FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

Bachelor of Engineering (BE) Degree – 146 Credits

Sem	Course Code	Course Title	Credit	Pre-Req	Co-Req
1	CSIS 200	Introduction to Computers and Programming	3		CSIS 285
1	CSIS 285	Basic Programming Lab	1		
1	ELCP 211	Engineering Drawing	1		
1	ELEN 201	Instrumentation Lab	1		
1	ENGL 203	English Communication Skills III	3		
1	MATH 200	Calculus I	3		
1	MATH 211	Linear Algebra I	3		
1		Engineering Breadth Elective	3		
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
2	CPEN 211	Introduction to Digital Logic Design	3	CSIS 200 Or CSIS 206	
2	CSIS 215	Object-Oriented Programming	3	CSIS 200	CSIS 286
2	CSIS 286	Object Oriented Programming Lab	1	CSIS 200	CSIS 215
2	ELCP 290	Introduction to the Engineering Design Fundamentals	1		
2	ELEN 202	Electrical Simulation and Design	1	CSIS 200 Or CSIS 206	ELEN 221
2	ELEN 221	Circuits Analysis I	3	MATH 200 MATH 211 ELEN 201	ELEN 202
2	MATH 202	Calculus II	3	MATH 200	
2	MATH 270	Differential Equations	3	MATH 200	
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
3	CPEN 202	Logic Lab	1		CPEN 212
3	CPEN 212	Logic Circuits	3	CPEN 211	CPEN 202
3	CPEN 220	Programming for Engineering Solutions	3	CSIS 200	MATH 230
3	GENG 221	Engineering Ethics	3	ELCP 290 ENGL 203	

3	ELEN 231	Electronics I	3	ELEN 221	
3	ENGL 2XX	English Elective	3	ENGL 203	
3	MATH 230	Numerical Analysis I	3	CSIS 200 MATH 200	
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
4	CPEN 213	Microprocessors	3	CPEN 212	
4	ELEN 222	Signals and Systems Theory	3	ELEN 221 MATH 270	
4	CPEN 313	Computer Embedded System	3	CPEN 212	CPEN309
4	GENG 222	Sustainable Development for Engineers	3	ELCP 290 ENGL 203	
4	ELEN 303	Circuits Analysis Lab	1	ELEN 221 ELEN 202	
4	ELEN 304	Electronics Lab	1	ELEN 231	
4	LISP 200	Information Skills and Search Techniques	1		ENGL 102
4	CPEN 309	Embedded Controllers Lab	1		CPEN 313
4	MATH 246	Probability for Engineers	3	MATH 200	
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
5	CPEN 305	Microcontrollers Lab	1	CPEN 213	
5	CPEN 307	PLC Lab	1		CPEN 324
5	CPEN 314	Computer Architecture	3	CPEN 313	
5	CPEN 324	Programmable Logic Controllers	3		CPEN 307
5	CPEN 241	Information Networking I	3		
5	ELCP 391	Senior Design 1	2	LISP 200 ELCP 290 GENG 221 GENG 222	
5	ELEN 341	Telecommunications	3	MATH 246 ELEN 222	
		Specialized Area Elective	3		
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
6	CPEN 310	Cybersecurity Lab	1		
6	CPEN 341	Cybersecurity	3		
6	CSPR XXX	Cultural Studies	3		
6	ELCP 392	Senior Design 2	2	ELCP 391	

6	ELEN 306	Telecommunications Lab	1	ELEN 341	
6	ELEN 326	Digital Signal Processing	3	ELEN 222	
6		Specialized Area Elective	3		
Specialized Area Elective (based on selected area):					
Telecommunications and Networking Track (6 credits from the following list):					
	ELEN 223	Electricity and Electromagnetism	3	MATH 202 MATH 270 ELEN 221	
	ELEN 340	Signal Transmission	3	ELEN 223	
Cyber Systems Track (6 credits from the following list):					
	CPEN 347	Teletraffic	3	CSIS 222	
	CSIS 216	Data Structure	3	CSIS 215	
	CSIS 221	Operating Systems	3	CSIS 215	
	CSIS 270	Databases	3	CSIS 200	
Artificial Intelligence and Machine Learning Track (6 credits from the following list):					
	CPEN 349	Artificial Intelligence for Engineers	3	CSIS 200 or CSIS 206	
	CSIS 216	Data Structure	3	CSIS 215	
	CSIS 221	Operating Systems	3	CSIS 215	
	CSIS 235	Mobile Programming	3	CSIS 215	
	CSIS 260	Introduction to Artificial Intelligence	3	CSIS 216	
	CSIS 270	Databases	3	CSIS 200	
Engineering Breadth Elective (3 credits from the following list):					
	MECH 221	Engineering Dynamics	3	CIVE 201	
	MECH 232	Thermodynamics	3		
	CIVE 201	Statics	3		

Sem	Course Code	Course Title	Credit	Pre-Req	Co-Req
7		Core Course Elective	3		
7		Core Course Elective	3		
7		Directed Elective	3		
7		Directed Elective	3		
7		Specialized Area Course	3		
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
8	GENG 400	Engineering Seminars	1		
8	GENG 490	Graduation Project	3		
8		Specialized Area Elective	3		
8		Specialized Area Elective	3		
8		Specialized Area Elective	3		
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
9	CPEN 480	Field Training	3		
Sem	**Course Code**	**Course Title**	**Credit**	**Pre-Req**	**Co-Req**
10	GENG 490	Graduation Project (Reactivation)	0		
10		Specialized Area Course	3		
10		General Elective	3		
		TOTAL	**146**		
Core Course Electives (6 credits from the following list):					
	ELEN 400	Linear Systems	3		
	ELEN 401	Optimization Theory	3		
	ELEN 402	Stochastic Theory	3		
Directed Electives (6 credits from the following list):					
	CPEN 441	Information Networking II	3	CPEN241	
	CSIS 375	Software Engineering	3		
	ELEN 417	Measurement Systems	3		
	ELEN 443	Digital Communication	3		

Specialized Area Courses (15 credits from each of the following lists):					
Cyber Systems Track:					
	CPEN 442	Network Programming	3	CPEN241	
	CPEN 445	Biometrics	3		
	CPEN 446	Network Management and Security	3	CPEN310	
	CPEN 447	Advanced Teletraffic	3	ELEN 443	
	CPEN 448	Cloud Computing and Big Data	3		
	CPEN 546	Wireless Networks	3		
	CPEN 549	Intelligent Networks	3	ELEN 443 CSlS 321	
	CSIS 375	Software Engineering	3		
Artificial Intelligence and Machine Learning Track:					
	CPEN 425	Neural Networks Design	3		
	CPEN 426	Deep Learning	3	CSIS 200 Or CSIS 206	
	CPEN 445	Biometrics	3		
	CPEN 448	Cloud Computing and Big Data	3		
	CPEN 452	Advanced Microcontroller Applications	3	CPEN 213 CPEN 220	
	CPEN 528	Machine Vision	3		
	ELEN 411	Mechatronics Systems	3		
	ELEN 466	Industrial Intelligent Networks	3		
	ELEN 525	Mobile Robots	3		
	ELEN 527	Fuzzy Logic Control	3		
	ELEN 544	Speech Technologies	3	ELEN 402	
	MECH 513	Robotics	3	MECH 221	
Telecommunications and Networking Track:					
	CPEN 441	Information Networking II	3	CPEN241	
	CPEN 442	Networking Programming	3	CPEN241	
	CPEN 546	Wireless Networks	3		
	ELEN 441	Information Theory and Error Correction	3		
	ELEN 443	Digital Communication	3		
	ELEN 446	Telecom Electronics	3		
	ELEN 472	Fiber Optics	3		

	ELEN 542	Wireless Communication Systems	3		
	ELEN 572	Satellite and Radar Communication	3		
	ELEN 574	Optical WDM Networks	3		
General Elective (3 credits from any Specialized Area Courses or from the following list):					
	CPEN 425	Neural Networks Design	3		
	CPEN 452	Advanced Microcontroller Applications	3	CPEN 213 CPEN 220	
	CPEN 545	Cryptography	3	ELEN 402	
	CSIS 374	Advanced Database Applications	3		
	ELEN 446	Telecom Electronics	3		
	ELEN 459	Engineering Image Processing	3		
	ELEN 525	Mobile Robots	3		
	ENMG 460	Decision and Risk Management	3		
	ENMG 555	Decision and Planning of Engineering Systems	3		
	ENMG 585	Quality Assurance and Control	3		
	GENG 402	Project Management	3		
	MECH 513	Robotics	3	MECH 221	

COURSE DESCRIPTIONS

CPEN 202 LOGIC LAB **0.3: 1 cr. E**

This laboratory provides hands-on experiments on digital circuits, supplementing the concepts presented in the digital course. The lab covers both combinational and sequential logic. Students are exposed to the conventional discrete gates as well as the highly integrated programmable logic devices such as FPGAs. Students implement and simulate their designs using computer aided design tools.

Co-requisite: CPEN 212

CPEN 211 INTRODUCTION TO DIGITAL LOGIC DESIGN **3.0: 3 cr. E**

This course is the first of a two-course series on digital design. It covers both combinational and sequential logic, equipping the students with the skills to design and analyze complex digital circuits. It covers a wide range of topics, including Boolean algebra, Karnaugh maps (K-maps), multiplexers, adders, decoders, flip-flops, registers, counters, and more. Through a combination of theoretical concepts and hands-on practical exercises, students will develop the skills necessary to design and analyze digital circuits and systems effectively.

Pre-requisites: CSlS 200 or CSlS 206

CPEN 212 LOGIC CIRCUITS **3.0: 3 cr. E**

This course is the second in a two-course series on digital design. The focus of this course is on designing combinational and sequential circuits. Design examples include Timing analysis, Registers, Register File, State-Machines, Arithmetic units etc... Several real-world applications will be discussed. Computer aided design tools and educational platforms such as FPGAs will be used throughout semester.

Pre-requisite: CPEN 211
Co-requisite: CPEN 202

CPEN 213 MICROPROCESSORS **3.0: 3 cr. E**

This course covers the concept of microcontrollers and their applications through an in-depth exposure to the Microchip PIC18F45K22 processor. The class emphasizes the following concepts: efficient software design techniques in Assembly and C languages, input/output ports, I/O devices (keypad, LCD, 7-segment displays, etc.), interrupts, timers, A/D and D/A conversion, asynchronous serial communications.

Pre-requisite: CPEN 212

CPEN 220 PROGRAMMING FOR ENGINEERING SOLUTIONS **3.0: 3 cr. E**

This course will teach students the skills to write assembly and C code to solve engineering problems. It will start with the basics of assembly language and gradually progress to advanced topics in C. By the end of the course, students will be able to write efficient and robust code that can be used to solve a wide range of engineering problems.

Co-requisite: MATH230
Pre-requisite: CSlS 200 or CSIS 206

CPEN 241 INFORMATION NETWORKING I **3.0: 3 cr. E**

This course covers: Networks and Open Systems Intercommunication (OSI) reference model. Standards organizations. Functionality, principal entities of protocol in physical link, network, transport, and session of applications layer.

CPEN 305 MICROCONTROLLERS LAB **0.3: 1 cr. E**
This lab aims at applying the various concepts taught in CPEN 213 (Microprocessors). The primary goal is to teach students how to design and implement working prototypes of various applications of the PIC18 microcontrollers such as: digital voltmeter, digital thermometer, programmable timer, LM12864L Graphics LCD, 4-Wire Resistive Touch-Screen Panel, Serial Communications and the UART, etc.

Pre-requisite: CPEN 213

CPEN 307 PLC LAB **0.3: 1 cr. E**
The ability of describing the communication links involved with PLC systems, the protocols, and networking methods. This Lab will permit the student to develop ladder programs involving internal relays, timers, counters, shift registers, sequencers, and data handling, safety issues with PLC systems, testing, and debugging.

Co-requisite: CPEN 324

CPEN 309 EMBEDDED CONTROLLERS LAB **0.3: 1 cr. E**
The lab complements the Embedded Systems course and gives students hands-on experience on the materials presented in the course. The set of experiments devised for the lab are based on Intel FPGA with NIOS II embedded processor. Experiments involve both hardware and software, leading to a complete system on a chip (SoC). Software will be developed in C/C++ for the NIOS embedded processor, whereas the hardware will be described using System Verilog HDL.

Co-requisite: CPEN 313

CPEN 310 CYBERSECURITY LAB **0.3: 1 cr. E**
The lab provides a hands-on learning experience in a safe environment covering current topics on the cybersecurity basics and applications of infrastructure security, network security, security devices, local network security, and access control monitoring systems.

CPEN 313 COMPUTER EMBEDDED SYSTEMS **3.0: 3 cr. E**
This course provides an introduction to embedded computing systems and their interface to memory and peripherals. The course is based on FPGA technology, where hardware interfaces with software leading to a complete system on a chip (SoC). Software will be developed mainly in C/C++ for the embedded processor, whereas the hardware will be described using System Verilog HDL.

Pre-requisite: CPEN 212

CPEN 314 COMPUTER ARCHITECTURE **3.0: 3 cr. E**
This course is an introduction to the organization and design of computer systems, assembly language programming, and the hardware/software interface. The central ideas of computer organization and design are covered with emphasis on processor architecture implementation, the relationship between hardware and software, and the basic design trade-offs employed in contemporary computer systems. Topics covered include performance evaluation, RISC-based instruction set architecture, single cycle, multi-cycle, and pipelined processor design, and memory hierarchy: cache and virtual memory.

Pre-requisite: CPEN 313

CPEN 324 PROGRAMMABLE LOGIC CONTROLLERS **3.0: 3 cr. E**
The student will be able to identify and explain the main design characteristics, internal architecture, and operating principles of programmable logic controllers. Also, the student will be capable of identifying

the characteristics of commonly used input and output devices. The ability of describing the communication links involved with PLC systems, the protocols, and networking methods. This course will permit the student to develop ladder programs involving internal relays, timers, counters, shift registers, sequencers, and data handling, safety issues with PLC systems, testing, and debugging.

Co-requisite: CPEN 307

CPEN 341 CYBERSECURITY **3.0: 3 cr. E**
This course introduces learners to the interdisciplinary field of cybersecurity by discussing the evolution of information security into cybersecurity. Learners will be exposed to multiple cybersecurity technologies, processes, and procedures, learn how to analyze the threats, vulnerabilities and risks present in these environments, and develop appropriate strategies to mitigate potential cybersecurity problems.

CPEN 347 TELETRAFFIC **3.0: 3 cr. E**
This course exposes students to theoretical and practical aspects of modern communication network design, including Teletraffic engineering and network performance modeling. It covers an overview of relevant stochastic traffic modeling, traffic characterization, traffic measurement techniques, network dimensioning principles, queuing theory and its application to performance evaluation of networks. Students analyze practical examples of network dimensioning for capacity and network performance evaluation using simulation software packages.

Pre-requisite: CSlS 222

CPEN 349 ARTIFICIAL INTELLIGENCE FOR ENGINEERS **3.0: 3 cr. E**
This course introduces Artificial Intelligence (AI) to engineering students, both the basic topics and state-of-art algorithms. The course will look into a variety of AI subareas such as problem solving, reasoning and machine learning. Modern tools will be used to implement and evaluate different AI techniques and synthesize solutions to real-world engineering problems.

Pre-requisite: CSlS 200 or CSIS 206

CPEN 425 NEURAL NETWORKS DESIGN **3.0: 3 cr. E**
This course focuses on Neural dynamics: architecture and signals, activation model, unsurprised learning, surprised learning, architectures and equilibrium. It also covers the Hopfield model and recurrent networks; the self- organizing map and Adaptive resonance theory.

CPEN 426 DEEP LEARNING **3.0: 3 cr. E**
This course introduces students to the theory and practice of deep learning, a subfield of machine learning that involves training artificial neural networks with multiple layers. Topics include Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Generative Adversarial Networks (GAN), autoencoders and Reinforcement learning. In this course, students will gain hands-on experience with deep learning algorithms and frameworks, and learn how to apply them to real-world problems in image recognition, natural language processing, and more.

Pre-requisite: CSIS200 or CSIS206.

CPEN 441 INFORMATION NETWORKING II **3.0: 3 cr. E**
This course presents the different aspects of computer networks. In this course, we follow the bottom up model starting from the physical layer and going towards the application layer. However, when presenting the application layer, a top down presentation will be followed in order to close the loop.

Upon successful completion of the course the students shall be able to: - Describe the TCP/IP stack in details - Discuss the technological choices in a networking protocol - Suggest a network design and configuration - Discuss advanced networking protocols - Select Network Protocol for Applications: HTTP, POP3, SMTP, DNS - Develop Basic Networking Programs - Identify the needs and propose new networking protocols - Setup a VLAN

Pre-requisite: CPEN241

CPEN 442 NETWORKING PROGRAMMING **3.0: 3 cr. E**

This course gives the students a fundamental knowledge and hands-on exercise of the networking software design and client/server applications development. Topics include the Common Gateway Interface (CGI), PHP, Servlets, JSP, RPC, CORBA, XML (parsing), SOAP, Web Service Development Language (WSDL), RESTful, RMI, EJB. They are grouped in three parts of the course: i/ web development, ii/ remote procedure calling and, iii/ distributed programming. Drupal is also introduced as a content management system (CMS). Notions of client-side programming are also introduced (JavaScript, AJAX).

Pre-requisite: CPEN241

CPEN 445 BIOMETRICS **3.0: 3 cr. E**

Biometrics has emerged from the specialized use in the forensics domain to a more mainstream use for computer authentication, identification document security, and surveillance for public safety. This course introduces the emerging area of biometrics and its challenges, with applications using MATLAB/OCTAVE and/or Python. Topics include: Identity recognition (verification, identification), biometric modalities (Face, fingerprint, voice, iris, handgeometry, etc.), performance measurement evaluation and reliability, multimodal biometric recognition (fusion, score normalization), biometric security, biometric privacy, imposture.

CPEN 446 NETWORK MANAGEMENT AND SECURITY **3.0: 3 cr. E**

This course details different aspects of network management and network security. This is a lecture oriented class really composed of two parts the network management and the network security. :
At the end of the course the students will be able to:

- Design a Firewall and a Network Security Policy
- Build and setup a Firewall
- Design a security solution
- Discuss and share cryptographic information
- Use open source network management and security solutions
- Integrate advanced network security protocols with applications
- Design a network management solution based on SNMP protocol
- Connect to a network management console component
- Add management capabilities to some components.

Pre-requisite: CPEN310

CPEN 447 ADVANCED TELETRAFFIC **3.0: 3 cr. E**

This course exposes students to source characterization of bursty sources (video, audio) through stochastic modeling of bursty traffic. The theory is illustrated through simulated results from the research literature. Students are also given computer projects to simulate bursty traffic sources. A major portion of the course is devoted to performance evaluation of networks using advanced queueing theory. The

course will also treat traffic management and control in ATM networks, statistical multiplexing, dimensioning of cellular networks, and frame relay dimensioning.

Pre-requisite: ELEN 443

CPEN 448 CLOUD COMPUTING AND BIG DATA 3.0: 3 cr. E

This course is divided into two parts tightly connected: Cloud Computing and Big Data. In the first part the course introduces the concepts of cloud computing and covers the different models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Different existing open source clouds are introduced with a focus on OpenStack. The different types of clouds are covered: private, public and hybrid clouds with examples of the most popular clouds today. MapReduce algorithm and Hadoop framework will be presented as well as several Big Data tools in particular Hive. Finally, this part shall introduce Data Warehousing. The second part of the course is dedicated to machine learning algorithms. Data analytics and data mining will be detailed as well. The course also stresses on the importance of data preparation and preprocessing.

CPEN 452 ADVANCED MICROCONTROLLER APPLICATIONS 3.0:3 cr. E

This course covers advanced topics in microcontroller applications. It covers the following topics: UART, SPI, I2C, 1-wire protocol, Capture/Compare/PWM modules, A/D conversion, D/A conversion, interface to sensors, human machine interface, software state machines, home automation concepts and advanced software techniques. Essentially, the course teaches students to design microcontroller-based automation modules and how to network them together to form a complete home automation system.

Pre-requisite: CPEN 213 and CPEN 220

CPEN 528 MACHINE VISION 3.0: 3 cr. E

This course introduces the students to fundamental techniques for low level and high level computer vision. Topics include image formation, early processing, boundary detection, image segmentation, texture analysis, shape from shading, photometric stereo, motion analysis via optic flow, object modeling, shape description, and object recognition. Models of human vision, subjective contours, visual illusions, apparent motion, mental rotations, cyclopean vision.

CPEN 545 CRYPTOGRAPHY 3.0: 3 cr. E

This course aims to introduce the students to cryptography in its algorithmic sides. The course starts with a definition of cryptosystems using simple examples (shift cipher, affine cipher, hill cipher, Vigenere cipher.). A small review of Shannon theory is then performed. Bulk encryption is detailed with a focus on Data Encryption Standard (DES) and its variants. Afterwards, public-key cryptosystems are studied (Diffie-Hellman, RSA, .). Attacks on both classes of cryptosystems are presented. The final part of the course is relative to hashing algorithms (MD4, MDs, .). At the end of the course, students will become aware of cryptography and of the strength and weakness of every cryptosystem.

Pre-requisite: ELEN 402

CPEN 546 WIRELESS NETWORKS 3.0: 3 cr. E

This graduate course introduces existing and currently developed Networking technologies used in Wireless systems. This covers both mobile and wireless networks. This is a lecture oriented class. The students will acquire knowledge and competences on how to design and build wireless networks and using which generation. The course has parts. In a first part we briefly review the wireless communication systems. In part2 cellular systems from 2G till 4G are covered. Part3 is dedicated to Wireless LAN. Part4 covers satellite communication and localization. Ad hoc networks and sensor networks are provided in Part5. Part 6 is dedicated to Internet of Things and Artificial Intelligence.

CPEN 549 INTELLIGENT NETWORKS **3.0: 3 cr. E**

This course presents intelligent networks in details. The underlying communication protocols (lNAP) will be described. Those presentations will cover intelligent networks for both fixed and wireless telephone networks. Students must have a good knowledge of networking principles and general telecommunication concepts in order to attend this course.

Pre-requisites: ELEN 443, CSlS 321

ELCP 211 ENGINEERING DRAWING **0.3: 1 cr. E**

The course prepares students to use AutoCAD to create complete, concise, and accurate engineering drawings. Students will also use the AutoCAD Electrical Toolset that offers automated drafting tools for designing wiring, circuiting, PLC modules, panels and more. They will also learn the interface and the workflow of developing accurate electrical schematics and drawings.

ELCP 290 INTRODUCTION TO THE ENGINEERING DESIGN FUNDAMENTALS 3.0: 1 cr. E

The course serves as a general introduction to the engineering profession, its main objectives, and concerns. It introduces the engineering design process, its phases, challenges and constraints, the qualities, and attributes of a modern-day engineer as expected by professional engineering societies, including integrity, professionalism, ethical commitment, and environmental requirements, as well as the role of the engineer in society. In addition, students will be introduced to project management skills, technical writing, and effective multidisciplinary teamwork. The course aims to set students on the way to future design and professional work in Electrical and Computer Engineering.

ELCP 391 SENIOR DESIGN 1 **0.3: 2 cr. E**

The course constitutes the first semester of a year-long culminating senior design project. In the course, small groups of two to four students are requested to form multidisciplinary teams and solve a relatively open-ended engineering design problem. Each team follows an iterative design process to propose a system/solution that meets the desired requirements, specifications, and constraints. The design should abide to the appropriate realistic constraints i.e., ethical, environmental, financial, safety health and technical, as well as the set standards, codes, and protocols. Students employ engineering design tools, documentation and previously acquired Engineering, Science and Mathematics knowledge for the complete conceptual phase of the design process. Namely, (1) understanding and formulating the problem (objectives, scope, elements, purpose), (2) define the design constraints and specifications (3) Performing a literature review and gathering the appropriate technical documentations, (4) analyzing the various components of the system, (5) selecting the appropriate hardware/software needed and (6) proposing a solution. At the end of the semester, teams will present a detailed design and convey to the public their findings through a comprehensive report that synthesizes all steps of the design process and exhibits individual team members' contributions.

Pre-requisites: ELCP 290, GENG 221, GENG 222, LISP 200

ELCP 392 SENIOR DESIGN 2 **0.3: 2 cr. E**

The course constitutes the second semester of a year-long culminating senior project. In this sequel course to ELCP391, the teams of students must complete the chosen capstone projects to complete the second phase of the design process namely, (1) carry on the culminating design by synthesis and analysis, and (2) build, test, and evaluate the physical/virtual model. At the end of the semester, teams will present/demonstrate their final design prototype/product and convey to the public their findings through a comprehensive report and presentation that synthesizes all steps of the design process and exhibits individual team members' contributions.

Pre-requisite: ELCP 391

ELCP 480 FIELD TRAINING **0.0: 3 cr. E**

Prior to graduation, students are expected to undergo training program at an institution whereby they get exposed and engaged in activities related to their field of studies, thereby gaining experience and demonstrating their skills.

FACULTY OF ENGINEERING GENERAL COURSES

GENG 221 ENGINEERING ETHICS **3.0: 3 cr. E**

This course introduces and reinforces the concepts, theories, and practice of engineering ethics and aims at providing basic knowledge of ethics for engineers in different types of work roles. It prepares the engineering students for identifying, taking responsibility for, and finding solutions to potential ethical problems/cases. It provides students with an interactive study of ethical theory and the development of professionalism and helps them think more clearly and deeply about ethical issues of the natures that engineers often face in professional practice, and explore resources, strategies, and options for dealing with such complications. Students review case studies of ethical conflicts in engineering practice. The course also covers engineering codes of ethics and requires students to resolve theoretical situations through the application of ethical codes.

(A core BS course as of 2023/24 to replace a CSPR XXX course for students who started from year 2022/2023. Previous students can take it as an equivalent of a CSPR XXX course if they have not already taken the required 3 CSPR XXX courses)

Pre-requisite: CHEN/CIVE/ELCP/MECH/290 (according to discipline), ENGL 203

GENG 222 SUSTAINABLE DEVELOPMENT FOR ENGINEERS **3.0: 3 cr. E**

This course introduces the fundamental and advanced concepts of sustainable development. It transitions students' understanding of the UN Sustainable Development Goals (SDGs) to focus specifically on the critical role of engineers in achieving these SDGs. Students should then be able to resolve problems by adopting sustainability principles, which should in turn reflect on the students' multidisciplinary design ability to ensure a proper sustainable design process to improve and preserve the quality of life for future generations.

(A core BS course as of 2023/24 to replace a CSPR XXX course for students who started from year 2022/2023. Previous students can take it as an equivalent of a CSPR XXX course if they have not already taken the required 3 CSPR XXX courses)

Pre-requisite: CHEN/CIVE/ELCP/MECH/290 (according to discipline), ENGL 203

GENG 311 ENGINEERING MANAGEMENT AND ECONOMICS **3.0: 3 cr. E**

Engineers with excellent managerial skills and superior economic acumen are needed as leader of the new century engineering world. This course prepares engineers to fulfill their managerial responsibilities and acquire useful economic perspectives. This course is organized to contain two major parts: (I) Functions of engineering management, and (II) Economic fundamentals for engineering managers. Part (I) introduces the basic functions on engineering management such as planning, organizing, leading and controlling, while part (II) covers the fundamentals of engineering economics.

GENG 400 ENGINEERING SEMINARS **2.0: 1 cr. E**

This module consists of lectures and seminars covering recent research and advances in various fields and applications of engineering disciplines.

GENG 402 PROJECT MANAGEMENT **3.0: 3 cr. E**

To make available the fundamentals of project management with the most workable types of organizations and the necessary capabilities that must be included to reasonably ensure success and minimize the possibility of failure. The course consists of construction contracting for contractors, owners, and engineers: bidding, industry structure, types of contracts, and delivery systems of

construction, planning, estimating, quantity take-off and pricing, labor and equipment estimate, proposal preparation, contract documents to prepare detailed estimates, permits, risk management, and taxes. Basic critical path planning and scheduling with activity on nodes and activity on arrows, monitoring, updating, controlling, crashing, resource leveling, resource allocation, and least cost scheduling including time-cost trade-off analysis. Computer applications using the Primavera software.

GENG 490 GRADUATION PROJECT **3.X: 3 cr. E**
An approved final design project.

Refer to General Listing of Course Descriptions for:

CSIS XXX
Refer to the Faculty of Arts and Sciences

CSPR XXX
Refer to the Faculty of Arts and Sciences

ELEN XXX
Refer to the Department of Electrical Engineering

ENGL XXX
Refer to the Faculty of Arts and Sciences

ENMG XXX
Refer to the Faculty of Engineering

GENG XXX
Refer to the Faculty of Engineering

LISP XXX
Refer to the Faculty of Arts and Sciences

MATH XXX
Refer to the Faculty of Arts and Sciences

MECH XXX
Refer to the Department of Mechanical Engineering