



# University of Hafr Al-Batin (UHB)

College of Computer Science and  
Engineering  
Framework of BSc. in Software.  
Engineering

**Undergraduate Program**

2023

## Program Degree Plan -- Software Engineering

### Common First Year (Freshman)

		Semester I				Semester II					
Course	Title	LT	LB	CR	Prerequisite	Course	Title	LT	LB	CR	Prerequisite
ENGL 1601	English Language I	0	16	6		ENGL 1602	English Language II	0	16	6	ENGL 1601
MATH 1301	General Mathematics	3	0	3		MATH 1302	General Statistics	3	0	3	
PHYS 1301	General Physics	2	2	3		MATH 1303	Calculus I	3	0	3	MATH 1301
CSEN 0341	Information Technology Skills and Its Applications	2	2	3		ARAB 0221	Arabic Editing	2	0	2	
TUTR 0231	Thinking and Learning Skills	2	0	2		ISLM 0211	Islamic Culture	2	0	2	
						UNIV 0XXX	University Elective Course I (Health Awareness and Safety Domain)	2	0	2	
		9	20	17				12	16	18	

### Second Year (Sophomore)

		Semester I				Semester II					
Course	Title	LT	LB	CR	Prerequisite	Course	Title	LT	LB	CR	Prerequisite
CSEN 2301	Fundamentals Of Computing	2	2	3		CSEN 2304	Basics of Networking	2	2	3	CSEN 2301
MATH 2403	Calculus II	4	0	4	MATH 1303	CSEN 2306	Data Structures	2	2	3	Co: CSEN2403
SWEN 2301	Web Programming	2	2	3		CSEN 2403	Programming II	3	2	4	CSEN 2302
CSEN 2302	Programming I	2	2	3	Co: CSEN 2301	CSEN 2305	Operating Systems Concepts	2	2	3	CSEN 2301
SWEN 2302	Introduction to Software Engineering	3	0	3	Co: CSEN 2301	CSEN 2307	Introduction to Database Systems	2	2	3	CSEN 2302
UNIV 0xxx	University Elective Course II	2	0	2		ISLM 0212	Intellectual Awareness	2	0	2	
		15	6	18				13	10	18	

(Exit Point with "Intermediate Diploma in Computer Science", Req. for < 1.75 GPA, Optional Otherwise) & Summer Session: CSEN 2091 Intermediate

### Third Year (Midler)

		Semester I				Semester II					
Course	Title	LT	LB	CR	Prerequisite	Course	Title	LT	LB	CR	Prerequisite
CSEN 3301	Discrete Structures	3	0	3	CSEN 2302	STAT 3351	Probability and Statistics for Engineers	3	0	3	MATH 1302
SWEN 3301	Software Requirement Engineering	2	2	3	SWEN 2302	SWEN 3403	Software Design and Architecture	3	2	4	SWEN 3301
XXXX xxx	Science Elective	x	x	3		MATH 2307	Linear Algebra	3	0	3	MATH 2403
SWEN 3302	User Interface Design	2	2	3	SWEN 2302	ENGL 2304	Academic and Professional Communication	3	0	3	ENGL1602
CSEN 3302	Design and Analysis of Algorithms	3	0	3	CSEN 2306	SWEN 3204	Software Project Management	2	0	2	Junior Standing
UNIV 0xxx	University Elective Course III	2	0	2		UNIV 0xxx	University Elective Course IV	2	0	2	
		12	4	17				16	2	17	

Summer Training SWEN 3081 (0,0,0): Upon Departmental Approval

### Fourth Year (Junior)

		Semester I				Semester II					
Course	Title	LT	LB	CR	Prerequisite	Course	Title	LT	LB	CR	Prerequisite
SWEN 4682	Cooperative Work	0	0	6	Departmental Approval	SWEN 4491	Project	2	4	4	SWEN 3403 SWEN 3204
						SWEN 4301	Software Testing and Quality Assurance	2	2	3	SWEN 3301
						XXXX xxx	Major Elective	x	x	3	
						CSEN 4302	Artificial Intelligence	3	0	3	CSEN 3301
						UNIV 0xxx	University Elective Course V	2	0	2	
		0	0	6				9	6	15	

Total Credits

126

**Course Description of BSc. Degree of Software  
Engineering. Program  
First Year - 1<sup>st</sup> Semester - 1<sup>st</sup> Level**

<b>ENGL 1601</b>	<b>English Language I</b>	<b>(0-16-6)</b>
<p>This first part of English as a foreign language program (240 hours) is targeting both semi-beginners and beginner levels. Emphasis is on building the skills of reading, listening, writing and speaking for application to academic studies in science and technology. Instruction in vocabulary and grammar supports development of these skills. At the same time, word-processing skills are introduced and practiced, study skills are developed and attitudes to study and work are reshaped. Instruction is facilitated through classroom instruction, assignments, project work and computer-based programs.</p>		
<b>Prerequisite</b>	None	
<b>MATH 1301</b>	<b>General Mathematics</b>	<b>(3-0-3)</b>
<p>This introductory course in mathematics covers the following two topics: The first topic includes: Algebraic expressions and Real number system-Exponents, Polynomials, inequalities, Linear functions, and Absolute value equations, Basics of functions and Transformations of functions and their Graphs, Composite of functions- Inverse of functions, Distance, Midpoint, Circles, Properties of Exponential and Logarithmic functions, Angles and arcs, Right angle Trigonometry-Trigonometric functions. The second topic includes: Algebra of Matrices, Determinants, Inverse of a Matrix, Gaussian Elimination Method and systems of linear equations.</p>		
<b>Prerequisite</b>	None	
<b>PHYS 1301</b>	<b>General Physics</b>	<b>(2-2-3)</b>
<p>This course is an introductory study and tools of physical science and will enable the students to describe the physical phenomena in terms of models, laws, and principles. The topics include Units, Physical Quantities, and Vectors, Motion Along a Straight Line, Motion in Two or Three Dimensions, Newton's Laws of Motion, Applying Newton's Laws, Work and Kinetic Energy, Potential Energy and Energy Conservation, Momentum, Impulse, and Collisions, Rotation of Rigid Bodies, Fluid Mechanics, Temperature and Heat, Mechanical Waves, Optics and Nuclear Physics.</p>		
<b>Prerequisite</b>	None	

CSEN 0341	Information Technology Skills and Its Applications	(2-2-3)
<p>This course provides an introduction to computer and different components. It also introduces applications for word processing, presentations and databases. The second part of the course covers an introduction to the risks and threats encountered by computer users and countermeasures for protection.</p>		
<b>Prerequisite</b>	None	

TUTR 0231	Thinking and Learning Skills	(2-0-2)
<p>The first component of this course deals with the concept of thinking and its types, besides thinking skills, levels, patterns, and programs. Creative thinking, its skills and development methods are also targeted, along with critical thinking and associated skills and strategies. There shall be applications and real-life-based activities. The second part of the course focuses on the concept of learning and highlights its effective skills, cognitive methods, principles, and characteristics.</p>		
<b>Prerequisite</b>	None	

**First Year - 2<sup>nd</sup> Semester - 2<sup>nd</sup> Level**

ENGL 1602	English Language II	(0-16-6)
<p>This second part of intensive English as a foreign language (240 hours) covers both pre-intermediate and intermediate levels. More importance is paid to developing basic language skills of listening, speaking, reading and writing aiming at reaching advanced language mastering. Likewise, application of these skills is focused and oriented towards scientific and technological specialized discourse. Thus, grammatical units, theme-based glossary as well as study skills are supposed to enhance knowledge, practice and reutilization of acquired abilities in diversified situations. A higher level of cognitive knowledge, such as analyzing, searching, comparing and knowledge internalization, is also targeted to help students develop self-reliance and confidence while using language.</p>		
<b>Prerequisite</b>	ENGL 1601	

<b>MATH 1302</b>	<b>General Statistics</b>	<b>(3-0-3)</b>
<p>This course covers Descriptive Statistics such as, graphical presentation of data, measures of location, dispersion, and skewness. Introduction to Probability, Discrete and Continuous Random variables and Probability Distributions such as: Binomial, Poisson, Geometric, Normal, exponential, T and F distribution. It also covers the sampling distribution of the mean, Point and interval estimation, Testing hypotheses of mean and proportions, correlation and regression analysis.</p>		
<b>Prerequisite</b>	None	
<b>MATH 1303</b>	<b>Calculus I</b>	<b>(3-0-3)</b>
<p>This course introduces the basic concepts of calculus. It covers limits and continuity of functions of a single variable. Differentiability and the Techniques of differentiation, Implicit differentiation, Local extrema, the first and second derivative tests for local extrema. Concavity and Inflection points of curves, curve sketching, applied extrema problems, the Mean Value Theorem and applications.</p>		
<b>Prerequisite</b>	MATH 1301	
<b>ARAB 0221</b>	<b>Arabic Editing</b>	<b>(2-0-2)</b>
<p>This course aims at developing the student's writing skills in Arabic. It deals with methods of appropriate and correct writing of letters, reports, records, minutes and research.</p>		
<b>Prerequisite</b>	None	
<b>ISLM 0211</b>	<b>Islamic Culture</b>	<b>(2-0-2)</b>
<p>This course deals with the concept of Islamic culture, its relationship to knowledge and civilization, encountered challenges and means of overcoming them. The course underlines the general characteristics of Islam, such as being the religion of science, moderation and morals. It covers also the inter-civilizations dialogue as well as introducing Islamic doctrine and pillars besides discussing faith nullifiers</p>		
<b>Prerequisite</b>	None	





## Second Year - 1<sup>st</sup> Semester - 3<sup>rd</sup> Level

<b>CSEN 2301</b>	<b>Fundamentals of Computing</b>	<b>(2-2-3)</b>
The focus will be given to computer literacy topics such as hardware, software, operating systems, data representation, programming languages, database systems, networks and Internet, and computer maintenance.		
<b>Prerequisite</b>	None	
<b>MATH 2403</b>	<b>Calculus II</b>	<b>(4-0-4)</b>
This course covers the definite and indefinite integrals of functions of a single variable, Fundamental Theorem of Calculus, Techniques of Integration, Hyperbolic Functions, applications of the definite integral to area, volume, arc length and surface of revolution and Improper Integrals. It also covers the sequences and series such as: convergence tests, integral, comparison, ratio, and root tests, alternating series, absolute and conditional convergence, power series, Taylor and Maclaurin series.		
<b>Prerequisite</b>	MATH 1303	
<b>CSEN 2302</b>	<b>Programming I</b>	<b>(2-2-3)</b>
Overview of computer programming and programming languages. Introduction to a typical object-oriented programming language. Basic data types and operators. Basic object-oriented concepts. Wrapper classes. Console input/output. Logical expressions and control structures. Classes and methods. Arrays and strings.		
<b>Co-requisite</b>	CSEN 2301	
<b>SWEN 2301</b>	<b>Web Programming</b>	<b>(2-2-3)</b>
Web Engineering fundamentals: requirements, analysis, design, testing. Internet basic for web applications. Technologies and tools for developing web applications: markup languages, styling, data description and transformation.		
<b>Prerequisite</b>	None	
<b>SWEN 2302</b>	<b>Introduction to Software Engineering</b>	<b>(3-0-3)</b>
Introduction to software engineering and software processes. Construction techniques and principals. Concepts of Programming Languages: Syntax and semantics. Analysis and Design Modes. Ethical and professional responsibilities.		
<b>Co-requisite</b>	CSEN 2301	



## Second Year - 2<sup>nd</sup> Semester - 4<sup>th</sup> Level

<b>CSEN 2403</b>	<b>Programming II</b>	<b>(3-2-4)</b>
Advanced object-oriented programming; inheritance; polymorphism; abstract classes and interfaces, container and collection classes, packages, object-oriented design, software modeling, event-driven programming, recursion, use of stacks, queues and lists from API, searching and sorting.		
<b>Prerequisite</b>	CSEN 2302	
<b>CSEN 2304</b>	<b>Basics of Networking</b>	<b>(2-2-3)</b>
Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media.		
<b>Prerequisite</b>	CSEN 2301	
<b>CSEN 2305</b>	<b>Operating Systems Concepts</b>	<b>(2-2-3)</b>
This course introduces the fundamentals of operating systems design and implementation. Topics include history and evolution of operating systems; Types of operating systems; Operating system structures; Process management: processes, threads, CPU scheduling, process synchronization; Memory management and virtual memory; File systems; I/O systems; Security and protection; Distributed systems; Case studies.		
<b>Prerequisite</b>	CSEN 2301	
<b>CSEN 2306</b>	<b>Data Structures</b>	<b>(2-2-3)</b>
Review of object-oriented concepts; Introduction to design patterns; Basic algorithms analysis; Fundamental data structures - implementation strategies for stacks, queues and linked lists; Recursion; Implementation strategies for tree and graph algorithms; Hash tables; Applications of data structures (e.g. data compression and memory management).		
<b>Co-requisite</b>	CSEN 2403	

CSEN 2307	Introduction to Database Systems	(2-2-3)
Basic database concepts, conceptual data modeling, relational data model, relational theory and languages, database design, SQL, introduction to query processing and optimization, and introduction to concurrency and recovery.		
<b>Prerequisite</b>	CSEN 2302	

ISLM 0212	Intellectual Awareness	(2-0-2)
This course deals with the concept of intellectual awareness, and focuses on its legitimacy, rules, significance, basis and components. The course sheds the light also the means of achieving and enhancing intellectual awareness among students, and discusses the reasons of intellectual deviation and methods of prevention and treatment.		
<b>Prerequisite</b>	None	

### Third Year - 1<sup>st</sup> Semester - 5<sup>th</sup> Level

CSEN 3301	Discrete Structures	(3-0-3)
Propositional Logic, Predicate Logic, Methods of Proof, Sets, Functions, Sequences and Summation, Mathematical induction, Inclusion-exclusion and Pigeonhole principles, Permutations and Combinations (with and without repetitions), The Binomial Theorem, Recurrence Relations; Trees and Graphs.		
<b>Prerequisite</b>	CSEN 2302	

SWEN 3301	Software Requirements Engineering	(2-2-3)
Requirements engineering process. Methods, tools and techniques for eliciting, organizing and documenting software requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements documentation standards. Traceability. Requirements management. Handling requirements changes and software product lines (SPLs). Students participate in a group project on software requirements.		
<b>Prerequisite</b>	SWEN 2302	



<b>SWEN 3302</b>	<b>User Interface Design</b>	<b>(2-2-3)</b>
Study of both theoretical and practical issues in human-computer interfaces. User interface design process. Usability engineering. Development, programming, and evaluating interface designs. Design of windows, and menus. Commands and natural languages I/O. Visual prototyping. User manuals, online help and tutorials. Students participate in a group project on software user interface design.		
<b>Prerequisite</b>	SWEN 2302	

<b>CSEN 3302</b>	<b>Design and Analysis of Algorithms</b>	<b>(3-0-3)</b>
Algorithms and Problem Solving; Basic Algorithmic Analysis; Advanced algorithmic analysis; Advanced Data Structures; Algorithmic strategies & Analysis of fundamental computing algorithms; Basic computability; The complexity classes: P and NP.		
<b>Prerequisite</b>	CSEN 2306	

### Third Year - 2<sup>nd</sup> Semester - 6<sup>th</sup> Level

<b>STAT 3351</b>	<b>Probability and Statistics for Engineers</b>	<b>(3-0-3)</b>
Introduces the basic concept of probability and statistics to engineering students. This course has designed to give emphasis on the understanding of the nature of randomness to real-world phenomena, the formulation of statistical methods by using intuitive arguments, and solving statistical problems by making meaningful decisions.		
<b>Prerequisite</b>	MATH 1302	

<b>SWEN 3403</b>	<b>Software Design and Architecture</b>	<b>(3-2-4)</b>
Study of design concepts and notations. Architecture, middleware architectures, design patterns, frameworks and components. Designing for qualities such as performance, security, reusability, reliability. Metrics and measurement. Basics of software evolution, reengineering, and reverse engineering. Students participate in a group project on software design.		
<b>Prerequisite</b>	SWEN 3301	

<b>MATH 2307</b>	<b>Linear Algebra</b>	<b>(3-0-3)</b>
This course covers Matrices and systems of linear equations, Vector spaces and subspaces, Linear independence, Basis and dimension, Inner product spaces, The Gram-Schmidt process, Linear transformations, Determinants, Diagonalization, and Real quadratic forms.		
<b>Prerequisite</b>	MATH 2403	

ENGL 2304	Academic and Professional Communication	(3-0-3)
<p>This course aims at acquainting students with different formal written communication forms such as memo, minutes, formal letters, emails, academic reports, proposal and research essays. It enables students to practice in drafting and writing these various communication forms to perform successfully in academic and professional environments. The course also includes sections of English grammar and vocabulary, punctually required to communicate adequately in academic and occupational situations.</p>		
<b>Prerequisite</b>	ENGL 1602	

SWEN 3204	Software Project Management	(2-0-2)
<p>Introduction project management concepts, tools, and techniques: integration management and project planning, scope management, scheduling, budget control, human resource management, communication management, risk analysis and management, project quality management, and procurement management.</p>		
<b>Prerequisite</b>	Junior Standing	

### Fourth Year - 1<sup>st</sup> Semester - 7<sup>th</sup> Level

SWEN 4682	Cooperative Work	(0-0-6)
<p>A continuous period of no less than 20 weeks spent as a normal employee in industry, business, or government agencies with the purpose of familiarizing students with the real world of work and enabling them to integrate their classroom learning to a real work environment. During this period, a student is exposed to a real-life work in the field. Each student is required to participate with at least one project. Students are required to submit progress reports during the work period. Students are also required to give a presentation and submit a final report on their experience and the knowledge they gained during their cooperative.</p>		
<b>Prerequisite</b>	Departmental approval	



## Fourth Year - 2<sup>nd</sup> Semester - 8<sup>th</sup> Level

SWEN 4491	Project	(2-4-4)
Student teams employ knowledge gained from courses throughout the program such as development of requirements, design, implementation, and quality assurance to develop a software solution to a real-world problem from conception to completion. Students develop project plan, software requirement specification and software design document, test their code, and evaluate their final product.		
<b>Prerequisite</b>	SWEN 3403 and SWEN 3204	

SWEN 3401	Software Testing and Quality Assurance	(2-2-3)
Concept of software quality, and software quality metrics. Software quality assurance planning & implementation. Quality process standards. Validation & verification. Reviews, walkthroughs, & inspections. Mechanisms for validating software systems. Techniques for generating and validating test data. Capability Maturity Model Integration (CMMI). Students participate in a group project on software validation and verification.		
<b>Prerequisite</b>	SWEN 3301	

CSEN 4302	Artificial Intelligence	(3-0-3)
Introduction to Artificial Intelligence (AI) history and applications; First order logic; State space representation; Blind and heuristic search; Constraint satisfaction and planning; Knowledge representation; Reasoning in uncertain situations; Machine learning; Prolog programming; Natural language processing, Expert systems and real AI applications.		
<b>Prerequisite</b>	CSEN 3301	





### Table (1) : University Elective Courses

#### Group (1) : Islamic and National Knowledge

1	ISLM 0215	Integrity and Work Ethics	(2-0-2)
2	SOSE 0213	National Identity	(2-0-2)
3	SOSE 0214	The History and the leading role of the Kingdom	(2-0-2)

#### Group (2) : Language Skills

1	ARAB 0222	Communication Skills	(2-0-2)
2	ARAB 0223	Media and Society	(2-0-2)

#### Group (3) : Thinking and Entrepreneurship

1	MGTS 0232	Entrepreneurship	(2-0-2)
2	MGTS 0233	Sustainable Development	(2-0-2)
3	TUTR 0234	Talent and Innovation	(2-0-2)
4	SOSE 0235	Voluntary Work	(2-0-2)

#### Group (4) : Technological Knowledge and Skills and Information Security

1	CSEN 0242	Fundamentals of Digital Transformation	(2-0-2)
2	CSEN 0243	Fundamentals of Information Security	(2-0-2)

#### Group (5) : Health and Safety Awareness

1	HIMT 0251	Health Culture	(2-0-2)
2	CIEN 0252	Security and Safety	(2-0-2)
3	SSPA 0253	Physical Activity	(1-2-2)
4	CLNU 0254	Food Security	(2-0-2)

Total

30

- The students will select only one course from each group



**ISLM 0215 Integrity and Work Ethics**

This course deals with the concepts of work, profession, ethics and their significance in Islam. It also highlights the factors affecting ethical behavior as well as the concepts and components of management in Islam. In addition, the course discusses the commendable professional ethics such as integrity and honesty, professional violations, means of overcoming irregularities and working conditions in Islam. There shall be as well ethical applications on the occupational and vocational systems within the Kingdom.

**Prerequisite** | None

**SOSE 0213 National Identity**

(2-0-2)

This course deals with the concept of national identity, and it highlights the means of promoting and safeguarding citizenship. The challenges encountered by national identity are also discussed as well as the means of dealing with them, in such a way that the national belonging shall be fostered among both individuals and the community.

**Prerequisite** | None

**SOSE 0214 The History and the leading role of the Kingdom**

(2-0-2)

This course deals with the contemporary history of the Kingdom of Saudi Arabia, the Riyadh recuperation by King Abdulaziz Al Saud, the decisive battles of the Kingdom's union as well as different stages of its renaissance and development. The course focuses also on the leading role, the worldwide importance and the religious significance of the Kingdom

**Prerequisite** | None

**ARAB 0222 Communication Skills**

(2-0-2)

This course aims at developing students' communication skills and preparing them for effective and successful communication. The course also provides students with appropriate communication cognitive and informational knowledge, besides enhancing their daily communicative practice using scientific methods

**Prerequisite** | None



ARAB 0223

Media and Society

(2-0-2)

This course deals with the basic association of language to traditional media and language to social media websites. It explores the significance of media, its effects, functions, and responsibilities on both the individual and society. The course aims at optimizing students' awareness towards newfound media thoughts and social media marketing as well as community, woman and child media-related issues.

**Prerequisite**

None

MGTS 0232

Entrepreneurship

(2-0-2)

This course covers the fundamentals of entrepreneurship and its practical applications. It emphasizes on developing the ability to seize opportunities, create project plans and feasibility studies, and trade-off between different projects using modern scientific methods.

**Prerequisite**

None

MGTS 0233

Sustainable Development

(2-0-2)

This course defines development and sustainable development, and focuses on their objectives, fundamental principles, and impediments. It highlights not only sustainable development's theories, strategies and elements, but it also sheds the light on local community development, and presents sustainable human development's standards along with their values and ethics.

**Prerequisite**

None

TUTR 0234

Talent and Innovation

(2-0-2)

This course marks out the concepts of talent and creativity and methods of identifying the gifted and talented individuals. Programs and enriching educative methods for talented and creative persons are also discussed besides methods of academic acceleration. In addition, this course sheds the light on the encountered challenges (counseling services), along with the family and school supportive role before dealing with the categorization of gifted persons with special needs.

**Prerequisite**

None



SOSE 0235

Voluntary Work

(2-0-2)

This course deals with the knowledge related to voluntary work and highlights its characteristics and significance across various divine religions, with a particular focus on the Islamic faith. It also outlines the traits and competencies associated to volunteers. The course sheds light on voluntary work forms, fields, mechanisms, factors of success, obstacles. Political and legal frameworks and planning methods for voluntary work are discussed as well, besides tracing the emergence and development of voluntary work in the Kingdom of Saudi Arabia and relevant institutions.

**Prerequisite** | None

CSEN 0242

Fundamentals of Digital Transformation

(2-0-2)

This course addresses the concept of digital transformation and its historical evolution towards rapid progress and digital transformation. It then focuses on using the latest communication and information technologies in developing digital infrastructure and facilitating the transformation into a digital future, including for instance, topics such as smart cities and IoT applications.

**Prerequisite** | None

CSEN 0243

Fundamentals of Information Security

(2-0-2)

This course covers the fundamental concepts and terminology related to the field of information security. It also lays the foundation for understanding data communications and the objectives of confidentiality, integrity, and authentication. It provides an overview of common threats and attacks, along with countermeasures and best practices for information security, including topics such as passwords, firewalls, mobile computing, antivirus measures. The course addresses some advanced subjects like biometrics and encryption

**Prerequisite** | None

HIMT 0251

Health Culture

(2-0-2)

This course deals with the general principles of health, introducing therapeutic, preventive medicine, epidemiology and infectious diseases. The course also marks out the fundamentals of proper nutrition, the benefits of food, and nutritional ingredients, as well as introducing the basics of first aid, saving lives and reducing injury risks.

**Prerequisite** | None



CIEN 0252

Security and Safety

(2-0-2)

This course deals with security and safety concepts and addresses various types of risks encountered by individuals in public life and work environments, including traffic hazards. It covers first aid, types of wounds and injuries, methods of handling and prevention of injuries. In addition, it addresses the methods of fire prevention, fire-fighting systems, alarm systems and control panels of these systems. Moreover, it focuses on the development of a culture of occupational safety and security. Finally, the course deals with legislation regulating public safety and security, whether related to traffic or otherwise

**Prerequisite**

None

SSPA 0253

Physical Activity

(1-2-2)

This course addresses, in its theoretical part, the significance of physical activity, its foundations and dimensions. It discusses the minimum level of physical activity required for health promotion, physical fitness and its components, besides the basic principles of training. It covers muscular strength, muscular endurance, body structure, in addition to the fitness of the respiratory circulatory system. Moreover, it focuses on the ability to design and develop a fitness program. Finally, in the practical part, both individual and group activities are covered.

**Prerequisite**

None

CLNU 0254

Food Security

(2-0-2)

This course covers the general principles of food security, the composition of food, and the division of its nutritional groups. It addresses issues related to malnutrition, as well as the problem of food deficiency, its causes, and infectious diseases transmitted through food. The course also explores the reasons behind food scarcity on one hand, and food production and achieving food security on the other. The complete food chain system, along with the food constitution and international health regulations, are discussed as well.

**Prerequisite**

None





## Table (2) : Elective Courses

### Group (1) : Technical Elective

1	SWEN 4351	Formal Methods and Models in Software Engineering	(3-0-3)
2	SWEN 4352	Object-Oriented Design Patterns	(3-0-3)
3	SWEN 4353	Software Metrics	(3-0-3)
4	SWEN 4354	Software Processes and Process Improvements	(3-0-3)
5	CSEN 4351	Computer Graphics	(3-0-3)
6	CSEN 4352	Advanced Database Systems	(3-0-3)
7	CSEN 4354	Internetwork Design and Management	(3-0-3)
8	CSEN 4355	Internet Engineering and Technologies	(3-0-3)
9	CSEN 4356	Mobile Computing	(3-0-3)
10	CSEN 4357	Pervasive and Ubiquitous Computing	(3-0-3)
11	CSEN 4358	Computer & Network Security	(3-0-3)
12	CSEN 4359	Computer Vision	(3-0-3)
13	CSEN 4361	Advanced Networking	(3-0-3)

### Group (2) : Free Elective

1			
2			

### Group (3) : Science Elective

1	PHYS 1403	General Physics II	(3-2-4)
2	BIOL 2350	Biology for Engineer	(2-2-3)
3	MATH 2305	Calculus III	(3-0-3)
4	MATH 4350	Introduction to Sets and Structures	(3-0-3)

### Total

- The students will select 1 Technical Elective and 1 Science Elective



SWEN 4351	Formal Methods and Models in Software Engineering	(3-0-3)
<p>Mathematical foundations for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specifications and designs. Use of assertions and proofs. Automated program and design transformation.</p>		
<b>Prerequisite</b>	CSEN 2306 and CSEN 3301	

SWEN 4352	Object-Oriented Design Patterns	(3-0-3)
<p>In-depth study of object-oriented design patterns. How design patterns solve design problems? How to select a design pattern? How to use a design pattern? Detailed study of creational patterns, structural patterns, and behavioural patterns. Case studies.</p>		
<b>Prerequisite</b>	SWEN 3403	

SWEN 4353	Software Metrics (3-0-3)	(3-0-3)
<p>Overview of software metrics, basics of measurement theory, goal-based framework for software measurement, empirical investigation in software engineering. Measuring internal product attributes, measuring external product attributes, measuring cost and effort, measuring software reliability, software test metrics, and object-oriented metrics.</p>		
<b>Prerequisite</b>	SWEN 3403	

SWEN 4354	Software Processes and Process Improvements	(3-0-3)
<p>Software process models. Software process analysis. Life cycle process models and standards. Process implementation at various levels like organization, project, team, or individual. Measurement and analysis of software process. Process improvements</p>		
<b>Prerequisite</b>	SWEN 3403	

CSEN 4351	Computer Graphics	(3-0-3)
Applications of Computer Graphics; Graphics systems and devices; Output Primitives and their Attributes; Geometric Transformations; Window to Viewport Mapping and Clipping; Curves and Surfaces; Three-Dimensional viewing; Hidden surface removal; illumination and color models, Animation.		
<b>Prerequisite</b>	CSEN 2306	

CSEN 4352	Advanced Database Systems	(3-0-3)
Advanced data models: object-oriented model and object-relational model, conceptual database design. Transaction processing: transactions, failure and recovery, and concurrency control techniques. Database backup and recovery. Query processing and optimization. Database security. Distributed databases: distributed data storage, distributed query processing, distributed transaction processing and concurrency control. Homogeneous and heterogeneous solutions, client-server architecture. XML and relational databases. Introduction to data warehousing, introduction to other.		
<b>Prerequisite</b>	CSEN 2307	

CSEN 4354	Internetwork Design and Management	(3-0-3)
Overview of computer networks. Principles of internetworking. Internetworking hardware. Bridging and switching technologies. Virtual LANs. Routing strategies. The network development life cycle. Network analysis and design methodology. Enterprise network design model. Backbone design concepts. Network security design. Structured cabling systems. Network design algorithms. Traffic flow analysis. Network reliability. Network management (SNMP). Network administration. Case studies.		
<b>Prerequisite</b>	CSEN 2304	

CSEN 4355	Internet Engineering and Technologies	(3-0-3)
Overview of current internet challenges and its next generation architecture. Overview of modern Internet protocols and supporting algorithms. Information retrieval architecture, design, and performance evaluation: search engines, proxy servers, and content distribution networks. Network programming.		
<b>Prerequisite</b>	CSEN 2304	

CSEN 4356	Mobile Computing	(3-0-3)
Introduction to different types of mobile computing; cellular networks, wireless mobile ad hoc and sensor networks, wireless LAN and so on. Discussion of different IEEE standardized protocols and their implementation and performances. New wireless technologies such as LTE and LTE advance. Quality of Service (QoS) issues. Modeling and optimization methods of wireless protocols.		
<b>Prerequisite</b>	CSEN 2304	



<b>CSEN 4357</b>	<b>Pervasive and Ubiquitous Computing</b>	<b>(3-0-3)</b>
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Introduction to ubiquitous and pervasive computing. Designing, building and evaluating ubiquitous computing technologies in order to create novel user experiences. Capturing and disseminating context information through sensors and sensor networks. Sensor network coverage, localization, synchronization, sleep scheduling, connectivity, routing, energy efficiency, data centric and transport protocols. Context-aware applications and intelligent objects and applications.

**Prerequisite** CSEN 2304

<b>CSEN 4358</b>	<b>Computer &amp; Network Security</b>	<b>(3-0-3)</b>
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Introduction to computer security (concepts, threats, attacks, assets, scope, trends). Cryptographic Protocols and standards. Integrity verification mechanisms. Wireless network security and associated protocols. Software tools to apply security in user environments. Access Control models and mechanisms. Database security, Intrusion detection systems, Firewalls. Malicious software, DoS attacks, Trusted computing and multilevel security.

**Prerequisite** CSEN 2304

<b>CSEN 4359</b>	<b>Computer Vision</b>	<b>(3-0-3)</b>
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Image acquisition, The digital image and its properties, Image preprocessing, Segmentation (thresholding, edge- and region-based segmentation), Shape representation and object recognition, Motion analysis, Case studies (object recognition / object tracking).

**Prerequisite** MATH 2307  
Departmental Approval

<b>CSEN 4361</b>	<b>Advanced Networking</b>	<b>(2-2-3)</b>
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Principles, architectures, algorithms, and protocols related to the Internet, with emphasis on routing, transport protocol design, flow control and congestion control, quality of service, traffic engineering and MPLS, network virtualization and software defined networking (SDN).

**Prerequisite** CSEN 2304



PHYS 1403	General Physics II	(3-2-4)
<p>This course designed to cover the following topics which include wave motion and sound; temperature, first and second law of thermodynamics; kinetic theory of gases; Coulomb's law; the electric field; Gauss' law; electric potential; capacitors and dielectrics; D.C. circuits; the magnetic field; Ampere's and Faraday's laws.</p>		
<b>Prerequisite</b>	PHYS 1301	

BIOL 2350	Biology for Engineer	(2-2-3)
<p>The course will provide the students with the basic understanding of the fundamental principles of biology. The course will cover basic information in chemical context of life, cell structure, cell function, energy transfer, cell division (mitosis) and DNA Technology and its engineering applications, basic information about microorganisms (microbiology) and viruses. Importantly, the lectures will emphasize topics of relevance to engineering applications.</p>		
<b>Prerequisite</b>	None	

MATH 2305	Calculus III	(3-0-3)
<p>This course covers the polar coordinates, polar curves, area in polar coordinates, vectors, lines, planes and surfaces, Cylindrical and spherical coordinates, Functions of two and three variables, limits and continuity, Partial derivatives, directional derivatives, Extrema of functions of two variables, double integrals, double integrals in polar coordinates, triple integrals, triple integrals in cylindrical and spherical coordinates.</p>		
<b>Prerequisite</b>	MATH 2403	

MATH 4350	MATH 4350 Introduction to Sets and Structures	(3-0-3)
<p>This course covers elementary logic, methods of proof, Set theory and operations on sets, relations and functions, Injective, surjective and bijective functions, operations on functions, finite and infinite sets, countable and uncountable sets, cardinal numbers, Equivalence relations and order, divisibility and the fundamental theorem of arithmetic, groups, subgroups, symmetric groups, cyclic groups, permutation group and order of an element, isomorphisms, cosets and Lagrange's Theorem.</p>		
<b>Prerequisite</b>	MATH 2403	

