Chulalongkorn School of Integrated Innovation

Bachelor of Arts and Science in Integrated Innovation (International Program)

Curriculum 2019

Curriculum

Total 126 credits for 4 academic years

Degree Structure

Total Credits	not less than	126	credits
1) General Education Courses	not less than	30	credits
2) Core and Project Specialization Courses	not less than	90	credits
2.1) Core courses	not less than	36	credits
2.2) Project and Approved Elective Courses	not less than	54	credits
3) Free Elective Courses	not less than	6	credits

Courses

1) **General Education Courses**

1.1) Social Courses	3	credits
1.2) Humanity Courses	3	credits
1.3) Science and Mathematics Courses	3	credits
1.4) Transdisciplinary Courses	3	credits
1.5) Language Courses	6	credits
5536121 English Technical Writing for Innovators	3	credits
1.6) Special General Education Course	12	credits
0201173 Rethinking Justice for Innovators	3	credits
5695102 Professional Communication Skills for Innovators	3	credits
5600190 Numerical Methods for Innovators	3	credits
5698101 Emerging Technologies for Lifelong Learning	3	credits
5695101 Design and Development of Product Prototype	3	credits
5600XXX Intellectual Property Management	3	credits
5600XXX Stakeholder Engagement for Innovators	3	credits

2) **Core and Project Specialization Courses**

	not less than	90	credits
2.1) Core courses	not less than	36	credits
2.1.1) Core Business Management		18	credits

5601101	ENTRE MGT/SOC ENT	3 (3-0-6)
	Entrepreneurship Management and Social Enterprise	
5601102	FIN/ACCTG MGT BUS	3 (3-0-6)
	Financial and Accounting Management for Technology Business	
5601103	MKTG BRD SALE VELO	3 (3-0-6)
	Marketing, Branding Sales Velocity	
5601201	TECH INNO MGT	3 (3-0-6)
	Technology Innovation Management	
5601202	DIGI OPN MGT	3 (3-0-6)

	Digital Operation Management		
5601301	BUS MOD/DIGI TRFN		3 (3-0-6)
	Business Modeling and Digital Transformation		

2.1.1) Core Technology   **18**   credits

5602101	MATH APP DIGI INTL	3 (3-0-6)
	Mathematics for Applied Digital Intelligence	
5602102	COMP PROG	3 (3-0-6)
	Introduction to Computer Programming	
5602103	INTR MM/COMP NETWK	3 (3-0-6)
	Introduction Multi-Media and Computer Networking	
5602201	DATA STRUC ALGOR	3 (3-0-6)
	Data Structure and Algorithm	
5602202	COG HUM FAC DES	3 (3-0-6)
	Cognitive Human Factor in Design	
5602301	APPLY AI	3 (3-0-6)
	Applied Artificial Intelligence	

2.2) Project and Specialization Courses   not less than   **54**   credits

2.2.1) Projects   not less than   **30**   credits

5603101	PROJ SEED I	3 (2-2-5)
	Project Seed I	
5603102	PROJ SEED II	3 (2-2-5)
	Project Seed II	
5603201	DES BUILD PROJ I	3 (2-2-5)
	Design-Build Project I	
5603202	DES BUILD PROJ II	3 (2-2-5)
	Design-Build Project II	
5603301	PROD ENTRE I	3 (1-2-6)
	Production and Entrepreneurization I	
5603302	PROD ENTRE II	3 (1-2-6)
	Production and Entrepreneurization II	
5603401	SENIOR PROJ I	6 (1-9-8)
	Senior Project I	
5603402	SENIOR PROJ II	6 (1-9-8)
	Senior Project II	

2.2.2) Specialization   not less than   **18**   credits

A) Health and Wellbeing

5604201	HUM BODY/MIND WELL	3 (3-0-6)
	Human Body and Mind Wellness	
5604202	HUM DIS/DISAB	3 (3-0-6)
	Human Diseases and Disabilities	
5604203	HLTH SOC BEH	3 (3-0-6)
	Health and Social Behavior	
5604204	SPORT EX LIFESTY	3 (3-0-6)

Sports, Exercise, and Lifestyle

5604205	INNO FUT CMB TECH	3 (3-0-6)
	Innovations and Future Trends in Cell and Molecular Biology Technology	
5604206	ANATOMY PHYSIO	3 (3-0-6)
	Anatomy and Physiology	
5604301	FD DRUG TECH WELL	3 (3-0-6)
	Food and Drugs Technology for Wellbeing	
5604302	PERSU HLTH TECH	3 (3-0-6)
	Persuasive Health Technology	
5604303	INTG INNO ELD CARE	3 (3-0-6)
	Integrated Innovation for Elderly Care	
5604304	HLTH ENV IMP ASSMT	3 (3-0-6)
	Health and Environmental Impact Assessment	
5604401	HLTH HAZ ID/PREV	3 (3-0-6)
	Health Hazard Identification and Prevention	
5604402	HLTH LOG/SY CH MGT	3 (3-0-6)
	Health Logistics and Supply Chain Management	
5604403	PSYCH TECH/INNO	3 (3-0-6)
	Psychology Technology and Innovation	
5604404	MNG INFO HLTH CARE	3 (3-0-6)
	Managing Information in Health Care	

B) Smart City and Inclusive Community

5605201	AUG/HYB ARCH	3 (3-0-6)
	Augmented and Hybrid Architecture	
5605202	DIGI CONSTRUC TECH	3 (3-0-6)
	Digital Construction Technology	
5605203	COMP AID DES/MFG	3 (3-0-6)
	Computer-Aided Design and Manufacturing	
5605204	HUM COMP INTA ARCH	3 (3-0-6)
	Human-Computer Interaction in Architecture	
5605205	SMART CITY MGT	3 (3-0-6)
	Smart City Information Management	
5605206	SMART MOBILITY	3 (3-0-6)
	Smart Mobility	
5605207	SOC ENT SMT CITIES	3 (3-0-6)
	Social Enterprise for Smart Cities	
5605301	INTL PROP MGT	3 (3-0-6)
	Intellectual Property Management	
5605302	PKG/BRD DES	3 (3-0-6)
	Packaging and Branding Design	
5605303	URB HIST THEO SOC	3 (3-0-6)
	Urban History, Theories, and Society	
5605304	URB ECO	3 (3-0-6)

	Urban Ecology	
5605305	Land Use, Mobility and Environment	3 (3-0-6)
	LAND USE MBL ENV	
5605401	HUM ENV INTA	3 (3-0-6)
	Human-Environment Interaction	
5605402	INTAN CULT HER DEV	3 (3-0-6)
	Intangible Cultural Heritage Development	
5605403	SMART CITY URB DEV	3 (3-0-6)
	Smart City and Urban Development	
5605404	STRAT/CREAT IDEA	3 (3-0-6)
	Strategic and Creative Ideation	

C) Sustainable Development

5606201	SUS OPN/SUS MGT	3 (3-0-6)
	Sustainable Operations and Sustainability Management	
5606202	FIN CLN ENGY ECON	3 (3-0-6)
	Financing the Clean Energy Economy	
5606203	SUS FD PROD SY CH	3 (3-0-6)
	Sustainability of Food Production and Supply Chain	
5606204	SUS URB FARM	3 (3-0-6)
	Sustainable Urban Farming	
5606205	SUS DEV/WASTE MGT	3 (3-0-6)
	Sustainable Development and Waste Management	
5606206	TECH GLOB SUS DEV	3 (3-0-6)
	Technology, Globalization, & Sustainable Development	
5606207	SUST PUB SERV	3 (3-0-6)
	Sustainability in Public Service	
5606208	CLIM SCIENCE AS	3 (3-0-6)
	Climate Change From Science to Action	
5606301	EFF MGT/INNO ENGY	3 (3-0-6)
	Energy Efficiency & Management and Innovation	
	for renewable energy	
5606302	SOCECON TRFN SUS	3 (3-0-6)
	Socioeconomic Transformation for Sustainability	
5606303	CIR ECON CITY	3 (3-0-6)
	Circularity: circular economy and city	
5606304	CLN TECH ENTRE	3 (3-0-6)
	Clean Technology Entrepreneurship	
5606305	BLDG ENGY PERF EVA	3 (3-0-6)
	Building and Energy Performance Evaluation	

D) Applied Digital Intelligence

5607201	ROBO CYBER OPN MGT	3 (3-0-6)

	Robot and Cybernetics Operation Management		
5607202	MAC LRNG	3 (3-0-6)	
	Machine Learning (Deep Learning)		
5607203	IoT/EMBED SYS	3 (3-0-6)	
	IoT/Embedded Systems		
5607204	MIX REAL	3 (3-0-6)	
	Mixed Reality (AR/VR/MR)		
5607205	INTRO MAC LRNG	3 (3-0-6)	
	Introduction to Machine Learning (Deep Learning)		
5607206	AI ROBOTICS IND	3 (3-0-6)	
	AI and Robotics for Industrial Applications		
5607207	GAME DESIGN DEV	3 (3-0-6)	
	Game Design and Development		
5607301	BIG DATA ANA	3 (3-0-6)	
	Big Data Analytics		
5607302	DIGI TR PRIV SEC	3 (3-0-6)	
	Digital Trust, Privacy & Security (Blockchain)		
5607303	AGT TECH	3 (3-0-6)	
	Agent Technology		
5607304	CRWSOCG SOC COMP	3 (3-0-6)	
	Crowdsourcing and Social Computing		
5607305	MGT HR TRFN DIGI	3 (3-0-6)	
	Management & HR Transformation in Digital Age		
5607401	GLOB ENTRE COMLN	3 (3-0-6)	
	Global Entrepreneurship and Technology Commercialization		
5607402	AI ROBO APP AG IND	3 (3-0-6)	
	AI and Robotic Application in Agriculture and Industry		
5607403	STRAT MGT REASON	3 (3-0-6)	
	Strategic Management and Reasoning		
5607404	CURR ISS A/S RES	3 (3-0-9)	
	Current Issues in Arts & Scientific Research		

2.2.3) Practice not less than 6 credits

5608101	IND STUD I	1 (1-0-2)	
	Independent Study I		
5608102	IND STUD II	2 (1-0-5)	
	Independent Study II		
5608103	IND STUD III	3 (1-0-8)	
	Independent Study III		
5608301	WKSP INTG INNO I	3 (3-0-6)	
	Workshop in Integrated Innovation I		
5608302	WKSP INTG INNO II	3 (3-0-6)	
	Workshop in Integrated Innovation II		
5608303	WKSP INTG INNO III	3 (3-0-6)	

Workshop in Integrated Innovation III

5608311	INTN INTG INNO I	3 (3-0-6)
	Internship in Integrated Innovation I	
5608312	INTN INTG INNO II	3 (3-0-6)
	Internship in Integrated Innovation II	
5608313	INTN INTG INNO III	3 (3-0-6)
	Internship in Integrated Innovation III	
5608321	INT FLD STUD I	3 (3-0-6)
	International Field Study I	
5608322	INT FLD STUD II	3 (3-0-6)
	International Field Study II	

3)   Free Elective Courses   not less than   6   credits

Year 1 – Semester 1

Code	Subject	Credits
5601101	Entrepreneurship Management and Social Enterprise	3 (3 - 0 - 6)
5601102	Financial and Accounting Management for Technology Business	3 (3 - 0 - 6)
5602101	Mathematics for Applied Digital Intelligence	3 (3 - 0 - 6)
5603101	Project Seed I	3 (2 - 2 - 5)
0201173	Rethinking Justice for Innovators	3 (3 - 0 - 6)
5695102	Professional Communication Skills for Innovators	3 (3 - 0 - 6)
Total Credits		18

Year 1 - Semester 2

Code	Subject	Credits
5601103	Marketing, Branding Sales Velocity	3 (3 - 0 - 6)
5602102	Introduction to Computer Programming	3 (3 - 0 - 6)
5602103	Introduction Multi-Media and Computer Networking	3 (3 - 0 - 6)
5603102	Project Seed II	3 (2 - 2 - 5)
5536121	English Technical Writing for Innovators	3 (3 - 0 - 6)
5600190	Numerical Methods for Innovators	3 (3 - 0 - 6)
	BAScii Special Gen-Ed	3 (3 - 0 - 6)
Total Credits		21

Year 2 - Semester 1

Code	Subject	Credits
5601301	Business Modeling and Digital Transformation	3 (3 - 0 - 6)
5602201	Data Structure and Algorithm	3 (3 - 0 - 6)
5602202	Cognitive Human Factor in Design	3 (3 - 0 - 6)
5603201	Design-Build Project I	3 (2 - 2 - 5)
	Specialization I	3 (3 - x - x)
	Gen Ed Course	3 (3 - x - x)
	Gen Ed Course	3 (3 - x - x)
Total Credits		21

Year 2 - Semester 2

Code	Subject	Credits
5601202	Digital Operation Management	3 (3 - 0 - 6)
5603202	Design-Build Project II	3 (2 - 2 - 5)
	Specialization II	3 (3 - x - x)
	Specialization III	3 (3 - x - x)
	Specialization IV	3 (3 - x - x)
	Gen Ed Course	3 (3 - x - x)
	Gen Ed Course	3 (3 - x - x)
Total Credits		**21**

Year 3 - Semester 1

Code	Subject	Credits
5601201	Technology Innovation Management	3 (3 - 0 - 6)
5602301	Applied Artificial Intelligence	3 (3 - 0 - 6)
5603301	Production and Entrepreneurization I	3 (1 - 4 – 4)
	Specialization V	3 (3 - x - x)
	Specialization VI	3 (3 - x - x)
	Practice I	3 (1 – 4 – 4)
Total Credits		**18**

Year 3 - Semester 2

Code	Subject	Credits
5603302	Production and Entrepreneurization II	3 (1 - 4 – 4)
	Gen Ed Language Course	3 (3 - x - x)
	Free Elective I	3 (3 - x - x)
	Free Elective II	3 (3 - x - x)
	Practice II	3 (1 – 4 – 4)
Total Credits		**15**

Year 4 - Semester 1

Code	Subject	Credits
5603401	Senior Project I	6 (1 – 9 – 8)
Total Credits		**6**

Year 4 - Semester 2

Code	Subject	Credits
5603402	Senior Project II	6 (1 – 9 – 8)
Total Credits		**6**

Course Description

1) General Education Courses
2) Core and Project Specialization Courses   not less than   90   credits
   2.1) Core courses   not less than   36   credits

      2.1.1)   Core Business Management   18   credits

5601101*   Entrepreneurship Management and Social Enterprise   3 (3-0-6)
           ENTRE MGT/SOC ENT

Prerequisite: None

Fundamental knowledge entrepreneurship and startup to create value for business and society. Entrepreneurial process of opportunity identification for founder to startup and scale up. Effects of entrepreneurial attitude, orientation and characteristics on types of startup. Dynamics of founding team formation. Resources optimization, bricolage and lean concept.

5601102*   Financial and Accounting Management for Technology Business3 (3-0-6)
           FIN/ACCTG MGT BUS

Prerequisite: None

This Accounting and Finance courses provides students with applied knowledge and specialized skills that will enable learners to understand the basic principles of Finance and apply them into real Entrepreneurship and Innovation case studies. During the first stage students will be introduced to the key concepts of Accounting and expand your knowledge in managerial accounting and financial analysis and projections; the second stage will introduce some risk management, governance, and venture management concepts, with some case studies.

5601103*   Marketing, Branding Sales Velocity   3 (3-0-6)
           MKTG BRD SALE VELO

Prerequisite: None

The course aims to equip and familiarize students with marketing fundamental concepts and consumer behavior as un underpinning notion to their marketing education. The lectures embrace and integrate a mixture of concepts derived from various disciplines such as marketing management, strategy, psychology, sociology and anthropology, which are used to study and explain Marketing and Consumer Behavior.

5601201* Technology Innovation Management   3 (3-0-6)
        TECH INNO MGT

Prerequisite: None

This course examines theories of innovation and their application to real-world business opportunities. A particular focus is placed on emerging scientific and technical innovations and the opportunities and challenges they present to both existing businesses and new venture entrepreneurs. This course explains how do firms and entrepreneurs bring in new business models and get new products and services to the market for enhancing the competitive advantage, through internal innovation, external innovation, and open innovation ecosystem.

5601202* Digital Operation Management   3 (3-0-6)
        DIGI OPN MGT

Prerequisite: None

This course studies problems encountered by firms in production and operations from managerial perspective. It examines the principles and analysis of decision-making for optimizing the production and services operations. Emphasis is placed on the design of manufacturing and services systems, product design and development, design of service delivery processes, location selection, facility layouts, material requirement planning, enterprise resource planning, quality control, inventory control, and scheduling, in the context of the digital transformation of the economy.

5601301* Business Modeling and Digital Transformation   3 (3-0-6)
        BUS MOD/DIGI TRFN

Prerequisite: None

Fundamental concepts of value chain and value creation in business processes, with a focus on transformational leadership and change management. Reconfiguration and inventing change in core business process. Managing change and transformation of strategic initiatives in collaboration with various functional and team. End-to-end transformation across business, technology, process and people.

2.1.2) Core Technology   18   credits

5602101* Mathematics for Applied Digital Intelligence   3 (3-0-6)
        MATH APP DIGI INTL

Prerequisite: None

Limits; Continuity; Differentiation and Integration of a real-valued function of a single variable; Applications of derivative and integral; Permutation and Combination; Probability and Bayesian Concepts; Discrete and Continuous Random Variables and Probability Distributions; Concepts of Centroid, Variance and Standard Deviation;

5602102* **Introduction to Computer Programming** 3 (3-0-6)
COMP PROG

Prerequisite: None

Fundamental Concept of Procedural and Object-oriented Programming Languages: Variable and Object Declarations; Iterative Instructions; Conditional Instructions; I/0 Instructions; Basic Graphics Library Functionality; Functions and Sub-programs; File Handling Instructions; Types of Sub-program Call; Visual Instructions; Applications; Understand basic Object-Oriented Programming concepts (inheritance, abstract classes, interfaces, polymorphism, extensions, encapsulation); Introduction to Algorithms and Recursion.

5602103* **Introduction Multi-Media and Computer Networking** 3 (3-0-6)
INTR MM/COMP NETWK

Prerequisite: None

Function of computer networks; representation of computer networks; modeling of computer networks; networking transmission media and protocols; representation of multi-media data; QoS (quality of service) in computer networks; protocols involved in multi-media communication; wireless and mobile networks; Recently Emerging Technologies (in networking and multi-media) including Internet of Things (IoT).

5602201* **Data Structure and Algorithm** 3 (3-0-6)
DATA STRUC ALGOR

Prerequisite: None

Abstract Data Types; Linked Lists; Array; Trees; Queues; Stack; Sorting; Searching; Array-based Sequences; Recursion; Maps and Hash Tables; Search Trees; Graph and Graph Algorithms, String Matching;.

5602202* **Cognitive Human Factor in Design** 3 (3-0-6)
COG HUM FAC DES

Prerequisite: None

Cost of interaction; Usability concepts; Perception; Attention; Memory; Human Learning; Individual Differences; Human Mind in Usability Design; Quantitative Evaluation of User Experience; Return on Investment; Data Analytics and User Experience; Customer Journey Map; Apply HCI and Usability Principles Through Web Design (HTML/CSS/JavaScript).

5602301* **Applied Artificial Intelligence** 3 (3-0-6)
APPLY AI

Prerequisite: None

Game Playing, Logic Reasoning; Concept of Rule-Based Decision; Fundamental Fuzzy Logic; Basic Neural Supervised and Unsupervised Learning; Applications of AI Methods.

2.2) Project and Specialization Courses not less than 54 credits
2.2.1)   Projects
5603101* **Project Seed I** 3 (2-2-5)
PROJ SEED I

Prerequisite: None

Students have the opportunity to conduct an independent research project with guidance from their faculty advisor which must be approved to make sure it meets academic, health and safety criteria. The advisor and the student develop a learning plan for the semester and regular meetings take place to discuss the student's project. Students are expected to hand in written work on a regular basis. Students may not repeat the same course number for credit either in the same or in a different semester.

5603102*   Project Seed II   3 (2-2-5)
           PROJ SEED II

Prerequisite: None

Students have the opportunity to conduct a team research project with guidance from their mentor (one per team) to make sure they meet an expected outcome of this subject which is workable prototype. The mentor and the student develop a learning plan for the semester and regular meetings take place to discuss the student's project. Students are expected to report their project progress on a weekly basis to the instructor.

5603201*   Design-Build Project I   3 (2-2-5)
           DES BUILD PROJ I

Prerequisite: None

The journey of crafting a promising startup has reached to almost the end of the underworld tunnel. Project Seed 3 subject emphasizes the creation of Minimal Viable Product (MVP) which is one step closer to the production stage or commercialization stage. Student will be introduced to various tools that use to develop MVP as well as several techniques that are implemented by various successful startups to obtain reasonable number of tractions. The journey will also touch base on how to develop a proper company including company registration process and vesting technique.

5603202*   Design-Build Project II   3 (2-2-5)
           DES BUILD PROJ II

Prerequisite: None

Product development is the core element in this subject. Our big main goal
for this series of subject is to ultimately solve a user problem. Up to now, the question that we need to answer is "Can you sustainably deliver the solution?" This subject aims to provide comprehensive knowledge, tool, and technique to the student with a view to assist the student in developing a profitable business. This subject focus on the designing a sustain business model which include the design of pricing mechanism, development of sales process, identify the cost of customer acquisition, estimating the lifetime value of your customer, and developing the product.

5603301*   Production and Entrepreneurization I   3 (1-2-6)
           PROD ENTRE I

Prerequisite: None

Short-term design and build project related to major area of interest to understand the process of streamlined production of a physical solution.

5603302* Production and Entrepreneurization II   **3 (1-2-6)**
          PROD ENTRE II

Prerequisite: None

Short-term design and build project related to major area of interest to understand the process of a streamlined production of a physical solution.

5603401* Senior Project I   **6 (1-9-8)**
          SENIOR PROJ I

Prerequisite: None

Production and research documentation of a scalable project of choice. Project must have innovation and promising commercial value. Intellectual properties must be registered and valuated.

5603402* Senior Project II   **6 (1-9-8)**
          SENIOR PROJ II

Prerequisite: None

Production and business plan of a scalable project of choice. Project must have innovation and commercial value and is partially funded by government agency or industry.

2.2.2)   Specialization

A)   Health and Wellbeing

5604201* Human Body and Mind Wellness   **3 (3-0-6)**
          HUM BODY/MIND WELL

Prerequisite: None

Introduction to individual health and wellbeing, overview of wellness concepts including mental, physical, social, emotional, vocational and spiritual aspects, special interest is given to community health services and to school health and safety problems.

5604202* Human Diseases and Disabilities   **3 (3-0-6)**
          HUM DIS/DISAB

Prerequisite: None

Understanding of the origin and contributing factors to the occurrence of various human diseases and disabilities and how they may be treated by clinical professionals, recognizing unique signs and symptoms of diseases that may be found in a health record or clinical tests for accurate diagnosis, treatment methods and equipment for common human diseases and disabilities.

5604203* Health and Social Behavior   **3 (3-0-6)**

HLTH SOC BEH

Prerequisite: None

Theoretical and analytical strategies for characterizing public health problems, behavioral, bio-behavioral, and social sciences as related to public health in program planning and evaluation, the role of race/ethnicity, culture, class, and gender in influencing physical and mental health status, interactions between the individual and society, and ethical issues in the design and implementation of community-based interventions.

5604204*   Sports, Exercise, and Lifestyle   3 (3-0-6)
          SPORT EX LIFESTY

Prerequisite: None

Impact of psychological, behavioral, social, and biological interactions on sports, exercise, and lifestyle, specific physiological and psychological benefits associated with exercise are addressed along with health promotion, intervention, and adherence. Innovations and business opportunities in sport and exercise industry.

5604205*   Innovations and Future Trends in Cell and Molecular   3 (3-0-6)
          Biology Technology
          INNO FUT CMB TECH UM DIS/DISAB

Prerequisite: None

Key concepts in molecular and cell biology will be introduced to understand selected innovations and future trends in life science. The innovations and future trends in biomedical fields will be the emphasis, though the covered technicals are also broadly applicable to other fields in life science. This course will also teach basic skills and tools in tackling biotechnology literature to gain technical knowledge for understanding the trends in bioscience industry.

5604206*   Anatomy and Physiology   3 (3-0-6)
           ANATOMY PHYSIO

Prerequisite: None

Human anatomy deals with how all parts of the human body interact to form a functional whole. The study of anatomy is separate from the study of physiology, although the two are often taught together. While anatomy studies the structure of the parts of an organism, physiology is concerned with the way those parts function together. For example, an anatomist may study the types of tissues found in different parts of the heart, while a physiologist may study how the heart regulates blood flow to supply oxygen to other organs in the body. While anatomy and physiology study different aspects of human biology, together they provide a more complete picture of what the human body is and how it works.

5604301* Food and Drugs Technology for Wellbeing   3 (3-0-6)
          FD DRUG TECH WELL

Prerequisite: None

Key knowledge and understanding in food and drug technology for wellbeing including nutrition, food processing and preservations, food safety, food sanitation, food service, food packaging/labelling, food law and regulations, culinary art and science, sensory science, trends of commercial herb drug, Immunization and vaccine for wellbeing, food and drug product development to increase value of traditional foods and herbal medicine.

5604302*   Persuasive Health Technology   3 (3-0-6)
          PERSU HLTH TECH

Prerequisite: None

Development of persuasive health technology to support the monitoring and coaching of implicit and explicit psychological and behavioral processes of healthcare promotion, methods for increasing involvement and adherence through a user-centered design framework involving users, emerging technologies and context.

5604303*   Integrated Innovation for Elderly Care   3 (3-0-6)
          INTG INNO ELD CARE

Prerequisite: None

Healthcare innovation within the field of healthy living and active aging, theories, tools and concepts for analyzing and developing viable innovative solutions for aging populations, demographic, biological, economic, social and cultural aspects of active aging and healthy living on current integrated innovation concept and methods.

5604304*   Health and Environmental Impact Assessment   3 (3-0-6)
          HLTH ENV IMP ASSMT

Prerequisite: None

Impact assessment of development projects on ecosystem, environment, health and quality of life, society and economics, environmental health impact assessment procedures, mitigation measures, impact monitoring and evaluation, and report preparation.

5604401*   Health Hazard Identification and Prevention   3 (3-0-6)
          HLTH HAZ ID/PREV

Prerequisite: None

Understanding and identifying health hazards, risk management in healthcare industry, organization plans, development and implementation of risk management strategies to prevent and mitigate financial losses, innovations that can help prevent and mitigate risks in health industry, development of strategies and tools that can reduce hazardous risks and improve the industry.

5604402*   Health Logistics and Supply Chain Management   3 (3-0-6)
          HLTH LOG/SY CH MGT

Prerequisite: None

Multiple, complex health systems that are organized in networks, improving the supply chain systematically from local care logistics to an approach based on health supply chain

management and prevent the network from under-optimization, concepts, methods and tools used in the health industry and applying knowledge to improve service quality in healthcare organizations.

5604403* Psychology Technology and Innovation   **3 (3-0-6)**
          PSYCH TECH/INNO
Prerequisite: None
Psychological guideline to shape technology and innovation. Existing technological possibilities for psychological diagnosis, research, counseling and behavior modification. Psychological knowledge to ergonomically optimize the design and usability of new technology and new environments. Behavioral and ethical implications for new technology.

5604404* Managing Information in Health Care   **3 (3-0-6)**
          MNG INFO HLTH CARE
Prerequisite: None
Development of strategies to reduce costs and improve access to quality healthcare through use of technology, advancement from volume-based to value-based healthcare systems, skills to facilitate communication between clinical providers and technical staff, benefits and barriers associated with digital and virtual health while advancing the knowledge of training, evaluation and management of health industries.

B) Smart City & Inclusive Community
5605201* Augmented and Hybrid Architecture   **3 (3-0-6)**
          AUG/HYB ARCH
Prerequisite: None
Study of augmented and hybrid architecture enhanced with digital technologies to respond to new digital behaviors in physical spaces.

5605202* Digital Construction Technology   **3 (3-0-6)**
          DIGI CONSTRUC TECH
Prerequisite: None
Study of novel digital technologies for architectural construction, planning, inspection and maintenance.

5605203* Computer-Aided Design and Manufacturing   **3 (3-0-6)**
          COMP AID DES/MFG
Prerequisite: None
Study of novel computer-aided design and manufacturing technologies in construction of the future.

5605204* Human-Computer Interaction in Architecture   **3 (3-0-6)**
          HUM COMP INTA ARCH
Prerequisite: None

Study of human-computer interactions for ubiquitous computing and calm technology within architecture.

5605205*   Smart City Information Management   3 (3-0-6)
          SMART CITY MGT

Prerequisite: None

Basic understanding of data components in smart city services; technology for data collection; data modeling approach for smart city planning and management; development process of city operating system.

5605206*   Smart Mobility   3 (3-0-6)
          SMART MOBILITY

Prerequisite: None

Conceptual framework of mobility as a service; system design and development of smart mobility services; understanding of urban policy and smart mobility; technologies in smart mobility; connected environment in smart mobility

5605207*   Social Enterprise for Smart Cities   3 (3-0-6)
          SOC ENT SMT CITIES

Prerequisite: None

Learn about the role of social enterprises in smart cities projects like sensors to measure water quality, wearable air quality monitors, crowdsourced data to identify illness outbreaks, and apps to help people with vision or hearing impairments navigate the city. Learn how to identify opportunities, working with government and community stakeholders, fund your idea, and create a business plan.

5605301*   Intellectual Property Management   3 (3-0-6)
          INTL PROP MGT

Prerequisite: None

In a contemporary world greatly influenced by innovative technologies, it is critical for both innovators and firms to strategically manage their intellectual assets such as corporate data, users' data, technological know-hows, trademarks, industrial designs, inventions, and contractual agreements. The course aims to achieve a thorough study on theory and practice of intellectual property (IP) and Data Security Management. It covers key concepts, various strategies, and their strengths and weaknesses in IP and data security management. In addition, by critically reviewing a number of actual cases, students will learn practical knowledge that can be applied in real life. Lastly, through group project activities, the course offers an opportunity for students to draft and present IP management plans for products and services of their own.

5605302*   Packaging and Branding Design   3 (3-0-6)
          PKG/BRD DES

Prerequisite: None

Study of the design of product packaging, labeling and information. Branding design in various digital media and campaigns.

5605303* Urban History, Theories and Society 3 (3-0-6)
URB HIST THEO SOC

Prerequisite: None

Fundamentals knowledge of urban history and theories. Incorporate critical thinking about cities. Review historical and key socio-economic processes and trends in urban development across time periods and cultural contexts.

5605304* Urban Ecology 3 (3-0-6)
URB ECO

Prerequisite: None

Examine urban systems as ecological systems. Learn a holistic approach to the design and management of built infrastructure, cities and the environment. Topics includes alternative energy generation, waste production, green infrastructure, rain water harvesting, waste water management, urban agriculture and sustainable cities of the future.

5603505* Land Use, Mobility and Environment 3 (3-0-6)
LAND USE MBL ENV

Prerequisite: None

Learn current land use and mobility-related themes confronting many cities.
Topics include rapid motorization and suburbanization, air pollution, infrastructure and mega infrastructure improvements, public-private partnership and other current and emerging topics. Learn how to develop strategic solutions to the land use-mobility environment challenges.

5605401* Human-Environment Interaction 3 (3-0-6)
HUM ENV INTA

Prerequisite: None

Learn design principles of human environment interaction. Understand mental models and human direct manipulation of both digital and non-digital environment. Cover techniques for the various areas of application and development.

5605402* Intangible Cultural Heritage Development 3 (3-0-6)
INTAN CULT HER DEV

Prerequisite: None

Survey of various intangible cultural heritage and development of cultural resources for social and economic value.

5605403* Smart City and Urban Development 3 (3-0-6)
SMART CITY URB DEV

Prerequisite: None

This course aims for students to learn two interacting components including Smart City concept and Urban development approach from theory to practice. The course will include: Introduction to the concept of smart city from the technology perspectives, strategy and planning approach, urban policy formation, infrastructure required for sustainable city development, to social consequences of automation. The course will also provide opportunities to students to apply knowledge to real-world cases.

5605404* Strategic and Creative Ideation   3 (3-0-6)
        STRAT/CREAT IDEA

Prerequisite: None

Strategies in creative design ideation for new product development in corporation or government environments.

C) Sustainable Development

5606201* Sustainable operations and sustainability management   3 (3-0-6)
        SUS OPN/SUS MGT

Prerequisite: None

This course is organized around the core concepts of management and operational sustainability. Students will learn how scholars think about the management and operation of organizations that are environmentally sound. The course emphases on urban sustainability as the planet's urban population continues to expand. It is structured into the following main sections: Value Chain Analysis, Stakeholder Engagement and Sustainability Communications.

5606202* Financing the Clean Energy Economy   3 (3-0-6)
        FIN CLN ENGY ECON

Prerequisite: None

This course focuses on the finance and market aspects of the clean energy economy and integrates technology, policy and finance to provide an understanding of both the opportunities and challenges. It also looks at energy efficiency, including two specific end-uses of energy that are responsible for most emissions: personal vehicles and buildings. Students in this class will learn the roles of technology, policy and finance in the transition to a clean energy economy.

5606203* Sustainability of Food Production and Supply Chain   3 (3-0-6)
        SUS FD PROD SY CH

Prerequisite: None

Students in this course will learn how to discuss the drivers of agricultural production and climate change challenges. They will develop an understanding of sustainable production

and productivity in relation to good agricultural practices, water and soil management and post-harvest practices. Students will also gain knowledge on the food production from a value chain perspective. By the end of this course, students should be able to develop an understanding of how agriculture is embedded in the ecological sphere and how it can be made more sustainable.

5606204* Sustainable Urban Farming   **3 (3-0-6)**
     SUS URB FARM

Prerequisite: None

Theory and principles of sustainable urban agriculture focuses on the growth of healthy environments in an urban context. Explore the many ways to achieve a sustainable agricultural system whether a small backyard, rooftop garden or a small farm that can help build a local food secure community. Food sovereignty, global food systems and food safety, soil health, seed saving, growing practices, market opportunities and business development strategies are all explored in this course.

5606205* Sustainable development and waste management   **3 (3-0-6)**
     SUS DEV/WASTE MGT

Prerequisite: None

This course provides an overview of the waste management situation covering key elements of the waste management system, with its technical, environmental, social, financial and institutional aspects. Students will learn about appropriate and already applied solutions through selected case studies as well as strategic planning and policy issues discussing future visions for waste management and the aspect of a circular and green economy.

5606206* Technology, Globalization, & Sustainable Development   **3 (3-0-6)**
     TECH GLOB SUS DEV

Prerequisite: None

Many dimensions of sustainability and their relationship to economic growth, and the use of national, multinational, and international political and economic mechanisms

including environmental and economic incentives to further sustainable development.

The inter-relationship of global economic/financial changes, employment, and working conditions; the environment in the context of globalization, technology, trade, and employment; and the importance of networks and organizational learning are examined.

Mechanisms for resolving the apparent conflicts between development, environment, and employment are explored.

5606207* Sustainability in Public Service   **3 (3-0-6)**

SUST PUB SERV

Prerequisite: None

The course is aimed at deepening students' knowledge and understanding of theories and principles underlying the current transformation in the management and governance of the public sector with a specific focus on innovation and sustainability. Public management and governance models are being transformed all over the world.

5606208* Climate Change From Science to Action 3 (3-0-6)
CLIM SCIENCE AS

Prerequisite: None

This course will focus on climate change: what human can do to mitigate climate risk and identify action opportunities to impact millions of lives and save our planet. In all, this course is devoted to understanding the scale of the climate problem and solution sets that would set us on an emissions pathway to achieve net-zero emissions..

5606301* Energy Efficiency & Management and Innovation 3 (3-0-6)
for renewable energy
EFF MGT/INNO ENGY

Prerequisite: None

This course explores the tension and ambiguity of energy and development issues such as energy planning and implementation as well as the potential of non-traditional energy businesses, projects and programs. It uses individual enterprise examples to examine resources & technologies, business & program models, policies & institutional approaches and the analysis of macro (country), meso (sector) and micro (transactions).

5606302* Socioeconomic Transformation for Sustainability 3 (3-0-6)
SOCECON TRFN SUS

Prerequisite: None

This course covers theories and practices associated with economic, environmental, and social transformation for sustainability. It offers an overview of historical/ political/ social backgrounds, key concepts and theories, different approaches to various related topics and areas in order for students to achieve both an in-depth knowledge and critical understanding of sustainability. With this knowledge and understanding, students will also have opportunities to discuss multiple issues related to the course topic through group seminar, and to analyze real-life sustainability projects in different fields and industries through a case-study analysis.

5606303* Circularity: circular economy and city 3 (3-0-6)
CIR ECON CITY

Prerequisite: None

This course explores the theoretical underpinnings of a circular economy, including the need for systems thinking, biomimicry and industrial ecology. It will focus on circular design principles and their use in different industries in the context of the city. Student will learn how cities reuse their resources to provide for housing, public spaces and urban qualities and how planning reduces the environmental impact of urban development. The course will also focus adaptive energy and waste and water resource management.

5606304* Clean Technology Entrepreneurship   **3 (3-0-6)**
        CLN TECH ENTRE

Prerequisite: None

This course focuses on the finance and market aspects of the clean energy economy and integrates technology, policy and finance to provide an understanding of both the opportunities and challenges. It also looks at energy efficiency, including two specific end-uses of energy that are responsible for most emissions: personal vehicles and buildings. Students in this class will learn the roles of technology, policy and finance in the transition to a clean energy economy.

5606305* Building and Energy Performance Evaluation   **3 (3-0-6)**
        BLDG ENGY PERF EVA

Prerequisite: None

Students in this course will learn and discuss how to evaluate sustainable buildings in terms of energy efficiency and human comfort through the advanced technologies such as Energy Modeling and Performance Evaluation. Students will be able to analyze energy uses (heating, cooling, lighting and equipment) and understand the energy behavior of buildings and people.

D) Applied Digital Intelligence

5607201* Robot and Cybernetics Operation Management   **3 (3-0-6)**
        ROBO CYBER OPN MGT

Prerequisite: None

The concepts, principle, problems and practices of operation management using robotic devices and intelligent systems in manufacturing and service industry. Topics include operation strategy, process design, capacity planning, facility design, forecasting, flow time management (cycle time), waiting & queues, inventory control, quality management (Six Sigma), quality assurance, security management, information management, and supply chain management.

5607202* Machine Learning (Deep Learning)   **3 (3-0-6)**
        MAC LRNG

Prerequisite: None

Basic machine learning both supervised and unsupervised. Learning theory, reinforcement leaning and adaptive control. Recent applications of machine learning.

5607203* IoT/Embedded Systems   3 (3-0-6)
**   IoT/EMBED SYS**

Prerequisite: None

Importance of IoT in society, the current components of typical IoT devices and trends for the future, IoT design considerations, constraints and interfacing between the physical world and device. Learn how to make design trade-offs between hardware and software as well as key components of networking. Understand how to connect device to the Internet, how to implement software configuration management and develop embedded software applications with ARM based Microcontrollers.

5607204* Mixed Reality (AR/VR/MR)   3 (3-0-6)
**   MIX REAL**

Prerequisite: None

Explore the exciting field of augmented reality, virtual reality, mixed reality and the advanced concepts and technologies for interfacing humans to complex machines. Introduction to advanced human computer interfaces such as Mixed Reality (MR), Virtual Reality (VR), Augmented Reality (AR) and Tangible User Interface (TUI) technologies. Review interface design principles from human factors and technological perspectives. Investigate hardware, software and design aspects of virtual and mixed interfaces. Learn about interfaces designed and implemented in the fields of medicine, education, design and entertainment. Hands-on experience through series of tutorial sessions to provide basic skills on how to use different tools to develop simple interface application.

5607205* Introduction to Machine Learning (Deep Learning)   3 (3-0-6)
**   INTRO MAC LRNG**

Prerequisite: None

This course provides a comprehensive introduction to the fields of machine learning.
It covers basic machine learning both supervised and unsupervised learning theory. It is aimed at advanced undergraduates and assumes no previous knowledge of machine learning concepts and knowledge. Students will learn basic algorithms and models in machine learning, such as linear regression, logistic regression, multi-class classifications, support vector machines, and neural networks, etc. The course will also cover some basic concepts and technologies in deep learning, such as algorithms of feedforward, back propagation and stochastic gradient descent (SGD), and basic architectures of deep neural networks, such as CNN, RNN, LSTM, and others. It might optionally cover very basic concepts in reinforcement learning.

5607206* AI and Robotics for Industrial Applications   3 (3-0-6)
          AI ROBOTICS IND

Prerequisite: None

This course provides basic principles of automated systems and the tasks that technicians perform on the job. Topics include the history, development, current and future applications of AI, robots and automated systems with an emphasis in industry. In order to understand the basic concepts of automation and robotic systems, this course focuses on the introduction to reinforcement learning to discuss how the basic concepts and theorem in the reinforcement learning can be integrated into the AI and robotics in industry. It is aimed at advanced undergraduates, and assumes no previous knowledge of AI and machine learning concepts and knowledge. Students will learn basic theorems and algorithms in reinforcement learning, such as Markov Decision Processing, Dynamic Programming, Monte Carlo Control, and Temporal-Difference Learning, and learn how to model the environments, design agents, reward the actions, and design the learning algorithms to simulate the industrial environment and robots to complete some automated tasks.

5607207* Game Design and Development   3 (3-0-6)
          GAME DESIGN DEV

Prerequisite: None

This course have goal for increase capability and artificial intelligence skill in Game Design and Development for in charge protocol and reduced inequalities on productions line. Students in this course use ARSA Framework and Photoshop are design and implement tools. Weekly work-in progress (WIP) reinforce learning along the way and a final project collaboration together real Organization with real MOU.

5607301* Big Data Analytics   3 (3-0-6)
          BIG DATA ANA

Prerequisite: None

This course will introduce students to the principles and practices of data analytics, i.e. the application of data science and machine learning techniques to develop a suite of tools designed to help businesses mine data for information, analyze information for insights, and utilize insights for decision making. The course will provide the mathematical/theoretical foundation for understanding data science and machine learning models, the computer programming foundation for coding applications/building data analysis pipeline, and class projects simulating business use cases.

5607302* Digital Trust, Privacy & Security (Blockchain)   3 (3-0-6)
          DIGI TR PRIV SEC

Prerequisite: None

Design, implementation and evaluation of secured system; Able to differentiate between secured and unsecured system; Techniques for achieving and assessing security in computer systems such as multi-user, distributed computer system, block chain and APIs; physical security; biometrics; information flow models; cryptography; public-key and

private-key concepts; authentication; security in electronic money and bitcoins; virus and malware; firewall; secure web browsers.

5607303* Agent Technology   3 (3-0-6)
   AGT TECH

Prerequisite: None

Principles of object technology. Agent base analysis, design, communication, system architecture and organization. Foundation for intelligent Physical Agents.

5607304* Crowdsourcing and Social Computing   3 (3-0-6)
   CRWSOCG SOC COMP

Prerequisite: None

Understand how crowdsourcing and social computing work. Design social computing and crowdsourcing system to engage the large online groups from crowdsourcing to the design of online communities. Manage incentive and workflow for team-base crowdsourcing.

5607305* Management & HR Transformation in Digital Age   3 (3-0-6)
   MGT HR TRFN DIGI

Prerequisite: None

Digital transformation is the integration and acceptance of new technology in all areas of a business, enabling a more innovative and productive workforce. It's a people-centric process, which is why HR plays such an essential part. In this course, we explore the role of HR in successful digital transformation. Learn how to move recruiting online, implement digital learning and development, leverage cloud productivity tools, eliminate the performance review, and start incorporating data into your decision-making. The combinational effects of technology are accelerating change in organization. Plus, find out how transforming your employee experience, company structure, and culture will lead to increased innovation, productivity, and engagement.

5607401* Global Entrepreneurship and Technology   3 (3-0-6)
   Commercialization
   GLOB ENTRE COMLN

Prerequisite: None

The innovative transformation of knowledge into new commercial products and services. The course provides a rigorous study of Global intellectual property management, licensing, the assessment of promising new technologies and technology-based entrepreneurship. Case studies of success and failure in technology commercialization, focusing on specific issues early stage ventures face.

5607402* AI and Robotic Application in Agriculture and Industry   3 (3-0-6)
   AI ROBO APP AG IND

Prerequisite: None

Learn basic principles of automated systems and the tasks that technicians perform on the job. Topics include the history, development, current and future applications of AI, robots

and automated systems with an emphasis in Agriculture and industry including their configuration, operation, components and controls. Understand the basic concepts of automation and robotic systems

5607403*   Strategic Management and Reasoning   **3 (3-0-6)**
          STRAT MGT REASON

Prerequisite: None

Learn the fundamentals of business's creation, growth and transformation to effectively lead and manage organizations; Learn the key elements of business mode; Able to outline the business case for a new product or service; Able to analyze business situations and develop strategies; Able to define personal or corporate challenge or opportunity and its competitive advantage.

5607404*   Current Issues in Arts & Scientific Research   **3 (3-0-9)**
          CURR ISS A/S RES

Prerequisite: None

A summary of the historical development of arts and scientific research; the advances, functions and implications of arts/scientific research in society. Explore the ethics of arts and scientific research a foundation for thinking about and recognizing the ethical dimensions of a variety of issues. Familiar with current ethical debates in a range of arts and scientific fields. Topics will include: misconduct in arts and research, conflicts of interest and scientific objectivity, publication and peer review, intellectual property and ethical decision making. Engage these issues with the help of philosophical tools, apply these tools to case studies and be challenged to think broadly about the role of artists and scientists in society as well as learn how to critically assess the ethical consequences of science for humankind.

2.2.3)   Practice

5608101*   Independent Study I   **1 (1-0-2)**
          IND STUDY I

Prerequisite: None

Students have the opportunity to conduct an independent study with guidance from their faculty advisor which must be approved to make sure it meets academic criteria. The advisor and the student develop a learning plan for the semester and regular meetings take place to discuss the student's project. Students are expected to hand in written work on a regular basis. Students may not repeat the same course number for credit either in the same or in a different semester

5608102*   Independent Study II   **2 (1-0-5)**
          IND STUDY II

Prerequisite: None

Students have the opportunity to conduct an independent study with guidance from their faculty advisor which must be approved to make sure it meets academic criteria. The advisor

and the student develop a learning plan for the semester and regular meetings take place to discuss the student's project. Students are expected to hand in written work on a regular basis. Students may not repeat the same course number for credit either in the same or in a different semester

5608103* **Independent Study III**   3 (1-0-8)
          IND STUDY III
 Prerequisite: None
 The independent study course requires program approval to enroll. Students in this course may conduct individual or group projects focused on research, literature review, or extension/enhancement of other coursework, especially in Food and Drug Technology for Wellbeing field. All work is conducted under supervision and evaluation of the student's advisor to be submitted to the course coordinator. The advisor and the student will develop a learning plan for the semester and regular meetings take place to discuss the student's project. Students are expected to hand in written work on a regular basis and deliver outputs as designed to achieve the learning objectives of the study.

5608301* **Workshop in Integrated Innovation I**   3 (3-0-6)
          WKSP INTG INNO I
 Prerequisite: None
International workshop related to major area of interest jointly organized by college and partner from government, industry or corporation.

5608302* **Workshop in Integrated Innovation II**   3 (3-0-6)
          WKSP INTG INNO II
 Prerequisite: None
International workshop related to major area of interest jointly organized by college and partner from government, industry or corporation.

5608303* **Workshop in Integrated Innovation III**   3 (3-0-6)
          WKSP INTG INNO III
 Prerequisite: None
International workshop related to major area of interest jointly organized by college and partner from government, industry or corporation.

5608311* **Internship in Integrated Innovation I**   3 (3-0-6)
          INTN INTG INNO I
 Prerequisite: None
Internship to study and takes the innovation experience a step further, allowing you to gain practical experience and delve further into cutting-edge technology and research.

5608312* **Internship in Integrated Innovation II**   3 (3-0-6)
          INTN INTG INNO II
 Prerequisite: None

Internship to study and takes the innovation experience a step further, allowing you to gain practical experience and delve further into cutting-edge technology and research.

5608313* **Internship in Integrated Innovation III**   3 (3-0-6)
          INTN INTG INNO III
 Prerequisite: None
Internship to study and takes the innovation experience a step further, allowing you to gain practical experience and delve further into cutting-edge technology and research.

5608321* **International Field Study I**   3 (3-0-6)
          INT FLD STUD I
 Prerequisite: None
International field trip to study and conduct research related to major area of interest at government, industry or corporation facilities abroad.

5608322* **International Field Study II**   3 (3-0-6)
          INT FLD STUD II
 Prerequisite: None
International field trip to study and conduct research related to major area of interest at government, industry or corporation facilities abroad.

3) Free Elective Courses   **not less than   6   credits**
          Prerequisite: None
          Elective Courses can be taken at any international programs across university.