economies; organizational culture and change		
ICTB 263	Healthcare and Medical Business	4
Prerequisites: None Healthcare business system and environment; contemporary business themes in healthcare and medical policy and practice; vulnerable population and potential demands; healthcare and service operations; healthcare products & services; entrepreneurship in healthcare and medical		
ICCH 221	Organic Chemistry I	4
Prerequisites: ICCH 102 General Chemistry II Concepts and mechanistic considerations of organic chemistry; molecular structures and properties; methane and alkane chemistries; stereochemistry; acyclic compounds; alkyl halides; alkenes; conjugation and resonance; alcohols; ethers and epoxides; alkynes		
ICCH 222	Organic Chemistry II	4
Prerequisites: ICCH 221 Organic Chemistry I Concepts of organic reactions through mechanistic approach; aromaticity and electrophilic aromatic substitution; spectroscopy and structure; aldehydes and ketones; carboxylic acids and derivatives; carbanions, amines, phenol and aryl halides; fats; carbohydrates; amino acids		
ICCH 224	Organic Chemistry Laboratory	2
Prerequisites: ICCH 103 Integrated Laboratory in Chemistry and ICCH 222 Organic Chemistry II or lecturer permission Fundamental organic laboratory techniques; recrystallization, refluxing, distillation, extraction, chromatography, spectroscopy; laboratory safety		
ICCH 231	Biochemistry	4
Prerequisites: ICBI 105 Molecules to Living Cells, ICCH 221 Organic Chemistry I or lecturer permission Structure and function of biomolecules, including proteins, carbohydrates, lipids, and nucleic acids; enzyme kinetics and catalysis; metabolism; regulations at the cellular and molecular levels		
ICCH 232	Biochemistry Laboratory	2
Prerequisites: ICBI 105 Molecules to Living Cells, ICCH 221 Organic Chemistry I or lecturer permission		

Laboratory practicals in biochemistry; error and statistical analysis of experimental data; physical and chemical properties of biomolecules; spectroscopic methods; electrophoretic techniques; chromatographic separations; isolation and characterization of biological materials; enzyme kinetics		
ICCS 205	Numerical Computation	4
Prerequisites: ICCS 102 Coding for All and ICMA 106 Calculus Taylor's theorem; roots of equations; interpolation; numerical integration and derivative; solutions to systems of equations; Monte Carlo simulation; optimization		
ICCS 206	Discrete Mathematics	4
Prerequisites: ICMA 106 Calculus Mathematical statements and logical deduction; proves and proof techniques including direct, contradiction, contrapositive, induction, and invariants; summation, asymptotics, and recurrences; counting: combinations, permutations, and basic counting techniques; discrete probability: finite probability space, events, conditional probability, independence, random variables, expectation, variance, covariance, discrete distributions; graphs: tree, tree traversal, undirected graphs, directed graphs, weighted graphs, Euler's tours, isomorphisms, spanning trees		
ICCS 209	Data Structures	4
Prerequisites: ICCS 111 Programming and Abstractions Corequisites: ICCS 206 Discrete Mathematics Sequential and parallel cost models; asymptotic analysis and implications; abstract data types and data structures, including sequences, ordered and unordered dictionaries, binary search trees, balanced binary search trees, disjoint sets, and priority queues; fundamental algorithms, including searching, sorting, and basic graph algorithms; algorithms design techniques, including inductive reasoning, divide and conquer, dynamic programming, and randomness; limits of computation		
ICCS 261	Principles of Data Science	4
Prerequisites: ICCS 102 Coding for All or ICCS 111 Programming and Abstractions; ICMA 151 Statistics for Science I Introduction to data science; data transformation and cleaning; visualization; exploratory data analysis; dimensionality reduction; principal component analysis; probability theory; sampling; hypothesis testing; modeling and estimation; Bayesian modeling; linear modeling		

ICCS 312	Algorithms and Tractability	4
Prerequisites: ICCS 209 Data Structures Asymptotic analysis (big-O, big-Omega, big-Theta, little-o, little-omega); recurrences; algorithmic strategies, including divide and conquer, greedy, inductive design, and dynamic programming; probabilistic analysis and randomized algorithms; graphs and graph algorithms, including traversal, minimum-spanning tree, shortest paths, network flow; amortized analysis; reduction, tractability, and basic complexity classes; NP-completeness, classic NP-complete problems, and techniques for coping with hard problems		
ICCS 361	Data Mining	4
Prerequisites: ICCS 209 Data Structures; ICCS 261 Principles of Data Science Overview of data mining and its applications; software stack for data mining; acquiring data from web-scraping and data APIs; structured, semi-structured, unstructured data; data cleansing and manipulation; dimensionality reduction; exploratory data analysis and visualization; large-scale data platforms including HDFS; machine learning algorithms for large data sets; recommendation systems; natural language processing and its applications		
ICCS 461	Machine Learning	4
Prerequisites: ICCS 261 Principles of Data Science; ICCS 205 Numerical Computation Probability and maximum likelihood estimate; k-nearest neighbor methods; decision tree and basic information theory; regressions; ensemble learning algorithms including bagging, boosting and random forest; support vector machines; perceptron and neural networks; deep learning; unsupervised learning; semi-supervised learning; PAC learning and VC dimension		
ICMA 106	Calculus I	4
Prerequisites: Placement test or ICMA 101 Precalculus Limits and continuity; differentiation and its techniques; derivatives of algebraic, logarithmic, exponential, and trigonometric functions; graph sketching; applications of the derivatives; antiderivative and integration; area under a curve and between curves		
ICMA 213	Calculus II	4
Prerequisites: ICMA 106 Calculus I		

Techniques of integration; improper integrals; indeterminate forms; applications of integration; sequences and series; power series; Taylor and Maclaurin series		
ICPY 101	Physics I	4
Prerequisites: None Measurement, units and dimensions; vectors, linear motion, Newton's laws of motion; kinetic and potential energy, rotational motion, linear and angular momentum; static equilibrium; fluid mechanics		
ICPY 102	Physics II	4
Prerequisites: ICPY 101 Physics I Thermodynamics; electricity and magnetism; optics; nuclear and atomic physics		
ICPY 105	Integrated Laboratory in Physics I	2
Prerequisites: ICPY 101 Physics I Measurement and uncertainty; propagation of errors; data analysis for experiments in motions, resonance, refraction, and diffraction, heat transfer, simple electrical circuit		



**Mahidol University**  
International College