FACULTY OF ENGINEERING
NAHDA UNIVERSITY
IN BENI SUEF
كلية الهندسة

NAHDA UNIVERSITY
IN BENI SUEF
جامعة النهضة ببني سويف

Student guide for the

Academic Year 2025/2026

Study plan 144 hours

NUB
FACULTY OF ENGINEERING
كلية الهندسة

A Message from the Director of the Quality Assurance Unit

My dear students of the Faculty of Engineering at Nahda University, I am pleased to welcome you to your faculty and wish you a successful academic journey filled with achievement and excellence.

The Faculty of Engineering at Nahda University is committed to implementing a comprehensive quality assurance and accreditation system, stemming from its firm belief that the student is the focus of the educational process.

The Quality Assurance Unit works on the continuous monitoring of program performance, course development, and improvement of teaching, learning, and assessment methods, in order to achieve the college's mission and vision, and to be consistent with national reference standards for quality. The Quality Unit has been keen to develop the college's programs in artificial intelligence and sustainable development (144 credit hours - 4 academic years).

The programs listed for the 2025/2026 academic year are: Civil Engineering for Intelligence and Sustainable Development, Digital Architecture, Electrical Power and Renewable Energy Engineering, Mechatronics and Intelligent Machines engineering, Communications and Computer Engineering.We always emphasize that your participation, opinions, and suggestions are fundamental to the success of our quality system and the achievement of continuous improvement.

Speech of the Engineer / Chairman of the Board of Trustees of the University

May God bless Egypt, our youth and the ambitious youth of expatriates from Arab and African countries who exert maximum effort for the development of our nation and the prosperity of our people. During my many years of experience and the various positions I have held and managed, i.e. in the fields of education, research, establishing universities, or organizing businesses, I have always been keen to support serious businesses and productive projects that add to Egypt's record of excellence and further raise its position among other countries. Al-Nahda University in BeniSuef is one of these projects that I am working on because it carries an innovative message in the teaching methods it adopts and the scientific research it targets. At Nahda University, we aspire to build a new generation capable of facing the challenges posed by the future. Therefore, we have committed to hard and effective work, and to provide specialized programs that develop the minds of our youth and enrich their educational experience.

Chairman of the Board of Trustees
Engineer / Mohammed Al-Rashidi

Speech of Prof. Dr. / President of the Universi

Al-Nahda University in BeniSuef, an Egyptian private university, under Presidential Decree No. 2006/253, spared no effort to make its way towards the desired excellence at a steady pace, and thus it occupies a prominent position in Upper Egypt by overcoming all the difficulties and challenges faced by the education sector at this stage in which we live. Al-Nahda University in BeniSuef has taken steps to obtain accreditation for all its diverse and comprehensive study programs, such as the university's programs in medicine, dentistry, pharmacy, engineering, computer science, media, marketing and business administration, which meet the needs of the local and regional community as well as the requirements of the labor market, while obtaining international accreditations for some programs and degrees granted by the university. In addition, Al-Nahda University in BeniSuef has started contacting many universities in various scientific disciplines, believing that it is necessary to cooperate with local, regional and international universities in various fields of education in order to ensure the quality of education.

The university continued its endeavor to develop academic programs in various fields of knowledge, which formed a complete fertile ground and tributary to the university's seven faculties, in addition to the university's keenness to develop the skills of the faculty in accordance with international standards, attract prominent teachers, and encourage teaching and scientific research while adhering to local, regional and international standards. In this context, the university has spared no effort to achieve this vision and mission in order to become a reality. In addition, Al-Nahda University in BeniSuef encourages student activities such as paying attention to student clubs and sports facilities such as halls and playgrounds, holding training courses to enrich the educational experience, simulate talents and refinement as part of preparation for postgraduate studies. The university also provides community service of tangible importance by providing distinguished medical services to the surrounding local community, providing expertise and consultations in various medical, health and applied fields, as well as hosting many local and regional activities on campus. Indeed, these major achievements by Al-Nahda University in BeniSuef are confident steps towards universality.

Prof. Dr. Hossam Al-Mallahi

President of Al-Nahda University

Speech of Prof. Dr. / Dean of the Faculty of Engineerin

My sons and daughters, students of the Faculty of Engineering, I take the opportunity of the beginning of the academic year 2025/2026 to congratulate all the old and new students of the faculty on the new academic year, may God return to you and your families with goodness, health, happiness and more knowledge. To our new students, I am particularly pleased to congratulate you on the first academic year of your life, and I commend you for choosing the prestigious engineering profession to be the future engineers who bear the responsibility for the advancement of the country. You are the descendants of the builders of the pyramids and great Arab and African civilizations, and you are required to follow the path to bring our beloved Egypt and our Arab and African world to the forefront among the nations of modern civilizations. As you move from the secondary stage in which you achieved honorable excellence to the university stage, in which we wish you continued excellence and advancement, you are going through more than one important transformation - first you are moving from a stage characterized by supervision, supervision and guidance at home and school in one way or another, to a stage in which you have more freedom.

This freedom must be accompanied by a greater sense of responsibility on your part in order to achieve its desired - the development of your abilities to create and create, and not, God forbid, be a path to defect or loss.

The college has accredited Fife new programs (144 hours/4years graduate) that keep pace with the rapid development in all engineering fields. The first year is also an opportunity for you to get to know the different engineering disciplines closely so that each of you can choose from these disciplines what It suits his inclinations and abilities. My sons and daughters, I pray to God that everyone's effort will be crowned with success, and that your studies at the college will be fruitful and successful and full of happy memories.

good luck,,,

Best Regards

Prof. Dr. Salem Mahmoud Elkhodary
Dean of Faculty of Engineering
Nahda University NUB
Board Member of the Egyptian Electrical Transmission Company
E-mail : salem.elkhodary@nub.edu.eg
Web. : www.nub.edu.eg

Speech of Prof. Dr. / Vice Dean for Education and Student Affairs:

First of all, I am pleased to welcome you my male and female students to the Faculty of Engineering at Al-Nahda University in BeniSuef, and I wish you a successful university life filled with seriousness, diligence and perseverance to obtain what you aspire to. With the brightness of a new academic year, I am pleased to extend to you my sincere congratulations and best wishes for a successful academic year full of giving and crowned with success that carries with it hope for a bright future thanks to your efforts and keenness to work hard, and your regularity in attending lectures, and permanent access to the various sources for the collection of scientific material with my emphasis on the college's constant interest and keenness to provide everything that would achieve excellence and excellence for college students. The administration of the College of Engineering and all the staffs of the college have been and still are keen to develop the College of Engineering programs and study courses in accordance with the global educational system. Below is a brief guide to the new engineering programs **(144 hours regulation and allows graduation in 4 years).**

The programs offered for the 2025/2026 academic year are: Civil Engineering for Intelligence and Sustainable Development, focusing on the design and construction of infrastructure such as roads, bridges, buildings, and dams; and Digital Architecture, focusing on integrating art and engineering to design

functional, aesthetic, and sustainable buildings, as well as architectural design, urban planning, and green architecture. Electrical power and renewable energy engineering, focusing on utilizing clean energy sources such as the sun, wind, and green hydrogen, and mechatronics and smart machines engineering, focusing on a combination of mechanical, electrical, and programming engineering to design smart systems. Communications and computer engineering, with a focus on data transmission, wired and wireless network design, 6G networks, fiber optics, and satellites.

We are proud to see you as distinguished graduates who occupy the highest positions to benefit your country and raise its status, God willing.

Prof. Dr. Sayed Abdelkader
Vice Dean for Education and Student Affairs

Faculty of Engineering

College Vision: The Faculty of Engineering should be distinguished in the Arab world and Africa and be characterized by creativity and innovation in providing educational services and scientific research with international standards to serve the community in order to achieve sustainable development plans.

College Mission: The College of Engineering is committed to preparing engineering cadres capable of creativity and innovation by providing contemporary academic programs that develop their knowledge and skills aspects to suit the local, regional and international labor market and meet the needs of society and giant national projects, encourage scientific research and apply quality standards in all its academic and service activities.

University Graduation and Graduation Scoring System

1. *The final grade for each course is the total score of students in the semester including practical tests, mid-term exams, and end-of-semester exams, where student work is continuously evaluated during the semester.*

2. *The final grade for each course consists of the student's assessment in the classroom, periodic tests, theoretical and practical exercises, and research, while the final semester exam score ranges from 40% to 60% of the final course mark.*

3. *The student's grade can be evaluated in applied courses such as project and research courses without a written test at the end of the semester. An oral test will be conducted that includes the evaluation of the report submitted by the student and the scientific work carried out through a discussion committee consisting of two faculty members, at least one of whom is from outside the university in addition to the project supervisor.*

4. *The student must obtain at least 60% of the total grades to pass the course, provided that he succeeds in the final exam by obtaining 40% of the final exam mark as a minimum to*

succeed in the course.

GRADING SYSTEM: GRADING SYSTEM

- The system of calculating the percentage of courses and percentage points is calculated according to the following table:

GPA	Percentage	Grade	GPA	Percentage	Grade
2.3	73% to less than 76%	**C +**	**4.0**	97% and higher	**A +**
2.0	70% to less than 73%	**C**	**4.0**	93% to less than 97%	**A**
1.7	67% to less than 70%	**C-**	**3.7**	89% to less than 93%	**A-**
1.3	64% to less than 67%	**D +**	**3.3**	84% to less than 89%	**B +**
1.0	60% to less than 64%	**D**	**3.0**	80% to less than 84%	**B**
0.0	Less than 60%	**F**	**2.7**	76% to less than 80%	**B-**

Average Grade Score: GPA

A. The average GPA score for one semester is calculated by obtaining the product of the grade points by the number of credit hours for each course to produce the so-called qualitative points (quality points), then the total qualitative points are divided by the total number of credit hours for the courses whose points are included in the calculation of the cumulative average. Grade point average = total qualitative points ÷ total credit hours for courses whose points are included in the calculation of the cumulative GPA. B.To obtain the cumulative grade point average (CGPA), the total qualitative points (quality points) are divided by the total credit hours for the courses whose points are included in the calculation of the cumulative grade point average for all semesters. The student's academic load in any semester (except the summer semester) is determined based on the value of the cumulative grade point average (CGPA) and not on the value of the average grade point GPA for the previous semester.

What are the implications of these estimates?

• The student's name is placed in the college honor list if he obtains a cumulative average of at least 3.3 and has recorded the maximum academic load without failing any course.

• The student receives a first class of honors if he graduates with a minimum cumulative average of 3.7 points and a second honors degree if he obtains a cumulative average of at least 3.3 points.

• If the student obtains a cumulative GPA of 3.3 or more, he may register three credit hours in excess of the maximum semester in exchange for additional fees. If the GPA exceeds 3.75, the student is allowed to register for an additional course without additional fees.

• If the student's cumulative average is less than two points, he will be placed under academic probation and the student will be officially notified of this.

PART4: Faculty of Engineering

Credit Hours: 144 Hours

• All courses are conducted in English

WHY JOIN THE FACULTY OF ENGINEERING?

The Faculty of Engineering at NUB provides outstanding engineering educational and research services that meet the highest quality standards by enhancing student creativity, teaching and learning through:

• Strengthening the capabilities of our graduate engineers with scientific skills, professional knowledge and ethical values.

• Training our graduates to keep abreast of rapid technological changes to lead the development of society,
as well as the surrounding environment.

• Providing technical laboratories with the latest equipment to support university students in conducting applied
research and quality tests on national projects.

• Production workshops to train university students on various technical machinery and tools to produce market requirements.

• Hosting an Engineering advisory center that provides consultancy services, training and research in various engineering fields.

Vision: ***The Faculty of Engineering at Nahda University aspires to promote leadership and excellence locally, regionally and internationally in engineering education, scientific research and community service, and to keep pace with technological developments.***

Mission: ***The Faculty of Engineering at Nahda University is committed to preparing distinguished engineers capable of competing in the local, regional and international labor market, while providing advanced educational programs that support digital transformation and sustainable development, achieving excellence in scientific research and community service, and applying quality standards within a framework of human values and social responsibility.***

Strategic Objects

• Attracting distinguished faculty members and researchers in various engineering fields.

• Development of skills and capabilities of faculty Staff.

• Improving the educational environment to encourage faculty members, researchers and students on innovation, respecting for the time and feeling Job satisfaction.

• Revaluing credibility and ethics where the faculty staff and teaching assistants being as a role model for students to follow noble human values.

• Continuous development of educational programs to meet the requirements of the labor market through various types of learning, teaching and evaluation for students.

• Graduating students to be high qualified engineers and good scientific researcher capable of leading and developing society for various engineering fields.

• Motivation of staff, researcher and students to do a research projects and linking it with industrial environment.

• Doing protocols with local and international universities for postgrads studies, research and student exchanging.

• Development of faculty management systems and academic departments

PART 5: Service & Facilities

LABORATORIES AND WORKSHOPS

Faculty provides equipped Laboratories and Workshops in order to develop students learning skills in every scientific branch.

BASIC SCIENCES department LABS

Include the following laboratories:

Physics labs.

Computer labs.

Chemical Engineering lab.

Electrical Engineering Department (Communication and Computer engineering) Labs

Include the following laboratories:

Electrical circuits laboratory.

Electrical measurements & testing laboratory.

Analogue and digital circuits laboratory.

Integrated circuit design laboratory.

Digital signal processing laboratory.

Micro controllers & applications laboratory.

Microprocessors & applications laboratory.

Optical communication laboratory.

Digital communication laboratory.

Antennas and wave propagation laboratory.

Electrical communication laboratory.

Programming languages laboratory.

CIVIL ENGINEERING department Labs.

Include the following laboratories:

Material laboratory.

Surveying laboratory.

Concrete technology laboratory.

Hydraulic laboratory.

Sanitary engineering laboratory.

Soil mechanics & foundation laboratory.

Architectural ENGINEERING DEPARTMENT LabS.

Include the following laboratories:

Optical & visual training laboratory.

Building construction laboratory.

Building materials laboratory.

Tools and equipment are available in numbers by which enable each student does practical experiments individually.

EDUCATIONAL WORKSHOPS

Operating machines in the existing shops allow to divide the students into groups of five students and then each student has direct hands-on training to conduct exercises required.

• Workshop of Operating Machines located in the workshops Building at the Faculty of Engineering.

• Welding Workshop located in the workshops Building at the Faculty of Engineering.

• Workshop of Wood-working Machinery located in the workshops Building at the Faculty of Engineering.

• Floors and cladding workshop.

ACADEMIC ADVISING

By qualified Staff Members & Staff Members Assistants, Faculty gives academic and scientific instructions to all students who desire to develop their academic performance, all of this is done through a special program called “Big Brother”.

LIBRARY

Library includes many of the references and textbooks which help students developing their scientific knowledge and enhancing their scientific comprehension.

Student activities and other services:

Summer camps.

Scientific and recreational trips.

Inventors care center.

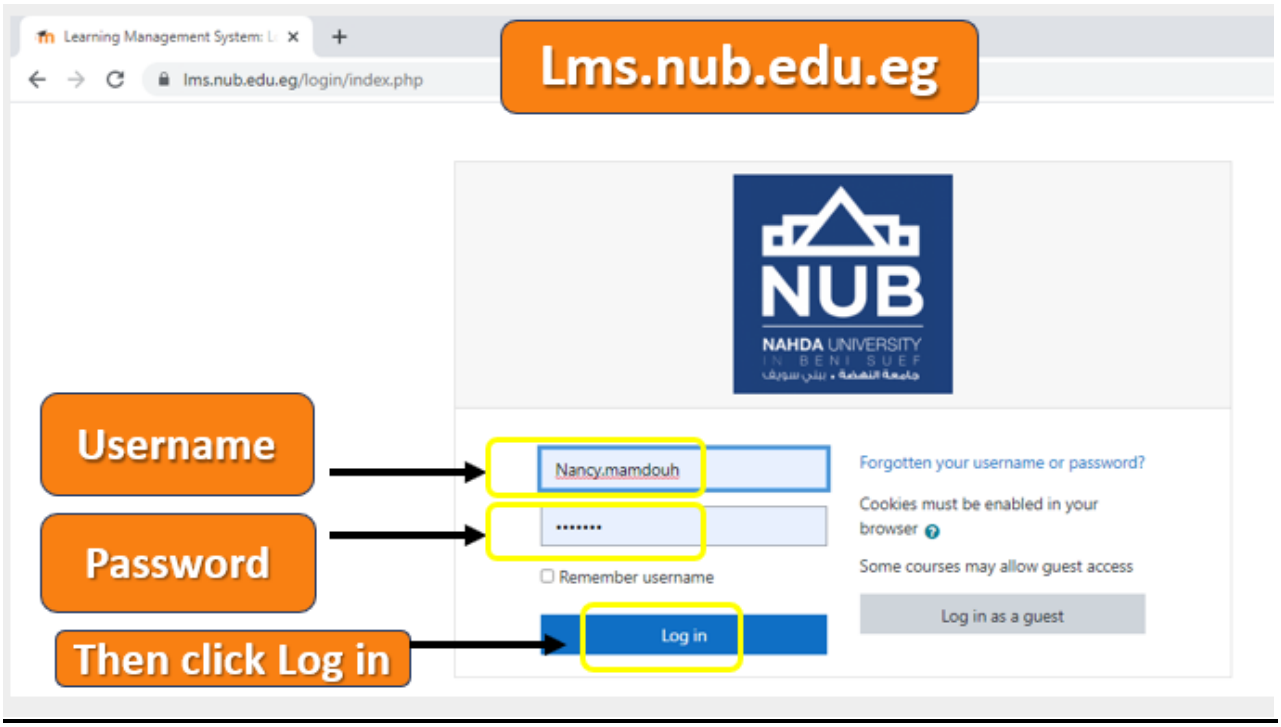
English language program.

Support Unit of e-learning.

E-mail to each student.

University Dental Hospital.

Indoor Minibus


Learning Management System
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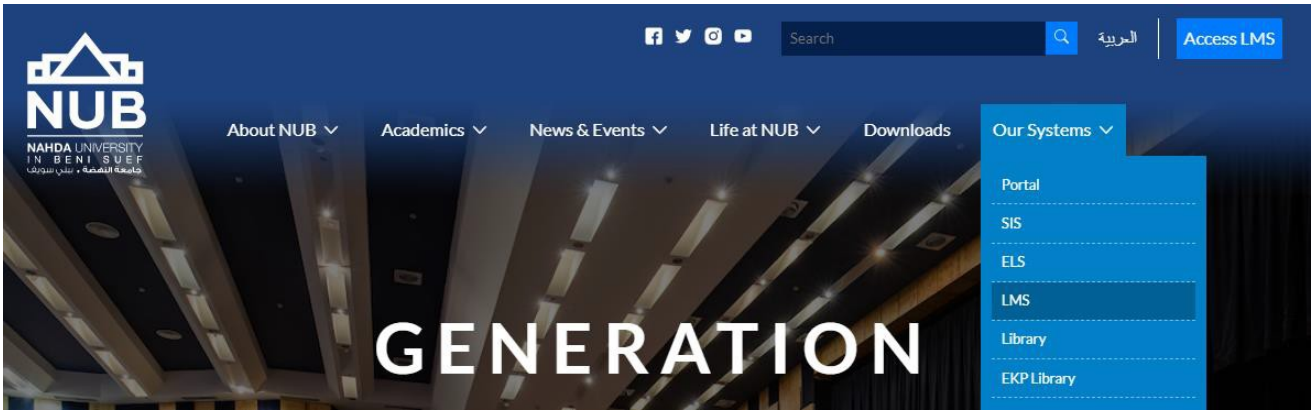
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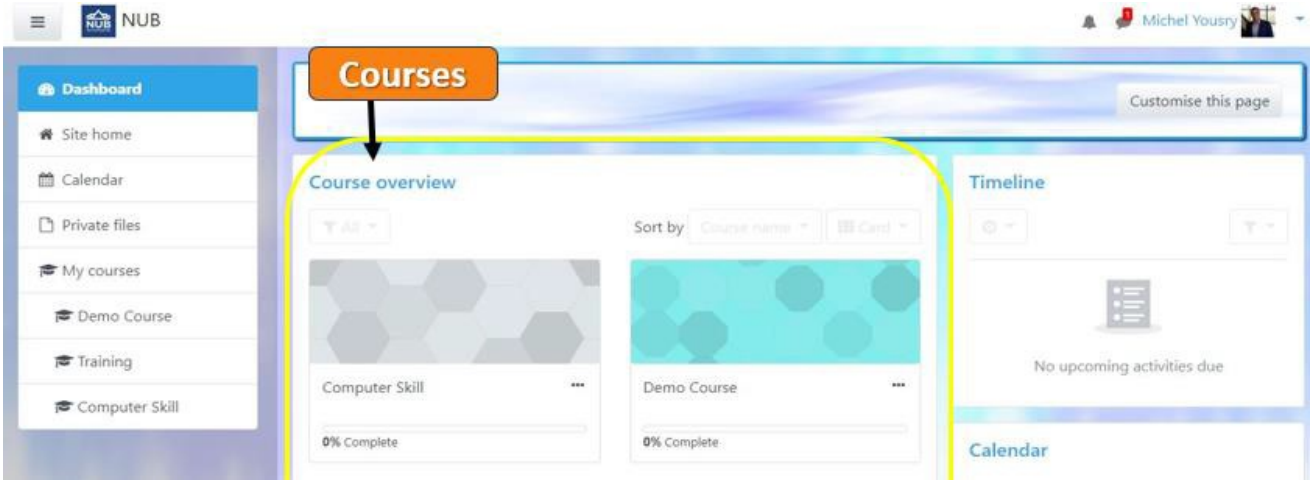

Contact

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PART II

Programs and Courses

Study plan 144 hours

www.nub.edu.eg

The Bylaws of Undergraduate Programs

Faculty of Engineering, Nahda University

March 2025

Participants in the Preparation of these Bylaws

The following list shows the staff members of the Faculty of Engineering, Nahda University who have effectively participated in the preparation of the 2024/2025 Bylaws for the Undergraduate Studies.

No.	Name	Occupation
1.	**Prof. Dr. Salem Mahmoud ElKodary**	Dean of the Faculty of Engineering
2.	**Prof. Dr. Sayed Abdelkader Ahmed**	Vice Dean of the Faculty of Engineering
3.	**Prof. Mostafa Deep Hashem**	Head of Civil Engineirng Department
4.	**Prof. Gamal Mohamed Dousoky**	Head of Mechatronics Engineering Department
5.	**Prof. Ahmed Abdelmoneim Ibrahim**	Head of Communication and Computer Engineering Department
6.	**Dr. Maher Abd El Kader Saleem**	Head of Basic Sciences Department
7.	**Dr. Rashwan Tahseen Almashhour**	Head of Architecture Engineering Department
8.	**Dr. Mohamed Kourany Saad**	Head of Electrical Power Engineering Department
9.	**Dr. Mohamed Adel Abdelaziem**	Lecturer
10.	**Assoc. Prof. Ahmed Abd El-Baset Donkol**	Bylaws and Governance Coordinator
11.	**Dr. Abdelrahman Ahmed Yasser Elsherief**	Bylaws and Governance Coordinator

General Articles of the Faculty

Part 1: Preface

The Vision

To be a distinguished faculty in educational services and applied research for community service and environmental development in various engineering fields.

The Mission:

The Faculty of Engineering is committed to preparing engineering cadres staff capable of creativity and innovation by offering contemporary academic programs that develop their cognitive and skill aspects in a manner that suits the local, regional and international labor market, meets the needs of society and giant national projects, encourages scientific research and applies quality standards in all its academic and service activities.

الجزء ١: مقدمة

الرؤية:

أن تكون الكلية متميزة في الخدمات التعليمية والبحوث التطبيقية لخدمة المجتمع وتنمية البيئة في مختلف المجالات الهندسية.

الرسالة:

تلتزم كلية الهندسة بإعداد كوادر هندسية قادرة على الإبداع والابتكار من خلال تقديم برامج أكاديمية معاصرة تنمي جوانبها المعرفية والمهارية بما يتناسب مع سوق العمل المحلي والإقليمي والدولي ، ويلبي احتياجات المجتمع والمشاريع الوطنية العملاقة ، ويشجع البحث العلمي ويطبق معايير الجودة في جميع أنشطتها الأكاديمية والخدمية.

الأهداف:

١. التطوير المستمر للبرامج الأكاديمية وتعزيز فعاليتها لتلبية متطلبات سوق العمل من خلال اعتماد طرائق التعليم والتعلم والتقويم الطلابي المتنوعة والمتقدمة.
٢. استقطاب أعضاء هيئة التدريس والباحثين المتميزين في مختلف التخصصات الهندسية لإثراء البيئة التعليمية والبحثية.
٣. تطوير مهارات وكفاءات أعضاء هيئة التدريس والهيئة المعاونة والموظفين الإداريين من خلال برامج تدريبية فعالة ومستمرة.
٤. تعزيز قيم النزاهة وأخلاقيات المهنة ، والتأكد من كون أعضاء هيئة التدريس قدوة تجسد القيم الأخلاقية والإنسانية الراقية.
٥. تشجيع البحث العلمي التطبيقي والمشاركة الفاعلة في المشاريع البحثية بالتعاون مع المؤسسات الصناعية والإنتاجية والخدمية.
٦. تحسين جودة التعليم من خلال المتابعة المستمرة واستخدام طرائق التدريس الحديثة والمعامل وورش العمل.
٧. إبرام بروتوكولات تعاون وشركات مع الجامعات المحلية والإقليمية والدولية في مجالات الدراسات العليا والبحوث وتبادل أعضاء هيئة التدريس والهيئة المعاونة والتبادل الطلابي الفعال.
٨. خلق بيئة ثقافية وتعليمية محفزة وداعمة تعزز الابتكار وتقدر قيمة الوقت وتعزز الرضا الوظيفي بين أعضاء هيئة التدريس والباحثين والطلاب.
٩. تخريج مهندسين وباحثين بمؤهلات أكاديمية وعلمية ومهنية وأخلاقية عالية، قادرين على التعلم مدى الحياة والمساهمة في التنمية الوطنية في مختلف المجالات الهندسية.
١٠. تطوير النظم الإدارية والأكاديمية بالكلية وتبني مبادئ الحوكمة والشفافية المؤسسية.
١١. تعزيز العلاقة بين الكلية وخريجيها وممثلي الصناعة وأطراف المجتمع المدني لضمان المنفعة المتبادلة وتبادل المعرفة والخبرات.
١٢. تقديم خدمات مهنية واستشارية وتدريبية وانتاجية عالية الجودة في مختلف المجالات الهندسية من خلال مركز الاستشارات والتدريب التابع للكلية.

The Objectives:

1. Continuously develop academic programs and enhance their effectiveness to meet labor market demands by adopting diverse and advanced teaching, learning, and student assessment methods.
2. Attract distinguished faculty members and researchers across various engineering disciplines to enrich the educational and research environment.
3. Enhance the skills and competencies of faculty members, teaching assistants, and administrative staff through effective and continuous training programs.
4. Promote the values of integrity and professional ethics, ensuring that faculty members serve as role models who embody high moral and human values.
5. Encourage applied scientific research and active participation in research projects in collaboration with industrial, productive, and service institutions.
6. Improve the quality of education through continuous monitoring and the use of state-of-the-art teaching tools, laboratories, and workshops.
7. Establish cooperation protocols with local, regional, and international universities in areas of postgraduate studies, research, and the exchange of faculty members and students.
8. Create a motivating and supportive educational environment that fosters innovation, respects time, and promotes job satisfaction among faculty, researchers, and students.
9. Graduate engineers and researchers with strong scientific, professional, and ethical qualifications, capable of lifelong learning and contributing to national development in engineering fields.
10. Develop the faculty's administrative and academic systems and adopt principles of governance and institutional transparency.
11. Strengthen the relationship between the faculty and its graduates, industry, and civil society to ensure mutual benefit and knowledge exchange.
12. Provide high-quality professional, consulting, training, and productive services in various engineering fields through the Faculty's Consultancy and Training Center.

Part 2: Organizational Structure

الجزء ٢: الهيكل التنظيمي

Article (1): Faculty Academic Departments

المادة (١): الأقسام الأكاديمية بالكلية

The faculty includes the following scientific Departments.

تضم الكلية الأقسام العلمية التالية.

Table 1 Departments Faculty students at FoE – NUB

#	Depatment	Code
1	Civil Engineirng Department	CVE
2	Architecture Engineering Department	DAE
3	Communication and Computer Engineering Department	CCE
4	Mechatronics Engineering Department	MIM
5	Electrical Power Engineering Department	EPR

جدول ١ الاقسام العلمية في كلية الهندسة جامعة النهضة .

م	القسم	رمز
١	قسم الهندسة المدنية	CVE
٢	قسم الهندسة العمارية	DAE
٣	قسم هندسة الاتصالات و الحاسبات	CCE
٤	قسم هندسة الميكاترونكس	MIM
٥	قسم هندسة القوى الكهربية	EPR

There are two departments serving Faculty students (Non Student Department):

يوجد قسمان يخدمان طلاب الكلية (قسم خدمي لايخرج طلاب):

Table 2 Departments serving Faculty students at FoE - NUB

No	Department	Code
1	Basic Sciences Department	BAS
		BME

جدول ٢: الأقسام التي تخدم طلاب الاقسام الخدمية في كلية الهندسة جامعة النهضة.

م	قسم	رمز
١	قسم العلوم الأساسية	BAS
		BME

Other Department Specializations that may be introduced by the faculty in the future.

بالاضافة الي أقسام التخصصات الاخري التي قد تطرحها الكلية مستقبلا.

Article (2): Offered Programs

Table 3 List of Undergraduate Programs offered by FoE – NUB

#	Program
1	Intelligent and Sustainable Civil Engineering Program
2	Digital Architecture Engineering Program
3	Communications and Computers Engineering Program
4	Mechatronics and Intelligent Machines Engineering Program
5	Electrical Power and Renewable Energy Engineering Program

Each department of the faculty is responsible for scientific research and teaching courses for all programs affiliated with it that require courses in the specialization of this program and per the program code. The program is responsible for the scientific content of the course under the supervision of the department affiliated with it and for nominating teachers for each course, whether from its department, another department or outside the college. The appointment of teachers from outside the college is subjected to the approval of the faculty Council.The engineering, humanities, general social and cultural courses that fall outside the scientific departments of the faculty will be taught by specialized members from of recognized universities and research centers. Additionally, the program is responsible for continuously developing the teaching methodologies and scientific content throughout the courses under the supervision of the department affiliated with it.

المادة (٢): البرامج المطروحة

الجدول ٣ قائمة برامج البكالوريوس التي تقدمها كلية الهندسة جامعة النهضة.

#	البرنامج
١	برنامج الهندسة المدنية الذكية والمستدامة
٢	برنامج هندسة العمارة الرقمية
٣	برنامج هندسة الاتصالات و الحاسبات
٤	برنامج هندسة الميكاترونكس والآلات الذكية
٥	برنامج هندسة الطاقة الكهربائية والطاقة المتجددة

يَعْنَى كل قسم من أقسام الكلية بالبحث العلمي وتدريس جميع المقررات التابعة له والتى قد تكون متطلب في برامج اخري ما دامت في تخصص هذا البرنامج، وحسب كود البرنامج. يختص البرنامج بالمحتوى العلمي للمقرر تحت إشراف القسم التابع له وترشيح المدرسين لكل مقرر سواء من قسمه أو قسم آخر أو خارج الكلية. يخضع تعيين المدرسين من خارج الكلية لموافقة مجلس الكلية. ويتم تدريس المقررات الهندسية والإنسانية والاجتماعية والثقافية العامة التي تقع خارج الأقسام العلمية بالكلية من قبل أعضاء هيئة التدريس من جامعات ومراكز بحثية معترف بها. بالإضافة إلى ذلك ، فإن البرنامج مسؤول عن التطوير المستمر لمنهجيات وطرائق التدريس والمحتوى العلمي لكافة المقررات تحت إشراف القسم التابع له.

Article (3): Degrees Awarded by the Faculty

Upon the recommendation of the Faculty Council and the approval of the University Council, the University grants a bachelor's degree in one of the following specializations

- Bachelor of Science in Intelligent and Sustainable Civil Engineering
- Bachelor of Science in Digital Architecture Engineering
- Bachelor of Science in Communications and Computers Engineering
- Bachelor of Science in Mechatronics and Intelligent Machines Engineering
- Bachelor of Science in Electrical Power and Renewable Energy Engineering

Degrees are awarded to students who have completed graduation requirements at the end of each semester (Fall – Spring – Summer)

Article (4): Procedure to add/freeze Programs

Any Department at FoE - NUB can propose a New Specialized Major or New Minor within the Discipline of this department. More than one department can jointly propose new Inter-Disciplinary (Major or Minor) Program.

Any group of 3 faculty members including at least one Professor at FoE - NUB can also submit a proposal for a new (Major or Minor) program.

The Program proposal should be submitted including all program information as in these bylaws. The proposal should also include a review of the available resources inside Nahda University to run this program.

All proposals should be submitted to the Faculty Council.

Once approved by the Faculty Council, it is forwarded to the Supreme Council of Universities through Nahda University and then added to these bylaws.

The Faculty Council may, freeze any Program temporarily or permanently if necessary.

المادة (٣): الدرجات العلمية التي تمنحها الكلية

بناء على موافقة مجلس الكلية ومجلس الجامعة تمنح الجامعة، درجة البكالوريوس في احد التخصصات التالية:

- بكالوريوس العلوم في الهندسة المدنية الذكية والمستدامة
- بكالوريوس العلوم في هندسة العمارة الرقمية
- بكالوريوس العلوم في هندسة الاتصالات والحاسبات
- بكالوريوس العلوم في هندسة الميكاترونكس والآلات الذكية
- بكالوريوس العلوم في هندسة الطاقة الكهربائية والطاقة المتجددة

تمنح الدرجات العلمية للطلاب الذين أكملوا متطلبات التخرج في نهاية كل فصل دراسي (الخريف - الربيع - الصيف)

المادة (٤): إجراءات إضافة / تجميد البرنامج

يمكن لأي قسم في كلية الهندسة – جامعة النهضة اقتراح تخصص رئيسي او فرعي جديد ضمن مجال هذا القسم. يمكن لأكثر من قسم علمي أن يقترح بشكل مشترك برنامجا جديدا متعدد التخصصات (رئيسي أو ثانوي).

كما يمكن لأي مجموعة من ٣ أعضاء هيئة تدريس بما في ذلك أستاذ واحد على الأقل في كلية الهندسة – جامعة النهضة تقديم اقتراح لبرنامج جديد (رئيسي أو ثانوي).

يجب تقديم مقترح البرنامج بما في ذلك جميع معلومات البرنامج كما هو موضح في هذه اللوائح.

يجب أن يتضمن المقترح أيضا مراجعة الموارد المتاحة داخل جامعة النهضة لتشغيل هذا البرنامج. و يجب تقديم جميع المقترحات إلى مجلس الكلية. بعد اعتماد المقترح من قبل مجلس الكلية ، يتم إحالته إلى المجلس الأعلى للجامعات عن طريق جامعة النهضة ثم إضافته إلى هذه اللوائح. يجوز لمجلس الكلية تجميد أي برنامج مؤقتا أو نهائيا إذا لزم الأمر.

Article (5): Agreements with other Universities

The Faculty Council, based on a proposal from the relevant Department Board, may propose agreements for cooperation in specific educational activities or to offer joint or dual degrees for one or some running study programs.

Article (6): Program Executive Committee

- Based on the approval of the Faculty Council, a Program Executive Committee is formed of four faculty members: the program's Executive Manager, who serves as chairman; two faculty members from academic departments related to the program; and the Coordinator of the Program. In case there are academic advisors for the program's students, the oldest of them is/are selected for membership in the Program Executive Committee.
- **The Program Executive Committee is responsible for:**

1- All administration aspects relevant to the program students.
2- Following up the academic advising for the program students.
3- Following the progress in study plan for each student until completing the program requirements.
4- Administration of the course equivalence for students transferred from other programs or from other faculties.
5- Following up the educational process and the field training.
6- Forming partnerships with distinguished training entities.
7- Planning course offerings at the beginning of every semester.
8- Identifying the requirement for developing the program's infrastructure, including auditoriums, lecture halls, exercise halls, laboratories, and their equipment.
9- The tasks assigned to them by the Faculty Council
   - The Program Executive Committee conducts monthly meetings to follow up on all activities related to the program.
   - The Program Executive Committee's recommendations are submitted to department consuil then to the Faculty Council for review and approval.

المادة (٥): الاتفاقيات مع الجامعات الأخرى

يجوز لمجلس الكلية بناء على اقتراح من مجلس القسم المعني اقتراح اتفاقيات للتعاون في أنشطة تعليمية محددة أو تقديم درجات مشتركة أو مزدوجة لبرنامج دراسي واحد أو أكثر.

المادة (٦): اللجنة التنفيذية للبرنامج

- بناء على موافقة مجلس الكلية ، يتم تشكيل لجنة تنفيذية للبرنامج من أربعة أعضاء هيئة تدريس: المدير التنفيذي للبرنامج ، الذي يشغل منصب رئيس مجلس الإدارة. عضوا هيئة تدريس من الأقسام الأكاديمية ذات الصلة بالبرنامج. ومنسق البرنامج. في حالة وجود مرشدين أكاديميين لطلاب البرنامج ، يتم الاختيار وفق الاقدمية لعضوية اللجنة التنفيذية للبرنامج
- **اللجنة التنفيذية للبرنامج مسؤولة عن:**

١. كافة الجوانب الإدارية ذات الصلة بطلاب البرنامج.
٢. متابعة الإرشاد الأكاديمي لطلاب البرنامج.
٣. متابعة التقدم في الخطة الدراسية لكل طالب حتى استكمال متطلبات البرنامج.
٤. إدارة معادلة المساقات للطلاب المحولين من برامج أخرى أو من كليات أخرى (المقاصات العلمية).
٥. متابعة العملية التعليمية والتدريب الميداني.
٦. تكوين شراكات مع جهات تدريبية متميزة.
٧. الخطة الدراسية لطرح المقررات في بداية كل فصل دراسي.
٨. تحديد متطلبات تطوير البنية التحتية للبرنامج بما في ذلك المدرجات وقاعات المحاضرات وقاعات التمارين والمختبرات ومعداتها.
٩. المهام الموكلة إليهم من قبل مجلس الكلية.
   - تعقد اللجنة التنفيذية للبرنامج اجتماعات دورية شهرية لمتابعة جميع الأنشطة المتعلقة بالبرنامج.
   - يتم تقديم توصيات اللجنة التنفيذية للبرنامج إلى قنصل القسم ثم إلى مجلس الكلية لمراجعتها واعتمادها.

Article (7): Program Executive Manager

The Dean appoints a faculty member as an executive manager for the program for two academic years, with the possibility of annual renewal based on his annual performance reports.

The Program Executive Manager shall undertake the following tasks.

1- Following up on the tasks assigned to the relevant Program Executive Committee.
2- Supervising the implementation of the program's internal bylaws.
3- Coordination between scientific programs in assigning teaching duties to faculty members.
4- Supervise administrative work by the program staff.
5- Supervising the regularity of academic advising in the program.
6- Follow up on the regularity of the educational process in accordance with the approved study schedules.
7- Organizing and supervising the program's scientific conference.
8- Develop a plan to develop and improve the efficiency of existing laboratories and coordinate with the college administration and funding agencies to provide modern equipment and tools that meet the requirements of the curricula.
9- Participate in updating course content based on modern trends in engineering and hold periodic meetings with students and faculty members to gather feedback on study materials and teaching methods.
10- Work to motivate faculty members and students to participate in scientific research and applied projects and direct research teams towards modern engineering fields and innovations with a societal impact.

The head of the department may hold the position of Program Executive manager unless he is appointed.

المادة (٧): المدير التنفيذي للبرنامج

يعين العميد عضو هيئة تدريس مديرا تنفيذيا للبرنامج لمدة عامين دراسيين، مع إمكانية التجديد السنوي بناء على تقارير أدائه السنوية.

يتولى المدير التنفيذي للبرنامج المهام التالية:

١. متابعة المهام الموكلة إلى اللجنة التنفيذية للبرنامج المعنية.
٢. الإشراف على تنفيذ اللائحة الداخلية للبرنامج.
٣. التنسيق بين البرامج العلمية في إسناد المهام التدريسية لأعضاء هيئة التدريس.
٤. الإشراف على العمل الإداري لموظفي البرنامج.
٥. الإشراف على انتظام الإرشاد الأكاديمي في البرنامج.
٦. متابعة انتظام العملية التعليمية وفقا للجداول الدراسية المعتمدة.
٧. التنظيم والإشراف على المؤتمرات العلمية للبرنامج.
٨. وضع خطة لتطوير وتحسين كفاءة المختبرات الموجودة والتنسيق مع إدارة الكلية وجهات التمويل لتوفير المعدات والأدوات الحديثة التي تلبي متطلبات المناهج الدراسية.
٩. المشاركة في تحديث محتوى المقرر بناء على الاتجاهات الحديثة في الهندسة وعقد لقاءات دورية مع الطلاب وأعضاء هيئة التدريس لجمع الملاحظات حول المواد الدراسية وطرق التدريس.
١٠. العمل على تحفيز أعضاء هيئة التدريس والطلاب على المشاركة في البحث العلمي والمشاريع التطبيقية وتوجيه فرق البحث نحو المجالات الهندسية الحديثة والابتكارات ذات الأثر المجتمعي.

يجوز لرئيس القسم شغل منصب المدير التنفيذي للبرنامج ما لم يتم تعيينه.

In cases where the Head of Department is not appointed as the Program Executive Manager, a complementary relationship shall be maintained between both roles. The Head of Department retains full academic and administrative authority as stipulated in the Universities Organization Law No. 49 of 1972 and its Executive Regulations.
Such authority includes
general oversight of the educational process within the department, ensuring integration of academic programs (if any), equitable distribution of teaching loads among faculty members, and coordination with the Faculty administration regarding all academic and administrative matters related to faculty affairs.
In this case, the Program Executive Manager shall remain responsible for the daily operational and executive functions of the program, under the supervision of the Head of Department and in accordance with the college's approved institutional structure.
In all cases, the Department Council retains its full academic and organizational authority as defined in the Universities Organization Law No. 49 of 1972 and its Executive Regulations.

Article (8): Coordinator of the Program

The Dean of the Faculty, based on the nomination of the Head of Department and the Executive Director of the Program, appoints a faculty member as the Program Coordinator for a period of two academic years with the possibility of annual renewal based on his annual performance reports. The Program Coordinator undertakes the following tasks:

1- The fulfillment of all quality assurance requirements in coordination with the program coordinator for continuous Development and Quality Assurance and Continuous Development and Quality

في الحالات التي لا يتم فيها تعيين رئيس القسم كمدير تنفيذي للبرنامج، يجب الحفاظ على علاقة تكاملية بين كلا الدورين. يحتفظ رئيس القسم بالصلاحيات الأكاديمية والإدارية الكاملة المنصوص عليها في قانون تنظيم الجامعات رقم ٤٩ لسنة ١٩٧٢ ولائحته التنفيذية.

وتشمل هذه السلطة:

الرقابة العامة على العملية التعليمية داخل القسم، وضمان تكامل البرامج الأكاديمية (إن وجدت)، والتوزيع العادل للأعباء التدريسية بين أعضاء هيئة التدريس، والتنسيق مع إدارة الكلية فيما يتعلق بجميع الأمور الأكاديمية والإدارية المتعلقة بشؤون الكلية.

في هذه الحالة ، يظل المدير التنفيذي للبرنامج مسئولا عن الوظائف التشغيلية والتنفيذية اليومية للبرنامج ، تحت إشراف رئيس القسم ووفقا للهيكل المؤسسي المعتمد للكلية.

وفي جميع الأحوال يحتفظ مجلس القسم بصلاحياته الأكاديمية والتنظيمية الكاملة على النحو المحدد في قانون تنظيم الجامعات رقم ٤٩ لسنة ١٩٧٢ ولائحته التنفيذية.

المادة (٨): منسق البرنامج

يقوم عميد الكلية بناء على ترشيح رئيس القسم والمدير التنفيذي للبرنامج بتعيين عضو هيئة تدريس كمنسق للبرنامج لمدة عامين دراسيين مع إمكانية التجديد السنوي بناء على تقارير أدائه السنوية، يتولى منسق البرنامج المهام التالية:

١. استيفاء جميع متطلبات ضمان الجودة بالتنسيق مع منسق البرنامج والتطوير المستمر وضمان الجودة في جامعة النهضة وفقا لمعايير الهيئة القومية

assurance Unit of FoE - NUB in accordance with the standards of the National Authority for Accreditation and Quality Assurance of Education and the relevant international bodies targeted by the faculty's strategic plan.

2- Preparing the annual self-study and annual report for the program.
3- Collect and analyze academic performance data (e.g., pass/fail rates, student satisfaction indicators, and feedback from faculty members) and include these findings in the annual and periodic reports submitted to the Faculty administration.
4- Identify potential problems and challenges that may hinder the educational process or affect students (e.g., lack of resources, difficulties in laboratories, weak electronic communication), and work on finding solutions in coordination with the program administration and the Faculty.
5- Establish permanent communication channels with relevant sectors (ministries, companies, and consulting offices, unions) to enhance training and employment opportunities, and ensure that learning outcomes are consistent with the needs of the labor market.

Article (9): Academic Advisor

The dean appoints an academic advisor for each group of students from the faculty academic staff, based on the nomination of the relevant department consuil and the opinion of the Head of the Department and the Executive Manager for the relevant program affiliated with it, to guide students in the course of their studies and help them choose courses and graduation project. Moreover, he determines the number of credit hours they can register according to their circumstances, abilities, and academic readiness, and helps them solve the problems they face while studying. In addition, he supervises the study programs for students, monitors their progress, monitors their performance, and follows up on field training as part of the educational process.

لضمان جودة التعليم والاعتماد والجهات الدولية ذات العلاقة المستهدفة بالخطة الاستراتيجية للكلية.

٢. الدراسة الذاتية السنوية والتقرير السنوي للبرنامج.
٣. جمع وتحليل بيانات الأداء الأكاديمي (على سبيل المثال، معدلات النجاح / الرسوب ومؤشرات رضا الطلاب والتغذية الراجعة من أعضاء هيئة التدريس) وإدراج هذه النتائج في التقارير السنوية والدورية المقدمة إلى إدارة الكلية.
٤. تحديد المشكلات والتحديات المحتملة التي قد تعيق العملية التعليمية أو تؤثر على الطلاب (مثل نقص الموارد، وصعوبات في المختبرات، وضعف الاتصال الإلكتروني)، والعمل على إيجاد الحلول بالتنسيق مع إدارة البرنامج والكلية.
٥. إنشاء قنوات اتصال دائمة مع القطاعات ذات العلاقة (الوزارات والشركات والمكاتب الاستشارية والنقابات) لتعزيز فرص التدريب والتوظيف، وضمان توافق مخرجات التعليم والتعلم مع احتياجات سوق العمل

المادة (٩): المرشد الأكاديمي

يعين العميد مرشدا أكاديميا لكل مجموعة من الطلاب من أعضاء هيئة التدريس بالكلية، بناء على ترشيح وتوصيات رئيس القسم المعني والمدير التنفيذي للبرنامج المختص التابع له، لتوجيه الطلاب في مسار دراستهم ومساعدتهم على اختيار المقررات ومشروع التخرج. كما يحدد عدد الساعات المعتمدة التي يمكنهم تسجيلها وفقا لظروفهم وقدراتهم وجاهزيتهم الأكاديمية، ويساعدهم على حل المشكلات التي يواجهونها أثناء الدراسة. بالإضافة إلى ذلك ، يشرف على البرامج الدراسية للطلاب ، ويراقب تقدمهم العلمي ، ويراقب أدائهم ، ويتابع التدريب الميداني كجزء من العملية التعليمية.

Accordingly:

1- The academic advisor meets with his students periodically to follow up on their results and provide them with guidance to avoid students being subjected to academic warnings.
2- Following up on cases of enrolment, warning and suspension in accordance with Faculty rules.
3- Following up on the students' results and their academic progress, in addition to their extracurricular activities.
4- All educational processes are carried out through the academic advisor and with his approval.
5- Each academic advisor sets an office hour in his time table each week, which is announced at the beginning of each semester to receive and discuss students' topics. A report on these topics is prepared and submitted to the Program Executive Committee.
6- The Academic Advisor may ask the student to repeat a course or some courses which he has already passed or ask him to register in specific courses to raise his cumulative GPA to that required for graduation.

Article (10): The Industry and Labor Market Advisory Board

The Higher Advisory Board for Industry and the Labor Market is formed at the Faculty under the chairmanship of the Dean, and the membership of Vice deans, Heads of Departments, Programs Executive Managers and Coordinators of the Programs for the different typologies representatives from bodies in the public and private sectors working in the areas of industry and the labor market related to the various specializations of the faculty, and its tasks are:

1- Submitting proposals regarding everything that serves to explore the future of the faculty's programs.

وبذلك:

١. يلتقي المرشد الأكاديمي بطلابه بشكل دوري لمتابعة نتائجهم وتقديم الإرشادات لهم لتجنب تعرض الطالب للانذار الأكاديمي.
٢. متابعة حالات ايقاف القيد والانذار الاكاديمي وفقا لقواعد الكلية.
٣. متابعة نتائج الطلاب وتقدمهم الأكاديمي بالإضافة إلى أنشطتهم اللاصفية.
٤. تتم جميع العمليات التعليمية من خلال المرشد الأكاديمي وبموافقته.
٥. يحدد كل مرشد أكاديمي ساعات عمل مكتبية في جدوله الزمني كل أسبوع ، والتي يتم الإعلان عنها في بداية كل فصل دراسي لاستقبال ومناقشة موضوعات الطلاب. يتم إعداد تقرير حول هذه الموضوعات وتقديمه إلى اللجنة التنفيذية للبرنامج.
٦. يجوز للمرشد الأكاديمي أن يطلب من الطالب إعادة مقرر أو بعض المقررات التي سبق أن اجتازها أو أن يطلب منه التسجيل في مقررات محددة لرفع معدله التراكمي المطلوب للتخرج.

المادة (١٠): المجلس الاستشاري الصناعي وسوق العمل

يشكل المجلس الاستشاري الأعلى للصناعة وسوق العمل بالكلية برئاسة العميد وعضوية وكلاء الكلية ورؤساء الأقسام والمديرين التنفيذيين للبرامج ومنسقي البرامج وممثلين عن جهات في القطاعين العام والخاص العاملة في مجالات الصناعة وسوق العمل المتعلقة بتخصصات الكلية المختلفة. وتتمثل مهامها فى:

١. تقديم المقترحات المتعلقة بكل ما يخدم استكشاف مستقبل برامج الكلية.

2- Providing ways to deepen the partnership between the faculty and the local and global community.
3- Contributing to the development of programs and curricula in accordance with the requirements of the labor market.
4- Contributing to the implementation of the faculty's strategic plan.
5- Submitting proposals that would provide material and moral support for the faculty.
6- Contributing to the development of a mechanism for coordination and the establishment of joint projects between the faculty and the sectors of society in order to find solutions to the problems of society in an integrated manner.
7- Suggesting methods to provide funding sources for the faculty's developmental projects.

The Industry and Labor Market Advisory Board is formed for each program under the chairmanship of the executive director of the program, coordinator of the program and the membership of representatives from entities in the public and/or private sectors working in the fields of industry and labor market related to the program, and its tasks are as follows:

1- Submitting proposals regarding whatever serves foreseeing program’s future.
2- Providing ways to deepen the partnership between the Faculty represented in the program and the local and global community.
3- Contributing to the development of program and curriculam in accordance with the requirements of the labor market.

٢. توفير سبل لتعميق الشراكة بين الكلية والمجتمع المحلي والعالمي.

٣. المساهمة في تطوير البرامج والمناهج وفقا لمتطلبات سوق العمل.

٤. المساهمة في تنفيذ الخطة الاستراتيجية للكلية.

٥. تقديم المقترحات التي من شأنها تقديم الدعم المادي والمعنوي لأعضاء هيئة التدريس.

٦. المساهمة في تطوير آلية للتنسيق وإقامة مشاريع مشتركة بين الكلية وقطاعات المجتمع من أجل إيجاد حلول لمشكلات المجتمع بشكل متكامل.

٧. اقتراح طرق لتوفير مصادر التمويل للمشاريع التنموية للكلية.

يتم تشكيل المجلس الاستشاري للصناعة وسوق العمل لكل برنامج برئاسة المدير التنفيذي للبرنامج ومنسق البرنامج وعضوية ممثلين عن الجهات المختلفة في القطاعين العام و/أو الخاص العاملة في مجالات الصناعة وسوق العمل المتعلقة بالبرنامج، وتتمثل مهامه فيما يلي:

١. تقديم المقترحات بشأن كل ما يخدم استشراف مستقبل البرنامج.

٢. توفير سبل تعميق الشراكة بين الكلية الممثلة في البرنامج والمجتمع المحلي والعالمي.

٣. المساهمة في تطوير البرامج والمناهج وفقا لمتطلبات سوق العمل.

4- Monitoring the performance of the academic units related to industry and the labor market in the courses of the program in order to find solutions to the problems of society in an integrated manner.
5- Suggesting participation in the training programs for the students of the program.
6- Submitting proposals that would provide financial and moral support for the program.

- The Advisory Board meets at the invitation of its chairman at least once a year, and it is permissible to hold board sessions inside or outside the faculty, and it is also permissible to invite whoever it sees from outside the board to attend its sessions.
- The membership of the boards shall be for two years, subject to renewal, and its members shall be granted a certificate of appreciation at the end of their membership term.

٤- متابعة أداء الوحدات الأكاديمية ذات الصلة بالصناعة وسوق العمل في مساقات البرنامج من أجل إيجاد حلول لمشكلات المجتمع بشكل متكامل.
٥- اقتراح المشاركة في البرامج التدريبية لطلاب البرنامج.
٦- تقديم المقترحات التي من شأنها تقديم الدعم المادي والمعنوي للبرنامج.

- يجتمع المجلس الاستشاري بدعوة من رئيسه مرة واحدة على الأقل في السنة، ويجوز عقد جلسات المجلس داخل الكلية أو خارجها، كما يجوز دعوة من يراه من خارج المجلس لحضور جلساته.
- تكون عضوية المجالس لمدة سنتين قابلة للتجديد، ويمنح أعضاؤها شهادة تقدير في نهاية مدة عضويتهم.

Part 3: Admission Regulations

Article (11): Admission Requirements:

- The faculty accepts the certificate of the Egyptian General Secondary School (Scientific section) or its equivalent, in accordance with the rules established by the Supreme Council of Universities, or technical diploma which approved by the Ministry of higher education.
- The medical examination shall prove the validity of the student to pursue the study.

Article (12): Accept depleted repetition times:

- Students transferring from other faculties or higher institutes are accepted in accordance with the approved academic regulations, provided that they have obtained a high school diploma or its equivalent with grades that meet the faculty's admission requirements, either in the year of obtaining the certificate or in the year of enrollment, whichever is lower. Additionally, the student must have been enrolled in a faculty or higher institute during the academic year preceding their transfer application.
- The student's enrollment level is determined by a specialized committee that evaluates the previously studied courses to ensure their alignment with the faculty's curriculum requirements. Based on this assessment, a decision regarding credit transfer is made and submitted to the Academic Council for approval upon the recommendation of the Dean of the Faculty.

الجزء ٣: لائحة القبول

المادة (١١): شروط القبول:

- تقبل الكلية شهادة الثانوية العامة المصرية (القسم العلمي) أو ما يعادلها وفقا للقواعد التي يضعها المجلس الأعلى للجامعات أو الدبلوم الفني المعتمد من وزارة التعليم العالي.
- يجب أن يثبت الفحص الطبي صحة الطالب لمتابعة الدراسة.

المادة (١٢): قبول مستنفذي مرات الرسوب:

- يتم قبول الطلاب المحولين من كليات أو معاهد عليا أخرى وفقا للوائح الأكاديمية المعتمدة، على أن يكونوا حاصلين على شهادة الثانوية العامة أو ما يعادلها بدرجات مستوفية لشروط القبول بالكلية، سواء في سنة الحصول على الشهادة أو في سنة القيد أيهما أقل. بالإضافة إلى ذلك ، يجب أن يكون الطالب مسجلا في كلية أو معهد عالي خلال العام الدراسي الذي يسبق طلب التحويل.
- يتم تحديد مستوى التحاق الطالب من قبل لجنة متخصصة تقوم بتقييم المقررات التي تمت دراستها سابقا للتأكد من مواءمتها مع متطلبات المناهج الدراسية للكلية. بناء على هذا التقييم ، يتم اتخاذ قرار بشأن معادلة الساعات المعتمدة وتقديمه إلى المجلس الأكاديمي للموافقة عليه بناء على توصية عميد الكلية.

Article (13): Transfer from a Corresponding or Non-Corresponding Faculty:

The student may be transferred to the faculty from corresponding or non-corresponding university faculties, provided that he has the total grades accepted by the faculty in the year of obtaining the secondary school or equivalent, and according to the regulations approved by the University Council and the Supreme Council of Private and National Universities.The student is enrolled at the level of study which corresponds to the number of credit hours approved in his new study plan.

Article (14): Transfer from Military Faculties:

Without prejudice to the conditions of admission to the faculty, the registration of dismissed students may be transferred from the military faculty "Military Technical College" (MTC) for non-validity of the military life or dismissal for failure of repetition times, as a new student at the first level provided that the student has obtained the total grades accepted by the faculty in the year of The qualification or year of separation is better for the student.

Article (15): Transfer of Students and Transfer of their Registration:

Students may be transferred to another equivalent faculty in the university or to a non-corresponding higher institutions provided that the minimum number of grades accepted by the faculty is obtained in the year of admission to the secondary school or equivalent, and according to the regulations approved by the University Council and the Supreme Council of Private and National Universities.

المادة (١٣): التحويل من كلية مناظرة أو غير مناظرة:

يجوز تحويل الطالب إلى الكلية من كليات الجامعة المناظرة أو غير المناظرة، على أن يكون حاصلا على مجموع الدرجات المقبولة لدى الكلية في سنة حصوله على الثانوية العامة أو ما يعادلها، ووفقا للأنظمة المعتمدة من مجلس الجامعة والمجلس الأعلى للجامعات الخاصة والاهلية. يتم تسجيل الطالب في المستوى الدراسي الذي يتوافق مع عدد الساعات المعتمدة في خطته الدراسية الجديدة.

المادة (١٤): النقل من الكليات العسكرية:

مع عدم الإخلال بشروط القبول في الكلية، يجوز نقل قيد الطلاب المفصولين من الكليات العسكرية "الكلية الفنية العسكرية" لعدم صلاحية الحياة العسكرية أو الفصل لتجاوز أوقات الرسوب، كطالب جديد في المستوى الأول على أن يكون الطالب قد حصل على مجموع الدرجات المقبولة لدى الكلية في سنة التأهيل أو سنة الانفصال ايهما أفضل للطالب.

المادة (١٥): نقل الطلاب ونقل تسجيلهم:

يجوز تحويل الطلاب إلى كلية أخرى معادلة في الجامعة أو إلى مؤسسات عليا غير مناظرة على أن يكون الحد الأدنى من الدرجات المقبولة لدى الكلية في سنة القبول في المدرسة الثانوية أو ما يعادلها، ووفقا للأنظمة المعتمدة من مجلس الجامعة والمجلس الأعلى للجامعات الخاصة والوطنية

Article (16): Change / Transfer of Specialization:

- A student can change his / her specialty upon his / her own request. Changing the speciality requires the approval of the two scientific department and the approval of the Faculty Council. The student shall complete the requirements of the degree specified in the regulations in the year of approval of the change of specialization.
- When a student is transferred from one program to another within the Faculty, the subjects that have not been equated by the other program are deleted from the student's academic registry.

المادة (١٦): تغيير / نقل التخصص:

- يمكن للطالب تغيير تخصصه بناء على طلبه الخاص. يتطلب تغيير التخصص موافقة القسمين العلميين وموافقة مجلس الكلية. أن يستكمل الطالب متطلبات الدرجة المحددة في اللائحة في سنة الموافقة على تغيير التخصص.
- عند تحويل الطالب من برنامج إلى آخر داخل الكلية ، يتم حذف المواد التي لم يتم مساواتها من قبل البرنامج الآخر من السجل الأكاديمي للطالب.

Part 4: Study Regulations based on Credit Hour System

Article (17): Programs' System:

- The official teaching Language is English, and the Faculty of Engineering will ascertain the student's proficiency in English. Textbooks, assignments, and examinations are all in English.
- The Faculty Council may, after taking the opinion of the Program Executive Committee and, depending on the nature of the academic courses, decide to hold the exam electronically in one or more courses. It is also permissible to have the exam in all or part of the course in a way that allows it to be corrected electronically.
- The Programs follow the Credit-Hour (CH) system. This is a measure of the contact hours between the teachers and the student per semester. One Credit Hour is equivalent to the course Contact Hours as follows:
  1. One-hour weekly lecture for a semester of 15 weeks.
  2. Two to three hours of weekly tutorial or Laboratory work for a semester of 15 weeks.
- One Contact Hour is divided into 50 minutes actual teaching and 10 minutes' break.
- For each course and Program in this curriculum, the European Credit Transfer and Accumulation System (ECTS) is given as a numerical descriptive value of qualification expressed in terms of Student Work-Load (SWL). It is defined as "the number of working hours typically required to complete the learning activities of course units to achieve their expected learning outcomes." This system was adopted

الجزء ٤: اللائحة الدراسية القائمة على نظام الساعات المعتمدة

المادة (١٧): نظام البرامج:

- لغة التدريس الرسمية هي اللغة الإنجليزية ، وستقوم كلية الهندسة بالتأكد من إجادة الطالب في اللغة الإنجليزية. الكتب الدراسية والتكليفات والامتحانات كلها باللغة الإنجليزية.
- يجوز لمجلس الكلية بعد أخذ رأي اللجنة التنفيذية للبرنامج وحسب طبيعة المقررات الأكاديمية أن يقرر إجراء الاختبار إلكترونيا في مقرر أو أكثر. كما يجوز إجراء الاختبار في كل أو جزء من المقرر بطريقة تسمح بتصحيحها إلكترونيا.
- تتبع البرامج نظام الساعة المعتمدة (CH). هذا مقياس لساعات الاتصال بين اعضاء هيئة التدريس والطالب في كل فصل دراسي. ساعة معتمدة واحدة تعادل ساعات الاتصال بالمقرر على النحو التالي:

١- محاضرة أسبوعية مدتها ساعة واحدة لمدة فصل دراسي مدته ١٥ أسبوعا.

٢- ساعتان إلى ثلاث ساعات من البرنامج التعليمي الأسبوعي أو العمل المختبري لمدة فصل دراسي مدته ١٥ أسبوعا.

- تنقسم ساعة الاتصال الواحدة إلى ٥٠ دقيقة من التدريس الفعلي و ١٠ دقائق من الاستراحة.
- لكل دورة وبرنامج في هذا اللائحة ، يعطي نظام التحويل والتراكم الاوروبي (ECTS) كقيمة وصفية رقمية للمؤهلات معبرا عنها من حيث عبء عمل الطالب (SWL). يتم تعريفه على أنه "عدد ساعات العمل المطلوبة عادة لإكمال أنشطة التعلم لوحدات المقرر لتحقيق نتائج

through the Bologna Declaration in 1999 at the University of Bologna in Italy to facilitate the mobility of students through Europe.

The total SWL comprises two components:

1- The structured SWL which is the scheduled teacher-contact hour's interventions.
2- The unstructured SWL (USWL) which is the time spent by students in their own self-study, completing course assignments, and preparing for all types of exams, e.g. assessment workload.

- It has been considered as an essential description of the educational qualification recommended in the European Higher Education Area as a key element of the Bologna and Europeans Framework Qualifications in terms of total SWL.
- One ECTS credit corresponds to 25 hours of total student working, and each 15-weeks academic semester should meet 30 ECTS. As an agreed requirement, 750 hours of total SWL are necessary in a full academic semester, or about 50 hours of total SWL/per week.

Expected values for each semester:

1. 16-19 CHs
2. 25-28 Contact hours per week for 15 weeks
3. 750 hours of total student work load
4. 30 ECTS

The distribution of marks is left to course designer to decide. It depends on the nature of the course. Some courses are theoretical, and therefore give more marks to the exams, and some courses are more practical and therefore give more marks to the projects, assignments and labs.

التعلم المتوقعة". تم اعتماد هذا النظام من خلال إعلان بولونيا في عام ١٩٩٩ في جامعة Bologna في إيطاليا لتسهيل تنقل الطلاب عبر أوروبا.

يتكون إجمالي SWL من مكونين:

١. SWL المنظم وهو تدخلات ساعات الاتصال بالمعلمين المجدولة.
٢. SWL غير المنظم (USWL) وهو الوقت الذي يقضيه الطلاب في دراستهم الذاتية ، وإكمال مهام المقرر ، والتحضير لجميع أنواع الامتحانات ، مثل عبء عمل التقييم.

- وقد اعتبر وصفا أساسيا للمؤهل التعليمي الموصى به في منطقة التعليم العالي الأوروبية كعنصر أساسي في مؤهلات إطار Bologna والأوروبيين من حيث إجمالي SWL.
- يتوافق رصيد ECTS واحد مع ٢٥ ساعة من إجمالي عمل الطالب ، ويجب أن يفي كل فصل دراسي مدته ١٥ أسبوعا ب ٣٠ ECTS. كشرط متفق عليه ، ٧٥٠ ساعة من إجمالي SWL ضرورية في فصل دراسي كامل ، أو حوالي ٥٠ ساعة من إجمالي SWL / في الأسبوع.

القيم المتوقعة لكل فصل دراسي:

١. ١٦-١٩ ساعة المعتمدة
٢. ٢٥-٢٨ ساعة اتصال في الأسبوع لمدة ١٥ أسبوعا
٣. ٧٥٠ ساعة من إجمالي عبء عمل الطلاب
٤. ٣٠ نظام التحويل والتراكم الاوروبي (ECTS)

يترك توزيع العلامات لمصمم المقرر لاتخاذ قرار. ذلك يعتمد على طبيعة المقرر. بعض المقررات نظرية ، وبالتالي تعطي المزيد من العلامات للامتحانات ، وبعض المقررات أكثر عملية وبالتالي تعطي المزيد من العلامات للمشاريع والتكليفات والمختبرات.

Article (18): Study Levels

- Whenever the student completes 25% of the Program requirements (36 Credit Hours), he will be transferred from one level to the next. The following Table shows the student status based on the completed number of achieved Credit Hours.

Table 4 Study Levels and relation to the achieved Credit Hours.

Study Level	Student Status	Achieved Credit Hours
1	Freshman	0% to less than 25% CH
2	Sophomore	25% to less than 50% CH
3	Junior	50% to less than 75% CH
4	Senior	75% to less than 100% CH

المادة (١٨): المستويات الدراسية

- عندما يكمل الطالب ٢٥٪ من متطلبات البرنامج (٣٦ ساعة معتمدة) ، سيتم نقله من مستوى إلى آخر. يعرض الجدول التالي حالة الطالب بناء على العدد المكتمل للساعات المعتمدة التي تم تحقيقها.

جدول ٤ مستويات الدراسة وعلاقتها بالساعات المعتمدة المحققة.

مستوى الدراسة	حالة الطالب	الساعات المعتمدة المحققة
١	طالب في الفرقة الأولى	٠٪ إلى أقل من ٢٥٪ الساعات المعتمدة
٢	طالب في الفرقة الثانية	٢٥٪ إلى أقل من ٥٠٪ الساعات المعتمدة
٣	طالب في الفرقة الثالثة	٥٠٪ إلى أقل من ٧٥٪ الساعات المعتمدة
٤	طالب في الفرقة الرابعة	٧٥٪ إلى أقل من ١٠٠٪ الساعات المعتمدة

Article (19): Academic Semesters and Course Registration

- The academic year comprises two main semesters (Fall semester and Spring Semester), and one optional summer semester:
  - ❖ First main semester (Fall): Begins on Saturday of the third week of September or the date set by the Supreme Council of Universities for the start of the study, and lasts for 15 weeks of teaching followed by 3 weeks of examinations. Course registration takes place within 3 weeks before the starting day of the semester.
  - ❖ Second main semester (Spring): Begins in February and lasts for 15 weeks followed by 3 weeks of examination. Course registration takes place within 1 week before the starting day of the semester.

المادة (١٩): الفصول الدراسية وتسجيل المقررات

- يتكون العام الدراسي من فصلين دراسيين رئيسيين (فصل الخريف وفصل الربيع) ، وفصل صيفي اختياري:
  - ❖ الفصل الدراسي الرئيسي الأول (الخريف): يبدأ يوم السبت من الأسبوع الثالث من شهر سبتمبر أو الموعد الذي يحدده المجلس الأعلى للجامعات لبدء الدراسة، ويستمر لمدة ١٥ أسبوعا من التدريس تليها ٣ أسابيع من الامتحانات. يتم تسجيل المقرر في غضون ٣ أسابيع قبل يوم بدء الفصل الدراسي.
  - ❖ الفصل الدراسي الرئيسي الثاني (الربيع): يبدأ في فبراير ويستمر لمدة ١٥ أسبوعا يليه ٣ أسابيع من الامتحان. يتم تسجيل المقرر في غضون أسبوع واحد قبل يوم بدء الفصل الدراسي.

❖ Summer semester: Begins late June or early July and lasts for 7 weeks followed by 1 week of examination. Course registration takes place within 1 week before the starting day of the semester.

- The detailed academic calendar is approved by the Faculty council and announced to students on the Faculty website before the start of the academic year.
- Registration in the summer semester is optional.
- New students' enrolment in the programs takes place all year long, after fulfilling all the programs enrolment requirements and paying the enrolment fees, per the student status.

❖ الفصل الصيفي: يبدأ في أواخر يونيو أو أوائل يوليو ويستمر لمدة ٧ أسابيع يليه أسبوع واحد من الامتحان. يتم تسجيل المقرر في غضون أسبوع واحد قبل يوم بدء الفصل الدراسي.

- يتم اعتماد التقويم الأكاديمي التفصيلي من قبل مجلس الكلية والإعلان عنه للطلاب على موقع الكلية قبل بدء العام الدراسي.
- التسجيل في الفصل الصيفي اختياري.
- يتم تسجيل الطلاب الجدد في البرامج طوال العام ، بعد استيفاء جميع متطلبات التسجيل في البرامج ودفع رسوم التسجيل ، حسب حالة الطالب.

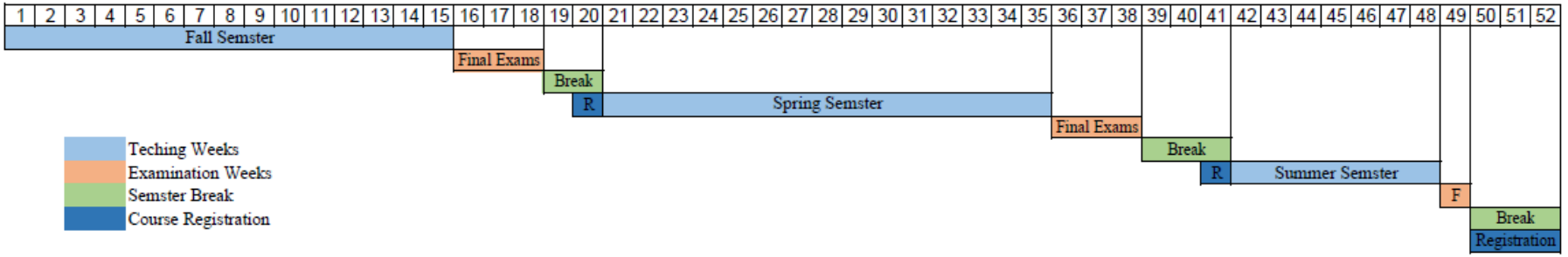

Figure 1 Academic Calendar

Article (20): Program Study Duration

- The minimum allowed study duration is eight main semesters.
- The maximum allowed study duration is eight academic years, which does not include frozen semesters (suspension of registration - medical excuse - etc.) for reasons accepted by the Faculty of Engineering Council, after which the student is dismissed from the programs.

Article (21): Terms of Course Registration

- The student may register for courses in the main semesters with a maximum total of Credit Hours according to the following rules (after approval of the Academic Advisor):
  - ❖ Up to 21 Credit Hours, for a student with a Cumulative GPA higher than or equal to 3.0.
  - ❖ Up to 18 Credit Hours, for a student with a Cumulative GPA higher than or equal to 2.0 but less than 3.0.
  - ❖ Up to 14 Credit Hours, for a student with a Cumulative GPA less than 2.0.

The student may register courses in the summer semester in a maximum total Credit Hours according to the following rules (after approval of the Academic Advisor):

- ❖ Up to 9 Credit Hours,

The student may register three additional credit hours for the maximum if his graduation depends on that with a recommendation of his academic Advisor and the approval of the academic board.

المادة (٢٠): مدة دراسة البرنامج

- الحد الأدنى لمدة الدراسة المسموح بها هو ثمانية فصول دراسية رئيسية.
- الحد الأقصى لمدة الدراسة المسموح بها هو ثماني سنوات دراسية، ولا تشمل الفصول الدراسية المجمدة (تعليق التسجيل - العذر الطبي - إلخ) لأسباب يقتربها مجلس كلية الهندسة، وبعدها يتم فصل الطالب من البرامج.

المادة (٢١): شروط التسجيل في المقررات

- يجوز للطالب التسجيل في المقررات في الفصول الدراسية الرئيسية بحد أقصى إجمالي الساعات المعتمدة وفقا للقواعد التالية (بعد موافقة المرشد الأكاديمي):
  - ❖ لغاية ٢١ ساعة معتمدة، للطالب الذي لديه معدل تراكمي أعلى من أو يساوي ٣,٠.
  - ❖ لغاية ١٨ ساعة معتمدة، للطالب الذي لديه معدل تراكمي أعلى من أو يساوي ٢,٠ ولكن أقل من ٣,٠.
  - ❖ لغاية ١٤ ساعة معتمدة، للطالب الذي لديه معدل تراكمي أقل من ٢,٠.

يجوز للطالب تسجيل المقررات في الفصل الصيفي بحد أقصى إجمالي الساعات المعتمدة وفقا للقواعد التالية (بعد موافقة المرشد الأكاديمي):

- ❖ ما يصل إلى ٩ ساعات معتمدة ،

يجوز للطالب تسجيل ثلاث ساعات معتمدة إضافية بحد أقصى إذا كان تخرجه يعتمد على ذلك بتوصية من مرشده الأكاديمي وبموافقة المجلس الأكاديمي.

Article (22): Degree Awarding Requirements

- To obtain the Bachelor of Science Degree in Engineering, the student must successfully complete the required Credit Hours in one of the Majors according to the requirements stipulated in Part 5, with a cumulative GPA at graduation of at least 2.0.
- The student must pass all zero-credit courses in his Program.
- The student must perform Field Training in accordance with the rules stipulated in these bylaws.
- The student can study a number of courses in another University, which has a cooperation agreement with Nahda University regarding the transfer of Credits. This requires prior approval from FoE - NUB. The Credit Hours of these courses are included in the student's graduation requirements, if the Credit Hours of these courses do not exceed 40% of total Credit Hours for the program.

Article (23): Field Training

- The student must complete two field-training sessions, each lasting 6 weeks, making the total training duration 12 weeks, in an industrial or service facility related to the student's program.
- The training follow-up will be handled by the academic advisor assigned by Program Executive Committee.
- A committee of examiners shall be formed by the competent department approved by the dean of the Faculty to hold an oral exam for the student
- The student must submit a technical report to committee of examiners at the end of the training period.

المادة (٢٢): متطلبات منح الدرجات

- للحصول على درجة بكالوريوس العلوم في الهندسة ، يجب على الطالب إكمال الساعات المعتمدة المطلوبة بنجاح في أحد التخصصات وفقا للمتطلبات المنصوص عليها في الجزء ٥ ، مع معدل تراكمي عند التخرج لا يقل عن ٢,٠.
- يجب على الطالب اجتياز جميع المقررات بدون ساعات معتمدة في برنامجه.
- يجب على الطالب إجراء التدريب الميداني وفقا للقواعد المنصوص عليها في هذه اللائحة.
- يمكن للطالب دراسة عدد من المقررات في جامعة أخرى لها اتفاقية تعاون مع جامعة النهضة بشأن تحويل الساعات المعتمدة. هذا يتطلب موافقة مسبقة من FoE - NUB. يتم تضمين الساعات المعتمدة لهذه المساقات في متطلبات تخرج الطالب، إذا كانت الساعات المعتمدة لهذه المقررات لا تتجاوز ٤٠٪ من إجمالي الساعات المعتمدة للبرنامج.

المادة (٢٣): التدريب الميداني

- يجب على الطالب إكمال جلستين تدريبيتين ميدانيتين ، مدة كل منهما ٦ أسابيع ، مما يجعل المدة الإجمالية للتدريب ١٢ أسبوعا ، في منشأة صناعية أو خدمية ذات صلة ببرنامج الطالب.
- سيتم التعامل مع متابعة التدريب من قبل المرشد الأكاديمي المعين من قبل اللجنة التنفيذية للبرنامج.
- تشكل القسم المختص لجنة من الممتحنين يوافق عليها عميد الكلية لإجراء امتحان شفوي للطالبة
- يجب على الطالب تقديم تقرير فني إلى لجنة الممتحنين في نهاية فترة التدريب.

- The company should submit a student's training evaluation form to the committee of examiners at the end of the training period
- The student's score in the field-training course is calculated on the basis of 50% of the student's activities (including the technical report + evaluation form from the company) and 50% for the oral exam by the examiners committee
- The field training is evaluated but does not count towards the cumulative GPA calculation.

Article (24): Adding and Dropping course

- Upon the approval of the academic advisor, the student may add courses in the first week of the main semesters, or the first three days of the summer semester.
- The student can drop courses, until the end of the second week of the main semesters or the end of the first week of the summer semester.

Article (25): Withdrawal from course

- The student may withdraw from the registration in one or more courses with an excuse accepted by the Faculty Council after the fourth week until the end of the tenth week or the first five weeks for the summer semester, taking into account the minimum academic load of the semester. In this case, the courses that have been withdrawn are recorded in the student's academic record.
- The student does not fail the withdrawn course, provided that the withdrawal application and approval are finalized within the time limit mentioned in the previous point.

- يجب على الشركة تقديم نموذج تقييم تدريب الطالب إلى لجنة الفاحصين في نهاية فترة التدريب.
- يتم احتساب درجة الطالب في المقرر لتدريبية الميدانية على أساس ٥٠٪ من أنشطة الطالب (بما في ذلك التقرير الفني + نموذج التقييم من الشركة) و ٥٠٪ للامتحان الشفوي من قبل لجنة الممتحنين.
- يتم تقييم التدريب الميداني ولكن لا يتم احتسابه ضمن حساب المعدل التراكمي.

المادة (٢٤): إضافة وحذف المساق

- يجوز للطالب بعد موافقة المرشد الأكاديمي إضافة مقررات في الأسبوع الأول من الفصول الدراسية الرئيسية، أو الأيام الثلاثة الأولى من الفصل الصيفي.
- يمكن للطالب التخلي عن المقررات حتى نهاية الأسبوع الثاني من الفصول الدراسية الرئيسية أو نهاية الأسبوع الأول من الفصل الصيفي.

المادة (٢٥): الانسحاب من المسار

- يجوز للطالب الانسحاب من التسجيل في مقرر أو أكثر بعذر يقبله مجلس الكلية بعد الأسبوع الرابع حتى نهاية الأسبوع العاشر أو الأسابيع الخمسة الأولى للفصل الصيفي، مع مراعاة الحد الأدنى للعبء الدراسي للفصل الدراسي. في هذه الحالة ، يتم تسجيل المقررات التي تم سحبها في السجل الأكاديمي للطالب.
- ألا يتخلف الطالب عن المقرر المسحوب بشرط الانتهاء من طلب الانسحاب والموافقة عليه خلال المهلة المذكورة في النقطة السابقة.

- The student gets a (W) grade in his academic record for the withdrawn course and is allowed to register that course (with full attendance and performing all activities including examinations) in a following semester.
- A student is not allowed to withdraw from a course if the number of hours the student takes in the semester is less than 12 hours, according to article (19).

Article (26): Course Repeating

The student can repeat a course for improvement if his grade satisfies the minimum passing requirement, according to the following rules:

- The student gets the higher grade of the course after repeating. This grade is the one that will be accounted for in the cumulative GPA, on condition that the improvement should be shown in the student's transcript.
- The maximum number of times that the student can repeat for repeating is **five times** during his/her study duration, except for improving courses with the purpose of getting out of the academic probation or satisfying the graduation requirements.
- For the elective course, the student is allowed to change it in the following semesters. This is subject to the approval of the academic advisor and the requirements of his program.
- In case that the student fails in the repetition, the previous grade for the course is cancelled and is not counted after that, the student is considered to have failed and gets an F grade.
- If the student fails a course (gets F grade), he should repeat the course (full attendance and performing all activities), **according to the following rules:**

- يحصل الطالب على درجة (W) في سجله الأكاديمي للمقرر المسحوب ويسمح له بتسجيل ذلك المقرر (مع الحضور الكامل وأداء جميع الأنشطة بما في ذلك الامتحانات) في فصل دراسي تالي.
- لا يسمح للطالب بالانسحاب من مقرر إذا كان عدد الساعات التي يستغرقها الطالب في الفصل الدراسي أقل من ١٢ ساعة، وفقا للمادة (١٩).

المادة (٢٦): تكرار المقرر

يمكن للطالب إعادة مقرر للتحسين إذا استوفى علامته الحد الأدنى من متطلبات النجاح ، وفقا للقواعد التالية:

- يحصل الطالب على الدرجة الأعلى من المقرر بعد التكرار. هذا المعدل هو الذي سيتم احتسابه في المعدل التراكمي ، بشرط أن يظهر التحسن في كشف درجات الطالب.
- الحد الأقصى لعدد المرات التي يمكن للطالب التكرار فيها هو **خمس مرات خلال** مدة دراسته، باستثناء تحسين المقررات بغرض الخروج من الاختبار الأكاديمي أو استيفاء متطلبات التخرج.
- بالنسبة للمقرر الاختياري ، يسمح للطالب بتغييره في الفصول الدراسية التالية. يخضع ذلك لموافقة المرشد الأكاديمي ومتطلبات برنامجه.
- في حالة فشل الطالب في الرسوب يتم إلغاء الدرجة السابقة للمقرر ولم يتم احتسابه بعد ذلك يعتبر الطالب راسبا ويحصل على درجة F.
- إذا رسب الطالب في مقرر (حصل على درجة F) ، فيجب عليه إعادة المقرر (الحضور الكامل وأداء جميع الأنشطة) ، **وفقا للقواعد التالية:**

- The maximum grade of the repeated course is B+.
- The student gets the grade of the course after repeating. This grade is the one that will be accounted for in the cumulative GPA, on condition that the repeating should be shown in the student's transcript.
- If a student repeats a course, he is required to repeat all course assessment criteria and will be completely re-evaluated. The course grade is calculated from scratch.

Article (27): Enrolment Suspension

The Faculty Council may suspend a student's enrolment for four consecutive or separate main semesters during study duration in the faculty if he presents an excuse that prevents him from regularly attending in studies, which the Faculty Council has investigated. In case of necessity, the University Council may increase the period of suspension of enrolment.

Article (28): Re-Enrollment

- Re-enrollment in the faculty with the approval of the faculty Council and the Academic Council after taking the opinion of the academic advisor and the Council of the department and the student's exhaustion academic warnings within the required period of time as a minimum of re-enrollment, which are four main semesters.
- The student shall pay the re-entry fee determined by the University Council, upon becoming a regular student once the absence of the reason for his dismissal from the faculty has ceased.
- The student shall register in the term of Re-enrollment a study load according to the last general cumulative rate before re-enrollment

- الحد الأقصى لدرجة المقرر المعاد هو B+.
- يحصل الطالب على تقدير المقرر بعد التكرار. هذا المعدل هو الذي سيتم احتسابه في المعدل التراكمي ، بشرط أن يظهر التكرار في كشف علامات الطالب.
- إذا كرر الطالب مقررا ، فسيطلب منه تكرار جميع معايير تقييم المقرر وسيتم إعادة تقييمه بالكامل. يتم احتساب درجة المقرر من البداية.

المادة (٢٧): تعليق القيد

يجوز لمجلس الكلية إيقاف قيد الطالب لمدة أربعة فصول دراسية رئيسية متتالية أو منفصلة خلال مدة الدراسة في الكلية إذا قدم عذرا يمنعه من الحضور المنتظم للدراسة، والتي قام مجلس الكلية بالتحقيق فيها. يجوز لمجلس الجامعة في حالة الضرورة زيادة فترة وقف التسجيل

المادة (٢٨): إعادة القيد

- إعادة القيد بالكلية بموافقة مجلس الكلية والمجلس الأكاديمي بعد أخذ رأي المرشد الأكاديمي ومجلس القسم وتحذيرات استنفاد الطالب الأكاديمي خلال المدة الزمنية المطلوبة كحد أدنى لإعادة القيد وهي أربعة فصول دراسية رئيسية.
- يسدد الطالب رسوم العودة التي يحددها مجلس الجامعة، عند بلوغه طالبا منتظما بعد زوال سبب فصله من الكلية.
- يسجل الطالب في مدة إعادة القيد عبء دراسي وفقا لآخر معدل تراكمي عام قبل إعادة التسجيل.

- The student may be registered and re-enrolled in the following cases:
  1. The new student who has not completed the registration procedures for an acceptable excuse.
  2. The student who withdrew his papers and is restricted to the faculty and gave an acceptable excuse.
  3. The student who did not apply to the Coordination Office in the year of obtaining the high school or its equivalent with acceptable excuse

Article (29): Student Evaluation

- The marks of each course are distributed as percentages of the total mark, divided into Course Activities, Mid-Term Assessment, Technical Assessment, and Final Assessment.
- With considering Article (15), the student must attend at least 75% of tutorial and laboratory hours for the course, otherwise he is considered failed, in this case he is not allowed to attend the technical assessment or final assessment of the course (if any).
- The Faculty Council may, based on the study of the Executive Committee of the program and after taking the opinion of the relevant department council and according to the nature of the courses, decide to decide to hold the exam in all or part of the course in a way that allows it to be corrected electronically. This will be presented to the University's Education and Student Affairs Council for approval and submitted to the Supreme Council for approval.
- For the student to pass a course, the minimum mark that must be earned in the final assessment is 40% of the total final assessment marks, otherwise the student will fail the course irrespective of the total marks he earned in the course and he will get an F grade in this course.

- **يجوز تسجيل الطالب وإعادة تسجيله في الحالات التالية:**
  ١. الطالب المستجد الذي لم ينته إجراءات التسجيل لعذر مقبول.
  ٢. الطالب الذي سحب أوراقه ويقتصر على أعضاء هيئة التدريس وقدم عذرا مقبولا.
  ٣. الطالب الذي لم يتقدم إلى مكتب التنسيق في سنة حصوله على الثانوية العامة أو ما يعادلها بعذر مقبول

المادة (٢٩): تقييم الطالب

- يتم توزيع علامات كل مقرر كنسب مئوية من العلامة الإجمالية ، مقسمة إلى أنشطة المقرر، وتقييم منتصف المدة ، والتقييم الفني ، والتقييم النهائي.
- مع مراعاة المادة (١٥) يجب على الطالب حضور ٧٥٪ على الأقل من الساعات التعليمية والمختبرية للمقرر، وإلا اعتبر راسبا، وفي هذه الحالة لا يسمح له بحضور التقييم الفني أو التقييم النهائي للمقرر (إن وجد).
- يجوز لمجلس الكلية بناء على دراسة اللجنة التنفيذية للبرنامج وبعد أخذ رأي مجلس القسم المعني ووفقا لطبيعة المقررات أن يقرر عقد الاختبار في كل أو جزء من المقرر بما يسمح بتصحيحه إلكترونيا. وسيتم عرض هذا المبلغ على مجلس شؤون التعليم والطلاب بالجامعة للموافقة عليه ورفعه إلى المجلس الأعلى للموافقة عليه.
- لكي يجتاز الطالب مقررا ، فإن الحد الأدنى للعلامة التي يجب الحصول عليها في التقييم النهائي هو ٤٠٪ من إجمالي علامات التقييم النهائي ، وإلا سيرسوب الطالب في المقرر بغض النظر عن إجمالي العلامات التي حصل عليها في المقرر وسيحصل على درجة F في هذا المقرر.

- The student fails the course if he obtains an F grade (less than 60% of the course marks) or was not allowed to attend the final assessment because of exceeding the absence percentage or cheating … etc. or did not attend the final assessment without submitting a prior excuse that is accepted by the Education and Student Affairs Committee and approved by the Faculty Council of Engineering.
- Zero-Credit courses are marked as Pass or Fail. The student gets a grade but does not contribute to the cumulative GPA. To pass the course, the student should get at least 60% of the course total marks.

Article (30): Course Grades

- The grade of each course is calculated based on the marks a student collects during his study of this course (Student Activities – Mid Term Assessment – Technical Assessment – Final Assessment). The following table shows how to calculate the grades and equivalent points based on the collected marks. The student must get a minimum Grade D in order to pass the course and be considered in the calculation of the Semester GPA and Cumulative GPA.
- The distribution of the marks among different assessment typologies is determined in the course description table of this Bylaws. However, the Faculty Council can modify the distribution for a course due to the different nature of the program upon request of the concerned Department and announce to the students before the beginning of the semester.

- رسوب الطالب في المقرر إذا حصل على درجة F (أقل من ٦٠٪ من علامات المقرر) أو لم يسمح له بحضور التقييم النهائي بسبب تجاوز نسبة الغياب أو الغش ... إلخ أو لم يحضر التقييم النهائي دون تقديم عذر مسبق تقبله لجنة شئون التعليم والطلاب ويوافق عليه مجلس كلية الهندسة.
- يتم وضع علامة على المقررات التدريبية بدون ساعات معتمدة على أنها ناجحة أو راسبة. يحصل الطالب على درجة ولكنه لا يساهم في المعدل التراكمي. لاجتياز المقرر ، يجب أن يحصل الطالب على ٦٠٪ على الأقل من إجمالي درجات المقرر.

المادة (٣٠): درجات المقررات

- يتم احتساب درجة كل مقرر بناء على العلامات التي يجمعها الطالب أثناء دراسته لهذا المقرر (الأنشطة الطلابية – تقييم منتصف الفصل الدراسي – التقييم الفني – التقييم النهائي). يوضح الجدول التالي كيفية حساب الدرجات والنقاط المكافئة بناء على العلامات التي تم جمعها. يجب أن يحصل الطالب على درجة D كحد أدنى لاجتياز المقرر وأن يتم أخذه في الاعتبار عند حساب المعدل التراكمي للفصل الدراسي والمعدل التراكمي.
- يتم تحديد توزيع العلامات بين أنماط التقييم المختلفة في جدول وصف المقرر في هذه اللائحة. ومع ذلك ، يمكن لمجلس الكلية تعديل التوزيع لمقرر ما نظرا لاختلاف طبيعة البرنامج بناء على طلب القسم المعني والإعلان عنه للطلاب قبل بداية الفصل الدراسي.

Table 5 Course marks, grades and equivalent points.

Marks % Collected	Student Status	Points
97% and above	A+	4.0
93% to less than 97%	A	
89% to less than 93%	A-	3.7
84% to less than 89%	B+	3.3
80% to less than 84%	B	3.0
76% to less than 80%	B-	2.7
73% to less than 76%	C+	2.3
70% to less than 73%	C	2.0
67% to less than 70%	C-	1.7
64% to less than 67%	D+	1.3
60% to less than 64%	D	1.0
Less than 60%	F	0.0

الجدول ٥ - علامات المقررات الدراسية والدرجات والنقاط المعادلة.

العلامات ٪ المحصلة	حالة الطالب	النقاط
٩٧٪ فما فوق	+A	٤,٠
٩٣٪ إلى أقل من ٩٧٪	A	
٨٩٪ إلى أقل من ٩٣٪	-A	٣,٧
٨٤٪ إلى أقل من ٨٩٪	+B	٣,٣
٨٠٪ إلى أقل من ٨٤٪	B	٣,٠
٧٦٪ إلى أقل من ٨٠٪	-B	٢,٧
٧٣٪ إلى أقل من ٧٦٪	+C	٢,٣
٧٠٪ إلى أقل من ٧٣٪	C	٢,٠
٦٧٪ إلى أقل من ٧٠٪	-C	١,٧
٦٤٪ إلى أقل من ٦٧٪	+D	١,٣
٦٠٪ إلى أقل من ٦٤٪	D	١,٠
أقل من ٦٠٪	F	٠,٠

Article (31): Estimates not included in the calculation of the student's GPA:

المادة (٣١): التقديرات غير المشمولة بحساب المعدل التراكمي للطالب:

Table 6 Grades don’t include in the calculation of the student's GPA

Rating	Description
P	Pass
F	Fail
I	Incomplete
W	Withdraw
AU	Audit
FW	Forbidden
FX	absence without excuse

الجدول ٦ لا يتم تضمين الدرجات في حساب المعدل التراكمي للطالب

تقييم الموقع	وصف
P	ناجح
F	راسب
I	غير مكتمل
W	انسحاب
AU	إستماع
FW	حرمان
FX	غياب بدون عذر

Article (32): Prerequisite:

- The prerequisite is a course which must be completed for the study of a subsequent course and the following conditions apply:
  1. A student may not take a course before successfully completing the prerequisite.
  2. A student may register one course in parallel with its prerequisite upon the approval of the lecturer or the department, if he is in the final term for graduation.

Article (33): Incomplete (I):

- If a student does not attend the final exam of the course in a semester with an excuse that is accepted by the Program Executive Committee and approved by the Faculty Council of Engineering, the course is considered Incomplete.
- The student will temporarily receive a grade (I) in the course until the exam is conducted. If the student fails to attend the final exam at the next available date two weeks after the end of the academic semester, the student will receive a grade (F) in that course. Grade (I) will not count towards the student's cumulative GPA.
- If the student cannot complete the study requirements of a specific course at the end of the semester, the student will be given an "Incomplete" grade. The instructor will fill in an incomplete form specifying the reasons and specify the assignments that the student did not complete. The student shall perform the makeup exam two week after the last exam in the Final Term Exam.

المادة (٣٢): المتطلب السابق:

- الشرط الأساسي هو مقرر يجب إكماله لدراسة مقرر لاحق وتنطبق الشروط التالية:

١. لا يجوز للطالب أن يأخذ مقررا قبل إكمال الشرط الأساسي بنجاح.

٢. يجوز للطالب تسجيل مقرر واحد بالتوازي مع متطلباته الأساسية بعد موافقة المحاضر أو القسم إذا كان في الفصل الدراسي النهائي للتخرج.

المادة (٣٣): غير مكتمل (I):

- إذا لم يحضر الطالب الامتحان النهائي للمقرر في فصل دراسي بعذر تقبل به اللجنة التنفيذية للبرنامج ويوافق عليه مجلس كلية الهندسة يعتبر المقرر غير مكتمل.
- سيحصل الطالب مؤقتا على درجة (I) في المقرر حتى يتم إجراء الاختبار. إذا فشل الطالب في حضور الاختبار النهائي في الموعد التالي المتاح بعد أسبوعين من نهاية الفصل الدراسي ، فسيحصل الطالب على درجة (F) في ذلك المقرر. لن يتم احتساب الدرجة (I) ضمن المعدل التراكمي للطالب.
- . إذا لم يتمكن الطالب من إكمال متطلبات الدراسة لمقرر معين في نهاية الفصل الدراسي ، منح الطالب درجة "غير مكتملة". سيقوم المدرس بملء نموذج غير مكتمل يحدد الأسباب ويحدد الواجبات التي لم يكملها الطالب. يجب على الطالب إجراء الامتحان تعويضي بعد أسبوعين من الامتحان الأخير من امتحان الفصل النهائي.

- The student must complete all the course requirements within two weeks after the last exam in the Final Term Exam in the same semester; otherwise he/she will receive a failed assessment in the course.

Article (34): Study Dismissal and Academic Warning

- A student receives an academic warning if his/her GPA is less than 2.0 in any main semester.
- A student will be dismissed from the university if his/her cumulative GPA remains below 2.0 for half of the required study duration (excluding summer semesters).
- If the student raises his cumulative GPA to 2.0 or above in any main semester, the count of consecutive academic warnings will be reset.
- If a student fails to meet graduation requirements within the maximum study duration, they will be permanently dismissed from the university.
- The student will be dismissed from FoE - NUB if he/she obtains a GPA of less than 1.0 in the first three consecutive main semesters.
- A student facing dismissal due to inability to raise his/her GPA to 2.0 will be granted one final opportunity.
- This opportunity includes studying two consecutive main semesters, plus a summer semester, provided that:
  - ❖ The student has successfully completed at least 80% of the total credit hours required for graduation.
  - ❖ There is a realistic chance to raise his/her semester GPA to at least 2.0.

- يجب على الطالب إكمال جميع متطلبات المقرر في غضون أسبوعين بعد الامتحان الأخير في امتحان الفصل النهائي في نفس الفصل الدراسي. وإلا فسوف يتلقى تقييما فاشلا في المقرر.

المادة (٣٤): الفصل الدراسي والتنبيه الأكاديمي

- يتلقى الطالب إنذارا أكاديميا إذا كان معدله التراكمي أقل من ٢,٠ في أي فصل دراسي رئيسي.
- سيتم فصل الطالب من الجامعة إذا ظل معدله التراكمي أقل من ٢,٠ لمدة نصف مدة الدراسة المطلوبة (باستثناء الفصول الصيفية).
- إذا رفع الطالب معدله التراكمي إلى ٢,٠ أو أعلى في أي فصل دراسي رئيسي ، إعادة تعيين عدد التحذيرات الأكاديمية المتتالية.
- إذا فشل الطالب في تلبية متطلبات التخرج خلال الحد الأقصى لمدة الدراسة ، فصله نهائيا من الجامعة.
- سيتم فصل الطالب من كلية الهندسة جامعة النهضة إذا حصل على معدل تراكمي أقل من ١,٠ في الفصول الدراسية الرئيسية الثلاثة الأولى المتتالية.
- سيتم منح الطالب الذي يواجه الفصل بسبب عدم قدرته على رفع معدله التراكمي إلى ٢,٠ فرصة أخيرة.
- تشمل هذه الفرصة دراسة فصلين دراسيين رئيسيين متتاليين، بالإضافة إلى فصل صيفي، شريطة:
  - ❖ أكمل الطالب بنجاح ما لا يقل عن ٨٠٪ من إجمالي الساعات المعتمدة المطلوبة للتخرج.
  - ❖ هناك فرصة واقعية لرفع المعدل التراكمي للفصل الدراسي إلى ٢,٠ على الأقل.

Article (35): Calculation of the Cumulative Grade Point Average (GPA)

- The Cumulative GPA score for a semester is calculated by obtaining the GPA score multiplied by the number of credit hours for each course to produce the so-called quality points. The sum of the quality points is then divided by the total number of credit hours in which the Cumulative GPA score is calculated.
- To obtain CGPA, the total qualitative score is divided by the total credit hours of the courses whose points are included in the calculation of the average CGPA for all semesters. The student's academic load in any semester (excluding the summer semester) is determined by the CGPA and not by the GPA of the previous semester.

  Note: The third decimal point of the average cumulative score is rounded to only two decimal places in accordance with the accepted accounting rules or as determined by the approved university regulations.

Article (36): The Approval of the Final Examination Results:

Council of the University shall approve the results of the final examinations to obtain a bachelor's degree or a higher degree at the suggestion of the Faculty Council.

المادة (٣٥): حساب المعدل التراكمي

- يتم احتساب درجة المعدل التراكمي للفصل الدراسي من خلال الحصول على درجة المعدل التراكمي مضروبا في عدد الساعات المعتمدة لكل مقرر لإنتاج ما يسمى بنقاط الجودة. ثم يتم تقسيم مجموع نقاط الجودة على إجمالي عدد الساعات المعتمدة التي يتم فيها حساب المعدل التراكمي للمعدل التراكمي.
- للحصول على المعدل التراكمي ، يتم تقسيم الدرجة النوعية الإجمالية على إجمالي الساعات المعتمدة للمقررات التي يتم تضمين نقاطها في حساب متوسط المعدل التراكمي لجميع الفصول الدراسية. يتم تحديد العبء الأكاديمي للطالب في أي فصل دراسي (باستثناء الفصل الصيفي) من خلال المعدل التراكمي وليس المعدل التراكمي للفصل الدراسي السابق.

ملاحظة: يتم تقريب الفاصلة العشرية الثالثة من متوسط الدرجة التراكمية إلى منزلتين عشريتين فقط وفقا للقواعد المحاسبية المقبولة أو وفقا لما تحدده لوائح الجامعة المعتمدة.

المادة (٣٦): الموافقة على نتائج الامتحان النهائي:

يوافق مجلس الجامعة على نتائج الامتحانات النهائية للحصول على درجة البكالوريوس أو أعلى بناء على اقتراح مجلس الكلية.

Article (37): Declaration of Honour:

For a student to achieve the declaration of honour, he / she has to fulfil the following conditions:

- Maintain a cumulative GPA of 3.3 throughout his study at the Program and any semester GPA should be higher than or equal 3.3.
- Does not fail any course throughout his study at the Program.
- Did not get any penalty throughout his study at the Faculty.

Article (38): Scholarships:

The University offers scholarships to outstanding students and students who face special emergency circumstances in accordance with the system established by the University Council and approved by the Board of Trustees.

Article (39): Discipline of Students:

The provisions of Law No. 12 of 2009 for Private and Private Universities and the Law of Organizing Universities No. 49 of 1972, its Executive Regulations and the decisions of the University Council apply to student discipline.

Article (40): General Provisions:

- No student may declare being unaware of any contents of the above-mentioned articles or of not being informed of the publications issued by the University.
- These regulations shall be applied on newly admitted students, where these regulations might be applied on old students if they were subject to clearing procedure, and then approved by the Faculty Council.

المادة (٣٧): مرتبة الشرف:

لكي يحصل الطالب على مرتبة الشرف، فإن عليه أن يستوفي الشروط التالية :

- الحفاظ على المعدال التراكمى ٣,٣ خلال فترة دراساته بالبرنامج مع تحقيق هذا المعدل على الأقل خلال جميع فصول الدراسة
- ألا يكون قد رسب فى أى مقرر دراسي خلا فترة راسته بالبرنامج
- ألا يكون قد تم توقيع أى عقوبات تأديبية خلال فترة دراسته بالكلية

المادة (٣٨): الابتعاث:

تقدم الجامعة منحا دراسية للطلاب المتفوقين والطلاب الذين يواجهون ظروفا طارئة خاصة وفقا للنظام الذي وضعه مجلس الجامعة ويوافق عليه مجلس الأمناء.

المادة (٣٩): تأديب الطلاب:

تسري على الانضباط الطلابي أحكام القانون رقم (١٢) لسنة ٢٠٠٩ بشأن الجامعات الخاصة والخاصة وقانون تنظيم الجامعات رقم (٤٩) لسنة ١٩٧٢ ولائحته التنفيذية وقرارات مجلس الجامعة.

المادة (٤٠): أحكام عامة:

- لا يجوز لأي طالب أن يثبت عدم علمه بأي من محتويات المواد المذكورة أعلاه أو عدم إبلاغه بالمطبوعات الصادرة عن الجامعة.
- تطبق هذه اللائحة على الطلاب المقبولين حديثا، حيث يجوز تطبيق هذه اللائحة على الطلاب القدامى إذا كانوا خاضعين لإجراءات المقصة، ثم اعتمادها من مجلس الكلية.

- Law No. 12 of 2009 for national and private universities and the Law of Organizing Universities No. 49 of 1972 and its executive regulations and its amendments and the resolutions of the University Council.

- وعلى القانون رقم (١٢) لسنة ٢٠٠٩ بشأن الجامعات الخاصة و الأهلية وقانون تنظيم الجامعات رقم (٤٩) لسنة ١٩٧٢ ولائحته التنفيذية وتعديلاته وقرارات مجلس الجامعة.

- ## Part 5. Details of the Offered Programs

Nahda University, upon the request of the Faculty of Engineering Council, awards the Bachelor of Science (B.Sc.) Degree in one of the Majors enumerated in Table 7.

Table 7. List of offered programs by the Faculty of Engineering, Nahda University.

#	Program	Code
1	Intelligent and Sustainable Civil Engineering Program	CVE
2	Digital Architecture Engineering Program	DAE
3	Communications and Computers Engineering Program	CCE
4	Mechatronics and Intelligent Machines Engineering Program	MIM
5	Electrical Power and Renewable Energy Engineering Program	EPR

According to the Supreme Council of Universities Terms of Reference for Undergraduate Engineering Programs, the courses in any program are divided into the following categories:

1.University requirements.
2.Faculty requirements.
3.Discipline requirements.
4.Program requirements.

Table 8 shows the distribution of Credit Hours among different programs.

	University requirements	Faculty requirements	Discipline requirements	Program requirements
Offered Programs	11 CH 8%	33 CH 23%	59 – 68 CH 40 – 47 %	34 – 42 CH 24 – 29 %

Figure 2 shows the different levels of competences as published in National Academic Reference Standards (NARS-2018). These Levels of competences determine the allocation of courses in different competency level with respect to the level requirements.

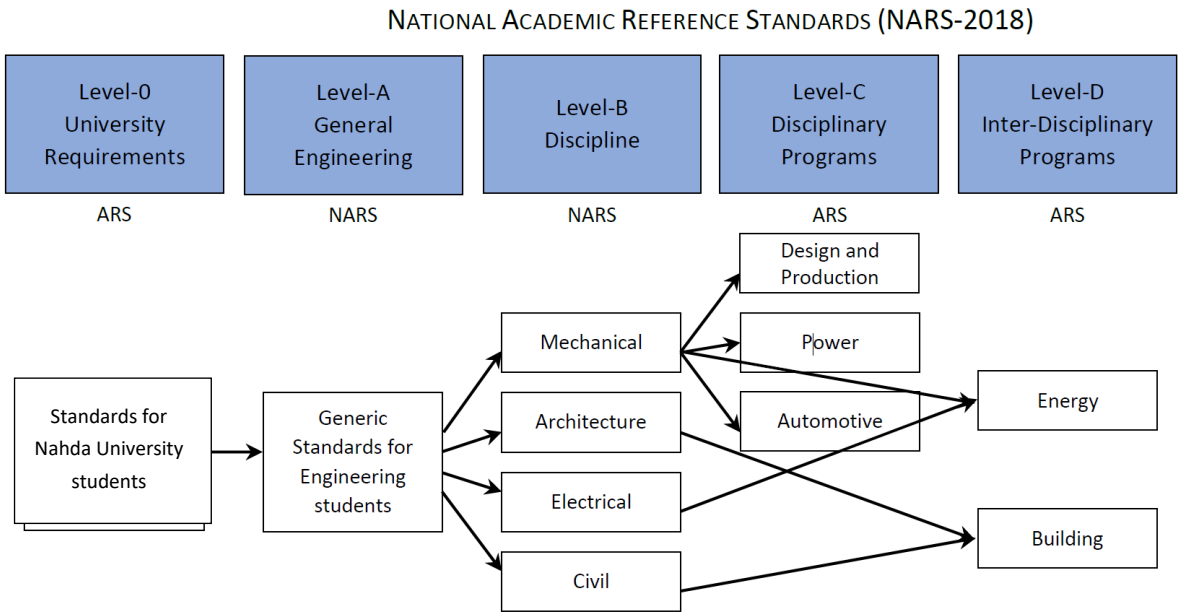

Figure 2 Different Levels of Competences as per NARS 2018, as published by NAQAAE

Table 9. Summarizes the overall data about the programs included in these bylaws.

#	Program	NC	Weight			Total Contact Hours				Requirements Distribution %				BS %	EC %
			CH	ECTS	SWL	Lec	Tut	Lab	TT	UR	FR	DR	PR		
1	CVE	60	144	250	6250	110	76	32	218	8%	23%	40%	29%	18%	20%
2	DAE	57	144	250	6250	86	103	33	222	8%	19%	47%	26%	15%	15%
3	CCE	58	144	250	6250	108	62	51	221	8%	23%	41%	28%	20%	15%
4	MIM	58	144	250	6250	108	57	53	218	8%	23%	40%	29%	18%	15%
5	EPR	56	144	250	6250	104	72	67	243	8%	23%	42%	27%	19%	18%

NC Total number of Courses
CH Credit Hour
ECTS European Credit Transfer System
SWL Student Workload

Lec Lectures
Tut Tutorials
Lab Laboratory
TT Total

UR University Requirement
FR Faculty Requirement
DR Discipline Requirement
PR Program Requirement

BS Basic Sciences Percentage, Credit Hours
EC Elective Courses Percentage, by Credit Hours

- ## Part 6. Academic Course Categorization and Coding System

  - The courses are categorized according to Figure (2), and this categorization is important as it connects them to the scientific program or department that offers them, regardless of the students' specialization. The first part of the course code is the program or scientific department code. The second part of the course code consists of three numbers: the first (N_1) represents the level, the second number (N_2) represents the minor specialization number within the program, and the third (N_3) represents the course number in the minor specialization.
  - The university's requirements for humanities, social sciences, and business administration are symbolized by the symbol (NUB)

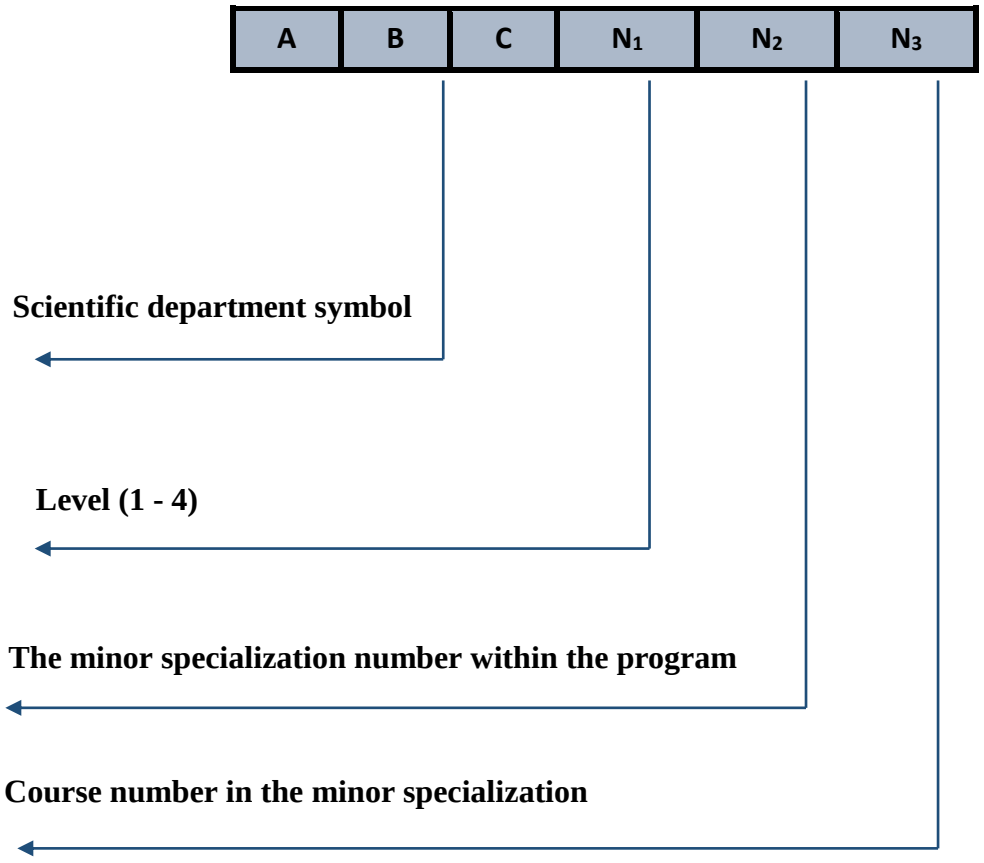

Figure (2) - Academic Course Categorization

Nahda University Requirements

- ## Nahda University Requirements Courses

In Egypt, the university is considered a core of Human Thinking at its highest level, and the source of investment and development of human resources. It is responsible for the progess of the Arabian Civilization, sustaining the Historical Heritage of the Egyptian Society, and conserving its traditions. It is also concerned with the education of Religion, Morals and Nationalism (Egyptian National Law for Universities, Law 49 for Year 1972).

To achieve this goal, Nahda University has designed several courses planned to build the student's personality, develop his skills, and increase his awareness of different topics. These courses are called University Requirements. These courses are:

Code	Course Title	Credits			Contact Hours			
		CH	ECTS	SWL	Lec	Tut	Lab	TT
ENG111	English (1)	1	2	50	1	0	0	1
ENG112	English (2)	1	2	50	1	0	0	1
ENG113	English (3)	2	3	75	2	0	0	2
-	University Elective (1)	2	3	75	2	0	0	2
-	University Elective (2)	2	3	75	2	0	0	2
-	University Elective (3)	1	2	50	1	0	0	1
-	University Elective (4)	2	3	75	2	0	0	2
CS-121	Aptech-Computer Skills (1)	0	0	0	2	0	0	2
CS-122	Aptech-Computer Skills (2)	0	0	0	2	0	0	2
CS-123	Aptech-Computer Skills (3)	0	0	0	2	0	0	2
Total		11	18	450	11	0	0	11
Pool of University Elective (1) (One Course)								
NUB111	History of Engineering	2	3	75	2	0	0	2
NUB112	Modern history of Egypt	2	3	75	2	0	0	2
NUB113	History of Civilizations	2	3	75	2	0	0	2
NUB114	Fundamentals of Engineering	2	3	75	2	0	0	2
Pool of University Elective (2) (One Course)								
NUB121	Report Writing and Communication Skills	2	3	75	2	0	0	2
NUB122	Climate Change, Energy and Water Issues	2	3	75	2	0	0	2
NUB123	Scientific Thinking	2	3	75	2	0	0	2
Pool of University Elective (3) (One Course)								

NUB131	Professional Legislations and Engineering Ethics	1	2	50	1	0	0	1
NUB132	Literature and Arts	1	2	50	1	٠	٠	1
NUB133	Human Rights	1	2	50	1	٠	٠	1
NUB134	Professional Ethics	1	2	50	1	٠	٠	1
Pool of University Elective (4) (One Course)								
NUB141	Building Safety and Fire Protection	2	3	75	2	0	0	2
NUB142	Entrepreneurship and Startups	2	3	75	2	0	0	2
NUB143	Business Administration	2	3	75	2	0	0	2
NUB144	Principle of General Management	2	3	75	2	0	0	2

- The pass of these courses in the table above is a prerequisite for graduation and is divided into three types as follows:

Type 1:

- Calculated in the cumulative total and calculated in the number of graduation hours.

Type 2:

- English language courses are not counted in the cumulative total and are calculated in the number of graduation hours.
- If the student is exempted from one or more of the English language courses based on the placement test result, the student must choose a course from the university faculties or an alternative course from the general requirements of the faculty to complete the credit hours of the university requirements.

Type 3:

- Computer Skills courses are not counted in the cumulative total and are not counted in the number of graduation hours.

- **Nahda University Requirements Courses Content**

ENG111	English (1)	1 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	-
Required SWL		Equivalent ECTS
50		2

Course Content

Aptech at NUB – preparing students with essential skills for the job market

NUB is committed to developing the student knowledge and skills so that our graduates become job ready at graduation. NUB, in association with Aptech Learning and Training Academy Ltd., India, for the first time in academic year 2017-18, introduced accredited English and computer courses as university requirements across all faculties. The courses are obligatory for students starting their first year at NUB, and are taught across three academic years, six semesters.

Spoken English courses from Aptech enable learners to use English for everyday situations and purposes related to social life, workplace and leisure. These courses prompt learners to use their own knowledge and personal experiences to express their ideas and opinions during classroom sessions.

The course delivered at NUB consists of five levels from Beginners level to Professional level and is equivalent to four credit hours.

Year 1 courses: Beginners and Spoken English – Pre Intermediate; Credit hours: 1, The course duration is two semesters.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

ENG112	English (2)	1 CH
Prerequisites	English (1) - ENG111	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	-
Required SWL		Equivalent ECTS
50		2

Course Content

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The course delivered at NUB consists of five levels from Beginners level to Professional level and is equivalent to four credit hours.

Year 2 courses: Spoken English – Intermediate and Upper Intermediate; Credit hours: 1, The course duration is two semesters.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

ENG113	English (3)	2 CH
Prerequisites	English (2) - ENG112	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
75		3

Course Content

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Spoken English courses from Aptech enable learners to use English for everyday situations and purposes related to social life, workplace and leisure. These courses prompt learners to use their own knowledge and personal experiences to express their ideas and opinions during classroom sessions.

The course delivered at NUB consists of five levels from Beginners level to Professional level and is equivalent to four credit hours.

Year 3 courses: Business Communication; Credit hours: 2, The course duration is two semesters.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

NUB111	History of Engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

The evolution of engineering from ancient to modern times, covering key innovations, influential engineers, and significant technological advancements. Topics include ancient engineering marvels, medieval construction techniques, Renaissance inventions, Industrial Revolution mechanization, and 20th-century breakthroughs. Emphasis is placed on sustainable and future engineering trends, highlighting the role of artificial intelligence and emerging technologies in shaping the future of engineering.

References

- "Engineering: An Illustrated History from Ancient Craft to Modern Technology" by Tom Jackson
- "The History of Engineering" by Graham Hollister-Short
- "The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution" by Walter Isaacson

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB112	Modern history of Egypt		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Egypt's modern history from the 19th century to the present, focusing on significant political, social, and economic developments. Key topics include the British occupation, the 1952 revolution, Nasser's presidency, the Sadat era, Mubarak's rule, and the 2011 revolution. The course highlights Egypt's evolving role in regional and global contexts, emphasizing contemporary challenges and future prospects.
References
• "A History of Modern Egypt" by Afaf Lutfi al-Sayyid Marsot • "Modern Egypt: The Formation of a Nation-State" by Arthur Goldschmidt Jr. • "The Egyptian Revolution of 2011: A Brief History" by Azmi Bishara

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB113	History of Civilizations		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Development and impact of major civilizations throughout history. It covers the rise and fall of ancient civilizations, including Mesopotamia, Egypt, Greece, Rome, China, and the Indus Valley. Key topics include cultural, technological, and political contributions, as well as interactions between civilizations. The course also examines the influence of these ancient civilizations on modern societies and their lasting legacies.
References
• "Guns, Germs, and Steel: The Fates of Human Societies" by Jared Diamond • "A History of World Civilizations" by Philip J. Adler and Randall L. Pouwels • "Civilization: The West and the Rest" by Niall Ferguson

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB114	Fundamentals of Engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

History of Engineering, Engineering definition, Engineering fields of specialization, Engineer carrier path, Engineers initial carrier profile, Study programs at NUB Faculty of Engineering, registration, advising and examination procedures, The engineering approach to problem solving, Engineering calculations: Numbering systems, units and dimensions, The International System of Units, Units Used with SI, Units conversions, Significant Figures, Scientific Notation, Branches of mathematics and physics. Case studies

References

- "Introduction to Engineering Design " by Andrew Samuel
- "Fundamentals of Engineering Mechanics" by Ferdinand P. Beer & E. Russell JohnstonJr
- "Engineering Mechanics: Statics and Dynamics" by R.C. Hibbeler

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB121	Report Writing and Communication Skills		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Typography and writing, Formal report components, types of engineering reports, content and appearance, communication types, nonverbal communication, memo, letter, email and social media, infographics in reports and presentations, types of graphs, how to evaluate written material and oral presentations.

References

- "Technical Communication" by Mike Markel and Stuart A.
- Selber "The Elements of Style" by William Strunk Jr. and E.B. White
- "Communicating in Groups: Applications and Skills" by Katherine Adams and Gloria Galanes

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB122	Climate Change, Energy and Water Issues		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Global climate and the greenhouse effect, Global Mean Surface Temperature, Heating and cooling of earth, the natural greenhouse effect, Energy flows within earth-atmosphere system, Global energy budget, Water cycles, Ground and surface water, Water-Food-Energy nexus, Resources efficiency, Environmental indicators.

References

- Islam R Khan MM. The Science of Climate Change. Hoboken NJ Beverly MA: John Wiley and Sons; Scrivener Publishing; 2019.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB123	Scientific Thinking		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Concept and Characteristics of Logical Thinking - Methods and Approaches to Thinking, Correlation, and Inference - Types and Objectives of Scientific Research - Concept of Scientific Research - Characteristics of Scientific Research - Stages, Steps, and Methodology of Scientific Research - Criteria and Guidelines for Utilizing Scientific Research to Serve Development Issues

References

- **“**Moore BN Parker R. Critical Thinking. Thirteenth ed. New Yo4k NY United States of America: McGraw-Hill Education; 2021

- "Scientific Methods in Practice" by Hugh G. Gauch
- "The Structure of Scientific Revolutions" by Thomas S. Kuhn
- "Thinking, Fast and Slow" by Daniel Kahneman

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB131	Professional Legislations and Engineering Ethics	1 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	-
Required SWL		Equivalent ECTS
50		2

Course Content

Introduction to the Egyptian Legal Systems. Egyptian Laws and Regulations. Legislations and Institutions related to the Profession: Engineers' Syndicate's Laws and By-laws, Engineering Professional Ethics, Commercial, Criminal and Civil Laws, International Law, Arbitration and Litigation.

References

- Popovski V. International Rule of Law and Professional Ethics. Farnham Surrey: Ashgate; 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB132	Literature and Arts	1 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	-
Required SWL		Equivalent ECTS
50		2

Course Content

Relation between the different typologies of literature and art to contemporary trends in science, engineering, culture, society, politics and other humanities related fields, discussing issues of beauty, taste, aesthetics, and iconography, identify elements of simple arguments, literary genres, and creative writings, different modes of verbal and visual communication

References

- Understanding Art, Ninth Edition, by Lois Fichner-Rathus (Boston, Wadsworth, Cengage Learning, 2007).
- The Art of Being Human: Humanities as a Technique for Living Pearson, Richard Janaro, Thelma Altshuler, (Emeritus) New World School for the Arts, 2017
- The Literature Book, Dorling Kindersley publishing UK, 2016
- The Art Book, Dorling Kindersley publishing UK, 2017

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB133	Human Rights		1 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	-	
Required SWL		Equivalent ECTS	
50		2	

Course Content

"The historical background of human rights - Constitutions and the protection of human rights - The crisis of rights and public freedoms in contemporary political and global systems - The political, social, economic, and technical causes of this crisis - Evaluating the role and activities of international organizations in protecting human rights - The Egyptian constitution and human rights in Egypt

References

- Human Rights: A Very Short Introduction" by Andrew Clapham
- international Human Rights Law" by Rhona K. M. Smith
- Comparative Human Rights Law" by Sandra Fredman

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB134	Professional Ethics		1 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	-	
Required SWL		Equivalent ECTS	
50		2	

Course Content
Global vision about Engineering Science & job of Engineer: Engineering Science is the indicator for any civilization since long time ago. Being an Engineer is one of the finest and the highest job (Engineering job based on creativity, innovation and development from his own imagination - serving the whole humanity and seeking for the quality in human life). Engineer`s responsibility in the national and the international scale: vital role for the engineer according to the international engineering contracts (FIDIC) - Responsibility of the engineer according to the Egyptian Laws. Job ethics and etiquette - global vision on the Engineers Syndicate law no.66 for 1974 - Confirming..
References
• Davis M. Engineering Ethics. London: Routledge; 2016..

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB141	Building Safety and Fire Protection	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
75		3

Course Content
Teaches recognition and mitigation of safety hazards. Includes OSHA safety standards, fire detection and protection, emergency procedures, and construction product properties. Discusses fire risk assessment, evacuation procedures, and fire safety management.
References
• OSHA, 29 CFR 1910 & 1926. • NFPA standards (org/Codes-and-Standards A11-Codes-and-Standards/List-of-Codes-and-Standards) • NEBOSH and IOSH standards.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB142	Entrepreneurship and Startups		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to Entrepreneurship: Definition of entrepreneurship and the importance of entrepreneurs. Characteristics of successful entrepreneurs, Differences between entrepreneurship and traditional businesses.

Innovating Ideas and Turning Them into Ventures: Creative thinking methods, analyzing market opportunities, Business models and how to choose the right one.

Writing a Business Plan: Components of a business plan, how to define goals and vision, Marketing and sales strategies.

Securing Funding: Funding sources (personal financing, loans, angel investors, venture capital), Pitching ideas to investors, Evaluating the benefits of startup funding.

Managing Startups: Challenges during the founding and growth stages, Effective management strategies, Building a strong team.

Expansion and Sustainable Growth: Expansion strategies and international growth, understanding risks and challenges related to rapid growth.

Legal and Economic Challenges: Laws and regulations for startups, Economic issues that startups may face and how to overcome them..

References

- Timmons, J. A., & Spinelli, S. (2014). New Venture Creation: Entrepreneurship for the 21st Century. McGraw-Hill Education.
- Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.
- Stevenson, H. H., & Jarillo, J. C. (1990). A Paradigm of Entrepreneurship: Entrepreneurial Management. Strategic Management Journal.
- Drucker, P. F. (1985). Innovation and Entrepreneurship: Practice and Principles. Harper & Row.
- Blank, S. (2013). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB143	Business Administration		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

The nature of business and entrepreneurship as the vehicle for making money by creating wealth and producing goods and services. Management, Planning, Controlling and Organizing. Various functional areas in business including: accounting, entrepreneurship, economics, finance management and marketing, legal environment of business, globalization and e-business

References

- "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries
- "Innovation and Entrepreneurship" by Peter F. Drucker
- "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers" by Alexander Osterwalder and Yves Pigneur

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

NUB14٤	Principles of General Management		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

1. Concept and importance of management
2. Management schools and management functions
3. Managerial roles and functions
4. The project
5. Basic dimensions of the management problem in developing countries
6. Administrative development and the development of management systems

References

- Principles of Management" by Stephen P. Robbins and Mary Coulter
- Management: Principles and Practices" by L.M. Prasad
- Management and Organizational Behavior" by Laurie J. Mullins

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40

CS-121	Aptech-Computer Skills (1)	0 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
0		0

Course Content

Semester 1:

- Increase desk-based productivity using MS Word

Semester 2:

Create Spreadsheets for analysing data using MS Excel

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CS-122	Aptech-Computer Skills (2)	0 CH
Prerequisites	Aptech-Computer Skills (1)	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
0		0

Course Content

Semester 3:

- Create advanced attractive presentations using Microsoft PowerPoint
- Use various Web tools for efficient communication and task management over the Web

Semester 4:

Normalise raw data into well-organised database tables in MS Access

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CS-123	Aptech-Computer Skills (3)		0 CH
Prerequisites	Aptech-Computer Skills (2)		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
0		0	

Course Content

Semester 5:

- Demonstrate the understanding of Digital marketing and media concepts.
- Effectively build your users lists, deliver e-mails & generate relevant clicks.
- Understand mobile marketing measurement and analytics.

Semester 6:

Use MS Project to track software development

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

Faculty of Engineering Requirements

All the programs offered at the Faculty of Engineering, Nahda University are Engineering Programs. The graduates are called Engineers and are automatically enrolled in the Egyptian Engineering Syndicate (EES).

According to the National Academic Reference Standards (NARS-2018), The Engineering Graduate must be able to (A-Level):

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
A5. Practice research techniques and methods of investigation as an inherent part of learning.
A6. Plan supervises and monitors implementation of engineering projects.
A7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.
.

To achieve these Intended Learning Outcomes, a set of courses must be completed as a Faculty Requirement. These courses are divided into Basic Science Courses and Basic Engineering Courses.

- **Faculty of Engineering Requirements Courses**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS113	Probability and Statistics	2	3	75	2	1	0	3	
BAS121	Vibration and Waves	3	8	125	2	2	1	5	
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
BAS131	Engineering Chemistry	3	5	125	2	2	1	5	
BAS141	Statics	3	5	125	2	2	0	4	
BAS142	Dynamics	3	5	125	2	2	0	4	BAS141
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
TRN2x1	Field training (1)	0	5	125	0	0	0	0	
TRN3x1	Field Training (2)	0	5	125	0	0	0	0	
-	Engineering Economy and Project Management Elective	2	3	75	2	1	0	3	
-	Structures and Properties of Materials Elective Courses	2	3	75	2	0	1	3	
-	Engineering Technology Elective Courses	2	3	75	2	0	1	3	
-	Spatial Perception and Design Elective Courses	2	3	75	1	0	3	4	
Total		**33**	**64**	**1600**	**24**	**18**	**9**	**51**	
Pool of Engineering Economy and Project Management Elective Courses (One Course)									
MIM21٦	Engineering Economy	2	3	75	2	1	0	3	
CVE223	Project Management Essentials	2	3	75	2	1	0	3	
EPR391	Project Management and Economic for Electrical Engineering	2	3	75	2	1	0	3	
CCE312	Software Project Management	2	3	75	2	1	0	3	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Pool of Structures and Properties of Materials Elective Courses (One Course)									
EPR111	Materials of Electrical Science	2	3	75	2	0	1	3	
CCE216	Properties of Electrical Materials	2	3	75	2	0	1	3	
CVE221	Structures and Properties of Construction Materials	2	3	75	2	0	1	3	
MIM111	Basics of Mechatronics	2	3	75	2	0	1	3	
Pool of Engineering Technology Elective Courses (One Course)									
GME141	Production Engineering	2	3	75	2	0	1	3	
CVE222	Modern Building Material	2	3	75	2	0	1	3	CVE121
DAE261	Building Technology and Maintenance	2	3	75	2	0	1	3	
Pool of Spatial Perception and Design Elective Courses (One Course)									
DAE161	Projection and Engineering Graphics	2	3	75	1	0	3	4	
MIM112	Computer Aided Drawing	2	3	75	1	0	3	4	
EPR333	AutoCAD Electrical Drawing	2	3	75	1	0	3	4	
CCE111	Electrical Installations and Construction Equipment	2	3	75	1	0	3	4	

A. Courses offered by Basic Sciences Department in Mechatronics and Intelligent Machines Engineering

No.	Code	Course Name
1	BME211	Theory of Machines
2	BME241	Strength of Materials
3	BME321	Machine Elements Design
4	BME411	Machine Construction
5	BME311	Mechanical Vibrations
6	BME251	Thermodynamics (1)
7	BME262	Fluid Mechanics and Aerodynamics
8	BME351	Heat Transfer

B. Courses offered by by Basic Sciences Department in Electrical Power and Renewable Energy

No.	Code	Course Name
1	BME251	Thermodynamics (1)
2	BME351	Heat Transfer
3	BME261	Fluid and Aerodynamics

- **Faculty of Engineering Requirements Courses Content**

BAS111	Mathematics (1)	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	-
Required SWL		Equivalent ECTS
125		5

Course Content

CALCULUS: Covers Relations and Functions including domain, range, and types like piecewise and symmetric. Explores Limits and Continuity with theorems, infinity limits, and L'Hopital's Rule.

DERIVATIVES: Focuses on derivative rules, including the Chain Rule and derivatives of various function types. Also covers higher order derivatives, implicit differentiation, and applications such as curve sketching and optimization.

INTEGRATION: Introduces basic integration concepts.

ANALYTIC GEOMETRY: Examines Conic Sections and their polar coordinates.

ALGEBRA: Discusses Partial Fractions.

References

- Stewart, James. Calculus. Australia, Cengage Learning, 2016.
- Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
- O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.
- Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS112	Mathematics (2)		3 CH
Prerequisites	Mathematics (1) - BAS111		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

INTEGRATION:

Types of integrals include indefinite integrals (using substitution, parts, and partial fractions) and definite integrals.

SEQUENCES AND SERIES:

Properties and tests for sequences and series, including limit laws, monotonicity, geometric series, divergence, and convergence (integral and comparison tests), and alternating series.

MULTIVARIABLE CALCULUS:

Functions of several variables, domain, range, graphing, and continuity. Partial derivatives, their geometric interpretation, and applications (maxima, minima, and optimization). Double and triple integrals with applications to calculating arc length, area, and volume.

References

- Stewart, James. Calculus. Australia, Cengage Learning, 2016.
- Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
- O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.
- Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS113	Probability and Statistics		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Descriptive and Inferential Statistics, Data Description, Measures of Central Tendency, Dispersion and Position. Review of Probability, Bayes' Theorem, Random Variables (Continuous and Discrete), Probability Distributions. Simple regression and correlation: Simple linear regression by least square method, validation the model, correlation coefficient.

References

- Ross, Sheldon. First Course in Probability, A, Global Edition. Pearson Higher Ed, 12 July 2019.
- Mendenhall, William, et al. *Introduction to Probability and Statistics*. Boston, Ma, Cengage, 2020.
- Rozanov, Y A. Probability Theory. Courier Corporation, 27 May 2013.
- Arnold, Barry C, et al. A First Course in Order Statistics. Philadelphia, Pa, Siam, 2008.
- Terrell, George R. Mathematical Statistics. Springer Science & Business Media, 6 Apr. 2006.
- Rosenkrantz, Walter A. Introduction to Probability and Statistics for Scientists and Engineers. New York, McGraw-Hill, 1997.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS211	Mathematics (3)		2 CH
Prerequisites	Mathematics (2) - BAS112		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Ordinary Differential Equations: Basics Concepts, Classification, and Formation of Differential Equations (ODEs and PDEs). Methods to solve first-order differential equations (Separable, Homogeneous, Exact, integrating Factor, Bernoulli Equation).

Second-Order Linear Differential Equations; Homogeneous Equations with Constant Coefficients; Operator D; Second-Order Nonhomogeneous Equations; Laplace Transform; Methods for Solving Partial Differential Equations.

References

- Kenneth B. Howell, Ordinary Differential Equations, 2nd Edition, 2019.
- Stewart, James. Calculus. Australia, Cengage Learning, 2016.
- Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
- O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.

- Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS212	Applied Engineering Mathematics for Civil Systems		2 CH
Prerequisites	Mathematics (2) - BAS112		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

1. Differential Equations:

First-Order ODEs: Separable equations, Exact equations and integrating factors.

Second-Order ODEs: Homogeneous equations with constant coefficients. Nonhomogeneous solutions using undetermined coefficients.

Laplace Transforms: Solving transient ODEs.

PDEs: Classification (parabolic, hyperbolic, elliptic) and examples.

2. Linear Algebra

Gauss Elimination:

Eigenvalues/Eigenvectors:

3. Numerical Methods:

Bisection Method.

Newton-Raphson Method.

4. Complex Numbers

Explores basic operations, trigonometric (polar) forms, and vector representation of complex numbers

References

- Kenneth B. Howell, Ordinary Differential Equations, 2nd Edition, 2019.
- Stewart, James. Calculus. Australia, Cengage Learning, 2016.
- Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
- O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.
- Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS213	Mathematics (4)		2 CH
Prerequisites	Mathematics (3) - BAS211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

ALGEBRA: Covers matrix algebra including systems, notations, determinants, and their properties. Discusses methods for solving linear systems such as Gauss Elimination, Gauss-Jordan, and Cramer's Rule, along with eigenvalues and eigenfunctions.

COMPLEX NUMBERS: Explores basic operations, trigonometric (polar) forms, and vector representation of complex numbers. Includes De Moivre's Theorem and calculations involving products, quotients, powers, and roots of complex numbers.

NUMERICAL ANALYSIS: Focuses on solving nonlinear equations using various methods: Iteration, Bisection, Secant, False Position, Fixed-Point Iteration, and Newton-Raphson.

References

- Stewart, James. Calculus. Australia, Cengage Learning, 2016.
- Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
- O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.
- Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria

Student Activities	Student Activities	Student Activities	Student Activities
40%	20%	0%	40%

BAS311	Mathematics (5)		2 CH
Prerequisites	Mathematics (4) - BAS213		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Partial differential equations: methods for solving linear and non-linear partial differential equations of first order.

Partial differential equations of order two with variable coefficients.

Some physical models (heat, waves, Laplace equations).

Special functions - System of linear and nonlinear equations and ordinary differential equations - Fourier analysis - Orthogonal Expansions - Wavelets.

References

7. Victor Ivrii, Partial differential equations, 2021.
8. Stewart, James. Calculus. Australia, Cengage Learning, 2016.
9. Autor: Erwin Kreyszig. Advanced Engineering Mathematics. Editora: S.L., Wiley, 2020.
10. O'Neil, Peter V. Advanced Engineering Mathematics, SI Edition. Cengage Learning, 27 Jan. 2017.
11. Zill, Dennis G, and Warren S Wright. Advanced Engineering Mathematics. Burlington, Ma, Jones & Bartlett Learning, 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS121	Vibration and Waves	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Review of basic physical mechanics: Work, Kinetic energy, Potential energy, Conservation of energy, Conservative and non-conservative forces, Potential gradient and Power. Vibrations: Uniform circular motion, Simple harmonic motion, energy of a simple harmonic oscillator, Superposition of harmonic vibrations, Damped vibration, Forced vibration and resonance. Wave motion: Wave equation, Transverse & Longitudinal waves, velocity of sound waves, Intensity of sound waves & intensity levels, Standing waves, Interference & Diffraction of light.

References

- Shipman, James T, et al. An Introduction to Physical Science. Cengage Learning, 2009.
- Serway, Raymond A, and Robert J Beichner. Physics for Scientists and Engineers with Modern Physics. Houghton Mifflin, 2000.
- Richard T.Weidner, Physics - Revised Version, Allyn and Bacon, Boston, USA, 1989.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam

30%	20%	10%	40%

BAS122	Electricity and Magnetism	3 CH
Prerequisites	Vibration and Waves - BAS121	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content

Electricity: Review of vectors, Coulomb's law, Electric field, Electric flux, Gauss Law and its applications, Electric potential, Capacitance and Dielectrics, Electric current and RC circuits. Magnetism: Magnetic field, Magnetic Force, Sources of Magnetic Fields, Ampere's law, Faraday's Law, Electromagnetic induction, Magnetic properties of materials and AC circuits.

References

- Shipman, James T, et al. An Introduction to Physical Science. Cengage Learning, 2009.
- Serway, Raymond A, and Robert J Beichner. Physics for Scientists and Engineers with Modern Physics. Houghton Mifflin, 2000.
- Richard T.Weidner, Physics - Revised Version, Allyn and Bacon, Boston, USA, 1989.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	10%	40%

BAS131	Engineering Chemistry	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Structure of matter, Atomic and electronic structure, Periodic tables, Naming of compounds, Equations of State – Introduction to Chemical Thermodynamics – Material & Energy Fuel Combustion – General Properties of Solutions – Dynamic Equilibrium in Physical – Basic Principles in Electrochemistry – Introduction to Corrosion Engineering – Selected topics in process – Chemical Industries (Industry of Cement – Chemical Fertilizer Industries – Metal Alloys Industry – Silicon Industry – Petrochemical Industries).

References

• Handbook of chemical engineering calculations; editors Tyler G. Hicks, Nicholas P. Chopey, Hicks, Tyler Gregory, New York, United States: McGraw-Hill, c.2012., 4th ed, Engineering Chemical February 2015 • Handbook notes, LMS: www.nub.edu.eg.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	10%	40%

BAS141	Statics	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	-
Required SWL		Equivalent ECTS
125		5

Course Content
Fundamentals of statics, Types of supports, Free Body Diagram (FBD), Equilibrium of system of particles under plane forces, Frames, Trusses and Machines, Space statics: Resultant of systems of space forces, Moments about a point and about an axis, Reduction of system of forces to one force and couple, Wrench, Equilibrium under system of space forces, Friction and its applications, Belt friction, Center of mass, Center of weight for single and composite bodies, Shearing forces and bending moment diagrams, Virtual work.

References
• R. C. Hibbeler, Statics, 14th edition, Pearson prentice hall, 2016. • Beer, Ferdinand P. Vector Mechanics for Engineers. McGraw-Hill Science, Engineering & Mathematics, 1 Feb. 2005. • Muvdi, Bichara B, et al. Statics for Engineers. Springer, 14 Jan. 2014.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS142	Dynamics	3 CH
Prerequisites	Statics - BAS141	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	-
Required SWL		Equivalent ECTS
125		5

Course Content
Kinematics of particles, linear motion, Motion in resistive media, Study of curvilinear motion using: Cartesian coordinates, cylindrical coordinate and Intrinsic coordinate, Relative motion, Kinetics of motion with applications on projectiles and harmonic motion, Work and energy, Applications on conservative and non-conservative fields of forces, Impulse and impact, Newton's empirical formula, Impact of particle with fixed plane, Impact of two small balls, Introduction to vibration mechanics.
References
• R. C. Hibbeler, Dynamics, 14th edition, Pearson prentice hall, 2016. • Muvdi, Bichara B, et al. Dynamics for Engineers. Springer Science & Business Media, 6 Dec. 2012.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

BAS143	Engineering Drawing (1)	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	3	-
Required SWL		Equivalent ECTS
75		3

Course Content
Introduction & importance of engineering drawing, Manual drawing, drawing instruments and their uses, conventions in drawing, geometrical constructions, scales, curves in engineering practice, principles of projections, projections of points, lines, planes and solids, auxiliary projections, sections of solids: intersections of solids, development of surfaces, axinometric projection and perspective projections. The principles of steel drawing and construction. Derivation of views and sections from given views of steel constructions. Fundamentals of architectural drawing. Home plan, Floor plan, symbols of windows, doors, stairs, ramps, etc.
References
• "Engineering Drawing and Design" by David A. Madsen and David P. Madsen • "Technical Drawing with Engineering Graphics" by Frederick E. Giesecke, Alva Mitchell, and Henry C. Spencer • "Architectural Drawing" by David Dernie

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

MIM216	Engineering Economy	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
75		3

Course Content

Origins of engineering economy, Principles of engineering economy, Design and manufacturing processes and EE, Cost estimation and cost terminology, Accounting, Balance sheet, Profit loss statement, Concept of equivalence, Money time relationships, Simple and compound interest rates, Single amounts and uniform series, Increasing and decreasing gradient, Application of money, Time relationships, Present value, Internal rate of return, External rate of return, Payback period, Evaluation of alternatives for different useful life and study period, Depreciation methods, Replacement analysis, Determination of the economic life of challenger and defender, Engineering economy techniques for evaluation of public projects.

References

- 'Engineering Economy' – 7th Edition Authors: Leland T. Blank & Anthony J. Tarquin. McGraw-Hill - ISBN 0073376301
- 'Basics of Engineering Economy', Anthony J. Tarquin. McGraw-Hill – ISBN 978–0–07–340129–4 ISBN 0–07–340129–3 (hard copy : alk. paper)
- 'Engineering Economy Analysis', Newman, Lavelle and Eschenbach, Engineering Press (8th edition).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	4٠%

CVE223	Project Management Essentials	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Definition of Projects and Project Management, Project management techniques, models, and knowledge to enable students to design and operate an effective project management system, Project Life Cycle in Construction, Project Scope Management, Quality Management, Introduction to Procurement Management, Introduction to Equipment Management, Introduction

to Risk Management, Human Resources Management including Charts and staff motivation, Communication, and stakeholder management, Construction method statements and constructability, introduction to operation research. Topics are aligned with the Project Management Body of Knowledge (PMBOK).

References

- PMI, A guide to the project management body of knowledge, 5th edition, PMI, USA
- Hinze, Jimmie, Construction Planning and Scheduling, 4th edition, Person Prentice Hall, New Jersey, USA, 2011
- Sears, S. et al., Construction Project Management, 6th edition, John Wiley and Sons, New York, 2015
- Mubarak, Saleh A., Construction Project Scheduling and Control, 3rd edition, John Wiley and Sons, New York, 2015

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR391	Project Management and Economics for Electrical Engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Definitions used in project management of the electrical power and renewable energy, The project life cycle, project stages, relationships and responsibilities of the different project parties, execution phase responsibilities, productivity, quality management, Time management, material delivery management, sequencing and scheduling.

The course also focuses on studying the economic and life cycle assessment of the electrical power and renewable energy systems in order to be able to make informed decisions when it comes to the design and implementation of them in different buildings.

References

- Chang, C.M., 2016. Engineering management: Meeting the global challenges. CRC Press.
- Leland Blank and Antony Tarquin: Engineering Economy, 2017
- C.M. Chang: Engineering Management - Meeting the Global Challenges, 2004.
- Twidell, John, and Tony Weir. Renewable Energy Resources. Taylor and Francis, 2005. ISBN: 9780419253303.
- McKay, David J. C. Sustainable Energy – Without the Hot Air. UIT Cambridge, Ltd., 2009. ISBN: 9780954452933.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE312	Software Project Management		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
75		3	

Course Content

The course introduces the methodologies and techniques for software project management both traditional and agile, this also includes scope, effort, risk estimation, plus scheduling and communication management of stakeholders. The course also includes several techniques and the student is introduced to different PM tools.

References

- Stellman, Andrew; Greene, Jennifer (2005). Applied Software Project Management. O'Reilly Media. ISBN
- Murali Chemuturi, Thomas M. Cagley, Mastering Software Project Management: Best Practices, Tools and Techniques, J.Ross Publishing. ISBN 2978-1-60427-034-1010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR111	Materials of Electrical Science		2 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Atoms and atomic structure of conducting materials, Materials Classification, Conductors, High/low - Resistive Materials, Semiconductors, Insulators, Magnetic Materials: B-H curve for different magnetic materials, magnetic losses, reduction of losses, Ferro-resonance, Study and Measurement of Electrical, Magnetic, and Optical Properties of Materials, Materials for Electronic

Components, Materials used in electrical power and renewable energy systems and energy storage systems.
Laboratory
• Conductivity (σ) of insulators, semiconductors, and conductors' materials. • Mechanical characteristics of insulators, semiconductors, and conductors' materials. • Magnetic characteristics of materials: B-H curve for different magnetic materials. • Magnetic losses, reduction of losses, Ferro-resonance. • Materials used in electrical power and renewable energy systems and energy storage systems.
References
• S. O. Kasap, Principles of Electrical Engineering Materials, McGraw - Hill, 2000. • J. Dekker, Electrical Engineering Materials, Prentice Hall, 1970. • L. Solymar, D. Walsh, R. R. A. Syms., Electrical Properties of Materials, Oxford University Press, 10th edn, ISBN: 9780191868504, 2. BI Bleaney, B Bleaney Electricity and Magnetism, Volume 2, Third Edition OUP Oxford, Mar 28, 2013 • Charles K. Alexander, Matthew N. O. Sadiku., 'Fundamentals of electric circuits', © The McGraw-Hill Companies, 4th ed, TK454.A452, 2009 • Chapman. Stephen J. 'Electric machinery fundamentals' © The McGraw-Hill Companies, 4th ed, ISBN 0--07246523, 2005.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	15%	40%

CCE216	Properties of Electrical Materials		2 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Conducting Materials: Structure of conducting materials, Conductivity in solid materials, Synthesize of alloys, Mechanical characteristics of conducting materials. Insulating Material: Ceramic and polymers, Electrical and mechanical characteristics, PVC and XLPE insulation materials in cables. Magnetic Materials: B-H curve for different magnetic materials, magnetic losses, reduction of losses, Ferro-resonance. Materials used in batteries: Primary batteries, secondary batteries. Silicon semiconductors industries: Metallurgical grade silicon, Electronic grade silicon.
Laboratory

- Conductivity (σ) of insulators, semiconductors, and conductors materials.
- Mechanical characteristics of insulators, semiconductors, and conductors materials.
- Magnetic characteristics of materials: B-H curve for different magnetic materials.
- Magnetic losses, reduction of losses, Ferro-resonance.
- Materials used in batteries.

References

- S. O. Kasap, Principles of Electrical Engineering Materials, McGraw - Hill, 2000.
- J. Dekker, Electrical Engineering Materials, Prentice Hall, 1970.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	15%	40%

CVE221	Structures and Properties of Construction Materials		2 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	٠	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to engineering materials. - Traditional materials - Alternate building materials - Composite materials - Smart materials. Material properties: physical, chemical, corrosion, electrical, thermal, and optical properties. Relationship between material properties and its internal structure. Basic properties of non-metal materials. Building stones, Bricks, Tiles, Timber, Isolation materials for moisture and heat, glass, Ceramics, Polymers and advanced composite materials, Mineral binders, Aggregates, Admixtures, Concrete.

Laboratory

- Tensile strength of mild steel.
- Cement testing (setting time, strength).
- Aggregate testing sive analysis test

References

- Thomas H. courtney, Mecanical Behaviar of Materia, Waveland Press Inc, 2005.
- Arthur lyons, Materials for Architects and Builders, Third Edition, 2007.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	10%	40%

MIM111	Basics of Mechatronics		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Mechatronics definition, background and history, industrial revolution, mechatronics design philosophy and methodologies, mechatronics and optimal machine design, mechatronics system components, configuration and synergetic. Case studies of mechatronic systems applications in automotive, industry, manufacturing, medical and healthcare etc. Beginning levels on programming, building electrical and electronics circuits, building simple mechatronic systems. Practice through Labs and projects. Introduction to microcontrollers such as Arduino: Arduino hardware overview, fundamentals and microcontroller board specifications, programming and understanding Arduino syntax, Examples on Arduino programming and using digital inputs/outputs and analog inputs in Arduino. Tips should be considered to build successful mechanical machines, actuator types such as stepper motors, Dc motors, AC motors, servo motors, pneumatics, hydraulics, …etc., selection criteria, and tips to select suitable actuators, electronic circuits and building printed circuits board (PCBs) tips. Select suitable: sensors, signal conditioning circuits, relays, motor drivers such as H-bridge, stepper motor driver

References

- Industrial Automation: Hands On 1st Edition by Frank Lamb (Author)
- Alciatore, D. G. and Histand, M.B., Introduction to Mechatronics and Measurement Systems, McGraw Hill, 2003.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	10%	40%

GME141	Production Engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course aims to provide engineering students with a simple introduction and general knowledge about engineering parts, their materials, and primary production processes and manufacturing technologies. It includes engineering materials classification, and introduction to materials selection for different applications. Production processes such as casting, joining and metal forming processes. Some manufacturing processes of polymers, machining processes of metals and wood. Measuring instrumentations. In addition, a brief view on new materials and introduction to advanced processing techniques (e.g. water jet cutting…. etc.) is provided.

Laboratory

- Centre Lathe & its operations.
- Shaping Machine & its operations.
- Milling Machine & its operations.
- Drilling Machine & its operations.
- Gase Welding.
- Electrical Arc Welding.

References

- fundamentals-of-modern-manufacturing-4th-edition-by-mikell-p-groover
- DeGarmo's Materials and Processes in Manufacturing by J. T. Black [A comprehensive reference on various manufacturing processes, materials, and selection].
- Machining and Machine Tools by Andreas A. Antonissen [Explores machining fundamentals, processes, and machine tools].

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30 %	20 %	10 %	40%

CVE222	Modern Building Material	2 CH
Prerequisites	Properties of Materials – CVE121	

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
2	0	1

Required SWL	Equivalent ECTS
75	3

Course Content

fresh concrete properties: Consistency, Workability, Cohesion, Segregation, Bleeding. Properties of hardened concrete: Strength, Volumetric changes, Elasticity and creep, Durability of concrete. Mix design: Engineered methods, Empirical methods. Non- destructive testing: Rebound hammer, Ultrasonic, Pulse velocity, Core, Steel detection. Different types of modern building materials, Advanced Composite Materials, Fibers and Polymer properties, Fabrication technology, Advantages and disadvantages of modern building materials ,Structural applications, Flexural, shear and axial strengthening of concrete elements using advanced composite materials

Laboratory

- Fresh concrete test (slump test, compact factor test VB time test).
- Hardened concrete test compression strength.
- Tensile strength test, modulus or rupture.
- Design of concrete mixes and testing it.
- Destructive and non-destructive tests.

References

- Mamlouk, M and Zaniewski, J, Materialsfor Civil and Construction Engineers, Prentice Hall, 3rd. Ed., 2006
- Concrete Technology by M.Neville and J.J.Brooks Publisher:Pearson Education, Inc., Pearson Prentice Hall,USA, 2nd Edition, 2010

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30 %	20 %	10 %	40%

DAE261	Building technology and Maintenance		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course aims at educating students technology principles – productions basics – mass production – machines – time and movement – production lines – workers and machines – incentives – architectural assembling – technologies of prefabricated buildings: Basics and methods – elements and components – manufacturing, transportation, and installation – maintenance, and support – basics of maintenance of different building components- construction material- Industrialized Building System (IBS)- Construction Solutions.

References

- Smith P & Julian W, Building services, applied science publications.
- Brian J.B. WoodBrian J.B. Wood, Building Maintenance, 2009.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30 %	20 %	10 %	40%

DAE161	Projection and Engineering Graphics		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course covers an introduction to Computer Aided Drafting (CAD), including architectural and assembly drawings using AutoCAD. It covers types of threaded fasteners, their use in plans and elevations, internal and external thread standards, and drawings. The course also covers 3D modeling techniques, isometric and axonometric models, pattern features, and 3D animation drafting. Students will practice using computer graphics packages like AUTOCAD, inserting dimensions, normal and auxiliary projection, sectioning and documentation, and 3D with simple examples.

Laboratory

- Autodesk AutoCAD 2024 or the latest version.

References

- Thomas, E. F., Fundamentals of Engineering Drawing, McGraw Hill Co., 1998.
- Hart, K. R., Engineering Drawing, English Universities Press Ltd., 1999.
- Thomas, E. F. and Vierck, C. J., Engineering Drawing and Graphic Technology, McGraw Hill Co., 2001.
- Richard Shelton Kirby, the Fundamentals of Mechanical Drawing, Nabu Press, 2009.
- Cecil Jensen; Jay Helsel and Dennis Short, Engineering Drawing and Design, McGraw Hill, 7th. Ed., 2007.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM212	Computer Aided Drawing		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

In the tutorial these contents will be covered: Introduction to Machine parts and assembly drawing, Types of threaded fasteners and washers, Internal and external Thread Standards,

definitions and drawings, bearing drawings, types of fittings, Fits and Tolerances, Geometrical Tolerances, Surface Finish. Exercises on assembly drawings such as: crane hook, stuffing box, valves, grinding wheel drive, worm and worm gear, machine vice, hand press, transmission shaft, 3d modeling using 3D CAD tools …, etc.
Laboratory
• Using computer lab to exercise on drawing
References
• Hart, K. R., Engineering Drawing with Problems, John Wiley and Sons, 1982. • Giesecke, F., Technical Drawing, Macmilan Publisher Co., 1986

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	10%	40%

EPR333	AutoCAD Electrical Drawing	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	0	3
Required SWL		Equivalent ECTS
75		3

Course Content
This course covers the indispensable core topics for working with the AutoCAD Electrical software and electrical terminology, . In this course, you will learn how to use many of the powerful electrical drawing creation tools in the software. You will create schematic drawings (ladder logic and point to point), panel drawings, and PLC-I/O circuits using automated commands for symbol insertion, component tagging, wire numbering, and drawing modification. In addition, you are introduced to methods of customizing electrical symbols, circuits, and databases. Other topics covered include title block linking, reporting tools, templates, and project files.
Laboratory
• Using computer lab to exercise on drawing
References
• Mastering AutoCAD 2019 and AutoCAD LT 2019. by George Omura (Author), Brian C. Benton (Author) • Adobe Photoshop CC Classroom in a Book (2019 Release) by Andrew Faulkner (Author), Conrad Chavez (Author) Photographic Rendering with V-Ray for Sketchup by Brian Bradley,2014. • Mastering AutoCAD 2019 and AutoCAD LT 2019. by George Omura (Author), Brian C. Benton (Author)
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	10%	40%

CCE111	Electrical Installations and Construction Equipment		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to electric circuits: Fundamental of Electricity (Voltage, current, resistance, power, resistor power ratings, Ohm's law). Simple resistive circuits. Kirchhoff's laws. Drawing of electrical symbols. Electrical installations in residential and industrial buildings (lighting, power, telephone, TV, air conditioning, lifts). Acoustic precautions. Alarm systems (Fire, Security, Gas), Electrical design for signaling systems in roads and railways, Electrical print reading. Assessment and selection of installations equipment.

Laboratory

- Drawing of electrical symbols using CAD software.
- Drawing of buildings wiring plans using CAD software.
- Applying electrical installation case studies using CAD software and in field.

References

- T. L. Floyd, and D. M. Buchla, "Principles of Electric Circuits: Conventional Current Version", 10 th ed., Pearson Education Limited, New York, 2020.
- Trevor Linsley, Basic Electrical Installation Work, 5th edition, Elsevier Ltd, 2008.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
35%	20%	15%	40%

BME211	Theory of Machines		3 CH
Prerequisites	Dynamics – BAS142		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Mechanisms: Definitions, open-chain and closed-chain systems, constraints, degrees of freedom, steering mechanisms, inversions of mechanisms. Kinematics of machines: position analysis, velocity analysis, acceleration analysis. Kinetics of machines: equilibrium of machines, D'Alembert's principle, force analysis, power analysis, inertia-effects and flywheel design. Synthesis of mechanisms. Cams: Types of cams, cam design, kinematics and kinetics of cam. Gears: Concept of gear motion, transmission, gear geometry and gear trains. Rotation matrix, homogeneous transformation matrix, direct and inverse kinematics
Laboratory
References
• "Theory of Machines" by R.S. Khurmi and J.K. Gupta • "Theory of Machines and Mechanisms" by John J. Uicker, Gordon R. Pennock, and Joseph E. Shigley

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

BME241	Strength of Materials	2 CH
Prerequisites	Theory of Machines – BME211	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
100		4

Course Content
Introduction, principles of mechanical properties, problems of engineering materials, testing types of mechanical properties, common methods of static and dynamic testing: tension, compression, bending, shear, hardness, impact, creep and fatigue. types of fracture, non- destructive testing of materials.
Laboratory
References
• "Mechanics of Materials" by Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, and David F. Mazurek (2020). • "Strength of Materials" by R.K. Bansal (2019). • "Mechanics of Materials" by James M. Gere and Barry J. Goodno (2018). • "Strength of Materials" by Timoshenko, S. P., and Gere, J. M. (2017).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME321	Machine Elements Design		3 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction to Design Concepts, General Concepts of (Deflection, Buckling and Thermal Stresses), Design for Fatigue, Design of Machine Elements (Bolts, Power Screws, Rivets, Keys, Welded Joints, Springs), Design of Power Transmission Elements (Shafts, Couplings, Gears, Belt Drives, Chain Drives), Selection of Bearings, Design of Pressure Cylinders. Use of interactive Finite Element computer programs for problem solving is illustrated and used.
Laboratory
References
• Shigley, M., Mechanical Engineering Design, McGraw Hill, 1997. • Orlov, P., Fundamentals of Machine Design, MIR Publisher, 1998. • Jain, R. K., Machine Design, Khanna Publishers, 1999.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME411	Machine Construction		3 CH
Prerequisites	Statics – BAS141		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Loading Diagrams, General concepts of Stress and Strain, Types of Stresses (Normal Stresses and Shear Stresses), Combined Stresses, Theories of Elastic Failure, and Safety Factor. Constructional details as affected by manufacturing, assembly, and strength considerations, Connections (Centering, Flanged, Riveted, Keyed, Splined, Screwed), Power Screw and its joints, Seals, Springs, Stress Concentrations, Reverse Engineering.
Laboratory
References
• Orlove, Fundamentals of Machine Design, MIR Publisher, 1977. • Shigly, Machine Design, McGraw Hill Co., 1999.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME311	Mechanical Vibrations	3 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	0
Required SWL		Equivalent ECTS
125		5

Course Content
Revision of mass-spring-damper system (free, damped, forced). Single degree of freedom systems (translational, rotational, torsional, and multi-body systems). Applications: Vibration isolation, Selection of Anti-Vibration-Mounts for machines, engines, HVAC equipment. Vibration of two degree of freedom systems (free, forced). Equivalent torsional systems: Geared system, Crank system. Applications: Vibration absorber, Crank system. Multi-degree-of-freedom systems. Continuous systems: bending of shafts, analytical solution, Whirling of shafts. Vibration measurements: Instrumentation. Frequency measurement. Damping characterization. Forced vibrations. Transmissibility. Vibration absorber. Field measurements.
References
• Rao, Singiresu S.S., Mechanical Vibrations with Disk, Addison Wesley, 1995. • Thomson, William T., and Marie Dillon Dahleh, Theory of Vibration with Applications, Simon and Schuster, 1997.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0 %	40%

BME251	Thermodynamics (1)		3 CH
Prerequisites	Engineering Chemistry - BAS131		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Thermal System, Control Volume, States of the Working Medium, Processes and Cycles, Calculation of Work, Heat Exchange with the Surroundings, Ideal Gases, Specific Heat at Constant Volume, Specific Heat at Constant Pressure, Equation of State, Pure Substances, Phase Equilibrium, Tables of Thermodynamic Properties, Internal Energy, Enthalpy, First Law of Thermodynamics on Closed Systems, First Law of Thermodynamics on Steady State Steady Flow Open Systems, The Case of Uniform State Uniform Flow, Application on Reciprocating Compressors, Ideal Gas Mixtures. Heat Engines, Refrigerator and Heat Pump, Second Law of Thermodynamics.

References

- Thermodynamics An Engineering Approach, Ninth Edition, 2019 By Çengel, Yunus A. Boles, Michael A. Kanoğlu, Mehmet.
- Fundamentals Of Thermodynamics 7th Edition, 2009 By Claus Borgnakke, Richard Edwin Sonntag.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0 %	40%

BME261	Fluid and Aerodynamics		3 CH
Prerequisites	Dynamics – BAS142		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Properties of Fluids, Density, Pressure, Forces on Submerged Bodies, Continuity, Boundary Layer Flow, Flow in Closed Conduits, Bernoulli's Equation, Major and Minor Losses in Pipes, Laminar and Turbulent Flows, Drag and Lift Forces, Compressible Flow, Stagnation Properties, Mach

Number and Sonic Velocity, Pumps in Series and Parallel, Selection of Pumps, Dimensional analysis: Buckingham theorem. Dynamic Similarity, Angular Velocity, Vortices, Stream Function, Potential Function, Wind tunnel for low velocity, Velocity potential, Laplace Equation.
Laboratory
• Effect of Momentum Change • Velocity Survey in a Circular Pipe Using Pitot Tube • Primary and Secondary Losses in Pipes • Sonic and Supersonic Air Flow
References
• Joseph H. Spurk, Nuri Askel, Fluid Mechanics, Springer, 2022. • John, D. Andereso, Fundamentals of Aerodynamics 6th Edition, McGraw-Hill, 2017. • John D. Anderson, Jr.” Fundamentals of Aerodynamics”5th edition, McGraw-Hill, 2011.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

BME261	Fluid and Aerodynamics		3 CH
Prerequisites	Dynamics – BAS142		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Properties of Fluids, Density, Pressure, Forces on Submerged Bodies, Continuity, Boundary Layer Flow, Flow in Closed Conduits, Bernoulli's Equation, Major and Minor Losses in Pipes, Laminar and Turbulent Flows, Drag and Lift Forces, Compressible Flow, Stagnation Properties, Mach Number and Sonic Velocity, Pumps in Series and Parallel, Selection of Pumps, Dimensional analysis: Buckingham theorem. Dynamic Similarity, Angular Velocity, Vortices, Stream Function, Potential Function, Wind tunnel for low velocity, Velocity potential, Laplace Equation.
Laboratory
• Effect of Momentum Change • Velocity Survey in a Circular Pipe Using Pitot Tube • Primary and Secondary Losses in Pipes
References
• Joseph H. Spurk, Nuri Askel, Fluid Mechanics, Springer, 2022.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

BME262	Fluid Mechanics and Aerodynamics		2 CH
Prerequisites	Thermodynamics(1) – BME251		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Properties of Fluids, Density, Pressure, Pressure Measurement, Forces on Submerged Bodies, Viscosity, Viscous Boundary Layers, Continuum Hypothesis, Streamlines, Velocity and Acceleration, Continuity Equation, Classification of Flow Fields: Pipe Flow, Jet Flow, Wake Flow, Boundary Layer Flow, Flow in Closed Conduits, Bernoulli's Equation, Major and Minor Losses in Pipes, Laminar and Turbulent Flows, Similitude and Dimensional Analysis, Lagrangian and Eulerian Coordinates, Transport Theorem on a Control Volume, Navier Stokes Equation, Flow around Immersed Bodies, Drag and Lift Forces, Compressible Flow, Stagnation Properties, Mach Number and Sonic Velocity, Equations of Gas Dynamics, Flow through Nozzles, Shock Waves, Classification of Turbo-Machines, Operation of Pumps, Series and Parallel Operation, Selection of Pumps.

Laboratory

- Effect of Momentum Change
- Velocity Survey in a Circular Pipe Using Pitot Tube
- Primary and Secondary Losses in Pipes

Sonic and Supersonic Air Flow

References

- Van Wylen, G. J. and Sonntag, R. E., Fundamentals of Classical Thermodynamics, John Wiley and Sons Inc., New York, 1973.
- El Wakil, M. M., Power Plant Technology, McGraw Hill Co., 1988.
- Holman, J. P., Heat Transfer, McGraw Hill Book Co., 1990.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME351	Heat Transfer	3 CH
Prerequisites	Thermodynamics (1) - BME251	
Number of weekly Contact Hours		

Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Thermal Conduction: The General Equation, Steady One Dimensional Conduction, Conduction without Heat Generation, Plane Wall, Composite Plane Wall, Composite Plane Wall Subjected to Convection, Overall Heat Transfer Coefficient, Cylindrical Shell, Composite Cylindrical Wall Subjected to Convection, Spherical Shell, Composite Spherical Shell Subjected to Convection, Extended Surfaces (Fins), Conduction with Uniform Internal Heat Generation, Conduction with Variable Thermal Conductivity, Steady Two Dimensional Conduction, Unsteady One Dimensional Conduction (Transient Conduction), Periodic Conduction. Convection: Types of Convection, Dimensionless Groups in Convection, Natural Convection, Forced Convection. Heat Exchanger: Heat Exchanger Types, Logarithmic Mean Temperature Difference, Effectiveness of Heat Exchangers. Thermal Radiation: Basic Concepts, Setfan-Boltzmann Law, Planck's Law, Radiation Properties of Real Surfaces, Emissivity and Absorptivity, Kirchoff's Law, Emissivity of Real Surfaces, Gray Surfaces, Selective Surfaces, Heat Exchange by Radiation, Heat Exchange between Two Planes, Heat Exchange between Two Cylinders or Spheres, Heat Exchange between Gray Surfaces, View Factors. Mass Transfer, Fick's Law of Diffusion, Mass Transfer Rate from a Pool of Liquid, and from a Liquid Droplet. Effect of using nanoparticles on the heat exchangers performance.

Laboratory

- Determination of the thermal conductivity coefficient of an insulating material
- Determination of the heat transfer coefficient in forced and natural convection heat transfer
- Determination of the temperature of a metal piece using the optical pyrometer
- Heat exchanger evaluation.
- Study of surface properties of two tubes in steam condensation

References

- Bird, R. B.; Steward, W. E. and Lishtbast, E. N., Transport Phenomena, John Wiley, and Sons Inc., 1960.
- Incroperal David, P. Devitt, Introduction to Heat Transfer, John Wiley, and Sons, 1990.
- Holman, J. P., Heat Transfer, McGraw Hill Book Co., 1990.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

Program 1: Intelligent and Sustainable Civil Engineering Program

- ## Program Description

The purpose of this program is to provide students with the necessary skills and knowledge for a successful career in civil engineering. The program is designed with a holistic approach that focuses on the development of both industry-relevant skills and academic competencies. Students will learn advanced concepts in designing main concrete, steel structures and infrastructure, as well as basics of site investigation. They will gain skills in laboratory, office, and site engineering, including preparation of specifications, project scheduling, design, quality control planning, and construction supervision processes. Additionally, the program aims to produce well-educated civil engineers with special expertise in sustainable utilities and infrastructure planning, surveying engineering, water and wastewater networks, solid waste management, highway and airport engineering, transportation planning, traffic engineering, and railway engineering. Graduates will be responsible for the life-cycle of the systems they create and must be capable of optimizing the total system performance of projects, considering their social and environmental impacts.

- ## Career Prospects

Radiates of this department has a variety of opportunities to work in design companies, construction companies, consulting firms, research entities and educational institutes or other similar organizations. They will be qualified for positions at companies specializing in the design, analysis, operation, construction, and management of a wide range of residential, commercial, industrial building and infrastructure projects. Possible jobs are design engineer, field engineer, construction developer, research assistant, quality engineer, and technical sales engineer.
Graduates of this department has a variety of opportunities to work, for example:

- Civil engineering contractors and project managers,
- Consulting firms in civil engineering and construction,
- Government authorities,
- Environmental engineering organizations.
- Water and sanitation utility companies.
- Road and bridge construction companies
- General Authority of Railways

- **Relation to Sustainable Development Goals**

GOAL 1: No Poverty	GOAL 2: Zero Hunger	GOAL 3: Good Health & Well-being	☒ GOAL 4: Quality Education	GOAL 5: Gender Equality	☒ GOAL 6: Clean Water & Sanitation
☒ GOAL 7: Affordable & Clean Energy	GOAL 8: Decent Work & Economic Growth	☒ GOAL 9: Industry, Innovation & Infrastructure	GOAL 10: Reduced Inequality	GOAL 11: Sustainable Cities & Communities	☒ GOAL 12: Responsible Consumption & Production
☒ GOAL 13: Climate Action	GOAL 14: Life Below Water	GOAL 15: Life on Land	GOAL 16: Peace & Justice Strong Institutions	GOAL 17: Partnerships to achieve. the Goal	

- **Program Concentrations**

The program provides the undergraduate student with a thorough foundation and technologies in the basic tenets of civil engineering and technologies. The program provides three different fields in which the students in this program can specialize. These three fields are:
1.Structural Engineering
2.Public Works Engineering
3.Irrigation and Water Resources Engineering

1. Structural Engineering is concerned with the structural design and structural analysis of buildings, bridges, towers and other structures. This involves identifying the loads which act upon a structure and the forces and stresses which arise within that structure due to those loads, and then designing the structure to successfully support and resist those loads. The loads can be self-weight of the structures, other dead load, live loads, moving (wheel) load, wind load, earthquake load, load from temperature change etc. The structural engineer must design structures to be safe for their users and to successfully fulfil the function they are designed for (to be serviceable). Due to the nature of some loading conditions, sub-disciplines within structural engineering have emerged, including wind engineering and earthquake engineering.

2. Public Works Engineering is concerned with public utilities and infrastructure development programs in cities as well as national levels. Also, design, construction, operation and maintenance of Utilities and Infrastructure systems. These systems include roads, airports, highway networks, transport systems, railway systems, traffic management, water and wastewater networks, water and wastewater treatment facilities and solid waste management.

3. Irrigation and Water Resources Engineering is concerned with the collection and management of water (as a natural resource). As a discipline it therefore combines elements of hydraulic, hydrology, environmental science, meteorology, conservation, and resource management. This area of civil engineering relates to the prediction and management of both the quality and the quantity of water in both underground (aquifers) and above ground (lakes, rivers, and streams, Canals and Drains) resources. Water resource engineer analysis and model very small to very large areas of the earth to predict the amount and content of water as it flows into, though, or out of a facility. Although the actual design of the facility may be left to other engineers. Also concerned with design of bridges, dams, canals, culverts, storm sewers. Irrigation and water resources engineers design these facilities using the concepts of fluid mechanics, and hydraulics, among others.

- ## Program Competences

According to the National Academic Reference Standards (NARS-2018), the competences for Graduates from NHADA University and all Engineering Programs, graduate must be able to (A-Level):

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
A5. Practice research techniques and methods of investigation as an inherent part of learning.
A6. Plan supervises and monitors implementation of engineering projects.
A7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

In addition to the above Competencies for All Engineering Programs the Basic Civil Engineering graduate must be able to (B-Level):

B1. Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.

B2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.

B3. Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.

B4. Deal with biddings, contracts and financial issues including project insurance and guarantees.

In addition to the competences for all Engineering Programs (A-Level), the competences for the Basic Civil Engineering Programs (B-Level), the competences for the Intelligent and sustainable Engineering Program, graduate must be able to (D-Level):

D1. Utilize technological and professional tools to design and execute components, modules, subsystems, or entire systems within the realm of Civil Engineering.

- **Required Courses**

List of Intelligent and Sustainable Civil Engineering Program Requirements Courses

Course Title	Weight			Contact Hours				%
	CH	ECTS	SWL	Lec	Tut	Lab	TT	
Nahda University Requirements	11	18	450	11	0	0	11	8 %
Faculty of Engineering Requirements	33	64	1600	23	17	12	52	23 %
Major Requirements of Intelligent and Sustainable Civil Engineering	58	96	2400	45	33	9	87	40 %
Minor Requirements of Intelligent and Sustainable Civil Engineering	42	72	1800	31	26	11	68	29 %
Total	144	250	6250	110	76	32	218	100

Major Requirements of Intelligent and Sustainable Civil Engineering

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
BAS212	Applied Engineering Mathematics for Civil Systems	2	3	75	2	1	0	3	BAS112
CVE211	Structural Analysis (1)	3	5	125	2	2	0	4	
CVE271	Engineering Surveying	2	3	75	2	0	1	3	
CVE261	Principle of Building Construction & Civil Drawing	4	8	200	2	6	0	8	
CVE212	Structural Analysis (2)	3	5	125	2	2	0	4	CVE211
CVE272	Topographic and Photogrammetric Surveying.	2	3	75	2	1	0	3	CVE271
CVE121	Properties of Materials	3	5	125	2	1	1	4	
CVE131	Engineering Geology	1	2	50	1	0	0	1	
CVE231	Soil Mechanics (1)	3	5	125	2	1	1	4	CVE131
CVE262	Fluid Mechanics	2	3	75	2	1	1	4	
CVE361	Hydraulics	2	3	75	2	1	1	4	CVE262
CVE241	Design of Concrete Structures (1)	3	5	125	2	2	0	4	CVE211 & CVE121
CVE201	Data Analysis and Image Processing using Python for Civil Engineers	2	3	75	1	0	2	3	
CVE301	Introduction to Machine Learning for Civil Engineers	3	5	125	2	1	2	5	CVE201
CVE405	Introduction to Deep Learning for Civil Engineers	2	4	100	2	1	0	3	CVE301
CVE232	Soil Mechanics (2)	3	5	125	2	2	0	4	CVE231
CVE281	Transportation and Traffic Engineering	2	3	75	2	1	0	3	
CVE362	Irrigation and drainage Engineering	2	3	75	2	1	0	3	CVE262
CVE351	Design of Steel Structures (1)	3	5	125	2	2	0	4	CVE212
CVE341	Design of Concrete Structures (2)	3	5	125	2	2	0	4	CVE241& CVE212
CVE331	Foundations Engineering (1)	3	5	125	2	2	0	4	CVE232
CVE382	Highway Engineering	2	3	75	2	1	0	3	CVE281
CVE491	Environment Risk Management	1	2	50	1	1	0	2	
CVE461	Design of Irrigation Structures (1)	2	3	75	2	1	0	3	CVE361
Total		58	96	2400	45	33	9	87	

Minor Requirements of Intelligent and Sustainable Civil Engineering

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CVE311	Structural Analysis (3)	2	4	100	2	1	0	3	CVE212
CVE492	Green Building systems and Infrastructure	2	3	75	1	2	0	3	CVE362
CVE451	Design of Steel Structures (2)	3	5	125	2	2	0	4	CVE351
CVE343	Design of Concrete Structures (3)	3	5	125	2	2	0	4	CVE341
CVE332	Foundations Engineering (2)	2	3	75	2	1	0	3	CVE331
CVE492	Wastewater Engineering	2	3	75	2	1	0	3	CVE391
CVE481	Railway Engineering	2	4	100	2	1	0	3	CVE281
CVE441	Design of Concrete Structures (4)	2	3	75	2	1	0	3	CVE343
CVE324	Introduction to BIM	3	6	150	2	1	2	5	CVE341
CVE421	Risk Management in Construction Projects	2	3	75	2	1	0	3	
CVE401	Thermal Analysis and sustainable systems for building	3	5	125	2	2	0	4	
CVE452	Design of Bridges	2	3	75	2	1	0	3	CVE451& CVE343
-	Civil Elective (1)	2	3	75	1	2	0	3	
-	Civil Elective (2)	2	3	75	2	1	0	3	
-	Civil Elective (3)	2	3	75	1	0	3	4	
-	Civil Elective (4)	3	6	150	1	3	3	7	101 Cr. hrs.
-	Civil Elective (5)	2	4	100	2	1	0	3	
-	Civil Elective (6)	3	6	150	1	3	3	7	
Total		42	72	1800	31	26	11	68	

Elective Courses of Intelligent and Sustainable Civil Engineering is distributed in five elective

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Civil Elective (1) Select 2 Credit hrs. (one course)									
CVE381	Transportation Planning	2	3	75	1	2	0	1	CVE281
CVE371	Maps, GIS & Remote Sensing	2	3	75	1	2	0	1	CVE271
CVE391	Solid wastes	2	3	75	1	2	0	1	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Civil Elective (1) Select 2 Credit hrs. (one course)									
CVE363	Hydrology	2	3	75	1	2	0	1	
CVE312	Structural Dynamics and Seismic analysis	2	3	75	1	2	0	1	CVE311
CVE342	Design of Wall Bearing Structures	2	3	75	1	2	0	1	CVE241
CVE321	Quality Control in Construction Engineering	2	3	75	1	2	0	1	CVE241& CVE121
CVE322	Recycling of Construction Materials	2	3	75	1	2	0	1	
CVE323	Management of Construction Projects	2	3	75	1	2	0	1	CVE223
Civil Elective (2) Select 2 Credit hrs. (one course)									
CVE383	Airport Engineering	2	3	75	2	1	0	3	CVE381
CVE384	Intelligent transportation systems	2	3	75	2	1	0	3	CVE381
CVE392	Plumbing Engineering	2	3	75	2	1	0	3	CVE262
CVE372	Geometric Geodesy and Geodetic Astronomy	2	3	75	2	1	0	3	CVE271
CVE364	Hydraulic Machines	2	3	75	2	1	0	3	CVE262& CVE361
CVE344	Design of High-Rise Buildings	2	3	75	2	1	0	3	CVE311& CVE341
CVE345	Pre-stressed Concrete	2	3	75	2	1	0	3	CVE341
CVE325	Advanced Materials	2	3	75	2	1	0	3	-
CVE326	Quantities and specifications	2	3	75	2	1	0	3	CVE341& CVE311
Civil Elective (3) Select 1 Credit hrs. (one course)									
CVE302	Software application in structural engineering	2	3	75	1	0	3	4	
CVE303	Software application in Public Works engineering	2	3	75	1	0	3	4	
CVE304	Software application in water resources engineering	2	3	75	1	0	3	4	
Civil Elective (4) Select 4 Credit hrs. (one course)									
CVE402	Graduation Project (1) and Computer Applications - Structural Engineering	3	6	150	1	2	3	6	101 hr & CVE311 & CVE341
CVE403	Graduation Project (1) and Computer Applications - Public Works	3	6	150	1	2	3	6	101 hr & CVE382

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CVE404	Graduation Project (1) and Computer Applications - Water Resources	3	6	150	1	2	3	6	101 hr & CVE262& CVE361
Civil Elective (5) Select 2 Credit hrs. (one course)									
CVE442	Design of Special reinforced concrete structures	2	4	100	2	1	0	3	CVE343
CVE422	Repair & Strengthening of Structures	2	4	100	2	1	0	3	CVE241
CVE423	Advanced BIM	2	4	100	2	1	0	3	CVE321
CVE424	Construction Engineering	2	4	100	2	1	0	3	CVE341
CVE431	Tunnels and underground structures	2	4	100	2	1	0	3	CVE332
CVE482	Highways Construction Material and Pavement Design	2	4	100	2	1	0	3	CVE382
CVE494	Construction of Water and Wastewater Infrastructure	2	4	100	2	1	0	3	CVE392
CVE495	Quality and chemistry of water	2	4	100	2	1	0	3	CVE492
CVE471	Advanced Topographic Surveying	2	4	100	2	1	0	3	CVE272
CVE462	Design of Irrigation Structures (2)	2	4	100	2	1	0	3	CVE461
CVE463	Harbor Engineering	2	4	100	2	1	0	3	CVE332
CVE464	Water Resources Management	2	4	100	2	1	0	3	CVE461
Civil Elective (6) Select 4 Credit hrs. (one course)									
CVE406	Graduation Project (2) - Structural Engineering	4	8	200	1	6	1	8	CVE402
CVE407	Graduation Project (2) - Public Works	4	8	200	1	6	1	8	CVE403
CVE408	Graduation Project (2) - water resources	4	8	200	1	6	1	8	CVE404

Elective Courses of Intelligent and Sustainable Civil Engineering is distributed in three Fields

I. Structural Engineering requirements

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CVE312	Structural Dynamics and Seismic analysis	2	3	75	1	2	0	3	CVE311
CVE342	Design of Wall Bearing Structures	2	3	75	1	2	0	3	CVE241
CVE321	Quality Control in Construction Engineering	2	3	75	2	1	0	3	CVE241& CVE121
CVE322	Recycling of Construction Materials	2	3	75	2	1	0	3	
CVE323	Management of Construction Projects	2	3	75	2	1	0	3	CVE223
CVE344	Design of High-Rise Buildings	2	3	75	2	1	0	3	CVE311& CVE341
CVE345	Pre-stressed Concrete	2	3	75	2	1	0	3	CVE341
CVE325	Advanced Materials	2	3	75	2	1	0	3	-
CVE326	Quantities and specifications	2	3	75	2	1	0	3	CVE341& CVE331
CVE302	Software application in structural engineering	2	3	75	1	0	3	4	
CVE403	Graduation Project (1) and Computer Applications - Structural Engineering	3	6	150	1	3	3	7	101 hr CVE311& CVE342
CVE442	Design of Special reinforced concrete structures	2	4	100	2	1	0	3	CVE343
CVE422	Repair & Strengthening of Structures	2	3	75	2	1	0	3	CVE241
CVE423	Advanced BIM	2	3	75	2	1	0	3	CVE321
CVE424	Construction Engineering	2	3	75	2	1	0	3	CVE341
CVE431	Tunnels and underground structures	2	4	100	2	1	0	3	CVE332
CVE406	Graduation Project (2) - Structural Engineering	3	6	150	1	3	3	7	CVE402

II. Public Works engineering requirements

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CVE381	Transportation Planning	2	3	75	1	2	0	3	CVE281
CVE371	Maps, GIS & Remote Sensing	2	3	75	1	2	0	3	CVE271
CVE391	Solid wastes	2	3	75	1	2	0	3	
CVE383	Airport Engineering	2	3	75	2	1	0	3	CVE381
CVE384	Intelligent transportation systems	2	3	75	2	1	0	3	CVE381
CVE392	Plumbing Engineering	2	3	75	2	1	0	3	CVE262
CVE372	Geometric Geodesy and Geodetic Astronomy	2	3	75	2	1	0	3	CVE271
CVE303	Software application in Public Works engineering	2	3	75	1	0	3	4	
CVE403	Graduation Project (1) and Computer Applications - Public Works	3	6	150	1	3	3	7	101 hr &CVE382
CVE482	Highways Construction Material and Pavement Design	2	4	100	2	1	0	3	CVE382
CVE494	Construction of Water and Wastewater Infrastructure	2	3	75	2	1	0	3	CVE392
CVE495	Quality and chemistry of water	2	4	100	2	1	0	3	CVE492
CVE471	Advanced Topographic Surveying	2	3	75	2	1	0	3	CVE272
CVE407	Graduation Project (2) - Public Works	3	6	150	1	3	3	7	CVE403

III. Water resources engineering requirements

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CVE363	Hydrology	2	3	75	1	2	0	3	
CVE364	Hydraulic Machines	2	3	75	2	1	0	3	CVE262& CVE361
CVE304	Software application in water resources engineering	2	3	75	1	0	3	4	
CVE405	Graduation Project (1) and Computer Applications - Water Resources	3	6	150	1	3	3	7	101 hr &CVE261 &CVE361
CVE462	Design of Irrigation Structures (2)	2	4	100	2	1	0	3	CVE461
CVE463	Harbor Engineering	2	4	100	2	1	0	3	CVE332
CVE464	Water Resources Management	2	4	100	2	1	0	3	CVE461
CVE408	Graduation Project (2) - water resources	3	6	150	1	3	3	7	CVE404

- **Proposed Study Plan**

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 1									
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS121	Vibration and Waves	3	5	125	2	2	1	5	
BAS141	Statics	3	5	125	2	2	0	4	
BAS131	Engineering Chemistry	3	5	125	2	2	1	5	
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
	NUB Elective (1)	2	3	75	2	0	0	2	
	NUB Elective (2)	2	3	75	2	0	0	2	
Total		18	30	750	13	11	2	26	
Semester 2									
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
BAS142	Dynamics	3	5	125	2	2	0	4	BAS141
BAS113	Probability and statistics	2	3	75	2	1	0	3	
CVE121	Properties of Materials	3	5	125	2	1	1	4	
-	Spatial Perception and Design Elective	2	3	75	1	0	3	4	
CVE131	Engineering Geology	1	2	50	1	0	0	1	
ENG111	English (1)	1	2	50	1	0	0	1	
Total		18	30	750	13	7	6	26	
Semester 3									
BAS212	Applied Engineering Mathematics for Civil Systems	2	3	75	2	1	0	3	BAS112
CVE261	Principle of Building Construction & Civil Drawing	4	8	200	2	6	0	8	-
CVE211	Structural Analysis (1)	3	5	125	2	2	0	4	
CVE271	Engineering Surveying	2	3	75	2	0	1	3	
CVE231	Soil Mechanics (1)	3	5	125	2	1	1	4	CVE131
-	Structures and Properties of Materials Elective	2	3	75	2	0	1	3	-
-	Engineering Technology Elective (Modern Building Material)	2	3	75	2	1	0	3	-
Total		18	30	750	14	11	3	28	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 4									
CVE262	Fluid Mechanics	2	3	75	2	1	1	4	
CVE241	Design of Concrete Structures (1)	3	5	125	2	2	0	4	CVE211 & CVE121
CVE212	Structural Analysis (2)	3	5	125	2	2	0	4	CVE211
CVE272	Topographic and Photogrammetric Surveying	2	3	75	2	1	0	3	CVE271
CVE232	Soil Mechanics (2)	3	5	125	2	2	0	4	CVE231
CVE281	Transportation and Traffic Engineering	2	3	75	2	1	0	3	
CVE201	Data Analysis and Image Processing using Python for Civil Engineers	2	3	75	1	0	2	3	
CVE223	Project Management Essentials	2	3	75	2	1	0	3	
Total		19	30	750	15	10	3	28	
Semester 5									
CVE361	Hydraulics	2	3	75	2	1	1	4	CVE262
CVE341	Design of Concrete Structures (2)	3	5	125	2	2	0	4	CVE241
CVE362	Irrigation and drainage Engineering	2	3	75	2	1	0	3	CVE262
CVE331	Foundations Engineering (1)	3	5	125	2	2	0	4	CVE232
CVE301	Introduction to Machine Learning for Civil Engineers	3	5	125	2	1	2	5	CVE201
CVE311	Structural Analysis (3)	2	4	100	2	1	0	3	CVE212
-	Civil Elective (1)	2	3	75	1	2	0	3	
-	NUB Elective (3)	1	2	50	1	0	0	1	
Total		18	30	750	14	9	3	27	

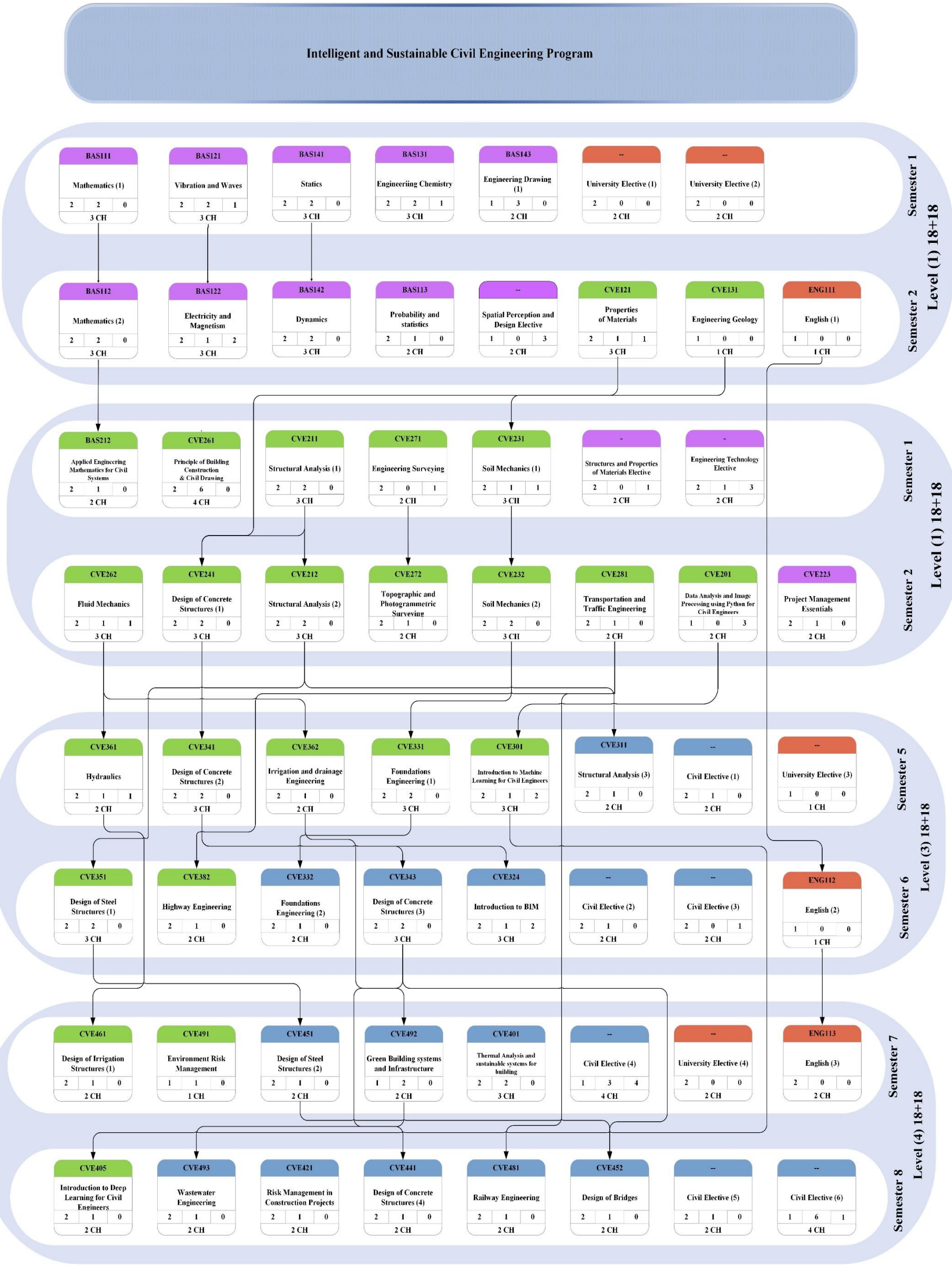
Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 6									
CVE351	Design of Steel Structures (1)	3	5	125	2	2	0	4	CVE212
CVE382	Highway Engineering	2	3	75	2	1	0	3	CVE281
CVE332	Foundations Engineering (2)	2	3	75	2	1	0	3	CVE331
CVE343	Design of Concrete Structures (3)	3	5	125	2	2	0	4	CVE341
CVE324	Introduction to BIM	3	6	150	2	1	2	5	CVE341
-	Civil Elective (2)	2	3	75	2	1	0	3	
-	Civil Elective (3)	2	3	75	1	0	3	4	
ENG112	English (2)	1	2	50	1	0	0	1	ENG111
Total		18	30	750	14	8	4	27	
Semester 7									
CVE461	Design of Irrigation Structures (1)	2	3	75	2	1	0	3	CVE361
CVE491	Environment Risk Management	1	2	50	1	1	0	2	
CVE451	Design of Steel Structures (2)	3	5	125	2	2	0	4	CVE351
CVE492	Green Building systems and Infrastructure	2	3	75	1	2	0	3	CVE362
CVE401	Thermal Analysis and sustainable systems for building	3	5	125	2	2	0	4	
-	Civil Elective (4)	3	6	150	1	3	3	7	101 Cr. hrs.
-	NUB Elective (4)	2	3	75	2	0	0	2	
ENG113	English (3)	2	3	75	2	0	0	2	ENG112
Total		18	30	750	14	10	3	28	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 8									
CVE405	Introduction to Deep Learning for Civil Engineers	2	4	100	2	1	0	3	CVE301
CVE493	Wastewater Engineering	2	3	75	2	1	0	3	CVE492
CVE421	Risk Management in Construction Projects	2	3	75	2	1	0	3	CVE322
CVE441	Design of Concrete Structures (4)	2	3	75	2	1	0	3	CVE343
CVE481	Railway Engineering	2	4	100	2	1	1	3	CVE281
CVE452	Design of Bridges	2	3	75	2	1	0	3	CVE451& CVE343
-	Civil Elective (5)	2	4	100	2	1	0	3	
-	Civil Elective (6)	3	6	150	1	3	3	7	
Total		17	30	750	15	10	3	28	

- ## Graduate Attributes

The graduates from Civil Engineering Program:

- Master a wide spectrum of civil engineering knowledge and specialized skills.
- Apply acquired knowledge using theories and abstract thinking in real life situations.
- Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
- Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
- Enhance comprehension of project management principles to proficiently strategize and implement engineering projects while adhering to budgetary and timeline limitations.
- Use techniques, skills and modern engineering tools necessary for civil engineering practice.


Intelligent and Sustainable Civil Engineering Program
Level (1) 18+18
Semester 1
BAS111 Mathematics (1) 2 2 0 3 CH
BAS121 Vibration and Waves 2 2 1 3 CH
BAS141 Statics 2 2 0 3 CH
BAS131 Engineeriing Chemistry 2 2 1 3 CH
BAS143 Engineering Drawing (1) 1 3 0 2 CH
-- University Elective (1) 2 0 0 2 CH
-- University Elective (2) 2 0 0 2 CH
Semester 2
BAS112 Mathematics (2) 2 2 0 3 CH
BAS122 Electricity and Magnetism 2 1 2 3 CH
BAS142 Dynamics 2 2 0 3 CH
BAS113 Probability and statistics 2 1 0 2 CH
-- Spatial Perception and Design Elective 1 0 3 2 CH
CVE121 Properties of Materials 2 1 1 3 CH
CVE131 Engineering Geology 1 0 0 1 CH
ENG111 English (1) 1 0 0 1 CH
Level (3) 18+18
Semester 5
BAS212 Applied Engineering Mathematics for Civil Systems 2 1 0 2 CH
CVE261 Principle of Building Construction & Civil Drawing 2 6 0 4 CH
CVE211 Structural Analysis (1) 2 2 0 3 CH
CVE271 Engineering Surveying 2 0 1 2 CH
CVE231 Soil Mechanics (1) 2 1 1 3 CH
- Structures and Properties of Materials Elective 2 0 1 2 CH
- Engineering Technology Elective 2 1 3 2 CH
Semester 6
CVE262 Fluid Mechanics 2 1 1 3 CH
CVE241 Design of Concrete Structures (1) 2 2 0 3 CH
CVE212 Structural Analysis (2) 2 2 0 3 CH
CVE272 Topographic and Photogrammetric Surveying 2 1 0 2 CH
CVE232 Soil Mechanics (2) 2 2 0 3 CH
CVE281 Transportation and Traffic Engineering 2 1 0 2 CH
CVE201 Data Analysis and Image Processing using Python for Civil Engineers 1 0 3 2 CH
CVE223 Project Management Essentials 2 1 0 2 CH
Level (4) 18+18
Semester 7
CVE361 Hydraulics 2 1 1 2 CH
CVE341 Design of Concrete Structures (2) 2 2 0 3 CH
CVE362 Irrigation and drainage Engineering 2 1 0 2 CH
CVE331 Foundations Engineering (1) 2 2 0 3 CH
CVE301 Introduction to Machine Learning for Civil Engineers 2 1 2 3 CH
CVE311 Structural Analysis (3) 2 1 0 2 CH
-- Civil Elective (1) 2 1 0 2 CH
-- University Elective (3) 1 0 0 1 CH
Semester 8
CVE351 Design of Steel Structures (1) 2 2 0 3 CH
CVE382 Highway Engineering 2 1 0 2 CH
CVE332 Foundations Engineering (2) 2 1 0 2 CH
CVE343 Design of Concrete Structures (3) 2 2 0 3 CH
CVE324 Introduction to BIM 2 1 2 3 CH
-- Civil Elective (2) 2 1 0 2 CH
-- Civil Elective (3) 2 0 1 2 CH
ENG112 English (2) 1 0 0 1 CH
Level (5) 18+18
Semester 9
CVE461 Design of Irrigation Structures (1) 2 1 0 2 CH
CVE491 Environment Risk Management 1 1 0 1 CH
CVE451 Design of Steel Structures (2) 2 1 0 2 CH
CVE492 Green Building systems and Infrastructure 1 2 0 2 CH
CVE401 Thermal Analysis and sustainable systems for building 2 2 0 3 CH
-- Civil Elective (4) 1 3 4 4 CH
-- University Elective (4) 2 0 0 2 CH
ENG113 English (3) 2 0 0 2 CH
Level (6) 18+18
Semester 10
CVE405 Introduction to Deep Learning for Civil Engineers 2 1 0 2 CH
CVE493 Wastewater Engineering 2 1 0 2 CH
CVE421 Risk Management in Construction Projects 2 1 0 2 CH
CVE441 Design of Concrete Structures (4) 2 1 0 2 CH
CVE481 Railway Engineering 2 1 0 2 CH
CVE452 Design of Bridges 2 1 0 2 CH
-- Civil Elective (5) 2 1 0 2 CH
-- Civil Elective (6) 1 6 1 4 CH
CVE
TRN 2x1 Field Training (1) 0 5 8 0 CH
TRN 3x1 Field Training (2) 0 5 8 0 CH
- The maximum allowed study duration is 8 academic years
- Cumulative GPA at any main semester < 2.0
- 10 Weeks of Field
- Training can be Started at the end of level 2 (Sophomore level)
University Req. 11 CH
Program. Major Req 58 CH
Faculty Req. 33 CH
Program. Minor Req 42 CH
Course Code
Course Title
Lec Tut Lab
CH

- **Intelligent and Sustainable Civil Engineering Program Courses Content**

- **Courses offered by Intelligent and Sustainable Civil Engineering Program (CVE)**

CVE211	Structural Analysis (1)		3 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Basics of Statics – Loads and Reactions – Axial Forces – Shear Forces- Determination of Statically Determinate and Statically Indeterminate Structures- Normal Forces - Shear Forces and Bending Moments in Beams and Frames – Statically Determinate Trusses – Influence Lines for Beams , Frames and Trusses – Properties of Plan Areas.
References
• Hibbeler (2012), Structural Analysis, 8ed, Prentice Hall, Pearson • Theory of structures Vol. 1, W.M.El-Dakhakhni, Dar El-Maaref, Cairo. • Theory of structures Vol. 2, by prof. Fayez Kaiser ,1975 , Egypt • Leet, Uang, Gilbert (2010), Fundamentals of Structural Analysis, McGraw • Emam, H., Mondial Press (2004)" Fundamental Theory of Structures. • Kenneth Leet "Fundamentals of Structural Analysis" • Russell Hibbeler "Structural Analysis" • Aslam Kaasimali "Structural Analysis"

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE212	Structural Analysis (2)		3 CH
Prerequisites	Structural Analysis (1) - CVE211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Normal stress, shear stress and combined stresses- Classical methods for beam deflection- Three moments' equations – Moving loads – Buckling in columns and thin plates.
References

- Theory of structures Vol. 2, W.M.El-Dakhakhni, Dar El-Maaref, Cairo
- Theory of structures Vol. 2, by prof. Fayez Kaiser , Egypt
- Salah Khalafallah "Structural Analysis: analysis of indeterminate structures"
- 4- K. U. Muthu "Indeterminate Structural Analysis"

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE311	Structural Analysis (3)		2 CH
Prerequisites	Structural Analysis (2) - CVE212		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Virtual work methods for deflection calculation, Graphical method for trusses, Virtual work methods for indeterminate structures, Influence lines for forces and displacements in indeterminate structures, Plastic center method, Moment distribution method, Bases of stiffness method, Stiffness method for computer analysis.

References

- Colin Caprani, Internet Book, 2010," Structural Analysis III: Moment Distribution.
- Theory of structures Vol. 2, by prof. Fayez Kaiser, 1975, Egypt.
- Theory of structures Vol. 2, W.M.El-Dakhakhni, Dar El-Maaref, Cairo.
- Russell Hibbeler "Structural Analysis"
- Aslam Kaasimali "Structural Analysis"
- Aslam Kaasimali "Matrix Analysis of Structure"

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE312	Structural Dynamics and Seismic analysis		2 CH
Prerequisites	Structural Analysis (3) - CVE311		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to Dynamic Analysis, Classification of Structural Systems According to Dynamic Analysis, Dynamic Analysis of Structural System with One Degree of Freedom, Approximate Methods of Analysis of Indeterminate Structures: Portal Frame, Cantilever Method, Hollow Vierendeel Girders, Introduction to Finite Element Method.

References

- A. K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering, 5th Edition, Prentice Hall, Englewood Cliffs, New Jersey, 2017.
- Dynamics of Structures, R. W. Clough and J. Penzien 3rd Edition 2003

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE121	Properties of Materials	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	1
Required SWL		Equivalent ECTS
125		5

Course Content

Material science Material properties, stresses and strain, Poisson ratio, method of testing, testing machines, tensile test, compression test properties of ductile materials, brittle materials semiductile materials. Concrete materials: Cement, Aggregate, Mixing water, Admixtures. Concrete manufacturing: Storage, Mixing, Transportation, Pouring, Compacting, Curing, Construction Joints, Shrinkage and movement joints, Formwork, Ready mixed concrete.

Laboratory

- Tensile strength of mild steel.
- Cement testing (Fineness Test, Standard Consistency Test, Initial and Final Setting Time Test, Compressive Strength Test, Autoclave Test for Soundness, Tensile Strength Test, Specific Gravity Test, Heat of Hydration Test)
- Aggregate testing (Sieve Analysis Test, Crushing Test, Impact Test, Abrasion Test, Flakiness Index Test, Elongation Index Test, Angularity Test, Soundness Test, Specific Gravity and Water Absorption Test)

References

- Materials for Civil and Construction Engineers, Michael Mamlouk and John P.
- Zaniewski, Prentice Hall, Second Ed., ISBN: 0-13-147714-5 Second edition – 2012
- Construction materials for civil engineering projects

- Egyptian codes of practice for reinforced concrete (2021) & Steel structures
- Egyptian Standard Specifications for different construction materials (Updated versions)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE223	Project Management Essentials		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Definition of Projects and Project Management, Project management techniques, models, and knowledge to enable students to design and operate an effective project management system, Project Life Cycle in Construction, Project Scope Management, Quality Management, Introduction to Procurement Management, Introduction to Equipment Management, Introduction to Risk Management, Human Resources Management including Charts and staff motivation, Communication, and stakeholder management, Construction method statements and constructability, introduction to operation research. Topics are aligned with the Project Management Body of Knowledge (PMBOK).

References

- PMI, A guide to the project management body of knowledge, 5th edition, PMI, USA
- Hinze, Jimmie, Construction Planning and Scheduling, 4th edition, Person Prentice Hall, New Jersey, USA, 2011
- Sears, S. et al., Construction Project Management, 6th edition, John Wiley and Sons, New York, 2015
- Mubarak, Saleh A., Construction Project Scheduling and Control, 3rd edition, John Wiley and Sons, New York, 2015

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE324	Introduction to BIM		3 CH
Prerequisites	Design of Concrete Structures (2) - CVE341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
150		6	

Course Content

Overview of the BIM Process. BIM history and definition. BIM benefits. BIM challenges Autodesk Revit. The use of BIM in the planning and design phase. The use of BIM in the construction phase. BIM Concepts. BIM Principles and practices for construction. Tools and Techniques for BIM Implementation. Collaborative Nature of BIM. BIM Standards ISO 19650. Introduction to Revit. Introduction to relevant BIM Software, and Applications.

References

- Building information modeling: a strategic implementation guide for architects, engineers, constructors, and real estate asset managers by Dana K. Smith
- Building Information Management. A Standard Framework and Guide to BS 1192
- BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE321	Quality Control in Construction Engineering		2 CH
Prerequisites	Design of Concrete Structures (1) - CVE241 Properties of Materials - CVE121		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Technical inspection - procedures for quality control – components of quality assurance - basics for quality control plans and the assurance of their success - statistical control using computer programs

References

- Quality control of concrete structures. proceedings of the International Symposium held by RILEM
- Quality control of concrete structures, L. Taerwe, H. Lambotte

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE322	Recycling of Construction Materials		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Recycling of wastes in construction: Types of waste materials, Agricultural wastes, Industrial wastes and by-products, Construction and demolition wastes, Solid waste materials (Glass, Rubber Tires, Saw dust, Paper, Carpet fibers……). Sustainability: Definition, Environmental, social, and economic aspects of sustainability, Sustainability in civil engineering, Environmental problems related to construction, Environmental impact of building materials. Green building: Building codes and green building rating systems, environmentally friendly cements and concretes (Green cements, Green concrete, Pervious concrete, Geo-polymer concrete).

References

- Materials for Civil and Construction Engineers, Michael Mamlouk and John P.
- Zaniewski, Prentice Hall, Second Ed., ISBN: 0-13-147714-5 Second edition – 2012
- Construction materials for civil engineering projects
- Egyptian codes of practice for reinforced concrete (2019) & Steel structures
- Egyptian Standard Specifications for different construction materials (Updated versions)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE323	Management of Construction Projects		2 CH
Prerequisites	Project Management Essentials – CVE223		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course is intended to provide an introduction to many facts of the construction management. This course intent is to provide a practical demonstration of the basic management techniques commonly used or encountered on a construction project. Course Outlines: Project need determination and feasibility studies; Project Cost Evaluation and Estimating; Project Schedule development; Design/Construction Contract Development; Project Engineering/Design; Engineering Procurement Specification development; Cost Accounting and Control; Labor availability Evaluation; Quality Assurance and Control; Safety; Project Closeout.

References

- Project Management Institute Essential books (text books), 2008 , Construction Engineering and management, PMBOK
- Frederick Gould and Nancy E. Joyce, Construction Project Management, Prentice Hall, 3rd. ed., 2008

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE325	Advanced Materials		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Stress analysis and Strain and theory's of failure - Lightweight concrete and fiber reinforced concrete - Additives to concrete and High strength concrete - Nano materials and its application in concrete, and Ferro cement – Materials for Protecting

References

- Mechanics of Advanced Composite Materials, Gibson, 1998
- Egyptian Code of practice for FRP Code 208 – 2006

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE326	Quantities and Specifications		2 CH
Prerequisites	Design of Concrete Structures (2) – CVE341 Foundation Engineering (1) – CVE331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Elements of contract documents. Writing of specifications documents that complement the working drawings. Defining the scope of work and detailed description of items and materials. Quality surveyor; rules and methods. The techniques of calculating the quantities of building items. Check listing the finished work and detecting faulty items.

References

- Building and Engineering Contracts, 7th Edition. B.S. Patil and S.P. Woolhouse.CRC Press, 2019.
- Abdullatif Abu Al-Ata Al-Bukhari, Engineering Encyclopedia for the Construction of Buildings and Public Utilities, Dar majed Printing, Cairo, Third Edition 1999.
- Mohammed Majed Abbas Khulusi, Quantities, Specifications and Performance Rates for Construction Work, part I, sixth edition

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE421	Risk Management in Construction Projects		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to risk management, Plan Risk Management, Identify Risks (due to consult-ants, owners, contractors or due to management), Perform Quantitative Risk Analysis, Perform Qualitative Risk Analysis, Force majeure risks, Plan Risk Responses and Control Risks, Safety in

Construction and Personal Protective Equipment, Accidents Investigation
References
• Practice Standard for Project Risk Management: PMI, Project Management Institute Institute, P. M. (2009) • Managing risk in construction projects, Smith, Nigel J,erna, Tony, Jobling, Paul, 2014 • PMI, A guide to the project management body of knowledge, 5th edition, PMI, USA • Hinze, Jimmie, Construction Planning and Scheduling, 4th edition, Person Prentice Hall, New Jersey, USA, 2011 • Hegazy, T., Computer-Based Construction Project Management, Prentice Hall, 2002. • Sears, S. et al., Construction Project Management, 6th edition, John Wiley and Sons, New York, 2015 • Mubarak, Saleh A., Construction Project Scheduling and Control, 3rd edition, John Wiley and Sons, New York, 2015 • Rita Mulcahy's Risk Management Tricks of the Trade for Project Managers: And PMI-RMP Exam Prep Guide: a Course in a Book, 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE422	Repair & Strengthening of Structures		2 CH
Prerequisites	Design of Concrete Structures (1) - CVE241		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Causes of deterioration of concrete structures, Evaluation of concrete structures, Repair and strengthening materials (types, selection and testing), Bond between repair and strengthening materials and substrate concrete, Different repair and strengthening techniques, Protection and maintenance of concrete structures, Repair and strengthening of different concrete elements (footing – column – beam – slab …. etc.), Structural analysis of repair and strengthening, Design of repair and strengthening, Case studies.
References
• Emmons, Peter H., Concrete repair and Maintenance, R.S. Means Co., Inc.,1993. • Allen, R. T. L.; Edwards, S. C. and Shaw, J. D. N., The Repair of Concrete Structures, Blackie Academic and Professional, 1993. • ACI Committee 440, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures, American Concrete Institute, 2017.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE423	Advanced BIM		2 CH
Prerequisites	Introduction to BIM - CVE324		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduce advanced BIM concepts and terminologies. Examine implementing BIM in an organization while introducing practical applications within a live project environment. Determining BIM capability and future goals within an organization. Developing a BIM roadmap. Developing a BIM execution plan. Identifying appropriate BIM tools and required technology infrastructure Managing change within the organization Identifying required changes to the business process. Managing Projects using Revit. Revit for Architecture and Structures. Developing 4D, 5D, and nDs, BIM Models and extracting time and cost from BIM Models, Developing training advanced applications by relevant BIM software.

References

- Building information modeling: a strategic implementation guide for architects, engineers, constructors, and real estate asset managers by Dana K. Smith
- Building Information Management. A Standard Framework and Guide to BS 1192
- BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers

Assessment Criteria			
Student Activities	Student Activities	Student Activities	Student Activities
40%	20%	0%	40%

CVE424	Construction Engineering		2 CH
Prerequisites	Design of Concrete Structures (2) - CVE341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
The major factors involved in heavy and building construction projects. The material is presented from the point of view of a field engineer with several assignments to illustrate the production planning required for construction projects. Course outline: Operational planning assignment; Project plans and specification; Earthwork fundamentals and calculations; Equipment production fundamentals; Tractors, Dozers, Rippers, Scarpers, Haulers, Loaders, Excavators; Aggregate production systems; Conveying systems; Formwork; Concrete pumps.
References
• Mamlouk, M and Zaniewski, J, Materials for Civil and Construction Engineers, Prentice Hall, 3rd. Ed., 2006.

Assessment Criteria			
Student Activities	Student Activities	Student Activities	Student Activities
40%	20%	0%	40%

CVE131	Engineering Geology		1 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	0	
Required SWL		Equivalent ECTS	
50		2	

Course Content
Rock forming minerals; Rock types and soil types; Soil and rock properties; Geological structure analysis; Plate tectonics; Geological time (relative and absolute geological age(; Geological maps and sections; Discontinuities analysis (Hemispherical projection); Weathering and soils; Surface processes (Floodplains and Alluvium, Glacial Deposits, Climatic Variants), Coastal processes; Groundwater flow; Geological and geophysical site Investigation; Engineering geophysics; Assessment of difficult grounds; Rock excavation; Rock as construction materials.
References
• Bell F. G, Engineering Geology and Construction, Spon Press, Taylor & Francis Group, London, 2004. • Waltham T., Foundtions of Engineering Geology, Spon Press, 3rd. Ed., 2009

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE231	Soil Mechanics (1)		3 CH
Prerequisites	Engineering Geology - CVE131		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Soil properties and preliminary definitions; soil investigation; soil classification; soil compaction; soil permeability; stresses, strains, and elastic deformations of soils; stress path; laboratory compaction tests; relative density; field compaction; compaction equipment; and site control of compaction. Seepage: flow net diagram, uplift pressure, and critical hydraulic gradient.

References

- Braja M. Das, Khaled Sobhan , ISBN 13- 978-1305970953 , 2017 “Principles of Geotechnical Engineering”, 9 edition,.
- K. R. Arora, ISBN 13- 978-8180141126 , 2020, " SOIL MECHANICS AND FOUNDATION ENGINEERING",

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE232	Soil Mechanics (2)		3 CH
Prerequisites	Soil Mechanics (1)- CVE 231		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Soil consolidation; prediction of settlement of structures; lateral earth pressure and shear strength of soil. Bearing capacity: modes of failure, shear strength parameters, bearing capacity equations, eccentric loads, and inclined loads. Contact pressure and settlement of foundations.

References

- Braja M. Das, Khaled Sobhan , ISBN 13- 978-1305970953 , 2017 “Principles of Geotechnical Engineering”, 9 edition,.
- K. R. Arora, ISBN 13- 978-8180141126 , 2020, " SOIL MECHANICS AND FOUNDATION ENGINEERING",

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE331	Foundations Engineering (1)		3 CH
Prerequisites	Soil Mechanics (2) - CVE232		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Analysis and design of shallow foundations: isolated and combined footings, strip foundations, and strap beams. Interaction of shallow foundations with elastic soil. Deep foundations: types, classification of piles, bearing capacity of a single pile, settlement of a single pile, pile load tests, design of pile caps, and subgrade reaction model.

References

- Egyptian code of practice for foundations, Cairo, 2020.
- Baraja, Das, Cengage Learning, ISBN 13- 978-0357684658 ,2023 “Principles of Foundation Engineering”, 10th Ed.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE332	Foundations Engineering (2)		2 CH
Prerequisites	Foundations Engineering (1) - CVE331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Stability analysis of retaining walls: action forces, rotational sliding, block stability, and foundation stresses. Laterally loaded piles. Slope stability: infinite slopes, finite slopes, mass methods, method of slices, and design charts. Stability analysis and design of sheet pile walls: cantilever and anchored sheet pile walls, free and fixed earth support, tie-backs, braced cuts, and site dewatering.

References

- Egyptian code of practice for foundations, Cairo, 2020.
- Baraja, Das, Cengage Learning, ISBN 13- 978-0357684658 ,2023 “Principles of Foundation Engineering”, 10th Ed.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE241	Design of Concrete Structures (1)		3 CH
Prerequisites	Structural Analysis (1)- CVE211 Properties of Materials - CVE121		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Theories of Design - The Codes of Practice in Reinforced concrete structures)-Ultimate limit strength method - Analysis of Sections (Stress-strain relations – the distribution of strains and stresses across a section - Analysis of the Section under Bending (single and double reinforcement) (rectangular –L and T section) , Shear- Analysis of the structure (Loads – load combinations – straining action)-Design of beams – (Loads distributions – straining action - design of section –details of steel reinforcement code requirements)- Analysis of Sections under centric and eccentric compression force based on limit state strength method and permissible stress method) - Design of short column.

References

- الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم ٢٠٣-٢٠١٨
- مساعدات التصميم مع أمثلة طبقًا للكود المصري لتصميم وتنفيذ المنشآت الخرسانية (اخر تحديث
- Reinforced Concrete Mechanics and Design, seventh edition, 2015
- Mashhour Ghoneim & Mahmoud El-Mihilmy: Design of Reinforced Concrete Structures, Volume 1, 2 & 3, second edition, 2008.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE341	Design of Concrete Structures (2)		3 CH
Prerequisites	Design of Concrete Structures (1) - CVE241 Structural Analysis (2) - CVE212		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Design the roof of structures (beam slab type- Hollow block slabs – ribbed stabs – flat slabs – paneled beams slabs) -Design of reinforced concrete elements under torsion, shear and moment and axial force – stairs.
References
• الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم ٢٠٣-٢٠١٨ • مساعدات التصميم مع أمثلة طبقًا للكود المصري لتصميم وتنفيذ المنشآت الخرسانية (اخر تحديث) • Reinforced Concrete Mechanics and Design, seventh edition, 2015 • James Mac Gregor & James K. Wight, Reinforced Concrete: Mechanics and design, 6th Ed., Prentice Hall, July 2013. • Mashhour Ghoneim & Mahmoud El-Mihilmy: Design of Reinforced Concrete Structures, Volume 2, second edition, 2008.Rita Mulcahy's Risk Management Tricks of the Trade for Project Managers: And PMI-RMP Exam Prep Guide: a Course in a Book, 2010

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE343	Design of Concrete Structures (3)		3 CH
Prerequisites	Design of Concrete Structures (2)- CVE341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Serviceability limit state - Design the reinforced concrete long columns -Design of reinforcement concrete shear wall - Big span systems (Frames - Arch slabs and Arch girders,)- Behavior and design of short cantilever and R.C Hinges supports.
References
• الكود المصري لتصميم وتنفيذ المنشآت الخرسانية كود رقم ٢٠٣-٢٠١٨ • Reinforced Concrete Mechanics and Design, seventh edition, 2015 • مساعدات التصميم مع أمثلة طبقًا للكود المصري لتصميم وتنفيذ المنشآت الخرسانية (اخر تحديث) • James Mac Gregor & James K. Wight, Reinforced Concrete: Mechanics and design, 6th Ed., Prentice Hall, July 2013. • Mashhour Ghoneim & Mahmoud El-Mihilmy: Design of Reinforced Concrete Structures, Volume 2, second edition, 2008.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE342	Design of Wall Bearing Structures		2 CH
Prerequisites	Design of Concrete Structures (1) - CVE241		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction: History of masonry, Masonry elements, Types of masonry construction, Analysis and design methods. Masonry materials: Masonry units, Mortar, Grout, Reinforcement. Masonry assemblages: Compression, Flexural, Shear in plane tensile strength. Reinforced beams and lintels: Flexural behavior and design, Shear behavior and design, Load distribution on lintel beams. Flexural walls: Load resisting mechanisms, Flexural behavior, Analysis and design of reinforced flexural walls. Load bearing walls under axial load and out of plane bending: Overview, Effects of bending on the capacity of walls, Effect of wall height, Interaction between axia l load an bending, Linear elastic analysis of unreinforced and reinforced sections, Effects of slenderness, Moment magnification, Special provisions for slender reinforced walls.

References

- Drysdale, Hamid, and Baker, Masonry Structures: Behavior and Design, Brick Institute of America and National Concrete Masonry Association, 1993
- Klingner, Masonry Structural Design, McGraw-Hill Education, 2010
- Richard E. Klingner 2010 Masonry Structure Design McGraw Hill Companies.
- Aita Danila Orietta Pedemonte and Kim Williams eds. Masonry Structures Between Mechanics and Architecture. Springer International Publishing 2015.
- Ohtsu Masayasu and D. G. Aggelis. Innovative AE and NDT techniques for on site measurement of concrete and masonry structures. RILEM State Art Rep 20 2016 89 103
- ECP 204 2005 Egyptian Code of Practice for Masonry Structures Housing and Building Research Center.
- Masonry Standards Joint Committee 2005 Building Code Requirements for Masonry Structures ACI 530 05 ASCE 5 05 TMS 402 05 American Concrete Institute American Society of Civil Engineers and The Masonry Society Detroit New York.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE344	Design of High-Rise Buildings		2 CH
Prerequisites	Structural Analysis (3) - CVE311 Design of Concrete Structures (2) - CVE341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	

2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Examines structural aspects of high-rise buildings, particularly fundamental approaches to the analysis of the behavior of different forms of building structures including frame, shear wall, tubular, core and outrigger - braced systems. Introducing the forces to which the structure is subjected, design criteria which are of the greatest relevance to tall buildings, and various structural forms which have developed over the years since the first skyscrapers were built at the turn of the century. Modeling of real structures for both preliminary and final analyses. Assessment of the stability of the structure, and the significance of creep and shrinkage. Dynamic response of structures subjected to wind and earthquake forces. Includes both accurate computer - based and approximate methods of analysis, Applications using structural analysis software programs.

References

- Taranath, Tall Building Design: Steel, Concrete, and Composite Systems, CRC Press, 2016
- Smith, Tall Building Structures: Analysis and Design, John Wiley & Sons, 1991

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE345	Pre-stressed Concrete		2 CH
Prerequisites	Design of Concrete Structures (2)-CVE341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Principles of prestressing- methods of prestressing – analysis of section under working loads – Design for serviceability limit state - Design for ultimate limit state.

References

- Egyptian Code for Design and Construction of Reinforced Concrete Structures ECP-203-18, 2nd edition, 2020
- Guide of structural engineering (part seven), Abdel- Rahman Megahed
- Reinforced concrete design, W.H. Mosley and J.H.Bungey ,MACMILLAN
- Reinforced concrete design handbook- Prof, Dr. Shaker El Behairy (sixth edition)

- Design of Reinforced Concrete Structure, Prof. Mashhour gheneim & Prof. Mahmoud El Mihilmy, Third Edition 2012, Volume 1
- Egyptian code for the design of concrete structures 203-2007

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE441	Design of Concrete Structures (4)	2 CH
Prerequisites	Design of Concrete Structures (3)-CVE343	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Serviceability limit and crack control, Design of water structures, Water tanks and its shapes, tanks rested on soil, semi embedded tanks, embedded tanks, elevated tanks, calculation of loads distributions, Analysis for straining action design of sections -circular beams and deep beams).

References

- Egyptian Code of Practice for the Design and Construction of Reinforced Concrete Structures. ECP 203 18
- Mashour Ghoneim & Mahmoud EL-Mihilmy, Design of Reinforced Concrete Structures, 2nd Ed., volume 1,2 & 3, 2008
- James Mac Gregor & James K. Wight, Reinforced Concrete: Mechanics and design, 5th Ed., Prentice Hall, July 2008.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE442	Design of Special reinforced concrete structures	2 CH
Prerequisites	Design of Concrete Structures (3) - CVE343	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
100		4

Course Content

Thin Shell Structures - Folded Plates - Yield Line Theory for Plates

References			
• Egyptian Code of Practice for the Design and Construction of Reinforced Concrete Structures. (ECP 203-20). • M. Hilal Theory and Design of Reinforced Concrete Tanks, 1988 • Mashour Ghoneim & Mahmoud EL-Mihilmy, Design of Reinforced Concrete Structures, 2nd Ed., volume 3, 2020			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE431	Tunnels and underground structures		2 CH
Prerequisites	Foundations Engineering (2) - CVE332		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	
Course Content			
Classification of Tunnels – Tunneling Techniques, Soil-Structure Interaction, Application of Finite Element Method to tunneling problems, Soil Settlement due to Tunneling, Analysis and Design of Tunnels and Under-ground Structures using Specialized Computer Programs.			
References			
• Columbs, Springer, 2008 “Design and Analysis of Tunnels ” • Mohsen Razevy, World Scientific Publishing, 2003 “Quantom Theory of Tunnels” • R. C. Hibbeler, Pearson Prentice Hall, 2010,” Structural Analysis”			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE351	Design of Steel Structures (1)		2 CH
Prerequisites	Structural Analysis (2) - CVE212		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	
Course Content			

Structural steel technology: Introduction to steel design theories, Steel fracture, Steel grades. Design elements: structural systems and General layout for multipurpose halls, Lateral resistance and bracing systems, Codes and specifications, Load calculations. Member design: Structural behavior, cross section classification (rolled section), Truss Tension members, Truss Compression members, Design of Purlins, Types of connections, Analysis and design of Bolted connections (Bearing-Type), Analysis and design of welded connections, Steel details for trusses, Steel details for wind bracing.

References

- Egyptian Code of Practice for Loads of Structural Works and Buildings, code No. 201 – 2011.
- Egyptian Code of Practice for Steel Construction and Bridges (Allowable Stress Design – ASD) Code No: (205) Ministerial Decree No 279 – 2001.
- Egyptian Code of Practice for Steel Construction and Bridges (Load and Resistance Factors Design) – 2008.
- Salmon C.G., Johnson J.E., and Malhas F.A. Steel Structures: Design and Behaviour, Prentice Hall, 5th ed. 2009.
- Design of Steel Structures to Eurocodes https://08102uegj-1106-y-https-link-springer-com.mplbci.ekb.eg/book/10.1007/978-3-319-95474-5.
- Jack C. McCormac and Stephen F. Csernak. Structural Steel Design, 6th edition – 2018.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE451	Design of Steel Structures (2)		3 CH
Prerequisites	Design of Steel Structures (1) - CVE351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Design of members: Compression members (columns) Lacing Bars and Batten Plates, Beams under bending, Torsion on beams, Beam-columns, Local buckling. Analysis and design of bolted connections (friction bolts), Design of Torsion and Tension Bracket Connection (Friction-Type) Steel details for frames, Design of Splice, Connection Design of Fixed Base Fatigue considerations, Fabrication and errection considerations, Introduction to composite beams and columns.

References

- Egyptian Code of Practice for Loads of Structural Works and Buildings, code No. 201 – 2011.
- Egyptian Code of Practice for Steel Construction and Bridges (Allowable Stress Design – ASD) Code No: (205) Ministerial Decree No 279 – 2001.
- Egyptian Code of Practice for Steel Construction and Bridges (Load and Resistance Factors Design) – 2008.
- Salmon C.G., Johnson J.E., and Malhas F.A. Steel Structures: Design and Behaviour, Prentice Hall, 5th ed. 2009.
- Design of Steel Structures to Eurocodes https://08102uegj-1106-y-https-link-springer-com.mplbci.ekb.eg/book/10.1007/978-3-319-95474-5.
- Jack C. McCormac and Stephen F. Csernak. Structural Steel Design, 6th edition – 2018.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE452	Design of Bridges		2 CH
Prerequisites	Design of Steel Structures (2) - CVE451 Design of Concrete Structures (3) - CVE343		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Structural system of bridges. Types of bridges: Structural systems in longitudinal and transverse directions, Material of construction, Design philosophy. Design loads: Roadway loading, Railway loading, other loads on bridges. Design of concrete bridges (types of Reinforced concrete bridges - elements of the bridge – typed of loads -solid slab type bridge- Box slab type). Design of steel floor beams systems: Stringer, Cross girders, Floor connections. Design of plate girder bridges: General design considerations. Design of truss bridges.

References

- Reinforced Concrete Mechanics and Design, seventh edition, 2015 .
- James Mac Gregor & James K. Wight, Reinforced Concrete: Mechanics and design, 6th Ed., Prentice Hall, July 2013.
- Mashhour Ghoneim & Mahmoud El-Mihilmy: Design of Reinforced Concrete Structures, Volume 2, second edition, 2008.
- A guide of structural engineer for the design and implementation of concrete structures -Prof. Abdul Rahman Mujahid Ahmed Egyptian Code of Practice for Steel Construction and

Bridges (Allowable Stress Design – ASD) Code No: (205) Ministerial Decree No 279 – 2001.
- Egyptian Code of Practice for Steel Construction and Bridges (Allowable Stress Design – ASD) Code No: (205) Ministerial Decree No 279 – 2001.
- Egyptian Code for Planning, Design, and Construction of Bridges and Elevated Intersection ECP No. 207, Part 4 – Loads and Forces on Bridges and Elevated Intersection, 2015.
- Egyptian Code for Planning, Design, and Construction of Bridges and Elevated Intersection ECP No. 207, Part 6 – Analysis and design of Steel Bridges (LRFD), 2015.
- Salmon, C., Johnson, J., and Malhas, F., Steel Structures Design and Behavior Pearson Education, Inc., ISBN:0-13-188556-1, Fifth Edition 2012.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE261	Principle of Building Construction & Civil Drawing		4 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	6	-	
Required SWL		Equivalent ECTS	
200		8	

Course Content

Historical introduction to building construction- The sequences of construction work - Types of buildings foundations- Build by fired bricks and stones - Build by fired bricks and stones Bearing walls, retaining walls and arches - Types of buildings slabs and ceilings - Different types of buildings insulation materials An Introduction to architectural working drawings (Plans – Facades – Sections) - Vertical movement elements (Stairs design)–Notation, dimensions and scale -Earth works (cross sections of canals, drains, roads, railways and non-rigid dams)– Irrigation structures (bridges– weirs– regulators– syphons– aqueducts–culverts)– Retaining structures –Drawing of simple steel structures and connections of steel bridges– Drawing of concrete structures (cross sections for columns, beams, slabs frames, and foundations– reinforcement details).

References

- Mohamed Abdallah, Working Drawings and Architectural Details, Egyptian Anglo Library, Cairo 1989.
- Novak, P., Moffat, A., Nalluri, C. and Narayanan, R., Hydraulic Structures, 4th Edition, Taylor & Francis, 2007. ISBN 0-203-96463-2 Master e-book ISBN.
- Perry S. Green, Thomas Sputo, Patrick Veltri A Teaching Guide for Structural Steel Connections, American Institute of Steel Construction, Civilax, 2016.
- Singh, Gurcharan. "Civil Engineering Drawing". Standard publications-Delhi, 2009.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE262	Fluid Mechanics		2 CH
Prerequisites	Fluid Mechanics CVE262		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to Irrigation and Drainage Engineering- Soil- Water Interaction- Water Duties- When Irrigation is needed- Agriculture and Irrigation Cycles- Irrigation Systems and their Areas in Egypt- Irrigation Methods- New Irrigation Systems- Sprinkler Irrigation – Drip Irrigation- Drainage- Drainage Systems- Alignment and Design of Irrigation Projects.

References

- Principles of Irrigation & Drainage engineering.
- Irrigation and Drainage Engineering,Waller,Peter,Yitayew,Muluneh,2016.
- Educational sites on water resources & irrigation engineering.
- Egyptian code of practice for irrigation design, Cairo, 2009.
- P. Novak, A.I.B. Moffat, C. Nalluri, and R. Narayanan. 2007. “Hydraulic Structures. Taylor & Francis, New York”.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE262	Fluid Mechanics		2 CH
Prerequisites	Fluid Mechanics CVE262		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

The properties of fluids - Forces in static fluids - Fluid pressure measurement -Hydrostatic pressure forces on surfaces - Kinematics of fluid motion - Energy equation - Momentum equation - Dimensional analysis, similitude, and models - Fluid Flow in pipes.

References

- Elementary Fluid Mechanics, Vennard & street, John Wiley & sons.
- Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch& Alric P. Rothmayer 'Fluid Mechanics' © 2013, 2010 John Wiley & Sons Singapore Pte. Ltd.
- Wiley - Fluid Mechanics - http://app.kortext.com/read/6310/?page=iv]
- French, R. H, Open Channel Hydraulics; Water Resources Pubns, 2007. ISBN 13: 9781887201445
- Chow V.T.; Open Channel Hydraulics; McGraw-Hill Education-Europe, 1981. ISBN 13: 9780070859067
- Frank M. White, Fluid Mechanics, 8th Edition, McGraw Hill, 2013. ISBN13: 9780073398273 Copyright: 2016

Laboratory

12. Centre of pressure
13. Flow through a Venturi meter
14. Orifice meters
15. Impact of jet
16. Dispersion of a freely discharge jet
17. Flow over a rectangular and vee notches.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE361	Hydraulics	2 CH
Prerequisites	Fluid Mechanics - CVE262	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-

Required SWL	Equivalent ECTS
75	3

Course Content

Liquid flows in open channels - Gradually varied flow in open channels - Hydraulic turbines - Non-steady flow in pipes and water hammer - Pumping machinery.

References

18. Open channel hydraulics. Prof M. Hanif Chaudhry, 2008.
19. Open Channel hydraulics. Ven Chow, 7th Edition.
20. Open channel hydraulics. Prof. French

Laboratory

21. Shallow Water Wave Celerity
22. Venturi Flume
23. Uniform Flow in Open Channels
24. Parshall Flume

25. The Hydraulic Jump
26. Flow Over a Broad Crested Weir
27. Axial Flow Pump

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE362	Irrigation and drainage Engineering		2 CH
Prerequisites	Fluid Mechanics - CVE262		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to Irrigation and Drainage Engineering- Soil- Water Interaction- Water Duties- When Irrigation is needed- Agriculture and Irrigation Cycles- Irrigation Systems and their Areas in Egypt- Irrigation Methods- New Irrigation Systems- Sprinkler Irrigation – Drip Irrigation- Drainage- Drainage Systems- Alignment and Design of Irrigation Projects.

References

- Principles of Irrigation & Drainage engineering.
- Irrigation and Drainage Engineering,Waller,Peter,Yitayew,Muluneh,2016.
- Educational sites on water resources & irrigation engineering.
- Egyptian code of practice for irrigation design, Cairo, 2009.
- P. Novak, A.I.B. Moffat, C. Nalluri, and R. Narayanan. 2007. “Hydraulic Structures. Taylor & Francis, New York”.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE461	Design of Irrigation Structures (1)		2 CH
Prerequisites	Irrigation and drainage Engineering - CVE362		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Design of canal cross sections with different bed material - Design of Bridges - Design of culverts - Design of syphons -Design of aqueducts - Design of tail escape - lining methods of irrigation channels.
References
• Hydraulic Structures, Novak, P.; Moffat, A.; Nalluri, C. & Narayanan, R., Fourth edition 2007. • Irrigation and Water Resources Engineering, G.L. Asawa, 2008. • Irrigation Engineering and Hydraulic Structures, S.R. Sahasrabudhe, 2013. • Design of Irrigation Works (1) I.S.B.N. 977-5248-95, 2015. • Egyptian code of practice for irrigation design, Cairo, 2009. • Novak, P., Moffat, A., Nalluri, C. and Narayanan, R., Hydraulic Structures, 1996. • Nazeih Assaad Younan, Design Textbooks in Civil Engineering – Irrigation Structures.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE363	Hydrology	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-
Required SWL		Equivalent ECTS
75		3

Course Content
Introduction: Hydrologic cycle, Environment and hydrology, Importance of hydrology. Hydrometeorology: Solar energy, Temperature, Vapor pressure, Humidity, Wind, Evaporation, Evapotranspiration. Precipitation: Conditions and types, Rainfall measurements and estimates, Rainfall statistical analysis, Design storm. Infiltration: Effective factors, Measurements, Estimates. Hydro-morphology: Watershed characteristics, Morphological parameters, Time parameters. Surface runoff: Peak flow estimate, Storm hydrograph, Unit hydrograph, Mass curves, Flow and water level measurements. Soil erosion and sedimentation: Effective factors, Soil loss, Sediment yield. Protection works against flash floods: Storage and detention works, Roads crossing works, Direction change works, Sediment traps, Storm water Drainage systems. Subsurface hydrology: Soil - water relations, Characteristics and types of aquifers, Flow through porous media, Well hydraulics, , Sea water intrusion in coastal aquifers.
References
• Shaw E. M., "Hydrology in Practice", Van Nostrand Reinhold (UK) Co. Ltd., 4th edition, August 29, 2010. • André Musy, Benoit Hingray, Cécile Picouet “Hydrology A Science for Engineers Edite”, Copyright Year 2015.

- Kevin Sene, "Flash Floods Forecasting and Warning", Springer Science + Business Media Dordrecht 2013.
- Mostafa M. Soliman, "Engineering Hydrology of Arid and Semi-Arid Regions", CRC Press 2017.
- K Subramanya, Engineering Hydrology, Tata McGraw - Hill, 3rd. Ed., 2008.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE364	Hydraulic Machines	2 CH
Prerequisites	Fluid Mechanics CVE262 & Hydraulics – CVE361	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Hydraulics turbines – types of turbines – properties of turbines – similarity in turbines – turbines performance – selection of turbines – non steady flow in pipes and water hammer – basic equation of water hammer – pressure wave in a conduit due to sudden closure of valve - Slow closing of a wave – surge tanks – pumping machinery – types of pumps – properties of pumps – limits of suction life - Pumps in series – pumps in parallel - performance curves of a pump.

References

- French, R. H, Open Channel Hydraulics; Water Resources Pubns, 2007. ISBN 13: 9781887201445
- Chow V.T.; Open Channel Hydraulics; McGraw-Hill Education-Europe, 1981. ISBN 13: 9780070859067
- Frank M. White, Fluid Mechanics, 8th Edition, McGraw Hill, 2013. ISBN13: 9780073398273 Copyright: 2016.
- P. Kumari, Hydraulic Machines: Fundamentals of Hydraulic Power Systems, CRC Press; 1 edition (December 27, 2012).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE462	Design of Irrigation Structures (2)	2 CH
Prerequisites	Design of Irrigation Structures (1) - CVE461	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-

Required SWL	Equivalent ECTS
100	4

Course Content

Water Control Structures- Weirs and Regulators- Design of Floors for the Water Control Structures- Navigation Locks- Storage Lakes- Dams: Classifications- Types- Ecological Studies- Stability of Dams- Protection of Dams.

References

- Hydraulic Structures, Novak, P.; Moffat, A.; Nalluri, C. & Narayanan, R., Fourth edition 2007.
- Irrigation and Water Resources Engineering, G.L. Asawa, 2008.
- Irrigation Engineering and Hydraulic Structures, S.R. Sahasrabudhe, 2013.
- Design of Irrigation Works (1) I.S.B.N. 977-5248-95, 2015.
- Egyptian code of practice for irrigation design, Cairo, 2009.
- Novak, P., Moffat, A., Nalluri, C. and Narayanan, R., Hydraulic Structures, 1996.
- Nazeih Assaad Younan, Design Textbooks in Civil Engineering – Irrigation Structures.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE463	Harbor Engineering		2 CH
Prerequisites	Foundations Engineering (2) - CVE332		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Linear theories on regular waves, irregular waves, statistical properties and spectra of sea waves, wave propagation and transformation, wave - structure interaction; Structural design of marine infrastructure: Breakwaters; Ramps; Sea Walls; Jetties, Marinas; Harbor geometry; Dredging and Reclamation: Equipment, work methods, environmental aspects, Geotechnical aspects; Hydrographic Surveying; Corrosion Protection; Coastal processes; Sediment transport; Storm surge; Modeling.

References

- Sorensen, R. M, Basic Coastal Engineering, Springer, NY, 2006.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE464	Water Resources Management	2 CH
Prerequisites	Design of Irrigation Structures (1) - CVE461	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
100		4

Course Content

Definition of water resources, it's statistics and water budget in Egypt Arab and Middle East Countries- different scopes of water use- general policies of water management- supply & requirements management- qualitative management of water- economic, social, legal political and organizational aspects that should be considered with water management- definition of integrated management of water resources- water management on international level, watershed level, city level and farm level.

References

- Principles of Water Resources: History, Development, Management, and Policy, 4th Edition, Thomas V. Cech, ISBN: 978-1-118-79029-8, April 2018.
- Water Resource Management Issues, Basic Principles and Applications, By Louis Theodore, R. Ryan Dupont, Copyright Year 2020.
- Open Channel Design: Fundamentals and Applications, Ernest W. Tollner, September 2021.
- Practices of Water Resources Development and Management, M. Hossain Ali, 2022 John Wiley & Sons Ltd.
- David Stephenson, Water Resources Management Hardcover – October 15, 2003.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE271	Engineering Surveying	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	1
Required SWL		Equivalent ECTS
75		3

Course Content

Introduction to mapping and surveying science - Different surveying instruments and their uses - The surveying maps and their types - Reconnaissance and surveying sketches drawing - Scales- International coordinate systems - Area Calculations and Land Division – Leveling – Cut and fill volume calculations –The Theodolite - Methods of observing angles and directions - Traverse

observations and calculations - Methods of observing distances - Theory of errors - Errors in surveying measurements, sources, types and treatment.

Laboratory

- Development of practical skills in AutoCAD.
- Basic understanding of data manipulation.
- Measurement of horizontal distances.
- Measurement of horizontal angles. 5.
- Measurement of elevations.
- Use of various software tools to manipulate data and develop and draw construction plans.
- Chain surveying, Electronic methods of linear measurements.
- Longitudinal Leveling.
- The Theodolite Surveying.

References

- S.K. Roy, Fundamentals of Surveying PHI Learning Private Limited, New Delhi, 2nd edition, 2010.
- William Irvine, F. Surveying for Construction The McGraw-Hill Companies,5th edition, 2005.
- Wilfred Schofield and Mark Breach, Engineering surveying, Elsevier, 6th. ed., 2007
- Kavanagh, Geomatics, Prentice Hall Publishers, New Jersey, 2003.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE272	Topographic and Photogrammetric Surveying		2 CH
Prerequisites	Engineering Surveying - CVE271		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Theodolite and its application and permanent adjustment – Tachometric surveying - triangulation networks – direct and indirect distance measurement – curves – basics of photogrammetry and remote sensing and photo interpretation – role of surveying in engineering projects.

References

- Charles D. Ghilani, Paul R. Wolf, Elementary Surveying an Introduction to Geomatics (13th Edition), Prentice Hall, 2012.
- Wilfred Schofield and Mark Breach, Engineering surveying, Elsevier, 6th. ed., 2007.
- Plane and Geodetic Surveying 2nd Edition. Aylmer Johnson. CRC Press, 2014.
- Barry F. Kavanagh, Surveying with Construction Application (6th Edition), Prentice Hall, 2007.
- Paul R. Wolf Bon A. Dewitt Benjamin E. Wilkinson Elements of Photogrammetry with applications in GIS Fourth Edition Mc Grow Hill Education 2018 American Society for Photogrammetry and Remote Sensing ASPRS.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE371	Maps, GIS & Remote Sensing		2 CH
Prerequisites	Engineering Surveying - CVE271		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction, GIS components, Data models: coordinates, attribute data and types, vector data models, Raster Data models, Data and file structure. Map projection and coordinate systems. Building a GIS data base, digitizing, coordinate transformation. Digital Data. Attribute data and tables. Basic spatial analysis in infrastructure projects.

References

- Bolstad P.2019. GIS Fundamentals: A First Text on Geographic Information Systems. XanEdu Publishing Inc; Sixth edition (July 15, 2019).
- Kumar T. 2014. Geographic Information System for Smart Cities. Copal Publishing Group (January 14, 2014).
- Celso, D., GIS for Building and Managing Infrastructure, ESRI Press, 2009.
- Abramoff, S., Remote Sensing for GIS Managers, ESRI Press, 2005.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE372	Geometric Geodesy and Geodetic Astronomy		2 CH
Prerequisites	Engineering Surveying - CVE271		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	

2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content
Gravity field of the Earth - Computational surface of the Earth - Geodetic horizontal control techniques - Geodetic datums - Terrestrial coordinate systems - Least squares adjustment - Geodetic Astronomy.
References
• Noureldin A. Karamat T. B. and J. Georgy 2013. Fundamentals of Inertial Navigation Satellite based Positioning and Their Integration. Springer. Sanz S. J. Juan Z. J. M. 2017. GNSS Data Processing Theory. gAGE Research Group of Astronomy and Geomatics. • Applications of Geodetic Survey. Prof.Abdelal M.abdelwahed • Flat and photographic Survey. Prof. Ali Shokry • Analysis and adjustment of surveying measurements Edward m.Mikhail • Engineering surveying sixth Edition. W. Schofield and Mark Breach. Taylor & Francis Ltd, 2007.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE471	Advanced Topographic Surveying	2 CH
Prerequisites	Topographic and Photogrammetric Surveying - CVE272	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
100		4

Course Content
Introduction to photogrammetry, Coordinates computations in photogrammetry, Flight mission, Topographic maps from digital photogrammetry, Introduction to remote sensing, Satellite images - Topographic maps from satellite images.
References
• Francis H. Moffitt and Edward M. Mikhail. Photogrammetry third edition Harper &Row, Publishers, New York, 1980. • Floyd F. Sabins, JR, Remote Sensing principles and interpretation W.H, Freeman And Company, San Francisco, 1978. • Paul J. Curran Principles of remote sensing Longman, London and New York, 1985. • Prof. Dr. Ing. Joerg Albertz, Dr Ing. Walter Kreiling Photogrammetric Guide Third edition, Herbert Wichmann Verlag Karlsruhe, 1980. • Paul R. Wolf, Bon A. Dewitt, Benjamin, E. Wilkinson Elements of Photogrammetry with

applications in GIS Fourth Edition Mc Grow Hill Education, 2018. • American Society for Photogrammetry and Remote Sensing (ASPRS).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE281	Transportation and Traffic Engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Introduction to Transportation Planning, Traffic Engineering: Characteristics of Drivers, Vehicles, and Pedestrians - Studies of Key Traffic Elements - Speed Studies - Relationships between Speed, Traffic Volume, and Traffic Density - Road Capacity and Level of Service - Traffic Control Devices - Traffic Signals - Parking Studies - Road Intersections.
References
• Mannering, F.L. and Kilareski, W.P., “Principles of Highway Engineering and Traffic Analysis", John Wiley & Sons, 2nd edition, New York, 1998. • Paul H.W. (1998) "Transportation Engineering", • Garber, N. J., Hoel, L. A., Traffic and Highway Engineering, 4th Edition, 2008. • Myer Kutz (2004) "Handbook of transportation engineering" Publisher: McGraw Hill, New York. • Findley, Daniel & Schroeder, B.J. & Cunningham, C.M. & Jr, Brown, (2015) "Highway Engineering: Planning, Design, and Operations". • Nicholas J. Garber, Lester A. Hoel (2009) “Traffic and Highway Engineering: Fourth edition” University of Virginia.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE382	Highway Engineering		2 CH
Prerequisites	Transportation and Traffic Engineering - CVE281		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	

75	3

Course Content

Introduction to Road Engineering - Classification of Road Networks - Design Traffic Volumes - Sight Distances – Design of Horizontal Curves – Design of Vertical Curves - Intersection design. Soil Classification - Soil Tests – Bituminous Materials and their Tests - Traffic Loads - Design Equivalent Loads - Design of Flexible Pavement - Design of Rigid Pavement – Hot Mix Asphalt Design

References

- Mannering, F.L. and Kilareski, W.P., "Principles of Highway Engineering and Traffic Analysis", John Wiley & Sons, 2nd edition, New York, 1998.
- Garber, N. J., Hoel, L. A., Traffic and Highway Engineering, 4th Edition, 2008.
- Findley, Daniel & Schroeder, B.J. & Cunningham, C.M. & Jr, Brown, (2015) "Highway Engineering: Planning, Design, and Operations".
- Nicholas J. Garber, Lester A. Hoel (2009) "Traffic and Highway Engineering: Fourth edition" University of Virginia
- Mahmoud Tawfeek Salem, 1985 " Highway and Airport Engineering".
- Findley, Daniel & Schroeder, B.J. & Cunningham, C.M. & Jr, Brown, (2015) "Highway Engineering: Planning, Design, and Operations"
- AASHTO (2001) "A policy on geometric design of highways and streets".
- T.F. Fwa (2006) "The Handbook of Highway Engineering" publisher: Taylor & Francis Group, LLC
- Nicholas J. Garber, Lester A. Hoel (2009) "Traffic and Highway Engineering: Fourth edition" University of Virginia
- Badr eldin Attef Mousa, 2007 " highway Engineering" Kafrelsheikh university.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE481	Railway Engineering	2 CH
Prerequisites	Transportation and Traffic Engineering - CVE281	

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	-

Required SWL	Equivalent ECTS
100	4

Course Content

Introduction to Railway Engineering - Dynamics of Train Movement - Engineering Planning for Railway Lines - Curves - Horizontal Alignment of the Railway on Curves - Transition Curves - Engineering and Design of Structural Elements for Railway Lines - Rails - Sleepers - Railway Stations -Mechanical and electrical signals.

References
• Myer Kutz (2004) "Handbook of transportation engineering" Publisher: McGraw Hill, New York. • W.W. Hay, McGraw Hill, 1974" Railway Engineering". • Wright and Paquett John Wiley, 1990" Transportation Engineering". • Hassaan Hemeda & Mahmoud T. Salem., 1986" Railway Engineering (in Arabic) ". • د/ محمد حافظ فهمي , "تخطيط النقل و السكك الحديدية " كلية الهندسة – جامعة الاسكندرية ,(٢٠٠٥)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE381	Transportation Planning	2 CH
Prerequisites	Transportation and Traffic Engineering- CVE281	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-
Required SWL		Equivalent ECTS
75		3

Course Content
Introduction to Transportation Planning - Transportation Supply and Demand - Stages of Transportation Planning - Transportation Demand Forecasting - Trip Generation - Trip Distribution - Modal Split - Network Planning and Trip Assignment - Evaluation of Transportation Projects - Introduction to Intelligent Transportation Systems.
References
• Paul H.W. (1998) "Transportation Engineering", • Myer Kutz (2004) "Handbook of Transportation Engineering" Publisher: McGraw Hill, New York. • Nicholas J. Garber, Lester A. Hoel (2009) "Traffic and Highway Engineering: Fourth edition" University of Virginia.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE383	Airport Engineering	2 CH
Prerequisites	Transportation Planning - CVE381	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS

75	3

Course Content

Types of airports, their classification and aircraft characteristics – Runways configuration - Airport safety surfaces – Geometric design of airports (runways, taxiways, terminals) - Structural design of airports (runways, taxiways, terminals) - Lighting systems and marking for airports.

References

- Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, Airport Engineering: Planning, Design and Development of 21st Century Airports, 4th Edition.
- (Roads and Airports Engineering) Mohammed Tawfiq Salem Dar Alrateb University. 1985.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE 384	Intelligent transportation systems	2 CH
Prerequisites	Transportation Planning - CVE381	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Definition of Intelligent Transportation Systems - Intelligent Transportation Systems - Key Underlying Technologies for ITS - Functional Areas in ITS - ITS Applications - Infrastructure Based Wireless ITS -. In-Vehicle ITS Services - Standardization for Intelligent Transport Systems - ITS Architecture - Low-Cost Intelligent Transportation Systems - Possible Applications of ITS in Egypt and Developing Countries.

References

- Shibata, Jun and Robert French (1997). A Comparison of Intelligent Transportation Systems: Progress Around the World Through 1996. ITS America, June 1.
- ERTICO (1997). Expected benefits of ITS. ERTICO vision presented at the Fourth international World Congress on Intelligent Transport Systems in Berlin, Germany.
- SHIBATA, J. (1998). General trends of ITS in the world – Key technology to improve traffic safety. IATSS Research 22(2), pp 7-22.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE482	Highways Construction Material and Pavement Design		2 CH
Prerequisites	Highway Engineering - CVE382		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Types of pavements, physical and mechanical properties of highways construction material, soil classification in highways, sub base- base layers properties, binder properties, Soil stabilization, Marshall Mix design, axle loads, analysis, and stresses, flexible and rigid pavements design - Stresses in flexible pavements - Stresses in rigid pavements – Soil strength tests - Airports pavement design.

References

- T.F. Fwa (2006) “The Handbook of Highway Engineering” publisher: Taylor & Francis Group, LLC
- John Read and David Whiteoak (2003) "The Shell Bitumen Handbook, Fifth Edition".
- Nicholas J. Garber, Lester A. Hoel (2009) “Traffic and Highway Engineering: Fourth edition” University of Virginia.".
- " موادالطرق واختباراتها الجزء الرابع: " الكود المصري لاعمال الطرق الحضرية والخلوية

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE492	Green Building systems and Infrastructure		2 CH
Prerequisites	Irrigation and drainage Engineering - CVE362		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Definitions -Required studies for estimating water uses - Population prediction – Rates of water consumption – Water sources – Water collection (Intakes ,Intake conduit , Low lift pumping station) – Design of water purification plant (Mixing tanks – Flocculation – Sedimentation – Filtration – Disinfecting - Clear water tanks) – Water distribution networks(Panning, Hydraulic designing , Accessories, Elevated tanks)- removal of water hardness- Iron and manganese removal. These fundamentals are in compliance with environmental basics and considerations.

References

- Hammer, M.J.and Hammer, M.J., Jr. "Water and Wastewater Tchnology", 6th Edition, Pearson Prentice Hall Inc, Upper Saddle River, New Jersey, 2008.
- Singh, G., and Singh, J., "Water Supply and Sanitary Engineering" Standard Publishers Distributers, Delhi, 2003.
- Egyptian Code for Water Purification Works (Ministry of Housing and Utilities)
- Egyptian Code for the Design and Implementation of Pipelines for Drinking Water and Sewage Networks (Ministry of Housing and Utilities

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE493	Wastewater Engineering	2 CH
Prerequisites	Green Building systems and Infrastructure – CVE49٢	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	-
Required SWL		Equivalent ECTS
75		3

Course Content

Wastewater sources and its specification – Wastewater discharges – Systems of wastewater sewer - Hydraulic design of wastewater sewer - Accessories of wastewater sewers – Lift pumping station – Wastewater treatment (Screens – Grit chamber – Primary settling tanks – Trickling filters – Activated sludge tanks- Final settling tanks) – Self-purification of water channels – Oxidation bonds.

References

- Metcalf and Eddy "Wastewater Engineering", 4th, McGraw Hill, NY, 2003.
- Hammer, M.J.and Hammer, M.J., Jr."Water and Wastewater Tchnology", 6th Edition, Pearson Prentice Hall Inc, Upper Saddle River, New Jersey ,2008.
- Egyptian Code for Sewage Treatment Works (Ministry of Housing and Utilities)
- Egyptian Code for the Design and Implementation of Pipelines for Drinking Water and Sewage Networks (Ministry of Housing and Utilities).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE491	Environment Risk Management	1 CH
Prerequisites	-	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	1	-
Required SWL		Equivalent ECTS

50	2

Course Content
Introduction to environmental sciences, water quality and standards, water pollution sources and impacts air pollution and control, solid waste management: collection, handling, separation and treatment, disposal, recycling and reuse. Introduction to environmental management, Environmental Hazards, Environmental Risk Identification, Quantification of Environmental Risks and Hazards. Strategies for handling Environmental Risks (Tolerate, Transfer, Treat or Termi-nate).
References
• Davis, M.L., and Cornwell,"Introduction to Environmental Engineering" 3rd edition New York: McGraw-Hill, Inc., 1998. • 2-Henry,J.G.,and Heinke,G.W.,"Environmental Science and Engineering "2 nd ed.,Prentice-Hall International ,Inc.,N.J.,U.S.A,1996.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE391	Solid wastes	2 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-

Required SWL	Equivalent ECTS
75	3

Course Content
Source, composition, properties and quantities of solid wastes, handling and storage at the source, solid wastes collection, solid wastes disposal, separation and processing technologies, recycling of solid wastes, planning and operation of solid wastes management systems.
References
• "Municipal Solid Waste." EPA. Environmental Protection Agency. Web. 7 Mar. 2015. • "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2012." Web. 7 Mar. 2015 • Healey, J. (2010). Recycling and Managing Waste v.305. Australia: The Spinney Press. Sta. Rosa City.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE392	Plumbing Engineering		2 CH
Prerequisites	Fluid Mechanics CVE 262		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Definition of plumbing system – Water consumption studies – Sanitary rooms in building – Sanitary equipment and its collection – Water supply systems in buildings – Design of water pipes – Types and specifications of pipes for sanitary equipment – Supply of cold and hot water in buildings – Dry wastes and its disposal.

References

- A.C. Panchdhari, Water Supply and Sanitary Installations, New Age International, 2005.
- Hall,F.,"Water installation and drainage systems, "The construction Press, Lancaster,1978
- Egyptian Code of Sanitary Installations in Buildings (Ministry of Housing and Utilities)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE494	Construction of Water and Wastewater Infrastructure		2 CH
Prerequisites	Plumbing Engineering – CVE392		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Construction of drinking water pipe networks – Longitudinal sections for pipe networks lines – Types of drinking water pipes – Accessories required for drinking water pipe networks – Construction of wastewater sewer – wastewater sewer systems – Methods for construction wastewater sewer – Accessories required for wastewater sewer – Longitudinal sections for wastewater sewer.

References

- El-Khouly, M.S., "Sanitary Engineering, Volume 1, Sewerage and Sewage", 4th Edition. Scientific Book House for publishing and Distributing, Cairo, 1990.
- El-Khouly, M.S., "Sanitary Engineering, Volume 2, Water Supply 4th Edition. Ain Shams University, Cairo, 1996.
- Egyptian Code for the Design and Implementation of Pipelines for Drinking Water and Sewage Networks (Ministry of Housing and Utilities)2010

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE495	Quality and chemistry of water		2 CH
Prerequisites	Green Building systems and Infrastructure - CVE492		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Hydrologic cycle of water –Introduction to chemistry- Water chemistry – Standers of water supply for different uses – Quality of surface water– Quality of ground water – Types and sources of water pollution chemistry – Choosing , collection testing and analyzing of water samples – Evaluation of water quality – Management and controlling of water quality – Application on Nile river.

References

- WHO (World Health Organization) Water Quality, 2005.
- Tchobano, G. and Schroeder, E.D., "Water Quality", "Characteristcs, Modeling, Modifcation "Addison Wisely Publishing Company, Inc., Reading, Massachusetts, 1985.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE201	Data Analysis and Image Processing using Python for Civil Engineers		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	2	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Introduction to Python for Civil Engineers * Python basics: syntax, data types, control flow, functions * Introduction to scientific computing libraries (NumPy, Pandas) Data Analysis Fundamentals, Data cleaning and preprocessing techniques * Data visualization with Matplotlib and Seaborn Image Processing for Civil Engineering * Digital image fundamentals: pixels, color spaces, formats * Image loading, manipulation, and transformation operations * Image filtering techniques: noise reduction, edge detection * Image segmentation for object identifi-cation and analysis.
Laboratory
• Develop a Python script for data analysis and visualization of a civil engineering dataset. • Using Image Processing for Crack Detection in Bridges • Analyzing Material Properties with Image Processing • Implement an image processing project for a specific civil engineering application
References
• Python Data Analysis - Third Edition, by Avinash Navlani, Armando Fandango, Ivan Idris, Released February 2021,Publisher(s): Packt Publishing,ISBN: 9781789955248 • Learning OpenCV 4 Computer Vision with Python 3 3rd ed. Edition by Joseph Howse Joe Minichino , Publisher : Packt Publishing; 3rd ed. edition (February 20, 2020) ,ISBN-10 : 1789531616

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	20%	40%

CVE301	Introduction to Machine Learning for Civil Engineers	3 CH
Prerequisites	Data Analysis and Image Processing using Python for Civil Engineers - CVE201	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content
Introduction to Machine Learning. Supervised vs. Unsupervised Learning, The Machine Learning Workflow. Supervised Learning Techniques: Linear Regression for Prediction Prob-lems, K-Nearest Neighbors (KNN) for Classification, Support Vector Machines (SVM) for Robust Classification, Decision Trees and Random Forests for Complex Relationships, Model Evaluation and Improvement, Performance Metrics (Accuracy, Precision, Recall), Overfitting and

Regularization Techniques, Cross-Validation for Robust Model Evaluation, Machine Learning for Civil Engineering Applications, Introduction to Deep Learning, Potential Appli-cations in Civil Engineering

Laboratory

- Predicting Structural Damage with Machine Learning
- Material Property Prediction using Machine Learning Models
- Traffic Flow Forecasting with Time Series Analysis

References

• Machine Learning: A First Course for Engineers and Scientists ,by Andreas Lindholm , Niklas Wahlström , Fredrik Lindsten , Thomas B. Schön , Publisher : Cambridge Uni-versity Press; New edition (June 2, 2022),ISBN-10 : 1108843603

• Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 3rd Edition,by Aurélien Géron , Publisher : O'Reilly Media; 3rd edition (November 8, 2022),ISBN-10 : 1098125975

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE401	Thermal Analysis and sustainable systems for building	3 CH
Prerequisites		

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
2	2	0

Required SWL	Equivalent ECTS
125	5

Course Content

Introduction to Sustainable Buildings- Definition of sustainability in the context of buildings- importance of sustainable building practices- Overview of key sustainability metrics -Heat transfer mechanisms- The different techniques to approach energy-efficient and energy-saving constructions applying the concepts of building physics- Cost-benefit analysis of sustainable building features - Geothermal Heat Pumps. Renewable Energy in Transportation. Sustainable Building Design.

References

- Smith, J. (2023). "Introduction to Sustainable Buildings." Journal/Book Title, Vol-ume(Issue), Page numbers. DOI/URL.
- Johnson, A. (2020). "Definition of Sustainability in Building Context." Journal/Book Ti-tle, Volume(Issue), Page numbers. DOI/URL.
- Green, B. (2019). "Importance of Sustainable Building Practices." Journal/Book Title, Volume(Issue), Page numbers. DOI/URL.

- Brown, C. (2021). "Overview of Key Sustainability Metrics." Journal/Book Title, Vol-ume(Issue), Page numbers. DOI/URL.
- White, D. (2018). "Heat Transfer Mechanisms in Sustainable Buildings." Journal/Book Title, Volume(Issue), Page numbers. DOI/URL.
- Anderson, E. (2017). "Cost-Benefit Analysis of Sustainable Building Features." Jour-nal/Book Title, Volume(Issue), Page numbers. DOI/URL.
- Martinez, F. (2016). "Geothermal Heat Pumps: A Sustainable Energy Solution." Jour-nal/Book Title, Volume(Issue), Page numbers. DOI/URL.
- Carter, G. (2022). "Renewable Energy in Transportation." Journal/Book Title, Vol-ume(Issue), Page numbers. DOI/URL.
- Taylor, H. (2015). "Sustainable Building Design: Principles and Practices." Journal/Book Title, Volume(Issue), Page numbers. DOI/URL.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CVE302	Software application in structural engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Introduction to computer-aided design software ,3D modeling and visualization (AutoCAD Civil 3D, Revit), Structural analysis and design software. Finite element analysis (FEA) soft-ware (SAP2000, Safe , ETABS) . Construction management software, Project scheduling and planning (e.g., Microsoft Project, Primavera). Geotechnical engineering software: Soil me-chanics and foundation design tool

References

- Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Pub-lishers,New Delhi.
- Advanced Design of Concrete Structures – Krishana Raju N., Tata Mc-Graw Hill, Delhi
- Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications.
- Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India
- High Rise Building Structures, Wolfgang Schueller, Wiley
- Tall Building Structures on Elastic Subgrade and Research of Semi-Analytical method by Gong Yaoqing. Beijing: Tsinghua University
- Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi

- Advanced Reinforced Concrete, Varghese A. V., Prentice Hall of India.
- Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi.
- Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010.
- IS Codes : IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16, SP:34,

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	-	-	50%

CVE303	Software application in Public Works engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Techniques of analytic simulation modeling - Traffic analysis software- Transportation -planning software – Computer application in geometric and structural design of highways – Civil 3rd Highway Project Design – using computers for contouring – Areas and volumes pro-grams – linear and non-linear interpolation.

References

- Auto Cad Soft ware
- Civil 3Rd Soft ware

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE304	Software application in water resources engineering		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

GIS Applications- Computer Application for Design of Hydraulic Structures, Hydraulics Application and Water Quality.

References

- Book
- "Water Resources Engineering" by Larry W. Mays - Year of publication: 2015.
- "Applied Hydrology" by Ven Te Chow, David R. Maidment, and Larry W. Mays - Year of publication: 1988.
- Introduction to Environmental Engineering and Science" by Gilbert M. Masters and Wendell P. Ela - Year of publication: 2008.
- Water Resources Systems Planning and Management" by S.K. Jain, V.P. Singh, and R.D. Singh - Year of publication: 2010.
- Tect book
- Applied Hydrology" by Ven Te Chow, David R. Maidment, and Larry W. Mays - Year of publication: 1988.
- Introduction to Environmental Engineering and Science" by Gilbert M. Masters and Wendell P. Ela - Year of publication: 2008.
- Water Resources Systems Planning and Management" by S.K. Jain, V.P. Singh, and R.D. Singh - Year of publication: 2010.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE402	Graduation Project (1) and Computer Applications - Structural Engineering	3 CH
Prerequisites	After Completing 101 CH & Structural Analysis (3) - CVE311 Design of Concrete Structures (2) - CVE341	

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
1	3	3

Required SWL	Equivalent ECTS
150	6

Course Content

Introduction to Computer Science - Word Processing and Spread Sheets Applications - Basics of Civil Engineering Drawings on Computers using CAD - Application of Structural Analysis Programs - Data Interchange between Applications. Computer application in projects management.
The Student Prepares a Project in One of the Following Fields:
Reinforced Concrete - Structural Analysis - Steel Structures - Properties and Strength of Material

- Soil Mechanics and Foundations - Construction and Project Management.
References
• SCI Inc. Online Manual Guide – 2011, Introductory Tutorial for SAP2000 • SCI Inc. Online Manual Guide – 2011, Introductory Tutorial for safe • John W. Bull, Spon Press 2003, Numerical Analysis and Modeling Hill, 2003. • The Egyptian codes related to the chosen tops

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE403	Graduation Project (1) and Computer Applications - Public Works	3 CH
Prerequisites	After Completing 101 CH & Highway Engineering - CVE382	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	3	3
Required SWL		Equivalent ECTS
150		6

Course Content
Introduction to Computer Science - Word Processing and Spread Sheets Applications - Basics of Civil Engineering Drawings on Computers - Application of Public Works Programs - Data Interchange between Applications. Computer application in projects management. The Student Prepares a Project in One of the Following Fields: Surveying – Highways - Sanitary and Environmental Engineering.
References
• John W. Bull, Spon Press 2003, Numerical Analysis and Modeling Hill, 2003. • The Egyptian codes related to the chosen tops

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE404	Graduation Project (1) and Computer Applications - Water Resources	3CH
Prerequisites	After Completing 101 CH & Fluid Mechanics &Hydraulics - CVE262 Irrigation and drainage Engineering – CVE362	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory

1	3	3
Required SWL		Equivalent ECTS
150		6

Course Content

Introduction to water networks - Different ways to prepare numerical model for water net-works - Using Water CAD program to design water networks - Using Water CAD program to evaluate existing water networks and identify various hydraulic problems - How to identify different solutions to overcome hydraulic problems to improve the performance of water net-works.
The Student Prepares a Project in One of the Following Fields:
Design of Irrigation Structures, Irrigation Systems, Ground Water, Protection Against Floods - Port Engineering and Shore Protection - Hydraulics.

References

- John W. Bull, Spon Press 2003, Numerical Analysis and Modeling Hill, 2003.
- The Egyptian codes related to the chosen tops

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE405	Introduction to Deep Learning for Civil Engineers	2 CH
Prerequisites	Introduction to Machine Learning for Civil Engineers – CVE301	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
100		4

Course Content

Introduction to Deep Learning, Introduction to AI and Machine Learning, The Fundamentals of Deep Learning, Artificial Neural Networks, Activation Functions and Loss Functions, Optimization Algorithms for Deep Learning, Deep Learning Architectures: Convolutional Neural Networks (CNNs) for Image Recognition, Recurrent Neural Networks (RNNs) for Sequential Data, Deep Autoencoders for Unsupervised Learning, Deep Learning for Civil Engineering Applications, Building and Training Deep Learning Models for Civil Engineering Problems.

Laboratory

- Introduction to Deep Learning Frameworks (TensorFlow, PyTorch)
- Applying Deep Learning to Structural Health Monitoring
- Deep Learning for Material Property Prediction and Inspection
- Traffic Flow Analysis and Prediction with Deep Learning

References

- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 3rd Edition, by Aurélien Géron , Publisher : O'Reilly Media; 3rd edition (November 8, 2022),ISBN-10 : 1098125975
- Deep Learning ,By Ian Goodfellow, Yoshua Bengio and Aaron Courville , Publisher: The MIT Press, November, 2016, ISBN: 9780262035613

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	30%	30%	30%

CVE406	Graduation Project (2) - Structural Engineering		3 CH
Prerequisites	Graduation Project (1) and Computer Applications - Structural Engineering CVE402		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	3	3	
Required SWL		Equivalent ECTS	
150		6	

Course Content

The Student The Student complete the Preparation of the Project which started in the first semester at One of the Following Fields:
Reinforced Concrete - Structural Analysis - Steel Structures - Properties and Strength of Material - Soil Mechanics and Foundations - Construction and Project Management.

References

- The Egyptian codes related to the chosen top

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE407	Graduation Project (2) - Public Works		3CH
Prerequisites	Graduation Project (1) and Computer Applications - Public Works CVE403		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	3	3	
Required SWL		Equivalent ECTS	
150		6	

Course Content

The Student complete the Preparation of the Project which started in the first semester at One of the Following Fields: Surveying – Highways - Sanitary and Environmental Engineering.
References
• The Egyptian codes related to the chosen tops

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

CVE408	Graduation Project (2) - water resources	3 CH
Prerequisites	Graduation Project (1) and Computer Applications- Water Resources - CVE404	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	3	3
Required SWL		Equivalent ECTS
150		6

Course Content
The Student complete the Preparation of the Project which started in the first semester in One of the Following Fields: Design of Irrigation Structures, Irrigation Systems, Ground Water, Protection Against Floods - Port Engineering and Shore Protection – Hydraulics
References
• The Egyptian codes related to the chosen tops

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

Courses offered by Basic Sciences in Intelligent and Sustainable Civil Engineering

No.	Code	Course Name
1	BAS212	Applied Engineering Mathematics for Civil Systems

- **Competencies VS Courses Matrices for Intelligent and sustainable Engineering Program**

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
-	University Elective (1)															
-	University Elective (2)															
-	University Elective (3)															
-	University Elective (4)															
NUB11١	History of Engineering					■		■								
NUB11٢	Modern history of Egypt					■		■								
NUB11٣	History of Civilizations					■		■								
NUB11٤	Fundamentals of Engineering	■		■												
NUB121	Report Writing and Communication Skills							■	■		■					
NUB122	Climate Change, Energy and Water Issues			■	■											
NUB123	Scientific Thinking							■		■	■					
NUB131	Professional Legislations and Engineering Ethics				■				■		■					
NUB132	Literature and Arts							■	■	■						
NUB133	Human Rights							■	■		■					
NUB134	Professional Ethics				■				■		■					
NUB141	Building Safety and Fire Protection	■			■											
NUB142	Entrepreneurship and Startups							■		■	■					
NUB143	Business Administration							■		■	■					
NUB144	Principle of General Management							■		■	■					
BAS111	Mathematics (1)	■														
BAS112	Mathematics (2)	■														
BAS113	Probability and Statistics		■													
BAS121	Vibration and Waves	■														
BAS122	Electricity and Magnetism	■														
BAS131	Engineering Chemistry	■														
BAS141	Statics		■													
BAS142	Dynamics		■													
BAS143	Engineering Drawing (1)								■	■						
TRN2x1	Field training (1)				■		■	■								
TRN3x1	Field Training (2)				■		■	■								
-	Engineering Economy and Project Management Elective															
-	Structures and Properties of Materials Elective Courses															
-	Engineering Technology Elective Courses															
-	Spatial Perception and Design Elective Courses															
CVE223	Project Management Essentials	■			■						■			■	■	
CVE221	Structures and Properties of Construction Materials		■		■						■	■		■		
CVE222	Modern Building Material	■			■						■	■		■		
DAE161	Projection and Engineering Graphics				■				■		■	■			■	
BAS212	Applied Engineering Mathematics for Civil Systems	■	■								■	■	■			
CVE211	Structural Analysis (1)	■	■								■	■				

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
CVE271	Engineering Surveying	■					■	■				■				
CVE261	Principle of Building Construction & Civil Drawing								■	■						
CVE212	Structural Analysis (2)	■	■								■	■				
CVE272	Topographic and Photogrammetric Surveying	■					■	■				■				
CVE121	Properties of Materials		■		■	■		■			■	■				
CVE131	Engineering Geology			■						■		■				
CVE231	Soil Mechanics (1)	■		■	■		■					■				
CVE262	Fluid Mechanics	■	■	■	■	■			■		■	■	■			
CVE361	Hydraulics			■	■								■			
CVE241	Design of Concrete Structures (1)			■	■								■			
CVE201	Data Analysis and Image Processing using Python for Civil Engineers	■			■											■
CVE301	Introduction to Machine Learning for Civil Engineers	■			■											■
CVE405	Introduction to Deep Learning for Civil Engineers	■			■											■
CVE232	Soil Mechanics (2)	■			■	■						■	■			
CVE281	Transportation and Traffic Engineering			■				■				■	■			
CVE362	Irrigation and drainage Engineering	■		■								■	■			
CVE351	Design of Steel Structures (1)			■	■								■			
CVE341	Design of Concrete Structures (2)			■	■								■			
CVE331	Foundations Engineering (1)		■	■								■	■			
CVE382	Highway Engineering			■			■	■			■	■	■			
CVE491	Environment Risk Management			■	■								■	■		
CVE461	Design of Irrigation Structures (1)			■						■	■		■	■		
CVE311	Structural Analysis (3)	■	■			■					■	■				
CVE492	Green Building systems and Infrastructure			■	■							■	■			■
CVE451	Design of Steel Structures (2)			■	■								■	■		
CVE343	Design of Concrete Structures (3)			■	■								■	■		
CVE332	Foundations Engineering (2)		■	■								■	■			
CVE493	Wastewater Engineering	■		■	■							■	■			
CVE484	Railway Engineering			■				■			■	■	■			
CVE441	Design of Concrete Structures (4)			■	■								■	■		
CVE324	Introduction to BIM				■		■	■	■		■			■	■	
CVE425	Risk Management in Construction Projects				■		■							■	■	
CVE401	Thermal Analysis and sustainable systems for building				■		■									■
CVE452	Design of Bridges				■		■									■
-	Civil Elective (1)															
-	Civil Elective (2)															
-	Civil Elective (3)															
-	Civil Elective (4)															
-	Civil Elective (5)															
-	Civil Elective (6)															
CVE381	Transportation Planning			■				■			■	■	■			
CVE471	Maps, GIS & Remote Sensing	■						■				■				

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
CVE391	Solid wastes				■								■			
CVE363	Hydrology		■			■							■	■		
CVE312	Structural Dynamics and Seismic analysis	■	■								■	■				
CVE342	Design of Wall Bearing Structures			■	■							■	■			
CVE321	Quality Control in Construction Engineering		■	■								■				
CVE322	Recycling of Construction Materials				■									■		
CVE323	Management of Construction Projects															
CVE383	Airport Engineering			■			■	■			■	■	■			
CVE384	Intelligent transportation systems			■				■			■	■	■			■
CVE392	Plumbing Engineering	■		■	■		■					■	■			
CVE372	Geometric Geodesy and Geodetic Astronomy	■										■				
CVE364	Hydraulic Machines	■	■	■									■	■		
CVE344	Design of High-Rise Buildings			■	■								■	■		
CVE345	Pre-stressed Concrete			■	■								■			
CVE325	Advanced Materials				■	■	■				■	■		■		
CVE326	Quantities and specifications				■									■		
CVE302	Software application in structural engineering			■	■								■			
CVE303	Software application in Public Works engineering			■	■								■	■		
CVE304	Software application in water resources engineering			■	■								■	■		
CVE405	Graduation Project (1) and Computer Applications - Structural Engineering			■	■			■	■	■			■	■	■	
CVE403	Graduation Project (1) and Computer Applications - Public Works			■	■			■	■	■			■	■		
CVE404	Graduation Project (1) and Computer Applications - Water Resources			■	■			■	■	■			■	■		
CVE445	Design of Special reinforced concrete structures			■	■						■	■	■			
CVE452	Design of Bridges			■	■								■	■		
CVE422	Repair & Strengthening of Structures				■	■		■	■			■		■		
CVE423	Advanced BIM						■	■	■	■	■			■		■
CVE424	Construction Engineering															
CVE431	Tunnels and underground structures		■	■						■		■	■			
CVE485	Highways Construction Material and Pavement Design			■				■			■	■	■			
CVE494	Construction of Water and Wastewater Infrastructure	■		■	■		■					■	■			
CVE495	Quality and chemistry of water			■	■		■							■		■
CVE471	Advanced Topographic Surveying						■	■			■		■	■		
CVE462	Design of Irrigation Structures (2)			■						■	■					
CVE463	Harbor Engineering			■		■							■	■		
CVE461	Water Resources Management						■		■	■	■		■	■		
CVE406	Graduation Project (2) - Structural Engineering			■	■			■	■	■			■	■	■	
CVE407	Graduation Project (2) - Public Works			■	■			■	■	■			■	■		
CVE408	Graduation Project (2) - water resources			■	■			■	■	■			■	■		

- **Targeted Sustainable Development Goals**

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
-	Nahda University Elective (1)																	
-	Nahda University Elective (2)																	
-	Nahda University Elective (3)																	
-	Nahda University Elective (4)																	
BAS111	Mathematics (1)				■					■								
BAS112	Mathematics (2)				■					■								
BAS113	Probability and Statistics				■					■								■
BAS121	Vibration and Waves				■			■		■								
BAS122	Electricity and Magnetism				■			■		■								
BAS131	Engineering Chemistry				■		■			■			■					
BAS141	Statics				■					■								
BAS142	Dynamics				■					■								
BAS143	Engineering Drawing (1)				■					■								
TRN2x1	Field training (1)				■				■	■								
TRN3x1	Field Training (2)				■				■	■								
-	Engineering Economy and Project Management Elective																	
-	Structures and Properties of Materials Elective Courses																	
-	Engineering Technology Elective Courses																	
-	Spatial Perception and Design Elective Courses																	
	Project Management Essentials				■					■								
	Structures and Properties of Materials				■					■								
	Structures and Properties of Construction Materials				■					■								
	Modern Building Material				■					■								
BAS212	Applied Engineering Mathematics for Civil Systems				■					■								
CVE211	Structural Analysis (1)				■					■								
CVE271	Engineering Surveying											■						
CVE261	Principle of Building Construction & Civil Drawing				■					■								
CVE212	Structural Analysis (2)				■					■								

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
CVE272	Topographic and Photogrammetric Surveying				■							■						
CVE121	Properties of Materials									■			■					
CVE131	Engineering Geology				■					■		■						
CVE231	Soil Mechanics (1)				■													
CVE262	Fluid Mechanics	■	■	■			■	■	■	■		■	■	■	■	■		
CVE361	Hydraulics	■	■	■			■	■	■	■		■	■	■	■	■		
CVE241	Design of Concrete Structures (1)				■					■								
CVE201	Data Analysis and Image Processing using Python for Civil Engineers								■	■		■						
CVE301	Introduction to Machine Learning for Civil Engineers								■	■		■						
CVE405	Introduction to Deep Learning for Civil Engineers								■	■		■						
CVE232	Soil Mechanics (2)				■					■		■						
CVE281	Transportation and Traffic Engineering									■		■						
CVE362	Irrigation and drainage Engineering	■	■	■			■	■	■			■	■	■		■		■
CVE351	Design of Steel Structures (1)				■	■												
CVE341	Design of Concrete Structures (2)				■					■		■						
CVE331	Foundations Engineering (1)				■					■		■						
CVE382	Highway Engineering											■						
CVE491	Environment Risk Management				■													
CVE461	Design of Irrigation Structures (1)				■		■											
CVE311	Structural Analysis (3)				■					■								
CVE492	Green Building systems and Infrastructure						■			■		■						
CVE451	Design of Steel Structures (2)											■						
CVE343	Design of Concrete Structures (3)				■					■		■						
CVE332	Foundations Engineering (2)									■								
CVE493	Wastewater Engineering						■			■		■						
CVE484	Railway Engineering											■						
CVE441	Design of Concrete Structures (4)				■					■		■						
CVE324	Introduction to BIM				■					■		■						
CVE425	Risk Management in Construction Projects				■													

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
CVE401	Thermal Analysis and sustainable systems for building				■			■		■		■						
CVE452	Design of Bridges																	
-	Civil Elective (1)																	
-	Civil Elective (2)																	
-	Civil Elective (3)																	
-	Civil Elective (4)																	
-	Civil Elective (5)																	
-	Civil Elective (6)																	
CVE381	Transportation Planning									■		■						
CVE471	Maps, GIS & Remote Sensing				■							■						
CVE391	Solid wastes						■			■		■						
CV363	Hydrology						■					■		■		■		
CVE312	Structural Dynamics and Seismic analysis				■		■		■			■						
CVE342	Design of Wall Bearing Structures				■													
CVE383	Airport Engineering											■						
CVE484	Intelligent transportation systems									■		■						
CVE392	Plumbing Engineering						■			■		■						
CVE472	Geometric Geodesy and Geodetic Astronomy				■							■						
CVE364	Hydraulic Machines	■	■	■			■	■	■	■		■	■	■	■	■		
CVE344	Design of High-Rise Buildings				■					■		■						
CVE321	Quality Control in Construction Engineering				■		■					■						
CVE345	Pre-stressed Concrete				■													
CVE322	Recycling of Construction Materials				■					■		■						
CVE323	Management of Construction Projects																	
CVE325	Advanced Materials									■		■						
CVE326	Quantities and specifications									■		■						
CVE302	Software application in structural engineering							■		■		■		■				
CVE303	Software application in Public Works engineering				■			■		■	■	■						
CVE304	Software application in water resources engineering				■			■		■	■							

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
CVE405	Graduation Project (1) and Computer Applications - Structural Engineering				■					■		■						
CVE403	Graduation Project (1) and Computer Applications - Public Works						■	■		■				■				
CVE404	Graduation Project (1) and Computer Applications - Water Resources			■			■	■				■	■	■		■		■
CVE445	Design of Special reinforced concrete structures									■		■						
CVE452	Design of Bridges				■					■		■						
CVE424	Repair & Strengthening of Structures									■								
CVE424	Construction Engineering									■								
CVE423	Advanced BIM									■								
CVE431	Tunnels and underground structures											■				■		
CVE485	Highways Construction Material and Pavement Design											■						
CVE494	Construction of Water and Wastewater Infrastructure						■			■		■						
CVE495	Quality and chemistry of water				■		■					■						
CVE471	Advanced Topographic Surveying											■						
CVE462	Design of Irrigation Structures (2)				■		■											
CVE463	Harbor Engineering				■							■						
CVE461	Water Resources Management	■	■	■			■	■	■			■		■		■		■
CVE406	Graduation Project (2) - Structural Engineering				■					■		■						
CVE407	Graduation Project (2) - Public Works						■	■		■		■		■				
CVE408	Graduation Project (2) - water resources		■	■			■	■					■	■		■		

- **Courses VS Teaching and Learning Methods Intelligent and Sustainable Civil Engineering**

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
-	University Elective (1)	■		■	■	■				■		
-	University Elective (2)	■		■	■	■				■		
-	University Elective (3)	■		■	■	■				■		
-	University Elective (4)	■		■	■	■				■		
BAS111	Mathematics (1)	■	■				■				■	
BAS112	Mathematics (2)	■	■				■				■	
BAS113	Probability and Statistics	■	■				■				■	
BAS121	Vibration and Waves	■	■				■				■	
BAS122	Electricity and Magnetism	■	■				■				■	
BAS131	Engineering Chemistry	■	■				■				■	
BAS141	Statics	■	■				■				■	
BAS142	Dynamics	■	■				■				■	
BAS143	Engineering Drawing (1)	■	■	■								
TRN2x1	Field training (1)			■	■	■		■	■			■
TRN3x1	Field Training (2)			■	■	■		■	■			■
-	Engineering Economy and Project Management Elective	■	■		■	■				■	■	■
-	Structures and Properties of Materials Elective Courses	■	■		■	■				■	■	
-	Engineering Technology Elective Courses	■	■		■	■				■	■	■
-	Spatial Perception and Design Elective Courses	■	■		■	■				■	■	
	Project Management Essentials	■	■				■				■	
	Structures and Properties of Materials	■	■				■				■	
	Structures and Properties of Construction Materials	■	■				■				■	
	Modern Building Material	■	■			■	■	■			■	
BAS212	Applied Engineering Mathematics for Civil Systems	■	■			■	■	■			■	
CVE211	Structural Analysis (1)	■	■			■	■	■			■	
CVE271	Engineering Surveying	■	■			■	■	■			■	
CVE261	Principle of Building Construction & Civil Drawing	■	■			■	■	■			■	
CVE212	Structural Analysis (2)	■	■			■	■				■	
CVE272	Topographic and Photogrammetric Surveying	■	■			■	■	■			■	
CVE121	Properties of Materials	■	■			■	■	■			■	
CVE131	Engineering Geology	■	■			■	■	■			■	
CVE231	Soil Mechanics (1)	■	■			■	■				■	

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
CVE262	Fluid Mechanics &Hydraulics	■	■			■	■				■	
CVE241	Design of Concrete Structures (1)	■	■			■	■	■			■	
CVE201	Data Analysis and Image Processing using Python for Civil Engineers	■	■			■	■				■	
CVE301	Introduction to Machine Learning for Civil Engineers	■	■			■	■	■			■	
CVE404	Introduction to Deep Learning for Civil Engineers	■	■			■	■	■			■	
CVE232	Soil Mechanics (2)	■	■			■	■	■			■	
CVE281	Transportation and Traffic Engineering	■	■			■	■	■			■	
CVE361	Irrigation and drainage Engineering	■	■			■	■	■			■	
CVE351	Design of Steel Structures (1)	■	■			■	■	■			■	
CVE341	Design of Concrete Structures (2)	■	■			■	■	■			■	
CVE331	Foundations Engineering (1)	■	■			■	■	■			■	
CVE382	Highway Engineering	■	■			■	■	■			■	
CVE425	Environment Risk Management	■	■			■	■	■			■	
CVE461	Design of Irrigation Structures (1)	■	■			■	■	■			■	
CVE311	Structural Analysis (3)	■	■			■	■	■			■	
CVE391	Green Building systems and Infrastructure	■	■			■	■	■			■	
CVE451	Design of Steel Structures (2)	■	■			■	■	■			■	
CVE342	Design of Concrete Structures (3)	■	■			■	■	■			■	
CVE332	Foundations Engineering (2)	■	■			■	■	■			■	
CVE491	Wastewater Engineering	■	■			■	■	■			■	
CVE484	Railway Engineering	■	■	■	■	■	■	■		■	■	■
CVE441	Design of Concrete Structures (4)	■	■	■	■	■	■	■		■	■	■
CVE321	Introduction to BIM	■	■		■	■	■	■		■	■	
CVE425	Risk Management in Construction Projects	■	■		■	■	■	■		■	■	
CVE302	Thermal Analysis and sustainable systems for building	■	■		■	■	■	■		■	■	
-	Civil Elective (1)	■	■		■	■	■	■		■	■	
-	Civil Elective (2)	■	■		■	■	■	■		■	■	
-	Civil Elective (3)	■	■		■	■	■	■		■	■	
-	Civil Elective (4)	■	■		■	■	■	■		■	■	
-	Civil Elective (5)	■	■		■	■	■	■		■	■	
-	Civil Elective (6)	■	■		■	■	■	■		■	■	
CVE481	Transportation Planning	■	■		■	■	■	■		■	■	
CVE471	Maps, GIS & Remote Sensing	■	■			■		■			■	
CVE492	Solid wastes	■	■			■		■			■	
CVE462	Hydrology	■	■			■		■			■	
CVE411	Structural Dynamics and Seismic analysis	■	■			■		■			■	
CVE442	Design of Wall Bearing Structures	■	■			■	■	■			■	

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
CVE482	Airport Engineering	■	■			■	■	■			■	
CVE483	Intelligent transportation systems	■	■			■	■	■			■	
CVE493	Plumbing Engineering	■	■			■	■	■			■	
CVE472	Geometric Geodesy and Geodetic Astronomy	■	■			■	■	■			■	
CVE463	Hydraulic Machines	■	■			■	■	■			■	
CVE443	Design of High-Rise Buildings	■	■			■	■	■			■	
CVE421	Quality Control in Construction Engineering	■	■	■	■	■	■	■		■	■	■
CVE444	Pre-stressed Concrete	■	■	■	■	■	■	■		■	■	■
CVE422	Recycling of Construction Materials	■	■		■	■	■	■	■	■	■	
CVE423	Advanced Materials	■	■		■	■	■	■	■	■	■	
CVE401	Software application in structural engineering	■	■		■	■	■	■		■	■	
CVE402	Software application in Public Works engineering	■	■		■	■	■	■		■	■	
CVE403	Software application in water resources engineering	■	■		■	■	■	■		■	■	
CVE405	Graduation Project (1) and Computer Applications - Structural Engineering	■	■		■	■	■	■		■	■	
CVE407	Graduation Project (1) and Computer Applications - Public Works	■	■		■	■	■	■		■	■	
CVE409	Graduation Project (1) and Computer Applications - Water Resources	■	■		■	■	■	■		■	■	
CVE445	Design of Special reinforced concrete structures	■	■		■	■	■	■		■	■	
CVE452	Design of Bridges	■	■		■	■	■	■		■	■	
CVE424	Repair & Strengthening of Structures	■	■		■	■	■	■		■	■	
CVE426	Advanced BIM	■	■		■	■	■	■		■	■	
CVE431	Tunnels and underground structures	■	■		■	■	■	■		■	■	
CVE485	Highways Construction Material and Pavement Design	■	■		■	■	■	■		■	■	
CVE495	Construction of Water and Wastewater Infrastructure	■	■		■	■	■	■		■	■	
CVE496	Quality and chemistry of water	■	■		■	■	■	■		■	■	
CVE473	Advanced Topographic Surveying	■	■		■	■	■	■		■	■	
CVE464	Design of Irrigation Structures (2)	■	■		■	■	■	■		■	■	
CVE465	Harbor Engineering	■	■		■	■	■	■		■	■	
CVE466	Water Resources Management	■	■		■	■	■	■		■	■	
CVE406	Graduation Project (2) - Structural Engineering	■	■		■	■	■	■		■	■	
CVE408	Graduation Project (2) - Public Works	■	■		■	■	■	■		■	■	
CVE400	Graduation Project (2) - water resources	■	■		■	■	■	■		■	■	

Graduate attributes (GA):

- Master a wide spectrum of civil engineering knowledge and specialized skills.
- Apply acquired knowledge using theories and abstract thinking in real life situations.
- Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
- Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
- Enhance comprehension of project management principles to proficiently strategize and implement engineering projects while adhering to budgetary and timeline limitations.
- Use techniques, skills and modern engineering tools necessary for civil engineering practice.

- **Competencies VS Graduate Attributes Matrix for Intelligent and sustainable Engineering Program**

Graduate attribute	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
Master a wide spectrum of civil engineering knowledge and specialized skills.	■		■	■	■						■	■			■
Apply acquired knowledge using theories and abstract thinking in real life situations.	■	■	■								■	■	■		■
Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance						■	■	■	■				■	■	
Value the importance of the environment, both physical and natural, and work to promote sustainability principles.			■	■							■		■		
Enhance comprehension of project management principles to proficiently strategize and implement engineering projects while adhering to budgetary and timeline limitations						■							■	■	
Use techniques, skills and modern engineering tools necessary for civil engineering practice				■							■				■

Program 2: Digital Architecture Engineering Program

- ## Program Description

In today's world, architects are compelled to challenge critical global issues through holding responsibility of the built environment, responding to societal needs, and conserving natural resources and the sustainable development goals according to Egypt's Vision 2030. The program is committed to offering well-rounded future generations of skilled professional architects through an education that is rooted in culture, sustained with theory and progressive with technologically advanced methods. The digital architecture program offers. a unique learning experience that blends computational modeling and digital fabrication to solve the emerging global issues of architectural problems. Benefit from the vernacular entities and the expert lecturers to enable the graduate to gain the skills necessary to excel in this growing field and call for better design solutions on applying digital technologies and software as design aiding tools and AI architecture generators to generate parametrically designed sophisticated architectural forms and production, manufacture these points digitally and using computer programing such as VR technology and AI applications in designing buildings.

- ## Career Prospects

It is intended that graduates of the Architecture Engineering program will acquire critical thinking and enhance design creativity to take a leading role in professional practice. Graduates will be eligible to work in architectural design firms, in design, building Information modeling, architecture interior design and decoration, architecture project management, architecture marketing, tender documents, as well as urban design and detailed planning. Apply digital technologies and software as design aiding tools to generate parametrically designed sophisticated architectural forms and production/ manufacture these points digitally and using computer programing such as VR technology and AI generators applications in designing buildings.

- ## Relation to Sustainable Development Goals

☒ GOAL 1: No Poverty	GOAL 2: Zero Hunger	☒ GOAL 3: Good Health & Well-being	☒ GOAL 4: Quality Education	☒ GOAL 5: Gender Equality	☒ GOAL 6: Clean Water & Sanitation
☒ GOAL 7: Affordable & Clean Energy	☒ GOAL 8: Decent Work & Economic Growth	☒ GOAL 9: Industry, Innovation & Infrastructure	☒ GOAL 10: Reduced Inequality	☒ GOAL 11: Sustainable Cities & Communities	☒ GOAL 12: Responsible Consumption & Production
☒ GOAL 13: Climate Action	GOAL 14: Life Below Water	☒ GOAL 15: Life on Land	☒ GOAL 16: Peace & Justice Strong Institutions	☒ GOAL 17: Partnerships to achieve. the Goal	

- ## Program Concentrations

There are no specified concentrations in this Program.

- ## Program Competences

According to the National Academic Reference Standards (NARS-2018), the competencies for Graduates from NHADA University and all Engineering Programs, graduate must be able to (A-Level):

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.
A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs, considering global, cultural, social, economic, environmental, ethical, and other aspects as appropriate to the discipline and within sustainable design and development principles and contexts.
A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues, and risk management principles.
A5. Practice research techniques and methods of investigation as an inherent part of learning.
A6. Plan, supervise, and monitor the implementation of engineering projects.
A7. Function efficiently as an individual and member of multi-disciplinary and multi-cultural teams.
A8. Communicate effectively – graphically, verbally, and in writing – with a range of audiences using contemporary tools.
A9. Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
A10. Acquire and apply new knowledge and practice self, lifelong, and other learning strategies

In addition to the above Competencies for All Engineering Programs the Architecture Engineering graduate must be able to (B-Level):

B1. Create architectural, urban, and planning designs that satisfy aesthetic and technical requirements, using adequate knowledge of history and theory, related fine arts, local culture and heritage, technologies, and human sciences.
B2. Produce designs that meet building users' requirements by understanding the relationship between people and buildings and between buildings and their environment and the need to relate buildings and the spaces between them to human needs and scale.
B3. Generate ecologically responsible environmental conservation and rehabilitation designs by understanding structural design, construction, technology, and engineering problems associated with building designs.
B4. Transform design concepts into buildings and integrate plans into overall planning within the constraints of project financing, project management, cost control, and project delivery

methods while having adequate knowledge of the industries, organizations, regulations, and procedures involved.

B5. Prepare design project briefs and documents and understand the context of the architect in the construction industry, including the architect's role in bidding, procurement of architectural services, and building production.

In addition to the competences for all Engineering Programs (A-Level) and the competencies for the (B-Level), The Digital Architecture Engineering Program graduate must be able to

(C-Level):

C1. Utilize advanced digital technologies and software as design support tools to create parametrically designed complex architectural forms, leveraging building information modeling (BIM) for digital production and manufacturing.

C2. Incorporate computer programs, including virtual reality VR technique and artificial intelligence (AI) applications, to enhance building design processes.

- ## Required Courses

To get a Bachelor of Science Degree in this program and to satisfy the Program Competencies, the following set of courses need to be completed.

List of Digital Architecture Engineering Program Requirements Courses

Course Title	Weight			Contact Hours				%
	CH	ECTS	SWL	Lec	Tut	Lab	TT	
Nahda University Requirements	11	18	450	11	0	0	11	8%
Faculty of Engineering Requirements	28	56	1400	20	15	9	44	19%
General Requirements of Digital Architecture Engineering	68	115	2875	30	70	16	116	47%
Requirements of Digital Architecture Engineering	37	61	1525	25	18	8	51	26%
Total	144	250	6250	86	103	33	222	100%

General Requirements of Digital Architecture Engineering Program

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
DAE111	Design Basics	3	5	125	1	5	0	5	
DAE211	Creativity Design Studio	3	5	125	1	5	0	5	DAE111
DAE212	Architecture and Dwelling Design Studio	3	5	125	1	5	0	6	DAE211
DAE311	Building Types and Legislations Design Studio	3	5	125	1	5	0	6	DAE212
DAE312	Architectural Technology Design Studio	3	5	125	1	5	0	6	DAE311
DAE411	Architectural Sustainable Rehabilitation Design Studio	3	5	125	1	5	0	6	DAE312
DAE412	Interior Design by VR Technique	3	5	125	1	4	0	5	
DAE413	Digital architecture and design technology GRAD 1	2	4	100	2	0	0	2	DAE312 10 CH
DAE414	Digital architecture and design technology GRAD 2	6	11	275	2	10	0	12	DAE411 DAE413
DAE221	Construction (1): Conventional Construction Systems	3	5	125	1	4	0	5	
DAE222	Construction (2): Finishing Works and wood construction	3	5	125	1	4	0	5	DAE221
DAE321	Construction (3): Advanced Construction and finishing systems	3	5	125	1	4	0	5	DAE222
DAE322	Working Design (1): Execution Drawings Coordination, Annotation and Coding	3	5	125	1	4	0	6	DAE321
DAE421	Working Design (2): Detailing and BOQs	3	5	125	1	4	0	6	DAE322
DAE422	Advanced Working Drawing/BIM Systems	3	5	125	1	0	3	4	DAE421 DAE351
DAE142	History of Arts and Architecture (1): Ancient Civilizations	2	3	75	2	0	0	2	
DAE241	History of Arts and Architecture (2): Islamic Architecture and western architecture	2	3	75	2	0	0	2	DAE142

DAE242	Theories of Contemporary Architecture and design methods	2	3	75	2	0	0	2	DAE241
DAE151	Visual Communication in Architecture	3	5	125	1	4	0	5	
DAE251	Digital Architecture technology 1 and History of Digital Architecture and Design	3	5	125	1	0	4	5	DAE151
DAE252	Digital Architecture technology 2 and History of Digital Architecture and Design	3	5	125	1	0	4	5	DAE251
DAE253	Programming for Design and Digital Fabrication	2	4	100	2	0	2	4	
DAE353	AI in Architecture design	2	4	100	1	0	3	4	
DAE461	Digital Media Studio	2	3	75	1	2	0	3	
Total		68	115	2875	30	70	16	116	

Requirements of Digital Architecture Engineering Program

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
DAE141	Human Behavior and the Built Environment	1	2	50	1	0	0	1	
DAE231	Sustainable Architecture	3	5	125	2	2	0	4	
DAE331	Landscape Architecture	3	5	125	1	3	0	4	
DAE332	Introduction to Urban Planning, Design, and housing	3	5	125	2	2	0	4	DAE331
DAE351	Building information modelling BIM	3	5	125	2	0	2	4	DAE252
DAE352	Architectural Computational Design	2	3	75	2	0	0	2	
DAE354	Parametric Design Studio	3	6	150	2	0	2	4	DAE252
DAE451	Digital Design & Fabrication	3	5	125	2	0	2	4	DAE353
DAE361	Technical installation in buildings	2	3	75	1	2	0	3	
CCE372	Acoustic and Illumination Systems in Buildings	2	3	75	1	2	0	3	
CVE213	Structure Analysis for Architecture Engineering	2	4	100	2	1	0	3	

CVE346	Reinforced Concrete and foundation for Architecture Engineering	2	3	75	2	1	0	3	
CVE453	Steel Structures for Architecture Engineering	2	3	75	2	1	0	3	
	Digital Architecture Elective (A)	2	3	75	1	0	2	3	
	Digital Architecture Elective (B)	2	3	75	1	2	0	3	
	Digital Architecture Elective (C)	2	3	75	1	2	0	3	
Total		37	61	1525	25	18	8	51	

Elective Courses of Digital Architecture Engineering Program is distributed in Three electives.

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Digital Architecture Elective (A) Select 2 Credit hrs. (one course)									
DAE323	Digital Knowledge Based Systems	2	3	75	1	0	2	3	
DAE324	Smart Building Information Systems	2	3	75	1	0	2	3	
DAE325	Advanced Building Integration Systems/BIM and Execution Documents	2	3	75	1	0	2	3	
Digital Architecture Elective (B) Select 2 Credit hrs. (one course)									
DAE431	Architecture, Culture & Heritage	2	3	75	1	2	0	3	
DAE432	Housing	2	3	75	1	2	0	3	
DAE433	History and Theory of Planning	2	3	75	1	2	0	3	
DAE434	Introduction to Regional Urban Planning	2	3	75	1	2	0	3	
Digital Architecture Elective (C) Select 2 Credit hrs. (one course)									
DAE462	Architectural & Urban Legislations and Sustainable	2	3	75	1	2	0	3	
DAE463	Digital Marketing	2	3	75	1	2	0	3	
DAE464	Thermal Control	2	3	75	1	2	0	3	
DAE465	Digital Sustainable Architecture	2	3	75	1	0	2	3	
DAE466	Feasibility studies for architecture and urban projects	2	3	75	1	2	0	3	

- **Proposed Study Plan**

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 1									
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS121	Vibration and Waves	3	5	125	2	2	1	5	
BAS131	Engineering Chemistry	3	5	125	2	2	1	4	
BAS141	Statics	3	5	125	2	2	0	5	
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
	University Elective (1)	2	3	75	2	0	0	2	
	University Elective (2)	2	3	75	2	0	0	2	
Total		18	30	750	13	11	2	26	
Semester 2									
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
DAE111	Design Basics	3	5	125	1	5	0	6	
DAE141	Human Behavior and the Built Environment	1	2	50	1	0	0	1	
DAE142	History of Arts and Architecture (1): Ancient Civilizations	2	3	75	2	0	0	2	
DAE151	Visual Communication in Architecture	3	5	125	1	4	0	5	
-	Spatial Perception and Design Elective	2	3	75	1	0	3	4	
ENG111	English (1)	1	2	50	1	0	0	1	
Total		18	30	750	11	12	5	28	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 3									
DAE211	Creativity Design Studio	3	5	125	1	4	0	5	DAE111
DAE221	Construction (1): Conventional Construction Systems	3	5	125	1	5	0	6	
DAE241	History of Arts and Architecture (2): Islamic Architecture and western architecture	2	3	75	2	0	0	2	DAE142
DAE251	Digital Architecture technology 1 and History of Digital Architecture and Design	3	5	125	1	0	4	5	DAE151
DAE231	Sustainable Architecture	3	5	125	2	2	0	4	
CVE213	Structural Analysis for Architecture Engineering	2	4	100	2	1	0	3	
-	Engineering Technology Elective	2	3	75	٢	١	0	3	
Total		18	30	750	11	13	4	28	
Semester 4									
DAE212	Architecture and Dwelling Design Studio	3	5	125	1	5	0	6	DAE211
DAE222	Construction (2): Finishing Works and wood construction	3	5	125	1	4	0	5	DAE221
DAE242	Theories of Contemporary Architecture and design methods	2	3	75	2	0	0	2	DAE241
DAE252	Digital Architecture technology 2 and History of Digital Architecture and Design	3	5	125	1	0	4	5	DAE251
DAE253	Programming for Design and Digital Fabrication	2	4	100	2	0	2	4	
-	Structures and Properties of Materials Elective	2	3	75	2	0	1	3	
-	University Elective (4)	2	3	75	2	0	0	2	
ENG112	English (2)	1	2	50	1	0	0	1	
Total		18	30	750	12	9	7	28	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 5									
DAE311	Building Types and Legislations Design Studio	3	5	125	1	5	0	6	DAE212
DAE321	Construction (3): Advanced Construction and finishing systems	3	5	125	1	4	0	5	DAE222
DAE331	Landscape Architecture	3	5	125	1	3	0	4	
DAE351	Building information modeling BIM	3	5	125	2	0	2	4	DAE252
DAE352	Architectural Computational Design	2	3	75	2	0	0	2	
DAE353	AI in Architecture design	2	4	100	1	0	3	4	
DAE361	Technical installation in buildings	2	3	75	1	2	0	3	
Total		18	30	750	9	14	5	28	
Semester 6									
DAE312	Architectural Technology Design Studio	3	5	125	1	5	0	6	DAE311
DAE322	Working Design (1): Execution Drawings Coordination, Annotation and Coding	3	5	125	1	4	0	5	DAE321
DAE332	Introduction to Urban Planning, Design, and housing	3	5	125	2	2	0	4	DAE331
DAE354	Parametric Design Studio	3	6	150	2	0	2	4	DAE252
CCE372	Acoustic and Illumination Systems in Buildings	2	3	75	1	2	0	3	
CVE34٦	Reinforced Concrete and foundation for Architecture Engineering	2	3	75	2	1	0	3	
	Digital Architecture Elective (A)	2	3	75	1	٠	٢	3	
Total		18	30	750	10	16	٤	28	

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 7									
DAE411	Architectural Sustainable Rehabilitation Design Studio	3	5	125	1	5	0	6	DAE312
DAE412	Interior Design by VR Technique	3	5	125	1	4	0	5	
DAE413	Digital architecture and design technology GRAD 1	2	4	100	2	0	0	2	DAE312& 101 CH
DAE421	Working Design (2): Detailing and BOQs	3	5	125	1	4	0	5	DAE322
DAE451	Digital Design & Fabrication	3	5	125	2	0	2	4	DAE352
DAE461	Digital Media Studio	2	3	75	1	2	0	3	
CVE453	Steel Structures for Architecture Engineering	2	3	75	2	1	0	3	
Total		18	30	750	10	16	2	28	
Semester 8									
DAE414	Digital architecture and design technology GRAD 2	6	11	275	2	10	0	12	DAE413& DAE411
DAE422	Advanced Working Drawing/BIM Systems and Execution Documents	3	5	125	1	0	3	4	DAE421& DAE351
	Digital Architecture Elective (B)	2	3	75	1	2	0	3	
	Digital Architecture Elective (C)	2	3	75	1	2	0	3	
ENG113	English (3)	2	3	75	2	0	0	2	
-	Engineering Economy and Project Management Elective	2	3	75	2	1	0	3	
	University Elective (3)	1	2	50	1	0	0	1	
Total		18	30	750	10	15	3	28	

- ## Graduate Attributes

The graduates from the Digital Architecture Engineering Program:

GA1. Master a wide spectrum of Architecture Engineering knowledge and specialized skills, specifically in environmental aspects and sustainability, and apply acquired knowledge using theories and abstract thinking in real-life situations.

GA2. Apply analytic critical and systemic thinking to identify, diagnose and solve Architecture Engineering problems with a wide range of complexity and variation.

GA3. Behave professionally and adhere to Architecture Engineering and sustainability ethics and standards.

GA4. Worked in and led a heterogeneous team of professionals from different engineering specialties and assumed responsibility for own and team performance.

GA5. Recognize his/her role in promoting the Architecture Engineering field and contribute to developing the architecture profession and the community.

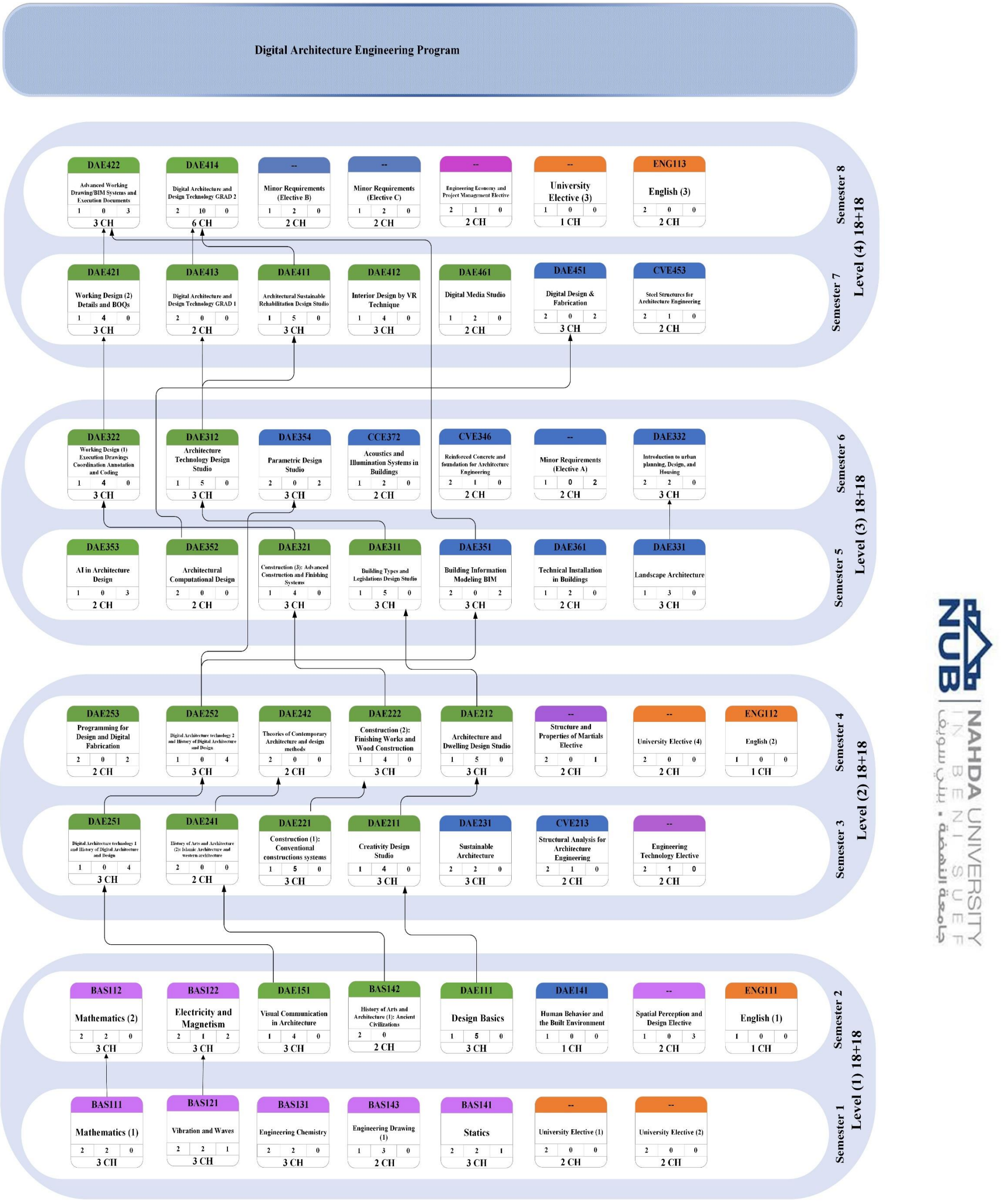
GA6. Value the importance of the physical and natural environment and work to promote sustainability principles.

GA7. Use techniques, skills, and modern engineering tools for Architecture Engineering practice. In addition to applying his/her knowledge and practical skills to create and develop architectural designs from the briefing phase to beyond the construction and operating phase.

GA8. Assume full responsibility for own learning and self-development, engage in lifelong learning, and demonstrate the capacity to engage in post-graduate and research studies.

GA9. Communicate effectively using different modes, tools, and languages with various audiences; to deal with academic/professional challenges critically and creatively.

GA10. Demonstrate leadership qualities, business and project administration, and entrepreneurial skills.


Digital Architecture Engineering Program
Level (4) 18+18
Semester 8
DAE422 Advanced Working Drawing/BIM Systems and Execution Documents 1 0 3 3 CH
DAE414 Digital Architecture and Design Technology GRAD 2 2 10 0 6 CH
-- Minor Requirements (Elective B) 1 2 0 2 CH
-- Minor Requirements (Elective C) 1 2 0 2 CH
-- Engineering Economy and Project Management Elective 2 1 0 2 CH
-- University Elective (3) 1 0 0 1 CH
ENG113 English (3) 2 0 0 2 CH
Semester 7
DAE421 Working Design (2) Details and BOQs 1 4 0 3 CH
DAE413 Digital Architecture and Design Technology GRAD 1 2 0 0 2 CH
DAE411 Architectural Sustainable Rehabilitation Design Studio 1 5 0 3 CH
DAE412 Interior Design by VR Technique 1 4 0 3 CH
DAE461 Digital Media Studio 1 2 0 2 CH
DAE451 Digital Design & Fabrication 2 0 2 3 CH
CVE453 Steel Structures for Architecture Engineering 2 1 0 2 CH
Level (3) 18+18
Semester 6
DAE322 Working Design (1) Execution Drawings Coordination Annotation and Coding 1 4 0 3 CH
DAE312 Architecture Technology Design Studio 1 5 0 3 CH
DAE354 Parametric Design Studio 2 0 2 3 CH
CCE372 Acoustics and Illumination Systems in Buildings 1 2 0 2 CH
CVE346 Reinforced Concrete and foundation for Architecture Engineering 2 1 0 2 CH
-- Minor Requirements (Elective A) 1 0 2 2 CH
DAE332 Introduction to urban planning, Design, and Housing 2 2 0 3 CH
Semester 5
DAE353 AI in Architecture Design 1 0 3 2 CH
DAE352 Architectural Computational Design 2 0 0 2 CH
DAE321 Construction (3): Advanced Construction and Finishing Systems 1 4 0 3 CH
DAE311 Building Types and Legislations Design Studio 1 5 0 3 CH
DAE351 Building Information Modeling BIM 2 0 2 3 CH
DAE361 Technical Installation in Buildings 1 2 0 2 CH
DAE331 Landscape Architecture 1 3 0 3 CH
Level (2) 18+18
Semester 4
DAE253 Programming for Design and Digital Fabrication 2 0 2 2 CH
DAE252 Digital Architecture technology 2 and History of Digital Architecture and Design 1 0 4 3 CH
DAE242 Theories of Contemporary Architecture and design methods 2 0 0 2 CH
DAE222 Construction (2): Finishing Works and Wood Construction 1 4 0 3 CH
DAE212 Architecture and Dwelling Design Studio 1 5 0 3 CH
-- Structure and Properties of Martials Elective 2 0 1 2 CH
-- University Elective (4) 2 0 0 2 CH
ENG112 English (2) 1 0 0 1 CH
Semester 3
DAE251 Digital Architecture technology 1 and History of Digital Architecture and Design 1 0 4 3 CH
DAE241 History of Arts and Architecture (2): Islamic Architecture and western architecture 2 0 0 2 CH
DAE221 Construction (1): Conventional constructions systems 1 5 0 3 CH
DAE211 Creativity Design Studio 1 4 0 3 CH
DAE231 Sustainable Architecture 2 2 0 3 CH
CVE213 Structural Analysis for Architecture Engineering 2 1 0 2 CH
-- Engineering Technology Elective 2 1 0 2 CH
Level (1) 18+18
Semester 2
BAS112 Mathematics (2) 2 2 0 3 CH
BAS122 Electricity and Magnetism 2 1 2 3 CH
DAE151 Visual Communication in Architecture 1 4 0 3 CH
BAS142 History of Arts and Architecture (1): Ancient Civilizations 2 0 2 CH
DAE111 Design Basics 1 5 0 3 CH
DAE141 Human Behavior and the Built Environment 1 0 0 1 CH
-- Spatial Perception and Design Elective 1 0 3 2 CH
ENG111 English (1) 1 0 0 1 CH
Semester 1
BAS111 Mathematics (1) 2 2 0 3 CH
BAS121 Vibration and Waves 2 2 1 3 CH
BAS131 Engineering Chemistry 2 2 0 3 CH
BAS143 Engineering Drawing (1) 1 3 0 2 CH
BAS141 Statics 2 2 1 3 CH
-- University Elective (1) 2 0 0 2 CH
-- University Elective (2) 2 0 0 2 CH
DAE
TRN 2x1 Field Training (1) 0 5 0 0 CH
TRN 3x1 Field Training (2) 0 5 0 0 CH
- The maximum allowed study duration is 8 academic years
- Cumulative GPA at any main semester < 2.0
- 10 Weeks of Field
- Training can be Started at the end of level 2 (Sophomore level)
University Req. 11 CH
Program. Major Req 68 CH
Faculty Req. 28 CH
Program. Minor Req 37 CH
Course Code
Course Title
Lec Tut Lab
CH

- **Digital Architecture Engineering Program Requirements Courses Content**

Courses offered by Digital Architecture Engineering Program

DAE111	Design Basics		3 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	5	0	
Required SWL		Equivalent ECTS	
125		5	
Course Content			
This course includes a study of the elements and foundations of design with an emphasis on the constructive idea of two-dimensional design, as well as a study of the foundations of abstract composition and their distribution on the spatial surface to organize them visually to develop the creative and expressive ability of students.			
References			
– Ching, F. D. (2023). **Architecture: Form, space, and order**. John Wiley & Sons. – Bielefeld, B. (2021). **Basics Design Ideas**. Birkhäuser – Aspelund, K. (2014). **Designing: an introduction**. Bloomsbury Publishing USA. – White, A. W. (2011). The elements of graphic design: space, unity, page architecture, and type. Skyhorse Publishing, Inc. – Anderson, J. (2010). **Basics architecture 03: Architectural design** (Vol. 3). AVA Publishing.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE211	Creativity Design Studio		3 CH
Prerequisites	Design Basics - DAE111		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	5	0	
Required SWL		Equivalent ECTS	
125		5	
Course Content			
Creative problem-solving application & Perception of architectural spaces in terms of user's experience. Designing small scale projects with simple spatial requirements involving concepts of design, ideas and imagination (projects could be private residence, kinder gardens, activity centers and libraries for children and simple service buildings in public places). Considerations of circulation, orientation, spatial compositions and structure.			

References

- Ching, F. D. (2023). ***Architecture: Form, space, and order***. John Wiley & Sons
- Cordua, C. H., & Sandness, S. (2023). Design Build with the Scarcity and Creativity Studio. Routledge.
- Temple, S. (Ed.). (2019). Developing creative thinking in beginning design. Routledge.
- Levitt, A. (2018). Listening to Design: A Guide to the Creative Process. Reaktion Books.
- Dabner, D., Stewart, S., & Vickress, A. (2017). ***Graphic design school: the principles and practice of graphic design***. John Wiley & Sons.
- Salama, A. M. (2016). Spatial design education: New directions for pedagogy in architecture and beyond. Routledge.
- Dudek, M. (2007). Schools and kindergartens: A design manual. DE GRUYTER.

Assessment Criteria			
Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE212	Architecture and Dwelling Design Studio		3 CH
Prerequisites	Creativity Design Studio - DAE211		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	5	-	
Required SWL		Equivalent ECTS	
125		٥	

Course Content

Global challenges include affordable housing, sustainable development, social and environmental justice, and the complexity of urban conditions. The relationship between dwelling units and residential buildings is reciprocal, with functional demands like daylight, ventilation, and accessibility competing with social inclusion, aesthetics, and economic efficiency. Savings options

References

- Ching, F. D. (2023). ***Architecture: Form, space, and order***. John Wiley & Sons.
- Phillips, S., Hoey, S., Mitchell, J. R., McKeown, H., Alexander, I., Platt, C., ... & Webster, M. (2022). Architects on DwellinMalpas, J. (2021). ***Rethinking dwelling: Heidegger, place, architecture***. Bloomsbury Publishing.
- Bloom, N. D., & Lasner, M. G. (Eds.). (2019). Affordable housing in New York: The people, places, and policies that transformed a city. Princeton University Press.
- Yigitcanlar, T., & Kamruzzaman, M. L. (Eds.). (2019). ***Planning, Development and Management of Sustainable Cities*****.** MDPI.
- Kleit, R. G., & Page, S. B. (2015). The changing role of public housing authorities in the affordable housing delivery system. ***Housing Studies***, *30*(4), 621-644.
- Singha, S. (2013). Architecture for rapid change and scarce resources. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE311	Building Types and Legislations Design Studio		3 CH
Prerequisites	Architecture and Dwelling Design Studio - DAE212		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	5	-	
Required SWL		Equivalent ECTS	
125		٥	

Course Content

Public building identity with consideration to cultural, recreational, or institutional aspects pursuing a complex program with divergent functions, circulations, and construction systems. Site limitations, context, and the application of specified codes. Local building codes and legislations criticize project legality in the light of local laws, legislations and building codes. Examples of selected projects: office buildings, museums, libraries, etc.

References

- Hmood, K. (Ed.). (2023). Conservation of Urban and Architectural Heritage: Past, Present and Future. BoD–Books on Demand.
- Iano, J., & Allen, E. (2022). The architect's studio companion: rules of thumb for preliminary design. John Wiley & Sons.
- De Wilde, P. (2018). ***Building performance analysis***. John Wiley & Sons.
- Self, R. (2014). The architecture of art museums: a decade of design: 2000-2010. Routledge.
- Yarrow, A., Clubb, B., & Draper, J. L. (2008). ***Public libraries, archives, and museums: Trends in collaboration and cooperation***. International Federation of Library Associations and Institutions (IFLA).
- Kwon, M. (2004). One place after another: Site-specific art and locational identity. MIT press.
- Fountain, J. E. (2004). Building the virtual state: Information technology and institutional

Assessment Criteria			
Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE312	Architectural Technology Design Studio		3 CH
Prerequisites	Building Types and Legislations Design Studio - DAE311		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	5	-	
Required SWL		Equivalent ECTS	

125	5

Course Content

Progressive technical design approaches are adopted embracing the intelligent adaptively of buildings to cope with dynamic environment. Applying passive and active environmental control principles to create comfortable and healthy indoor environments. Integrating building systems into a comprehensive design that meets the functional, aesthetic and environmental requirements of the project. Different types of building systems, considering Building Management System (BMS), Building Energy Management System (BEMS). Examples of selected projects hospitals.

References

- Wagenaar, C., Mens, N., Manja, G., Niemeijer, C., & Guthknecht, T. (2018). ***Hospitals: A design manual***. Birkhäuser.
- Jaskiewicz, T. J. (2013). Towards a methodology for complex adaptive interactive architecture. Technische Universiteit Delft.
- Levermore, G. (2013). Building energy management systems: An application to heating, natural ventilation, lighting and occupant satisfaction. Routledge.
- Bradshaw, V. (2010). The building environment: Active and passive control systems. John Wiley & Sons.
- Bachman, L. R. (2004). Integrated buildings: The systems basis of architecture (Vol. 9). John Wiley & Sons.
- So, A. T. P., & Chan, W. L. (1999). ***Intelligent building systems*** (Vol. 5). Springer Science & Business Media.

Assessment Criteria

Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE411	Architectural Sustainable Rehabilitation Design Studio	3 CH
Prerequisites	Architectural Technology Design Studio - DAE312	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
1	5	-

Required SWL	Equivalent ECTS
125	٥

Course Content

Applying technological systems to a comprehensive design project that is functionally, aesthetically, and environmentally sound. The rehabilitation principles with respect to conservation and energy efficiency. Building's technical inspection and architectural management. The critical analysis of rehabilitation and applying effective methods and solutions. The evaluation and rehabilitation methods of heritage and vernacular architecture.

References

- Desideri, U., & Asdrubali, F. (Eds.). (2018). ***Handbook of energy efficiency in buildings: a life cycle approach***. Butterworth-Heinemann.
- Chwieduk, D. A. (2017). Towards modern options of energy conservation in buildings. ***Renewable Energy***, *101*, 1194-1202.
- Martani, C. (2015). Risk Management in Architectural Design: control of uncertainty over building use and maintenance. Springer International Publishing.
- Correia, M., Dipasquale, L., & Mecca, S. (2014). ***Versus: heritage for tomorrow: vernacular knowledge for sustainable architecture*** (p. 288). Firenze University Press.
- Rabun, J. S., & Kelso, R. M. (2009). ***Building evaluation for adaptive reuse and preservation***. John Wiley & Sons.
- Wimmer, W., Züst, R., & Lee, K. M. (2004). Ecodesign implementation: a systematic guidance on integrating environmental considerations into product development (Vol. 6). Springer Science & Business Media.

Assessment Criteria			
Student Activities	Mid-Term Exam	Oral Jury	Final Exam
60%	0%	20%	20%

DAE412	Interior Design by VR Technique		3 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	4	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

An overview of interior design principles and concepts; including perspective, color theory, design aesthetic and presentation methods. It tackles interior space elements through project-based activities (walls, ceilings, floors, windows, doors, furniture and accessories). It also focuses on the stages of concept development and presentation toward the goal of creating a beginning interior design portfolio.

References

- Ramstedt, F. (2020). *The Interior Design Handbook*. Penguin UK.
- Mitton, M. (2012). Interior design visual presentation: a guide to graphics, models and presentation techniques. John Wiley & Sons.
- Ching, F. D., & Binggeli, C. (2018). ***Interior design illustrated***. John Wiley & Sons.
- Sully, A. (2015). Interior Design: conceptual basis. Springer.
- Moxon, S., & Moxon, S. (2012). ***Sustainability in interior design***. Hachette UK.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	0%	40%

DAE413	Digital architecture and design technology GRAD 1		2CH
Prerequisites	After completing 101CH, Architectural Technology Design Studio - DAE312		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Scientific background of design studios, experimental design, digital architecture, environmental and sustainable design, human aspects, human-centered design and structural basis for architecture by the Analysis of collected data regarding the proposed site, Analysis and discussion of similar projects and preparing a technical report concerning the environmental analysis of the site, comparative study with similar projects. The final report leads to the final architectural program of the project of the **Digital architecture and design technology GRAD 2**

References

- Sheil, B., Skavara, M., Thomsen, M. R., & Ayres, P. (Eds.). (2024). ***Fabricate 2024: Creating Resourceful Futures***. UCL Press.
- Sheil, B., Thomsen, M. R., Tamke, M., & Hanna, S. (Eds.). (2020). ***Design transactions: rethinking information modelling for a new material age***. UCL Press.
- Oxman, R., & Oxman, R. (Eds.). (2014). ***Theories of the Digital in Architecture*** (Vol. 99). Abingdon: Routledge.
- Grobman, Y., & Neuman, E. (2013). Performalism: form and performance in digital architecture. Routledge.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final/Oral Exam
50%	0%	0%	50%

DAE414	Digital architecture and design technology GRAD 2		6 CH
Prerequisites	Architectural Sustainable Rehabilitation Design Studio - DAE411, Digital architecture and design technology GRAD 1 - DAE413.		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	10	-	
Required SWL		Equivalent ECTS	
275		11	

Course Content

Comprehensive design project, professional ability of designing mega projects, multi-layered functions, impressive forms, awareness of the contemporary architectural trends, theories, social needs and practice "Architecture" professionally, serving the local community.
References
– Salama, A. M. (2021). Transformative pedagogy in architecture and urbanism. Routledge.
– Salama, A. M. (2016). Spatial design education: New directions for pedagogy in architecture and beyond. Routledge. – Krupinska, J. (2014). What an architecture student should know. Routledge. – Menges, A., & Ahlquist, S. (2011). Computational design thinking: computation design thinking. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final/Oral Exam
50%	0%	0%	50%

DAE221	Construction (1): Conventional Construction Systems		3 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	4	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
The course aims at understanding the building construction process and the construction of basic and essential components of any building. Students will learn about the main conventional construction systems, building's essential needs such as building protection against sun heat and dampness, bridging wall openings, retaining soil, and connecting different levels. Course topics will be: the load bearing walls, the RC skeleton, Arches, Lintels, Retaining walls, and also, design, construction, and finishing of linear and spiral staircases.
References
– Ching, F. D. (2020). ***Building construction illustrated***. John Wiley & Sons. – Allen, E., & Iano, J. (2019). Fundamentals of building construction: materials and methods. John Wiley & Sons. – Ambrose, J., & Tripeny, P. (2016). ***Simplified engineering for architects and builders***. John Wiley & Sons. – Chudley, R., & Greeno, R. (2006). *Building construction handbook*. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	-	40%

DAE222	Construction (2): Finishing Works and wood construction		3 CH
Prerequisites	Construction (1): Conventional Construction Systems- DAE221		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	4	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

The course aims at understanding the building finishing process and materials. Students will learn about the carpentry work of doors and windows, and the process and materials of finishing architectural internal spaces; floors, walls, and ceiling. Course topics will be: timber Doors & Windows, floor finishing: tiles, rolls, fabric, cast in situ, and boards, wall cladding, tiles, plastering, paints, boards, paper, ceiling finishing: tiles, boards, plastering, and paints.

References

- Allen, E., & Iano, J. (2019). Fundamentals of building construction: materials and methods. John Wiley & Sons.
- Hashmi, M. S. J. (2016). ***Comprehensive materials finishing***. Elsevier.
- Williams, R. S. (2010). Finishing of wood. ***Wood Handbook***, 16-39.
- Cattell, D. (2003). Specialist floor finishes: design and installation. Routledge.
- Savage, C. (1998). Trim carpentry techniques: installing doors, windows, base and crown. Taunton Press.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	-	40%

DAE321	Construction (3): Advanced Construction and finishing systems		3 CH
Prerequisites	Construction (2): Finishing Works and wood construction - DAE222		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	4	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

The course aims at understanding the advanced building construction process and technologies . Students will learn about the wide span structure systems, precast and post tension systems, and Structural Glazing system. In addition, the student will learn about advanced finishing and cladding materials and techniques such as: raised floors, curtain walls, Stretched ceiling, GRC and GRP.

- References
- Ching, F. D. (2020). ***Building construction illustrated***. John Wiley & Sons.
- Allen, E., & Rand, P. (2016). Architectural detailing: function, constructibility, aesthetics. John Wiley & Sons.
- Naboni, R., & Paoletti, I. (2015). ***Advanced customization in architectural design and construction***. Cham: Springer International Publishing.
- Khoraskani, R. A. (2015**).** ***Advanced connection systems for architectural glazing*** (pp. 5-20). Springer International Publishing.
- El-Reedy, M. A. (2012). Reinforced concrete structural reliability. CRC Press.
- Cooper, R., Aouad, G., Lee, A., Wu, S., Fleming, A., & Kagioglou, M. (2008). ***Process management in design and construction***. John Wiley & Sons.
- Deplazes, A. (Ed.). (2005). ***Constructing architecture: materials, processes***, *structures*. Springer Science & Business Media.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	-	٤0%

DAE322	Working Design (1): Execution Drawings Coordination, Annotation and Coding	3 CH
Prerequisites	Construction (3): Advanced Construction and finishing systems - DAE321	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	4	-
Required SWL		Equivalent ECTS
125		5

Course Content

The course aims at informing students about execution drawings as needed to construct buildings , and spatial needs for basic technical systems, to coordinate between the technical systems, and organize related information. Also, it aims at training students on documenting data and information, preparing architectural execution drawings, and coding them according to the US CSI coding system. The aims are realized through a study of technical and drafting systems; preparation base drawings that guarantee appropriateness of spaces for structural, sanitary, electrical, air condition, and movement systems; organization data and annotations in plans, sections, and elevations.

References

- Ching, F. D., & Winkel, S. R. (2021). Building codes illustrated: a guide to understanding the 2021 international building code. John Wiley & Sons.
- American Institute of Architects. (2017). ***The Architecture Student's Handbook of Professional Practice***. John Wiley & Sons.
- Styles, K., & Bichard, A. (2012). ***Working drawings handbook***. Routledge.
- Ballast, D. K. (2009). Architect's handbook of construction detailing. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
60%.	-	-	٤0%.

DAE323	Digital Knowledge Based Systems	2 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	2
Required SWL		Equivalent ECTS
75		3

Course Content

This course has two subjects to focus on. The first one is the application of knowledge-based expert system methodology in CAE. Topics include knowledge-based programming methodologies, knowledge-based engineering techniques, expert system development environments and representative expert system applications in CAE. Each student develops a prototype expert system for an application of him/her choice. The second subject discusses issues related to practical applications of shape grammar: shapes, shape arithmetic, symmetry, spatial relations & shape computations.

References

- Bhambri, P., Rani, S., Balas, V. E., & Elngar, A. A. (Eds.). (2023). Integration of AI-Based Manufacturing and Industrial Engineering Systems with the Internet of Things. CRC Press.
- Yu, R., Gu, N., & Ostwald, M. J. (2021). Computational design: technology, cognition and environments. CRC Press.
- Liebowitz, J. (Ed.). (2019). ***The handbook of applied expert systems***. cRc Press.
- Sriram, R. D. (2012). Intelligent systems for engineering: a knowledge-based approach. Springer Science & Business Media.
- Menges, A., & Ahlquist, S. (2011). Computational design thinking: computation design thinking. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE324	Smart Building Information Systems		2CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	2	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course focuses on different work methodologies. Critical analysis of information and choice of argumentation in smart buildings. Work methodologies and pedagogical interest.

References

- Lévy, F., & Ouellette, J. W. (2019). Bim for design firms: Data Rich Architecture at Small and medium scales. John Wiley & Sons.
- Arayici, Y., Counsell, J., Mahdjoubi, L., Nagy, G., Ḥawwās, S. Z., & Dweidar, K. (Eds.). (2017). ***Heritage building information modelling***. Abingdon: Routledge.
- Kensek, K. (2014). ***Building information modeling***. Routledge.
- Eastman, C. M. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.
- Eastman, C. M. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.

– Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE325	Advanced Building Integration Systems/BIM and Execution Documents		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	2	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course introduces the state-of-the-art and major innovations in building technologies and structural, enclosure, telecommunications, mechanical, lighting, and interior systems. The course continues the mandate for Total Building Performance, clarifying the full range of building performance mandates required in today's architecture, including building integrity, thermal quality,

acoustic quality, visual quality, air quality, and spatial quality. Graduates of the department are expected to lead multidisciplinary design processes, enhance sustainable environmental performance, and ensure the long-term integrity of integrated systems.
Laboratory
– Outodesk Rivet 2023 or the latest version.
References
– Grondzik, W. T., & Kwok, A. G. (2019). ***Mechanical and electrical equipment for buildings***. John wiley & sons. – Stansinoupolos, P., Smith, M., Hargroves, K., & Desha, C. (2013). ***Whole system design: An integrated approach to sustainable engineering***. Routledge. – Syed, A. (2012). Advanced building technologies for sustainability (Vol. 3). John Wiley & Sons. – Eastman, C. M. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers, and contractors. John Wiley & Sons. – Kensek, K. (2014). ***Building information modeling***. Routledge.
– Krygiel, E., & Nies, B. (2008). Green BIM: **successful sustainable design with building information modeling**. John Wiley & Sons. – Preiser, W. F., & Vischer, J. (Eds.). (2005). ***Assessing building performance***. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE421	Working Design (2): Detailing and BOQs		3 CH
Prerequisites	Working Design (1): Execution Drawings Coordination, Annotation and Coding - DAE322		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	4	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

The course aims at informing students about detailing architectural spaces. Student will start to investigate and design internal finishing, installations, accessories, and fixtures. Student will train to analyze, evaluate, and choose the optimum specifications of different items. In addition, student will integrate these specifications and manufacturer's details into the design.

Also, student will learn how to make "Component", "Sub-Component" and "Assembly Drawings" and quantity surveying to produce BOQs. Advanced supplementary systems and technical installations will be discussed such as systems of: Security, Firefighting, Fire Alarm, BMS, Automation, and other similar systems.

References
– Kilmer, R., & Kilmer, W. O. (2021). ***Construction drawings and details for interiors***. John Wiley & Sons. – Ching, F. D. (2020). ***Building construction illustrated***. John Wiley & Sons. – Towey, D. (2017). Construction quantity surveying: a practical guide for the contractor's QS. John Wiley & Sons. – Ballast, D. K. (2014). ***Architect's Handbook of Construction Detailing***. (2nd ed.). John Wiley & Sons. – Cotgrave, A., & Riley, M. (2012). ***Total sustainability in the built environment***. Bloomsbury Publishing. – Emmitt, S., Olie, J., & Schmid, P. (2009). *Principles of architectural detailing*. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
60%.	-	-	40%.

DAE422	Advanced Working Drawing/BIM Systems and Execution Documents		3 CH
Prerequisites	Working Design (2): Detailing and BOQs - DAE421 & Building information modelling BIM - DAE351		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
125		5	

Course Content
This text focuses on creating working drawings for tendering, site construction, and factory manufacturing. It discusses the coordination of spatial needs for technical systems like structure, HVAC, lights, and sanitation. The text also discusses the use of BIM applications like Revit for construction documents and the creation of specifications documents. It also covers job conditions, scope of work, detailed descriptions of items and materials, quality surveying, quantity calculation, and inspection of finished work.
Laboratory
– Outodesk Rivet 2023 or the latest version.
References

- Adekunle, S., Aigbavboa, C. O., Ejohwomu, O., Thwala, W. D., & Mahamadu, A. M. (2023). *A **Building Information Modelling Maturity Model for Developing Countries***. Routledge.
- Kilmer, R., & Kilmer, W. O. (2021). ***Construction drawings and details for interiors***. John Wiley & Sons.
- Banihashemi, S., Golizadeh, H., & Rahim/herian, F. P. (2022). ***Data-driven BIM for energy efficient building design***. Routledge.
- Casini, M. (2021). Construction 4.0: Advanced Technology, Tools and Materials for the Digital
- Transformation of the Construction Industry. Woodhead Publishing
- Ching, F. D. (2020). ***Building construction illustrated***. John Wiley & Sons.
- Towey, D. (2017). Construction quantity surveying: a practical guide for the contractor's QS. John Wiley & Sons.
- Ballast, D. K. (2014). ***Architect's Handbook of Construction Detailing***. (2nd ed.). John Wiley & Sons.
- Eastman, C. M. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.
- Smith, D. K., & Tardif, M. (2009). Building information modeling: a strategic implementation guide for architects, engineers, constructors, and real estate asset managers. John Wiley & Sons.
- Krygiel, E., & Nies, B. (2008). Green BIM: successful sustainable design with building information modeling. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE231	Sustainable Architecture		3 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

The course examines the environmental impact of building design and construction. The concept of sustainable architecture is discussed as a means of reducing this impact. Understanding the principles of Sustainable architecture that seeks to minimize the negative environmental impact of buildings by enhancing efficiency and moderation in the use of materials and energy. Applications of the techniques of ecologically conscious approach in the field of architecture.

References

- Tabb, P. J., & Deviren, A. S. (2017). The greening of architecture: A critical history and survey of contemporary sustainable architecture and urban design. Routledge.
- Kibert, C. J. (2016). Sustainable construction: green building design and delivery. John Wiley & Sons.
- Iyengar, K. (2015). Sustainable architectural design: An overview. Routledge.
- Randolph, J., & Masters, G. M. (2008). ***Energy for sustainability: Technology, planning, policy***. Island Press.
- Kubba, S. (2012). Handbook of green building design and construction: LEED, BREEAM, and Green Globes. Butterworth-Heinemann.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE331	Landscape Architecture	3 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	3	-
Required SWL		Equivalent ECTS
125		5

Course Content

Overview of the urban context and its landscaping elements. The elements of the urban landscape: Open spaces, Built form, Urban form, Greenery, Street furniture, Movement patterns. The classical urban design contexts and their theories.

References

- Carmona, M. (2021). Public places urban spaces: The dimensions of urban design. Routledge.
- Sonkoly, G. (2017). ***Historical urban landscape***. New York: Palgrave Macmillan.
- Parker, S. (2015). Urban theory and the urban experience: Encountering the city. Routledge.
- Liversedge, J., & Holden, R. (2014). ***Landscape architecture: an introduction***. Hachette UK.
- Chen, G. (2011). Landscape architecture: planting design illustrated. ArchiteG, Inc.
- Deming, M. E., & Swaffield, S. (2011). ***Landscape architectural research: Inquiry, strategy, design***. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	0%	40%

DAE332	Introduction to Urban Planning, design, and housing	3CH
Prerequisites	Landscape Architecture - DAE331	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory

2	2	-
Required SWL		Equivalent ECTS
125		5

Course Content

Overview of the urban context elements. Introduction to urban design and planning theories and practice. The meaning and scope of urban design. The classical urban design contexts and their theories. The meaning of Urban morphology, and the vocabulary of urban form and space as the standards and best practice of urban design elements. Housing market and needs: demand and supply issues, housing provision system, its components, and relevant actors. Housing problems, housing typology in terms of types and levels

References

- Carmona, M. (2021). Public places urban spaces: The dimensions of urban design. Routledge.
- Kasprisin, R. (2019). Urban design: the composition of complexity. Routledge.
- Sonkoly, G. (2017). ***Historical urban landscape***. New York: Palgrave Macmillan.
- Parker, S. (2015). Urban theory and the urban experience: Encountering the city. Routledge.
- Liversedge, J., & Holden, R. (2014). ***Landscape architecture: an introduction***. Hachette UK.
- Chen, G. (2011). Landscape architecture: planting design illustrated. ArchiteG, Inc.
- Deming, M. E., & Swaffield, S. (2011). ***Landscape architectural research: Inquiry, strategy, design***. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	0%	40%

DAE431	Architecture, Culture & Heritage	2 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-
Required SWL		Equivalent ECTS
75		3

Course Content

The course introduces students to the importance of culture and heritage in architectural design and development process. It develops students' analytical and descriptive skills to understand the meaning and significance of Human Heritage as a product of Culture and Civilization, with special reference to Egyptian Architectural Heritage. It also enhances the students design skills to deploy the layers of conceptions, beliefs, values, and architectural products in the different Egyptian historic periods while addressing contemporary Architectural and Urban Design problems.

References

- Mahgoub, Y., Cavalagli, N., Versaci, A., Bougdah, H., & Serra-Permanyer, M. (Eds.). (2021). ***Cities' identity through architecture and arts***. Springer International Publishing.
- Casares, J., & Amarillo, S. D. (Eds.). (2020). ***Islamic heritage architecture and art III*** (Vol. 197). WIT Press.
- Šćitaroci, M. O., Šćitaroci, B. B. O., & Mrđa, A. (Eds.). (2019). ***Cultural urban heritage: development, learning and landscape strategies***. Springer.
- Bold, J., Larkham, P., & Pickard, R. (Eds.). (2017). ***Authentic reconstruction: authenticity, architecture and the built heritage***. Bloomsbury Publishing.
- Rizzo, I., & Mignosa, A. (Eds.). (2013). ***Handbook on the economics of cultural heritage***. Edward Elgar Publishing.
- Gillman, D. (2010). ***The idea of cultural heritage***. Cambridge University Press.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

DAE432	Housing		2CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course aims at the students to Understand the Housing market problems, housing typology and needs: demand and supply issues, housing provision system, its components, and relevant actors. Assessment of housing and services needs for a neighborhood. Fundamentals of land parceling, with application in real project. Movement network, roads hierarchy, and parking areas. Application of
theoretical studies in a project dealing with urban, social, and economic surveys for an existing area. Analysis and diagnosis of alternative solutions to housing projects.

References

- Grander, M., & Stephens, M. (Eds.). (2024). ***The Routledge Handbook of Housing and Welfare***. Routledge.
- Carmona, M. (2021). Public places urban spaces: The dimensions of urban design. Routledge.
- Fordham, R., Finlay, S., Gardener, J., Macmillan, A., Muldoon, C., Taylor, G., & Welch, G. (2019). ***Housing need and the need for housing***. Routledge.
- Leitner, H., Peck, J., & Sheppard, E. (Eds.). (2019**). *Urban studies inside/out: theory, method, practice***. Sage.
- Coiacetto, E., & Coiacetto, E. (2012). ***Understanding land development: A project-based approach***. CSIRO PUBLISHING.
- Walljasper, J. (2007). The great neighborhood book: A do-it-yourself guide to placemaking. New society publishers.
- Saunders, P. (2003). Social theory and the urban question. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	0%	40%

DAE433	History and Theory of Planning	2 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-

Required SWL	Equivalent ECTS
75	3

Course Content

The course explores the history and development of cities from pre-historic times to modern times, focusing on the development of planning theories and comprehensive studies. It covers various civilizations, including ancient Egyptians, Mesopotamian civilizations, ancient Greeks, Romanians, Middle Ages, Islamic states, Renaissance, and Baroque eras. The course also includes field studies on urban residential sites and small towns, enhancing students' understanding of planning science and applying planning principles on small-scale contemporary plans.

References

- Brown, P. (2024). **The world of late antiquity**: AD 150-750. Thames & Hudson.
- Classen, A. (Ed.). (2023). Globalism in the Middle Ages and the Early Modern Age: Innovative Approaches and Perspectives (Vol. 27). Walter de Gruyter GmbH & Co KG.
- Rietbergen, P. (2020). ***Europe: a cultural history***. Routledge.
- Ching, F. D., Jarzombek, M. M., & Prakash, V. (2017). ***A global history of architecture***. John Wiley & Sons.

- Allmendinger, P. (2017). ***Planning theory***. Bloomsbury Publishing.
- Martin, T. R. (2013). Ancient Greece: from prehistoric to Hellenistic times. Yale University Press.
- Bhattacharya, B. (2006). ***Urban development in India: since pre-historic time***. Concept Publishing Company.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

DAE434	Introduction to Regional Urban Planning		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course introduces regional planning concepts and frameworks, focusing on urban and regional development issues. It explores contemporary urban growth and human interventions, examining the past, present, and future of cities through four interrelated themes: environment, equity, economy, and culture. Students learn to develop land use plans and programs to create communities, accommodate population growth, and revitalize physical facilities in towns, cities, counties, and metropolitan areas.

References

- Grander, M., & Stephens, M. (Eds.). (2024). ***The Routledge Handbook of Housing and Welfare***. Routledge.
- . Hall, P., & Tewdwr-Jones, M. (2019). ***Urban and regional planning***. Routledge.
- Lichfield, N., Kettle, P., & Whitbread, M. (2016**). Evaluation in the Planning Process: The Urban and Regional Planning Series,** Volume 10 (Vol. 10). Elsevier.
- Bracken, I. (2014). Urban planning methods: Research and policy analysis. Routledge.
- Paris, C. (Ed.). (2013). Critical readings in planning theory: Urban and regional planning series. Elsevier.
- Thompson, S., & Maginn, P. J. (Eds.). (2012). Planning Australia: An overview of urban and regional planning.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

DAE141	Human Behavior and the Built Environment	1 CH

Prerequisites	-	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	0	-
Required SWL		Equivalent ECTS
50		2

Course Content

The course aims at exploring the way active human use of physical settings influences or is influenced by aspects of sustainability in the built environment. This includes categories of human experience such territoriality, way finding, cultural expression, visual and non-visual aesthetics, and task performance. The methods used in identifying and analyzing such kinds of social and cultural dimensions; ethnography, photo elicitation, agent-based modeling as a key for developing evidence based sustainable design.

References

- Engineer, A., Ida, A., Jung, W., & Sternberg, E. M. (2024). Measuring the Impact of the Built Environment on Health, Wellbeing, and Performance: Techniques, Methods, and Implications for Design Research. Taylor & Francis.
- Sussman, A., & Hollander, J. (2021). Cognitive architecture: Designing for how we respond to the built environment. Routledge.
- Molen, N. (2016). A method for employing qualitative data in the development of spatial agent-based models. Michigan State University.
- Langevin, J. (2014). Human Behavior & Low Energy Architecture: Linking Environmental Adaptation, Personal Comfort, & Energy Use in the Built Environment. Drexel University.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

DAE142	History of Arts and Architecture (1): Ancient Civilizations	2 CH
Prerequisites	-	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
75		3

Course Content

This course aims at elaborating the relation between the architectural concept and the philosophy of design in different ages. It tackles the effects of physical, cultural, natural, and constructional possibilities on the different architectural elements, through a study of art and architecture for different ancient eras: Ancient Egyptian, West Asiatic, Babylonian, Assyrian, Persian, Greek, Roman, the early Christian and byzantine period.
References
• Von Reber, F., & Clarke, J. T. (2024). ***History of Ancient Art***. BoD–Books on Demand. • Gray, G. T. (2021). An Introduction to the History of Architecture, Art & Design. Sunway University Press. • Arnold, D. (2020). ***Art history: A very short introduction***. Oxford University Press. • Freeman, C. (2014). Egypt, Greece, and Rome: civilizations of the ancient Mediterranean. Oxford University Press, USA. • Sear, F. (2002). ***Roman architecture***. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE241	History of Arts and Architecture (2): Islamic Architecture and western architecture		2 CH
Prerequisites	History of Arts and Architecture (1): Ancient Civilizations – DAE142		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content
This course investigates the meaning, principles and development of the Islamic art and architecture in a chronological order in the Islamic world with special reference to Egypt clarifying the impact of the different political, economic, cultural, and environmental factors on the architectural space and elements through different periods and typologies The concepts and architectural characteristics of Architecture in Western Europe from Romanesque architecture till the nineteenth century Neoclassical architecture.
References

- Ray, N. (2023). Thinking Through Twentieth-century Architecture. Routledge.
- . Kamalipour, H., Aelbrecht, P., & Peimani, N. (Eds.). (2023). ***The Routledge handbook of urban design research methods***. Routledge.
- Summerson, J., & Powers, A. (2023). ***The classical language of architecture***. Thames & Hudson.
- Hernandez, S. (Ed.). (2022). ***Islamic Heritage Architecture IV*** (Vol. 211). WIT Press.
- Hillenbrand, R. (2019). *Studies in the Islamic Decorative Arts*. Pindar Press.
- Ettinghausen, R., Grabar, O., & Jenkins, M. (2003). ***Islamic art and architecture*** *650-1250* (Vol. 59). Yale University Press.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE242	Theories of Contemporary Architecture and design methods	2 CH
Prerequisites	History of Arts and Architecture (2): Islamic Architecture and western architecture - DAE241	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	-
Required SWL		Equivalent ECTS
75		3

Course Content

The theoretical foundations of architectural movements from the innovations of the Industrial Revolution to the rich pluralism of Contemporary Architecture. Correlation and interpretation of socio-cultural, political, economic, and industrial conditions, values, concepts, and canonical characteristics.

References

- Giamarelos, S. (2022). Resisting Postmodern Architecture: Critical Regionalism Before Globalisation. UCL Press.
- Szalapaj, P. (2014). Contemporary architecture and the digital design process. Routledge.
- Borden, I., Fraser, M., & Penner, B. (2014). Forty ways to think about architecture: architectural history and theory today. John Wiley & Sons.
- Abel, C. (2012). ***Architecture and identity***. Routledge.
- Kalay, Y. E. (2004). Architecture's new media: Principles, theories, and methods of computer-aided design. MIT press.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE151	Visual Communication in Architecture	3 CH
Prerequisites	-	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	4	0
Required SWL		Equivalent ECTS
125		5

Course Content

This course includes studying the fundamental skills of freehand drawing techniques, addressing the modeling and graphics component of computer-aided architectural design. Different exercises are to be applied in both 2D and 3D. Students will develop the ability to graphically communicate simple forms by transforming visual information into 2D images with shade and shadows and visualize 3D objects in perspective.

This course explains computer usage as a tool for architects to be used in 2D/3D drawings representation.

References

- Ching, F. D. (2023). ***Architectural graphics***. John Wiley & Sons.
- Byrkjeflot, H., Mjøset, L., Mordhorst, M., & Petersen, K. (2022). ***The making and circulation of Nordic models, ideas and images*** (p. 304). Taylor & Francis.
- Seidler, D. R. (2020). **Digital Drawing for Designers: A Visual Guide to AutoCAD** 2021. Bloomsbury Publishing USA.
- Liu, Y., Pears, N., Rosin, P. L., & Huber, P. (Eds.). (2020). ***3D imaging, analysis and applications***. Cham, Switzerland: Springer International Publishing.
- McMorrough, J. (2014). Drawing for architects: How to explore concepts, define elements, and create effective built design through illustration. Rockport Publishers.
- Yee, R. (2012). Architectural drawing: a visual compendium of types and methods. John Wiley & Sons.
- Klawonn, F. (2012). ***Introduction to computer graphics: using Java 2D and 3D***. Springer Science & Business Media.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
60%	0%	0%	40%

DAE251	Digital Architecture technology 1 and History of Digital Architecture and Design	3 CH
Prerequisites	Visual Communication in Architecture - DAE151	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	4
Required SWL		Equivalent ECTS
125		5

Course Content

Digital media and its application in architecture. Focus is on enabling skill acquisition in the use of AutoCAD, 3D Studio Max. Course introduces 2D drafting and 3D modeling using CAD applications - modeling, rendering and animation using 3D Studio Max and Exploring man-machine relations, Digitality as part of utopian thinking, digital revolution, The generalization of the "digital

architecture", The Theory of Digital Design, digital design methods in architecture, graphic representation of architectural forms and drawings such as classic CAD programs, or automation between 2D and 3D views characteristic of BIM platforms

Laboratory

- Outodesk AutoCAD 2024 or the latest version.

References

- Esquivel, G. (Ed.). (2024). Design Technology and Digital Production: An Architecture Anthology. Taylor & Francis.
- Ching, F. D. (2023). ***Architectural graphics***. John Wiley & Sons.
- Seidler, D. R. (2020). **Digital Drawing for Designers: A Visual Guide to AutoCAD** 2021. Bloomsbury Publishing USA.
- Liu, Y., Pears, N., Rosin, P. L., & Huber, P. (Eds.). (2020). ***3D imaging, analysis and applications***. Cham, Switzerland: Springer International Publishing.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE252	Digital Architecture technology 2 and History of Digital Architecture and Design	3 CH
Prerequisites	Digital Architecture technology 1 and History of Digital Architecture and Design - DAE251	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	-	4
Required SWL		Equivalent ECTS
125		5

Course Content

This course covers the basics of 2D and 3D animation, from creating motion graphics to production. It covers text and object animations, video composition, audio, and effects. Students will learn to use tools like 3D max, Maya, Photoshop, Illustrator, Flash, and Adobe After Effects. The course also

covers the shift from representational to algorithmic logic, digital tools, and performance-oriented design. It also incorporates computer science concepts like computational design, AI, and process-oriented generative algorithms into architecture.
Laboratory
– Outodesk AutoCAD 2024, or the latest version. – Autodesk 3DS MAX 2024, or the latest version. – Adobe Photoshop cs6 2023, or the latest version.
Reference
– Chen, L., Penney, D., & Jiménez, D. (2022). AI for computer architecture: principles, practice, and prospects. Springer Nature. – Hovestadt, L., Hirschberg, U., & Fritz, O. (Eds.). (2020). Atlas of digital architecture: Terminology, concepts, methods, tools, examples, phenomena. Birkhäuser. – Nichols, R. (2020). Mastering Adobe Photoshop Elements 2020: Supercharge your image editing using the latest features and techniques in Photoshop Elements. Packt Publishing Ltd.
– Liu, Y., Pears, N., Rosin, P. L., & Huber, P. (Eds.). (2020). ***3D imaging, analysis and applications***. Cham, Switzerland: Springer International Publishing. – Melendez, F. (2019). Drawing from the Model: Fundamentals of Digital Drawing, 3D Modeling, and Visual Programming in Architectural Design. John Wiley & Sons. – Barker, C. (2016). Photoshop Tricks for Designers: How to Create Bada $$ Effects in Photoshop. Peachpit Press. – Denz, N. (2014). Process-oriented analysis and validation of multi-agent-based simulations (Vol. 7). Logos Verlag Berlin GmbH. – Vince, J., & Earnshaw, R. (Eds.). (2012). ***Advances in modelling, animation and rendering***. Springer Science & Business Media.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE253	Programming for Design and Digital Fabrication		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	2	
Required SWL		Equivalent ECTS	
100		4	
Course Content			

Data modeling, analyzing statistical data, data interpretation, algorithmic thinking, implementing algorithms, basics of programming and scripting, form generation process, programming languages supported by 3d modelling, fabrication, 3D printing.
Laboratory
– Rhino ٨- Rhinoceros 3D. or the latest version – Adobe Grasshopper٣,٠٣,٠١ , or the latest version.
References
– Sussman, A., & Hollander, J. (2021). Cognitive architecture: Designing for how we respond to the built environment. Routledge. – Nandi, C. (2021). Programming Language Tools and Techniques for Computational Fabrication. University of Washington. – Horvath, J., & Cameron, R. (2015). ***3D Printing with mattercontrol***. Apress. – Coates, P. (2010). ***Programming. architecture***. Routledge. – Levy, H., & Eckhouse, R. (2014). ***Computer programming and architecture: the VAX***. Digital Press. – Coates, P. (2010). ***Programming. architecture***. Routledge.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE351	Building Information Modeling (BIM)		3 CH
Prerequisites	Digital Architecture technology 2 and History of Digital Architecture and Design - DAE252		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
The course introduces the insight and tools to plan more efficiently, design, construct, and manage buildings and infrastructure and it helps architects to develop their designs and to create, coordinate, and manage tender drawings. Students will learn how to use one of BIM applications to develop the schematic design and to generate its tender documents. Application will be on moderate scale architecture projects such as administration building, clubhouse, small MPUs and similar projects.
Laboratory
– Outodesk Rivet 2023 or the latest version.
References

- Asterios Agkathidis, Al-Assisted Architectural Design: Generative Form-Finding Methods By Using Al-2024
- Leite, F. L. (2019). BIM for design coordination: A virtual design and construction guide for designers, general contractors, and MEP subcontractors. John Wiley & Sons.
- De Wilde, P. (2018). ***Building performance analysis***. John Wiley & Sons.
- Sacks, R., Eastman, C., Lee, G., & Teicholz, P. (2018). BIM handbook: A guide to building information modeling for owners, designers, engineers, contractors, and facility managers. John Wiley & Sons.
- Borrmann, A., König, M., Koch, C., & Beetz, J. (2018). ***Building information modeling: Why? what? how?*** (pp. 1-24). Springer International Publishing.
- Hardin, B., & McCool, D. (2015). BIM and construction management: proven tools, methods, and workflows. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE352	Architectural Computational Design		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	0	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course aims to equip architecture students with the knowledge and skills necessary to use computational tools and digital technologies to enhance and analyze architectural designs. It focuses on parametric modeling and computational algorithms, such as genetic algorithms and multi-objective search, to develop innovative and sustainable design solutions. The course addresses the structural and energy performance analysis of architectural elements, integrating digital fabrication techniques like 3D printing and CNC to transform digital models into executable designs. Additionally, it highlights the use of big data and algorithms to analyze trends and predict design needs, with a strong emphasis on energy and resource efficiency. The course includes practical projects that enable students to integrate these tools into the architectural design process, fostering creative thinking and interdisciplinary analysis to achieve optimal architectural performance.

References

Menges, A., & Ahlquist, S. (2011***). Computational design thinking: computation design thinking***. John Wiley & Sons.
Tedeschi, A., & Wirz, F. (2014). ***AAD_Algorithms-Aided Design: Parametric Strategies Using Grasshopper.***
Harmon, B. (2024). ***Computational Design for Landscape Architects***. Taylor & Francis.
Kyratsis, P., Manavis, A., & Davim, J. P. (Eds.). (2023). ***Computational design and digital manufacturing.*** Springer.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE353	AI in Architecture Design		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	-	3	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Introduction to AI, Data acquisition, Architecture Design and AI, AI Urbanism, AI for Building Design issues. Digital revolution and AI challenges

Laboratory

- AI-Aided Design for Architects
- Rhino ٨- Rhinoceros 3D. or the latest version
- Adobe Grasshopper٣،٠٣،٠١ , or the latest version

References

Agkathidis, A., Song, Y., & Ioanna, S. (2024). ***AI-Assisted Design: Utilising artificial intelligence as a generative form-finding tool in architectural design studio teaching***.
livrepository.liverpool.ac.uk
Komatina, D., Miletić, M., & Mosurović Ružičić, M. (2024). ***Embracing Artificial Intelligence (AI) in Architectural Education: A Step towards Sustainable Practice?.*** Buildings, 14(8).
Leach, N. (2021). ***Architecture in the age of artificial intelligence.*** torrossa.com

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE354	Parametric Design Studio		3 CH
Prerequisites	Digital Architecture technology 2 - DAE252		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	

2	-	2
Required SWL		Equivalent ECTS
150		6

Course Content

Parametric Modeling, algorithms, generative systems, form finding, performance-based evaluation, scripting, analysis tools, optimization methods, digital fabrication, parametric tools such as Rhino, Grasshopper.

Laboratory

- Rhino ٨- Rhinoceros 3D. or the latest version
- Adobe Grasshopper٣،٠٣،٠١ , or the latest version

References

- Jacobus, F., Carpenter, A., Loerts, R. S., Nunzio, A., & Bedeschi, F. (2023). ***Architectonics and Parametric Thinking: Computational Modeling for Beginning Design***. Routledge.
- Toker, U. (2022). Parametric Methods for Beginners: Architecture Applications. Routledge.
- Agkathidis, A. (2016). ***Generative design***. Hachette UK.
- Tang, M. (2014). Parametric building design using Autodesk Maya. Routledge.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE451	Digital Design & Fabrication	3 CH
Prerequisites	Parametric Design Studio – DAE353	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	-	2
Required SWL		Equivalent ECTS
125		5

Course Content

This course focuses on model development and introduces students to various modeling techniques and materials. It emphasizes the model's capacity to communicate design concepts at various scales and covers both physical and digital forms. The curriculum explores additive, subtractive, and casting modeling processes with various materials. Students also learn about digital manufacturing processes like milling, rapid prototyping, 3D printing, and laser cutting, where applicable. The course aims to cultivate material sensitivity and enhance students' understanding of software.

Laboratory

- Rhino ٨- Rhinoceros 3D. or the latest version
- Adobe Grasshopper٣،٠٣،٠١ , or the latest version

References

- Beorkrem, C. (2017). Material strategies in digital fabrication. Routledge.
- Johnson, J., & Vermillion, J. (2016). ***Digital design exercises for architecture students***. Routledge.
- Caneparo, L., & Cerrato, A. (2014). Digital fabrication in architecture, engineering and construction. Springer Netherlands.
- Dunn, N. (2014). Architectural Modelmaking Second Edition. Hachette UK.
- Stavric, M., Sidanin, P., & Tepavcevic, B. (2013). Architectural Scale Models in the Digital Age design, representation and manufacturing. Springer Wien NewYork.
- Mills, C. B. (2011). Designing with models: a studio guide to architectural process models. John Wiley & Sons.
- Corser, R. (2010). Fabricating architecture: selected readings in digital design and manufacturing. Princeton Architectural Press.
- Knoll, W., & Hechinger, M. (2007). ***Architectural models: construction techniques***. J. Ross Publishing.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	40%	0%

DAE361	Technical installation in buildings		2CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	
Course Content			
Techniques used in technological systems in buildings (Sanitary. Water supply, alarm systems, firefighting systems, communication systems, air conditioning systems, electronic control systems), Basic concepts, materials, and technical installations with its influence on contemporary architecture and applications.			
References			

- Ching, F. D., & Shapiro, I. M. (2020). *Green building illustrated*. John Wiley & Sons.
- Grondzik, W. T., & Kwok, A. G. (2019). ***Mechanical and electrical equipment for buildings***. John wiley & sons.
- Angle, J. S., Gala Jr, M. F., Harlow, D., & Lombardo, W. B. (2019). ***Firefighting strategies and tactics***. Jones & Bartlett Learning.
- Hall, F., & Greeno, R. (2017). ***Building services handbook***. Routledge.
- Sinopoli, J. M. (2009). Smart buildings systems for architects, owners and builders. Butterworth-Heinemann.
- Panchdhari, A. C. (2005). ***Water supply and sanitary installations***. New Age International.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE461	Digital Media Studio		2 CH
Prerequisites	-		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	2	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Advanced projects in architectural visualization with an emphasis on the use of computer graphics animation and video production media. The workshop introduces advanced visualization software and teaches exploration of spatial expressions in motion graphics format. Students review and discuss selected literature and video materials on films.

References

Pallasmaa, J., & Zambelli, M. (2020). ***Inseminations: Seeds for architectural thought***. John Wiley & Sons.

Stone, R. B., & Wahlin, L. (2018). *The theory and practice of motion design: critical perspectives and professional practice*. Routledge.

Brodlie, K. W., Carpenter, L. A., Earnshaw, R. A., Gallop, J. R., Hubbold, R. J., Mumford, A. M., ... & Quarendon, P. (Eds.). (2012). ***Scientific visualization: techniques and applications***. Springer Science & Business Media.

Kerlow, I. V. (2009). ***The art of 3D computer animation and effects***. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	10%	0%	40%

DAE462	Architectural & Urban Legislations and Sustainable	2CH

Prerequisites	-	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-
Required SWL		Equivalent ECTS
75		3

Course Content

This course discusses the roles of architects, contractors, and owners in the building and construction process, focusing on professional practice codes, legislations, contracts, fees, bidding, and construction supervision. It also discusses contracting agreements, guarantees against construction, certificates for sustainable construction, and relevant legislation flaws. analyzing the types of certificates approved for sustainable construction, such as LEED or Green Pyramid, and studying the relevant legislation flaws. Case studies. Discussion of building codes and examples.

References

- Jackson, B. J. (2020). Construction management JumpStart: the best first step toward a career in construction management. John Wiley & Sons.
- Ashworth, A., & Perera, S. (2018). Contractual procedures in the construction industry. Routledge.
- Sacks, R., Eastman, C., Lee, G., & Teicholz, P. (2018). BIM handbook: A guide to building information modeling for owners, designers, engineers, contractors, and facility managers. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

DAE463	Digital Marketing	2 CH
Prerequisites	-	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	2	-
Required SWL		Equivalent ECTS
75		3

Course Content

Program 3: Communications and Computers Engineering Program

- ## Program Description

The Communication and Computer Engineering Program is where computer programming, networks, and communication engineering merges to prepare the Computer and Communication Engineer of the future.

The Communication and Computer technology program aims at providing future engineers with appropriate theoretical knowledge and technical skills to respond to professional market demands in the fields of Communication and Computer engineering technology.

- ## Career Prospects

Students who earn their CCE BSc degree gain a profound understanding of communications and Computers engineering built on a thorough background of physical science, mathematics and technology. Coursework prepares students for careers in government agencies, all local and international industries – from communication systems and computer programing and network security – or for future study in graduate schools.

- ## Relation to Sustainable Development Goals

□ GOAL 1: No Poverty	□ GOAL 2: Zero Hunger	☒GOAL 3: Good Health & Well-being	☒GOAL 4: Quality Education	□ GOAL 5: Gender Equality	☒GOAL 6: Clean Water & Sanitation
☒GOAL 7: Affordable & Clean Energy	☒GOAL8: Decent Work & Economic Growth	☒GOAL 9: Industry, Innovation & Infrastructure	□ GOAL 10: Reduced Inequality	☒GOAL 11: Sustainable Cities & Communities	☒GOAL 12: Responsible Consumption & Production
☒GOAL 13: Climate Action	☒GOAL 14: Life Below Water	☒GOAL 15: Life on Land	□ GOAL 16: Peace & Justice Strong Institutions	☒GOAL 17: Partnerships to achieve the Goal	

- ## Program Concentrations

The program qualifies graduates to work as Computers and communications engineers. The graduate can be specialized in one of the following two concentrations:

1. **Communications Engineering:** Graduates are more specialized in the design of communication engineering systems. Graduates demonstrate additional abilities to model, analyze, design and build communication engineering systems and networks.
2. **Computers Engineering:** Graduates are more specialized in computer programing for software and hardware implementations. Graduates demonstrate additional abilities to model, analyze, design and build software engineering systems and networks.

- ## Program Competences

According to the National Academic Reference Standards (NARS-2018), the competences for Graduates from NHADA University and all Engineering Programs, graduate must be able to (A-Level):

1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
2. Develop and conduct appropriate experimentation and/or simulation, analyse and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
5. Practice research techniques and methods of investigation as an inherent part of learning.
6. Plan, supervise and monitor implementation of engineering projects.
7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

In addition to the Competences for all Engineering Programs the Basic Electrical Engineering graduate must be able to (B-Level):

2. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
3. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
4. Design and implement elements, modules, sub-systems, or systems in electrical/electronic/digital engineering using technological and professional tools.
5. Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input excitation and evaluate its suitability for a specific application.
6. Adopt suitable national and international standards and codes to design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

In addition to the competences for all Engineering Programs (A-Level) and the competences for the Electrical Engineering Discipline (B-Level), the Communications and computers Engineering Program graduate must be able to (C-Level):

1. Articulate the main concepts and limitations of performance of communication and computer engineering systems

Concentration	Competence
Communication Engineering	C1a. Use the main concepts and limitations of performance of electrical communication systems and devices.
Computer Engineering	C1b. Relate the essential concepts and limitations of performance of computer engineering systems, networks, and devices.

2. Establish the models, analyze them and compare between different designs of communication and computer engineering systems and utilize the software tools required to optimize their performance.

Concentration	Competence
Communication Engineering	C2a. Model, correlate and design electrical communication engineering systems and utilize the software tools for performance optimization.
Computer Engineering	C2b. Categorize the types of computer engineering based models, develop the required analysis and codes for these models, then examine the systems in computer engineering and recognize the software tools required to optimize their performance.

3. Develop the knowledge about measurement equipment, calibration and the ability to use these tools to characterize communication and computer engineering components and systems.

Concentration	Competence
Communication Engineering	C3a. Compare and transfer the key points about measurement equipment, and grade the ability to use them to characterize components and systems in communication engineering.
Computer Engineering	C3b. Criticize and discover the measurement equipment, and verify the ability to use them to indicate the role of each element and component in the systems of computer engineering.

4. Pivot the additional abilities related to the field of the concentration within communication and computer engineering as listed below:

Concentration	Competence
Communication Engineering	C4a. Design and rewrite additional abilities to model, analyze, design, and implement communication engineering systems and networks.
Computer Engineering	C4b. Modify the existing algorithms, models, analysis topologies, designs, testing and validation procedures and the enhancement approaches implemented in computer engineering systems.

- ## Graduate Attributes

The graduates from Communications and Computers program should be able to:

- Master a wide spectrum of communications and computers engineering knowledge and specialized skills, specifically in the realm of environmental aspects and sustainability and can apply acquired knowledge using theories and abstract thinking in real life situations.
- Apply analytic critical and systemic thinking to identify, diagnose and solve communications and computers engineering problems with a wide range of complexity and variation.
- Behave professionally and adhere to communication and computer engineering and sustainability ethics and standards.
- Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
- Recognize his/her role in promoting the communication and computer engineering field and contribute in the development of the Communication and Computer profession and the community;
- Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
- Use techniques, skills, and modern engineering tools necessary for communications and computers engineering practice. In addition to applying his/her own knowledge

and practical skills to create and develop communications and computers designs starting from the briefing phase till beyond the construction and operating phase.

- Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
- Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner;
- Demonstrate leadership qualities, business and project administration and entrepreneurial skills.

• Program Assessment Methods

Considering that the program Competencies illustrate a holistic status that would be achieved through a journey involves many different courses within different levels, and the final competence achievement can only be assessed at the end of its journey, each single competence is broken-down into measurable Learning Outcomes LOs that should be achieved in different courses. Thus, the program graduate competence may be considered as the final goal, while the courses LOs may be considered as the procedural aims/objectives.

Hence, different assessment methods are applied in program courses to assess these procedural aims/objectives. For further detail, refer to the courses' specifications and the assessment topologies can be listed as follows:

- ❖ Written Exams.
- ❖ Practical Exams.
- ❖ Oral Exams.
- ❖ Projects.
- ❖ Research.

• Teaching and Learning Methods

The Program of Communications and Computer Engineering followed the following methods of teaching and learning to achieve the mission of the program:

1. Teaching and learning strategies in traditional education

1-1 Teaching strategies (where the faculty member is the focus)

- Lectures
- Field visit

1-2 Learning strategies (where the student is the focus)

1-2-1 Cooperative education

- Education based on group projects
- Education based on collective research

- Brainstorming

1-2-2 Interactive education strategies

- Self-study
- Reporting and research
- Problem solving
- Individual projects
- Education in experimental discovery

2- Distance teaching and learning strategies (e-learning)

- **Required Courses**
- **List of Communications and Computers Engineering Program Requirements Courses**

Course Title	Weight			Contact Hours				%
	CH	ECTS	SWL	Lec	Tut	Lab	TT	
University Requirements	11	18	450	11	0	0	11	8%
Faculty of Engineering Requirements	33	64	1600	24	17	10	51	23%
Major Requirements of Communications and Computers Engineering	59	100	2500	44	27	24	95	41%
Minor Requirements of Communications and Computers	41	68	1700	29	18	17	64	28%
Total	**144**	**250**	**6250**	**108**	**62**	**51**	**221**	**100%**

- **Credit hour distribution according to NARS 2018 requirements**

No.	Requirement	Achieved Percentage	Required Percentage (NARS2018)
1	Humanities and Social Sciences	9%	9-12%
2	Mathematics and Basic Science	22.2%	20-26%
3	Basic Engineering Science	22%	20-23%
4	Applied Engineering Sciences	22%	20-22%
5	Computer Science and its Applications	10.4%	9-11%
6	Projects and Engineering Applications	8.2%	8-10%
7	Specialized topics of the program	6.2%	6-8%

Major Requirements of Communications and Computers Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
BAS213	Mathematics (4)	2	3	75	2	1	0	3	BAS211
BAS311	Mathematics (5)	2	3	75	2	1	0	3	BAS212
CCE161	Computer Programming	2	4	100	2	0	1	3	
CCE211	Electrical Circuits (1)	3	5	125	2	2	1	5	BAS122
CCE214	Electrical Circuits (2)	3	5	125	2	2	1	5	CCE211
CCE212	Electromagnetic Fields	3	5	125	2	2	1	5	BAS112, BAS122
CCE251	Logic Circuits Design	3	5	125	2	1	2	5	
CCE213	Electrical Measurements and Instrumentation	3	5	125	2	1	2	5	BAS122
CCE231	Electronic Devices	3	5	125	2	2	1	5	CCE211
CCE252	Advanced Logic Circuits Design	2	4	100	2	0	1	3	CCE251
CCE221	Signal Analysis	3	5	125	2	2	1	5	BAS211
CCE215	Modeling and System Analysis	3	5	125	2	2	1	5	BAS211
CCE321	Electrical Communications	3	5	125	2	1	2	5	CCE221
CCE331	Electronic Circuits	3	5	125	2	1	2	5	CCE231
CCE341	Optoelectronics	2	4	100	2	1	0	3	CCE231
CCE351	Computer Organization and Architecture	3	5	125	2	1	2	5	CCE252
CCE311	Control Systems	3	5	125	2	2	1	5	CCE221,CCE 215
CCE352	Microprocessors and Applications	3	5	125	2	1	2	5	CCE161,CCE 351
CCE332	Digital Circuit design	2	4	100	2	1	0	3	CCE331
CCE353	Computer Networks	3	5	125	2	1	1	4	CCE321
CCE322	Digital Signal Processing	3	5	125	2	1	2	5	CCE221
Total		59	100	2500	44	27	24	95	

Minor Requirements of Communications and Computers Engineering

- **Minor Requirements of Communications Engineering**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CCE361	Data Structure and Algorithms	2	3	75	2	0	1	3	CCE161
CCE481	Computer Vision	2	3	75	2	0	1	3	CCE161
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
CCE451	Computer and Network Security	2	3	75	2	1	0	3	CCE353
CCE323	Digital Communication Systems	3	5	125	2	2	1	5	BAS113, CCE321
CCE421	Communication Networks	3	5	125	2	1	1	4	CCE323
CCE441	Antenna and Wave Propagation	3	5	125	2	2	1	5	CCE212
CCE442	Optical communication Systems	2	3	75	2	1	0	3	CCE212
CCE422	Information and Coding Theory	2	3	75	2	1	0	3	CCE323
CCE443	Microwave Devices and Circuits	2	4	100	2	1	0	3	CCE212
CCE423	Mobile communications	3	5	125	2	2	1	5	CCE421
CCE491	Communications and Computers Graduation Project (1)	2	4	100	1	0	3	4	101 CH.
CCE492	Communications and Computers Graduation Project (2)	3	5	125	0	0	6	6	CCE491
	Communications Engineering Elective (1)	3	5	125	2	2	0	4	
	Communications Engineering Elective (2)	3	5	125	2	2	0	4	
	Communications Engineering Elective (3)	3	5	125	2	2	0	4	
Total		41	68	1700	29	18	17	64	

- **Minor Requirements of Computers Engineering**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CCE361	Data Structure and Algorithms	2	3	75	2	0	1	3	CCE161
CCE481	Computer Vision	2	3	75	2	0	1	3	CCE161
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
CCE451	Computer and Network Security	2	3	75	2	1	0	3	CCE353
CCE362	Database Systems	3	5	125	2	2	1	5	CCE161
CCE461	Big-Data Analytics	2	3	75	2	0	1	3	CCE362
CCE462	Cloud Computing	3	5	125	2	1	1	4	CCE353
CCE463	Operating Systems	3	5	125	2	1	2	5	CCE352
CCE464	Software Engineering	2	3	75	2	1	0	3	CCE361
CCE483	Internet Of Things	3	5	125	2	2	1	5	CCE482,CCE 362
CCE465	Data Mining	2	4	100	2	1	0	3	CCE461
CCE491	Communications and Computers Graduation Project (1)	2	4	100	1	0	3	4	١٠ CH
CCE392	Communications and Computers Graduation Project (2)	3	5	125	0	0	6	6	CCE491
	Computers Engineering Elective (1)	3	5	125	2	0	2	4	
	Computers Engineering Elective (2)	3	5	125	2	2	0	4	
	Computers Engineering Elective (3)	3	5	125	2	2	0	4	
Total		41	68	1700	29	14	21	64	

Elective Courses of Communications and Computers Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Pools of Communications Engineering Elective Courses									
Communications Engineering Elective (1) Select 3 Credit hrs. (one course)									
CCE431	Integrated Circuits Design	3	5	125	2	1	1	4	CCE331
CCE424	Telephony Systems	3	5	125	2	1	1	4	CCE321
CCE425	Acoustics	3	5	125	2	2	0	4	BAS121

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Communications Engineering Elective (2) Select 3 Credit hrs. (one course)									
CCE432	VLSI Technology	3	5	125	2	2	0	4	CCE331
CCE426	Satellite Communication	3	5	125	2	2	0	4	CCE421
CCE427	Selected Topics in Communication Systems	3	5	125	2	2	0	4	CCE421
Communications Engineering Elective (3) Select 3 Credit hrs. (one course)									
CCE444	RF Integrated Circuits Design	3	5	125	2	2	0	4	CCE331
CCE445	Photonics Micro-Systems	3	5	125	2	2	0	4	CCE212, CCE442
CCE446	Radar Systems	3	5	125	2	1	1	4	CCE212, CCE441
CCE447	Bio electromagnetics	3	5	125	2	2	0	4	CCE212
Pools of Computers Engineering Elective Courses									
Computers Engineering Elective (1) Select 3 Credit hrs. (one course)									
CCE466	Object-Oriented Programming	3	5	125	2	0	2	4	CCE161
CCE484	Computational Intelligence	3	5	125	2	0	2	4	BAS113, CCE161
CCE485	Microcontrollers and Applications	3	5	125	2	0	2	4	CCE352
Computers Engineering Elective (2) Select 3 Credit hrs. (one course)									
CCE452	Selected Topics in Computer networks and Security	3	5	125	2	2	0	4	CCE353
CCE453	Introduction to Network Operations and Management	3	5	125	2	2	0	4	CCE353
CCE486	Artificial Intelligence and its Applications	3	5	125	2	1	1	4	BAS113, CCE161
Computers Engineering Elective (3) Select 3 Credit hrs. (one course)									
CCE467	Selected Topics in Distributed and Mobile Computing	3	5	125	2	2	0	4	CCE462
CCE468	Mobile and Web Application Development	3	5	125	2	2	0	4	CCE362
CCE487	Fundamentals of Deep Learning	3	5	125	2	2	0	4	BAS113, CCE161

- **Proposed Study Plan**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 1									
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS121	Vibration and Waves	3	5	125	2	2	1	5	
BAS141	Statics	3	5	125	2	2	0	4	
BAS131	Engineering Chemistry	3	5	125	2	2	1	5	
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
	University Elective (1)	2	3	75	2	0	0	2	
	University Elective (2)	2	3	75	2	0	0	2	
Total		18	30	750	13	11	2	26	
Semester 2									
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
BAS142	Dynamics	3	5	125	2	2	0	4	BAS141
BAS113	Probability and Statistics	2	3	75	2	1	0	3	
CCE161	Computer Programming	2	4	100	2	0	1	3	
-	Engineering Technology Elective	2	3	75	2	0	2	4	
-	Spatial Perception and Design Elective	2	3	75	0	0	4	4	
ENG111	English (1)	1	2	50	1	0	0	1	
Total		18	30	750	13	6	9	28	
Semester 3									
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
CCE211	Electrical Circuits (1)	3	5	125	2	2	1	5	BAS122
CCE212	Electromagnetic Fields	3	5	125	2	2	1	5	BAS112, BAS122
CCE251	Logic Circuits Design	3	5	125	2	1	2	5	
CCE213	Electrical Measurements and Instrumentation	3	5	125	2	1	2	5	BAS122
-	Structures and Properties of Materials Elective	2	3	75	2	0	1	3	
-	University Elective (3)	1	2	50	1	0	0	1	
ENG112	English (2)	1	2	50	1	0	0	1	
Total		18	30	750	14	7	7	28	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 4									
BAS213	Mathematics (4)	2	3	75	2	1	0	3	BAS211
CCE214	Electrical Circuits (2)	3	5	125	2	2	1	5	CCE211
CCE231	Electronic Devices	3	5	125	2	2	1	5	CCE211
CCE252	Advanced Logic Circuits Design	2	4	100	2	0	1	3	CCE251
CCE221	Signal Analysis	3	5	125	2	2	1	5	BAS211
CCE215	Modeling and System Analysis	3	5	125	2	2	1	5	BAS211
ENG113	English (3)	2	3	75	2	0	0	2	
Total		18	30	750	14	9	5	28	
Semester 5									
BAS311	Mathematics (5)	2	3	75	2	1	0	3	BAS212
CCE321	Electrical Communications	3	5	125	2	1	2	5	CCE221
CCE331	Electronic Circuits	3	5	125	2	1	2	5	CCE231
CCE341	Optoelectronics	2	4	100	2	1	0	3	CCE231
CCE351	Computer Organization and Architecture	3	5	125	2	1	2	5	CCE252
CCE311	Control Systems	3	5	125	2	2	1	5	CCE221, CCE215
	University Elective (4)	2	3	75	2	0	0	2	
Total		18	30	750	14	7	7	28	

- **Communications Engineering Track**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 6									
CCE352	Microprocessors and Applications	3	5	125	2	1	2	5	CCE161, CCE351
CCE332	Digital Circuit design	2	4	100	2	1	0	3	CCE331
CCE353	Computer Networks	3	5	125	2	1	1	4	CCE321
CCE361	Data Structure and Algorithms	2	3	75	2	0	1	3	CCE161
CCE322	Digital Signal Processing	3	5	125	2	1	2	5	CCE221
CCE323	Digital Communication Systems	3	5	125	2	2	1	5	BAS113, CCE321
-	Engineering Economy and Project Management Elective	2	3	75	2	1	0	3	
Total		18	30	750	14	7	7	28	
Semester 7									
CCE491	Communications and Computers Graduation Project (1)	2	4	100	1	0	3	4	101 CH
CCE481	Computer Vision	2	3	75	2	0	1	3	CCE161
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
CCE421	Communication Networks	3	5	125	2	1	1	4	CCE323
CCE441	Antenna and Wave Propagation	3	5	125	2	2	1	5	CCE212
CCE442	Optical communication Systems	2	3	75	2	1	0	3	CCE212
-	Communications Engineering Elective (1)	3	5	125	2	2	0	4	
Total		18	30	750	13	7	8	28	

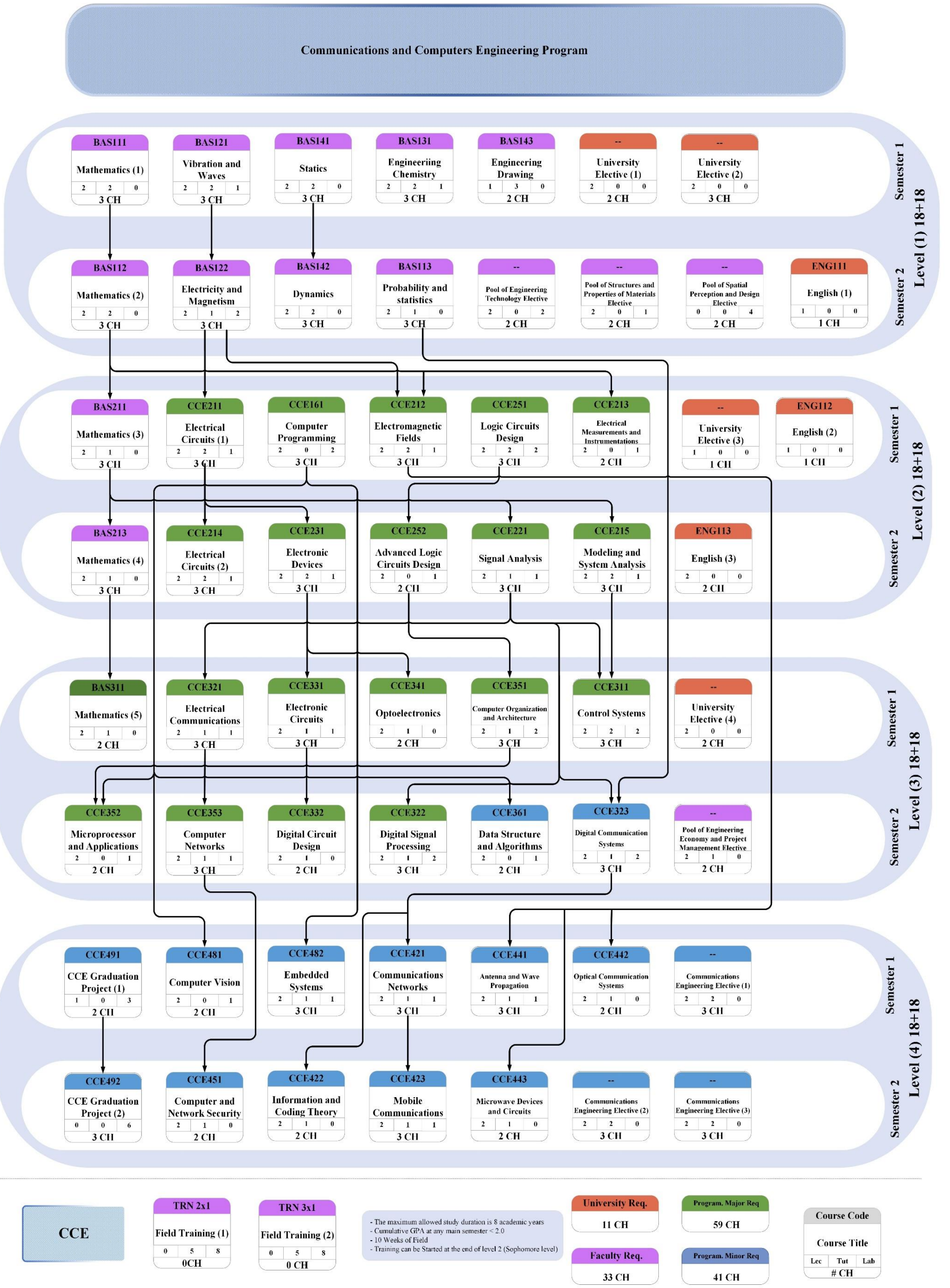
Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 8									
CCE492	Communications and Computers Graduation Project (2)	3	5	125	0	0	6	6	CCE491
CCE451	Computer and Network Security	2	3	75	2	1	0	3	CCE353
CCE422	Information and Coding Theory	2	3	75	2	1	0	3	CCE323
CCE443	Microwave Devices and Circuits	2	4	100	2	1	0	3	CCE212
CCE423	Mobile communications	3	5	125	2	2	1	5	CCE421
-	Communications Engineering Elective (2)	3	5	125	2	2	0	4	
-	Communications Engineering Elective (3)	3	5	125	2	2	0	4	
Total		18	30	750	12	9	7	28	

- **Computers Engineering Track**

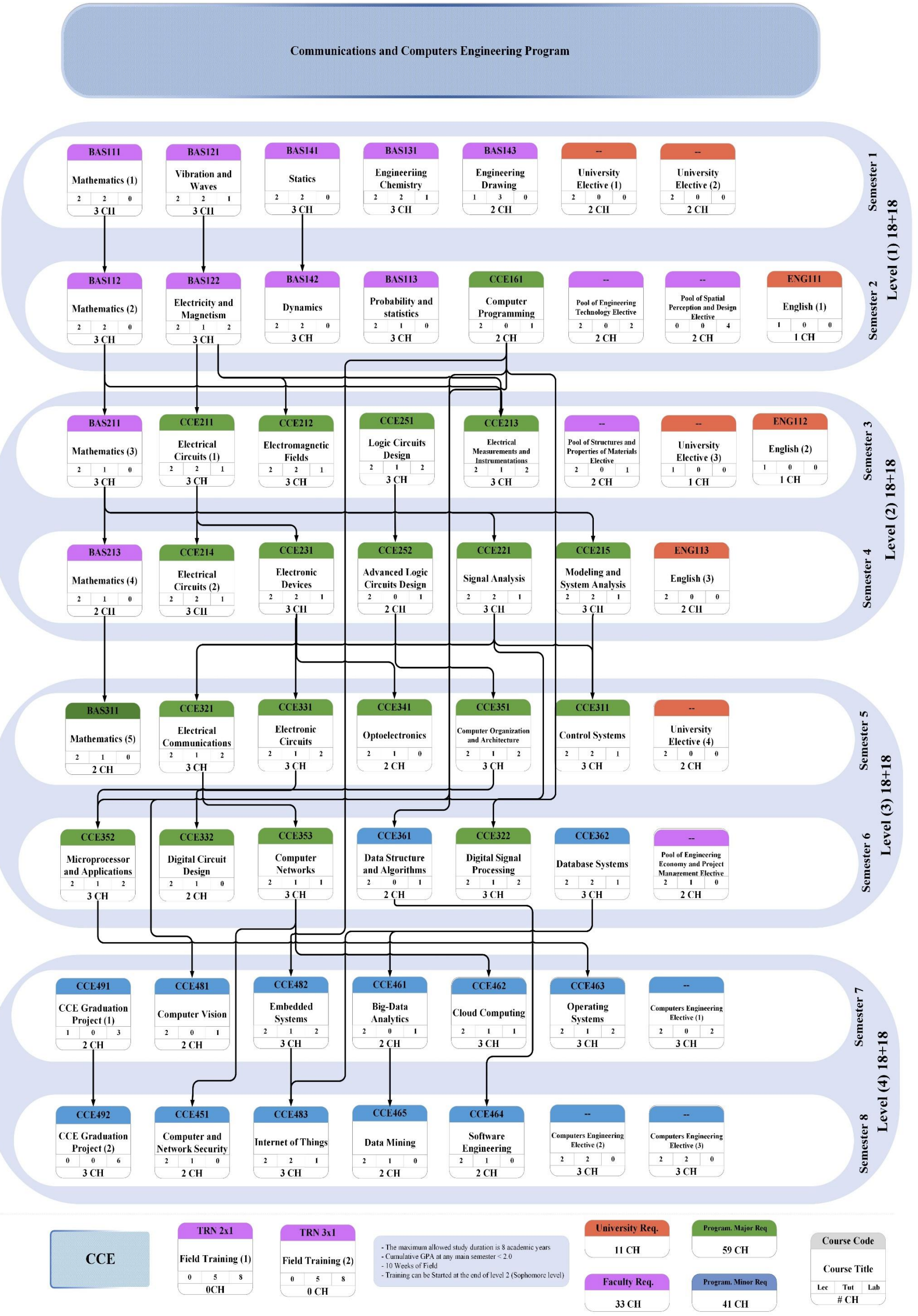
Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 6									
CCE352	Microprocessors and Applications	3	5	125	2	1	2	5	CCE161, CCE351
CCE332	Digital Circuit design	2	4	100	2	1	0	3	CCE331
CCE353	Computer Networks	3	5	125	2	1	1	4	CCE321
CCE361	Data Structure and Algorithms	2	3	75	2	0	1	3	CCE161
CCE322	Digital Signal Processing	3	5	125	2	1	2	5	CCE221
CCE362	Database Systems	3	5	125	2	2	1	5	CCE161
-	Engineering Economy and Project Management Elective	2	3	75	2	1	0	3	
Total		18	30	750	14	7	7	28	
Semester 7									
CCE491	Communications and Computers Graduation Project (1)	2	4	100	1	0	3	4	101 CH
CCE481	Computer Vision	2	3	75	2	0	1	3	CCE161
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
CCE461	Big-Data Analytics	2	3	75	2	0	1	3	CCE362
CCE462	Cloud Computing	3	5	125	2	1	1	4	CCE353
CCE463	Operating Systems	3	5	125	2	1	2	5	CCE352
-	Computers Engineering Elective (1)	3	5	125	2	0	2	4	
Total		18	30	750	013	4	10	27	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 8									
CCE392	Communications and Computers Graduation Project (2)	3	5	125	0	0	6	6	CCE491
CCE451	Computer and Network Security	2	3	75	2	1	0	3	CCE353
CCE464	Software Engineering	2	3	75	2	1	0	3	CCE361
CCE483	Internet Of Things	3	5	125	2	2	1	5	CCE482, CCE362
CCE465	Data Mining	2	4	100	2	1	0	3	CCE461
-	Computers Engineering Elective (2)	3	5	125	2	2	0	4	
-	Computers Engineering Elective (3)	3	5	125	2	2	0	4	
Total		18	30	750	12	9	7	28	

- **Communications Engineering Track**



- **Computers Engineering Track**



Communications and Computers Engineering Program Course Content

Courses offered by Communications and Computers Engineering Program (CCE)

CCE211	Electrical circuits (1)		3 CH
Prerequisites	Electricity and Magnetism – BAS122		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Current, Voltage, Power and energy, Constant and controlled current/voltage sources, Series and Parallel Circuit Analysis, DC circuits (Loop/mesh and Nodal methods), Circuit Theorems, Operational Amplifier, Capacitance and inductance, Response of First Order Circuits, Response of Second Order Circuits, alternating current, Analysis of AC circuits using Vectors, Computation of power.

Laboratory

- Electrical circuits Components
- Kirchhoff's Voltage Law (KVL)
- Theremins theorem
- Superposition theorem
- Measuring the impedance of R,C in AC
- RC Network as a low-pass Filter
- Project

References

- James M.Fiore, DC electric circuit analysis-A practical approach", Mohawk Valley community college, Libre Texts, 2020.
- Charles K. Alexander | Matthew n. o. Sadiku, Fundamentals of electric circuits, 5th edition, McGraw Hill, 2013.
- J. W. Nilsson and S. A. Riedel, Electric Circuits, Prentice - Hall, 8th. Ed., 2008.
- F. P. Yatsko and D. M. Hata, Circuits: Principles, Harcourt Brace College Publishers, 1992.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE212	Electromagnetic Fields		3 CH
Prerequisites	Electricity and Magnetism – BAS122, Mathematics (2) – BAS112		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
5		125	

Course Content

Vector analysis, Coulomb's law, Electric field intensity, Electric flux, Gauss's law, Divergence, Electric energy and potential, Electric conductors, Electrical resistance, Dielectric materials, Electrical capacitance, Poisson's equation, Laplace's equation. Steady magnetic fields, Ampere's law, Magnetic forces, Magnetic materials, Magnetic circuits, Inductance. Time varying magnetic fields, Maxwell's equations.

Laboratory

- Laboratory exercises about the basic concepts of electromagnetic.
- Problems Simulation using CAD software.

References

- W. Hayt and J. Buck, Engineering Electromagnetics, McGraw - Hill, 8th edition, 2012.
- Carson, D.R. and Lorrain, P. L., Introduction to Electromagnetic Fields and Waves, Literary Licensing, LLC, 2013.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE213	Electrical Measurements and Instrumentation		3 CH
Prerequisites	Electricity and Magnetism – BAS122		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction about measurements, Errors in measurements, Statistical analysis of errors in measurements, Measurements of all electrical quantities (current, voltage, energy, and power) for dc and ac current, Measurement of resistances and capacitors, The multi-meter, The oscilloscope, Signal generators, Measurements of time period and frequency, Spectrum analyzers, Logic analyzers, Logic probe, Energy transducers (pressure, force, displacement, level, light, temperature, speed), A/D and D/A and applications, Data acquisition cards.

Laboratory
• Accuracy and Precision in experimental data. • Error in Measurement • The voltmeter loading effect in circuits • Oscilloscope operation and Basic oscilloscope measurements. • Measuring frequency and phase shift with the oscilloscope. • Basic function generator.
References
• Larry D. Jones and A. Foster Chin, Electronic Instruments and Measurements, Prentice - Hall International, 2nd. Ed., 1991. • V. Baksh, U. A. Baksh, Electronic Instrumentation, Technical Publications, 2009. • Klaas B. Klaassen, Electronic Measurement and Instrumentation, Cambridge Univ. Press, 1999. • M. M. S. Anand, Electronic Instruments and Instrumentation technology, PHI Learning Pvt. Ltd, 2004.

Assessment Criteria			
Student Activities	Student Activities	Student Activities	Student Activities
30%	30%	30%	30%

CCE214	Electrical circuits (2)		3 CH
Prerequisites	Electrical circuits (1) - CCE211		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Network structures, Operational Amplifier, Response ofFirst Order Circuits, Response of Second Order Circuits, Three - phase Circuits, Mutual Inductance,Laplace and Fourier Transforms in Electric Circuits, Transfer Function, Two port Networks,Introduction to Frequency Selective Circuits, Fourier Series, Circuit Analysis using PSPICE simulation.
Laboratory
• Operational Amplifierdifferent applications. • Two port Networks analysis • Analysis using PSPICE simulation • Project
References
• James M.Fiore, AC electric circuit analysis-A practical approach", Mohawk Valley community college, LibreTexts, 2020. • Charles K. Alexander | Matthew n. o. Sadiku, Fundamentals of electric circuits, 5th edition,

McGraw Hill, 2013.
- J. W. Nilsson and S. A. Riedel, Electric Circuits, Prentice - Hall, 8th. Ed., 2008.
- F. P. Yatsko and D. M. Hata, Circuits: Principles, Harcourt Brace College Publishers, 1992.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE215	Modeling and System Analysis		3 CH
Prerequisites	Mathematics (3)		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Study and analysis of continuous and discrete linear systems- State variables to represent continuous and discrete systems - Analysis of continuous and discrete linear systems using Laplace transforms - Analysis of discrete systems described by differential equations - Z-transforms and their applications in the analysis of discrete systems - Study of the signal flow curve and calculation of vector functions - Impulse response And using convolution integration to calculate the response to any input, State-space analysis, Finite state machines, Applications and case studies.

Laboratory

- Introduction to Matlab.
- Plotting response curves using Matlab.
- Transformation of mathematical models of dynamic systems using Matlab.
- Matlab representation of systems in block diagram form.
  - Impulse response analysis of dynamic systems using Matlab.

References

- Signals & Systems, by Oppenheim, Willsky, Nawab (Prentice Hall), 2 edition (August 16, 1996)
- Digital Signal Processing: A Computer-based Approach, by Sanjit K. Mitra, 3-rd Edition, McGraw-Hill,2005
- S. Engell, G. Frehse, and E. Schnieder (Eds.): Modelling, Analysis, and Design of Hybrid Systems, © Springer-Verlag Berlin Heidelberg 2008. (available on ekb)
- René David and HassaneAlla: Discrete, Continuous, and Hybrid Petri Nets, Springer-Verlag Berlin Heidelberg 2010. (available on ekb)
- William S. Levine, The Control Systems Handbook: Control System Advanced Methods, CRC Press, Second Edition, 2018.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE311	Control Systems		3 CH
Prerequisites	Signal Analysis, Modeling and System Analysis		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Block diagram representation of physical control systems. Introduction to feedback control systems. Characteristics of closed loop systems. Introduction to discrete event control systems. Obtainment of transfer functions along with illustrative examples. Block diagram reduction. Signal flow graphs. Performance of control systems. Time response of first and second order systems and response specifications. Identification of systems from time response. Static error analysis. Classical controllers: P, PI, PD, PID. Routh method for stability analysis. Root locus. Frequency response. State space representation in canonical forms. Introduction to digital control systems. Model of the sampling process. Z-transform.

Laboratory

References

- Ajit k. Mandal, Introduction to Control Engineering – Modeling, Analysis and Design, New Academic Science; 3rd edition. March 15, 2016.
- Roland S. Burns, Advanced Control Engineering, Elsevier Ltd, 2011.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE221	Signal Analysis		3 CH
Prerequisites	Mathematics (4)		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Signals and systems: continuous - time and discrete - time, elementary signals, basic system properties. Linear Time Invariant Systems: continuous - time and discrete - time convolution, system properties. Fourier series representation of periodic signals: continuous - time and discrete - time. Continuous - time and discrete - time Fourier transforms and their properties. Frequency response of LTI systems. Sampling of continuous - time signals. Laplace transform and its properties.

Laboratory

- Basic signals and time - transformations.
- Linear time - invariant systems and convolution.
- Fourier series analysis and synthesis.
- Fourier transform and its properties.
- Magnitude and phase frequency responses of LTI systems.
- Sampling and aliasing.

References

- A. Oppenheim and A. Willsky, Signals and Systems, Prentice Hall, 2nd. Ed., 1997.
- John R. Buck, Computer Explorations in Signals and Systems Using MATLAB, Prentice Hall, 2nd. Ed., 2002.
- M. J. Roberts, Signals and Systems: Analysis Using Transform Methods and MATLAB, McGraw-Hill, 2nd. Ed., 2012.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE321	Electrical Communications	3 CH
Prerequisites	Signal Analysis	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	2

Required SWL	Equivalent ECTS
125	5

Course Content

Communication system elements, Overview of current communication systems. Communication channels properties. Basics of analog communication: amplitude, angle, frequency and analog pulse modulation; frequency division multiplexing. Basics of digital communication: sampling, quantization, pulse code modulation, Delta Modulation, Differential PCM, time division multiplexing, binary signal formats. Digital carrier modulation: ASK, PSK, FSK and QAM. Multiple - access techniques.

Laboratory

- Communication channels.
- Amplitude modulation.

- Frequency and phase modulation.
- Phase locked loop.
- Sampling and TDM.
- Digital carrier modulation.

References

- Simon Haykin and M. Moher, Communication Systems, John Wiley and Sons, Inc., 5th. Ed., 2009.
- Z. Ding and B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press, 5th. Ed., 2019.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE322	Digital Signal Processing		3 CH
Prerequisites	Signal Analysis		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Z - transform: ROC and properties. Transform analysis of LTI systems: system function and frequency response, linear - phase, minimum - phase and all - pass systems. Structures for discrete - time systems: basic IIR and FIR structures. Filter design techniques: filter specifications, IIR design, FIR design. Discrete Fourier Transform: sampling of the Fourier transform, properties of the DFT, circular convolution, linear convolution using DFT, FFT. Spectral analysis using DFT. Adaptive filters: LMS, RLS

Laboratory

- Introduction to Filter Design and Analysis Tool.
- Pole - Zero editing: effect on transfer function.
- Linear - phase, minimum - phase and all - pass systems.
- FIR and IIR filter design.
- DFT and FFT.
- Spectral analysis.
- Adaptive filter.

References

- Oppenheim and R. Schafer, Discrete - Time Signal Processing, Pearson, 3rd. Ed., 2010.
- John R. Buck, Computer Explorations in Signals and Systems Using MATLAB, Prentice Hall, 2nd. Ed., 2002.
- L. Tan and J. Jiang, Digital Signal Processing: Fundamentals and Applications, Academic Press, Elsevier, 3rd. Ed., 2019

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE323	Digital Communication Systems	3 CH
Prerequisites	Electrical Communications – CCE321, Probability and Statistics – BAS113	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Random processes: Gaussian process, narrow - band noise. Baseband pulse transmission: matched filter, inter - symbol interference. Signal space analysis: correlation receiver, probability of error. Performance of digital carrier modulation schemes. Spread - spectrum modulation. Multi - carrier modulation: OFDM. Fundamentals of information theory: source coding, channel capacity. Basic error - control coding.

Laboratory

- Random processes.
- Baseband pulse transmission.
- Matched filter and correlation receiver.
- Phase and timing recovery.
- OFDM.
- Error correction coding.

References

- Simon Haykin, Digital Communication Systems, John Wiley and Sons, Inc., 1st. Ed., 2013.
- Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall, 2nd. Ed., 2001.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE421	Communication Networks	3 CH
Prerequisites	Digital Communication Systems – CCE323	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	1
Required SWL		Equivalent ECTS
125		5

Course Content

Introduction to telecommunication networks, Network topology, switching: Telegraph, Telephone, Telex, Data, Signaling, ISDN, Broad band, Private switching. Management network multiplexing: Analog, Digital, Wavelength division. Data transmission interface equipment: Modems, Digital data interface equipment. Codecs: Audio, Video. Copper lines: Open wire, Twisted pair cable, Coaxial cable. Optical fiber technology: Types of optical fibers, Cables, Wavelength Division Multiplexing in optical networks, Applications, Radio relay technology, Systems. Mobile radio: Service mode technology. Satellites: Services, Technology, Digital subscriber lines.

Laboratory

- Introduction to Networks lab
- Cabling & Packet Sniffing
- Network Devices & Packet Tracer
- Basic Device Configuration
- Basic Network Operation and Troubleshooting
- Address Subnetting
- VLSM & Route Summarization
- ATM NETWORKS
- ATM LAYERING
- ATM CELL SIMULATION
- Creating a simple wireless scenario.
- Creating random traffic-pattern for wireless scenario.
- Creating a simple wired and wireless scenario.
- Running MobileIP in a simple wired and wireless topology

References

- Computer Networks", Andrew S. Tanenbaum, 4th ed., Prentice Hall
- Data And Computer Communications", William Stallings, 8th ed., Prentice Hall

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE422	Information and Coding Theory	3 CH
Prerequisites	Digital Communication Systems – CCE323	

Number of weekly Contact Hours

Lecture: 2	Tutorial: 1	Laboratory: 0
2	1	0

Required SWL	Equivalent ECTS
75	3

Course Content

Uncertainty, information and uncertainty scale at Shannon -Source code: Characteristics of source codes: Codes, instantaneous code, Kraft's inequality, Huffman, and Fano codes- memoryless discrete channels- mutual information- Information channel modeling: model of binary symmetric channel. Shannon theorem for channel capacity. Error detection and correction: Linear block codes- Syndrome calculation- cyclic code - convolutional codes- Code tree and trellis diagram- Decoding: Viterbi algorithm.

Laboratory

References

- J. S. Chitode,"Information Theory and Coding: Information, Source Coding andChannel Coding", 2020.
- OrhanGazi,"Forward Error Correction via Channel Coding", 2019.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE423	Mobile Communications	3 CH
Prerequisites	Communication Networks - CCE421	

Number of weekly Contact Hours

Lecture:	Tutorial:	Laboratory:
2	2	1

Required SWL	Equivalent ECTS
125	5

Course Content

Introduction to mobile cellular systems. Radio Resource management - Small and large-scale fading. The GSM system: GSM Network Architecture, GSM Air Interface, GSM Network Protocols. CDMA system: CDMA modulation and demodulation, CDMA air links, types of codes in CDMA, power control in CDMA. UMTS Evolution & Air interface, UMTS Network, UMTS Protocol Stack &Physical layer processing. LTE Network Structure, LTE Air interface, LTE Protocol stack & Physical Layer, LTE Planning.

Laboratory

Derive Test Using TEMS Investigation, Planning using ATOLL.

- Single Site Verification test, Cluster Test, Main Road Test, Benchmarking Test, SWAP test.
- 2G Problems: Cross sector, Cross feeder, HO Failures, Missing Neighbors, dropped calls, blocked calls, Overshooting, Hardware problem using TEMS software.
- 3G Problems: Cross sector, Cross feeder, Missing Neighbors, Pilot Pollution using TMES software.
- Introduction to 4G Planning using ATOLL software.

References

- RajibTaid,"Mobile Communications Systems Development: A Practical Introduction to System Understanding, Implementation and Deployment", 2021.
- Simon, M., "Digital communication over fading channels: a unified approach to performance analysis", 2000.
- Gordon L. Stüber,"Principles of Mobile Communication", 2017.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE424	Telephony Systems		3 CH
Prerequisites	Electrical Communications – CCE321		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to telephone networks - Pulse code editing - Digital synchronous sequence - AXE digital switch - ISDN - Asynchronous transfer mode - Broadband ISDN. PCM and TDM applications - Electronic switching systems. Signaling system protocol #7. Data communication over PSTN: digital subscriber line technology. ISDN service. Introduction to VoIP Telephony. Traffic analysis: Traffic intensity, grade of service, traffic distributions, applications of the Erlang - B formula in sizing the switch components.

Laboratory

- Structure of public switched telephone network
- PCM applications T and E carrier systems.
- TDM applications T and E carrier systems.
- Examples to apply Signaling system protocol #7
- Apply Data communication over PSTN: digital subscriber line technology.
- ISDN service
- VoIP Telephony

References

- P. Gnanasivam, Traffic System Design Handbook, New Age International Publishers, 1st. Ed., 2005.
- James R. Boucher, Traffic System Design Handbook, Telecommunications Handbook Series, IEEE Press, New York, 1993.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE425	Acoustics		3 CH
Prerequisites	Vibration and Waves – BAS121		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to acoustics, One dimensional plane, spherical and cylindrical sound waves, Transmission, reflection and absorption of incident plane sound waves, Vibrating strings, Vibrating bars, Membranes and plates, Pipes waveguides and resonators, Fundamentals of room acoustics, Acoustic ducts and filters, Sound absorption and sound absorbers, Sound measuring Instruments, Physiology of hearing, Architectural acoustics, Walls enclosures and barriers, Underwater acoustics, Microphones, Radiation patterns for microphones, Loudspeakers.

Laboratory

References

- Michael Moser, Engineering acoustics: an introduction to noise control, Springer, 2004.
- Floyd Toole, Sound reproduction, Loudspeakers, and rooms, Focal Press, 2008.
- Daniel R. Raichel, The science and application of acoustics, Springer, 2000.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE426	Satellite Communication		3 CH
Prerequisites	Communication Networks - CCE421		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
٢	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

An overview of satellite communication systems. Orbital concepts: Orbital parameters, geostationary orbits, low earth and medium earth orbits. System components: The space Link, space and earth segments. Earth stations technology. Space link (uplink and downlink) analysis. Frequency division multiple - access, time division multiple - access, and code division multiple - access. Packet switching in satellite systems. Examples of satellite communication systems.

Laboratory

References			
• Dennis Roddy, Satellite Communications, Barnes and Noble, 4th. Ed., 2006. • Maral and Bousquet, Satellite Communications Systems: Systems, Techniques and Technology, John Wiley, Inc, 5rd. Ed., 2020.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE427	Selected Topics in Communication Systems		3 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	
Course Content			
Selected topics in recent directions and advances in communication systemswill be presented in this course. Course material will reflect the needs of the graduating students.			
Laboratory			
References			
• Periodicals and Journals in Communications			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE231	Electronic Devices		3 CH
Prerequisites	Electrical Circuits (1) - CCE211		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	
Course Content			
The course presents PN junction diodes, special diodes, diode circuits applications, rectifiers, and peak detectors - Bipolar junction transistors (BJT), dc models, modes of operation, bias and stabilization, graphical analysis, small-signal ac models - Junction field-effect transistors (JFETs). Metal oxide semiconductor field-effect transistors (MOSFETs), dc models, modes of			

operation, bias and stabilization, small signal ac models, and amplifier configurations. Logic circuits: BJT logic families, construction, properties, speed, and applications.

Laboratory

- Circuit Connection Revision (using the instrument in measuring with connecting resistive elements)
- PN junction characteristics, and Diode circuits
- Applied Diodes Applications, and Zener Applications
- BJT characteristics and DC analysis
- BJT AC analysis
- JFET characteristics, JFET DC - AC analysis
- MOS characteristics, MOS DC - AC analysis

References

- Floyd, Thomas L., and David Buchla. Electronics Fundamentals: Circuits, Devices & Applications, 9th Edition. Prentice Hall Press, 2021.
- Razavi, Behzad. Fundamentals of microelectronics, 3rd Edition. John Wiley & Sons, 2021.
- Sedra, Adel S., and Kenneth Carless Smith. Microelectronic circuits: theory and applications, 8th Edition. Oxford University Press, 2019.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE331	Electronic Circuits	3 CH
Prerequisites	Electronic Devices - CCE231	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	2

Required SWL	Equivalent ECTS
125	5

Course Content

The course presents small geometry effects in MOSFETs. BJT and MOS analog multipliers - Oscillators and waveform shaping - linear oscillators, nonlinear oscillators and multivibrators, MOS - C continuous time filters, switched - C filters - current conveyors and current feedback amplifiers - Voltage references - Data converters. Phase locked loops.

Laboratory

- Electronic devices Revision.
- Current conveyor, and CFOA.
- Passive (low and high pass filter) Filter circuits.
- Active (low and high pass filter) Filter circuits.
- MOS-C Filter, Switched Capacitor response.
- Oscillator circuits (applied BJT oscillator analysis, and applied MOS oscillator analysis).
- Wave Function Generator analysis (multivibrators analysis).

- Phase-Locked Loop analysis.

References

- Floyd, Thomas L., and David Buchla. Electronics Fundamentals: Circuits, Devices & Applications, 9th Edition. Prentice Hall Press, 2021.
- Razavi, Behzad. Fundamentals of microelectronics, 3rd Edition. John Wiley & Sons, 2021.
- Sedra, Adel S., and Kenneth Carless Smith. Microelectronic circuits: theory and applications, 8th Edition. Oxford University Press, 2019.
- Wade, Jessica, Joseph Razzell Hollis, and Sebastian Wood. Printed Electronics. IOP Publishing, 2018.
- Boylestad R. L., &Nashelsky L, Electronic Devices and Circuit Theory,11thEdition, Pearson Prentice Hall, 2008.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE332	Digital Circuit design	2 CH
Prerequisites	Electronic Circuits – CCE331	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	0

Required SWL	Equivalent ECTS
100	4

Course Content

The course presents CMOS Inverter: Noise margin, Propagation delay, Power dissipation, CMOS combinational circuits: Static design, pass transistors and transmission gates, Dynamic design, CMOS sequential circuits: Latches, Flip- flops, Counters, Monostable Ring oscillator, Random Access Memory RAM, Read Only Memory ROM, Emitter Coupled Logic ECL, Bi CMOS circuits.

Laboratory

References

- Li, Y. Computer Principles and Design in Verilog HDL. Chichester, UK: John Wiley & Sons, Ltd. 2015.
- Floyd, Thomas L., and David Buchla. Electronics Fundamentals: Circuits, Devices & Applications, 9th Edition. Prentice Hall Press, 2021.
- Razavi, Behzad. Fundamentals of microelectronics, 3rd Edition. John Wiley & Sons, 2021.
- Sedra, Adel S., and Kenneth Carless Smith. Microelectronic circuits: theory and applications, 8th Edition. Oxford University Press, 2019.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE431	Integrated Circuits Design		3 CH
Prerequisites	Electronic Circuits – CCE331		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Integrated circuits trends and implementation methodologies - MOS inverters, inverters switching characteristics, MOS logic gates circuits, Digital circuit synthesis, clocking and timing, interconnects issues, power dissipation, combinational and sequential MOS logic circuits. Memories and array circuits, low power design, packaging, power and I/O issues. Testing and design for testability methodologies and tools. Full - custom IC design project. Introduction to VHDL and FPGAs language.

Laboratory

- Circuit simulation by Hspice
- Circuit Layout & Verification (Process & layout)
- Circuit Layout & Verification (Layout environment & tool)
- Circuit Layout & Verification (Verification environment & tool)
- One-Bit Mirror Adder Design
- Bit Accumulator Design
- MOSFET simulation (Hspice overview)
- MOSFET simulation (MOSFET circuit simulation)
    - VLSI circuit simulation (Combinational logic circuits)
- VLSI circuit simulation (Sequential logic circuits)

References

- Karim Abbas, Handbook of Digital CMOS Technology, Circuits, and Systems, Springer, Jan 14, 2020
- Udit Kumar , Aditya Gupta, et al, The VLSI Handbook: Design Principles, Industry and Career Perspectives, Jul 7, 2021
- N. H. E. Weste and D. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Addison - Wesley, 3rd. Ed., 2004.
- J.M. Rabaey, A. Chandrakasan, B. Nikolic, Digital Integrated Circuits, Prentice hall, 3rd Ed., 2007.
- S. Kang, Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, McGraw Hill, 3rd. Ed.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE432	VLSI Technology		3 CH
Prerequisites	Electronic Circuits – CCE331		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to VLSI technology, future trends and technology limitations. Basic technology modules include crystal growth and wafer preparation; mask generation techniques; lithography; diffusion process; ion implantation; oxidation; etching techniques - wet etching and plasma etching; thin film deposition - epitaxial growth, chemical vapor deposition techniques, metallization; clean room technology; Advanced process integration for CMOS, Bi-CMOS, and Bipolar fabrication; Failure analysis techniques. Advanced packaging techniques.

References

- Taur, Yuan, and Tak H. Ning. Fundamentals of modern VLSI devices. Cambridge University Press, 2021.
- Plummer, James D. Silicon VLSI technology: fundamentals, practice, and modeling. Pearson Education India, 2009.
- Wolf, Wayne. Modern VLSI Design: IP-Based Design (paperback). Pearson Education, 2008.
- Widmann, Dietrich, Hermann Mader, and Hans Friedrich. Technology of integrated circuits. Vol. 2. Springer Science & Business Media, 2000.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE341	Optoelectronics		2 CH
Prerequisites	Electronic Devices - CCE231		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Light-matter interaction, 3-level and 4-level lasers, Gain coefficient, Gain saturation, Fabry-Perot resonators, Photons in semiconductors, Heterojunctions, Double-heterostructure semiconductor lasers, Single- and multiple-quantum well lasers, DFB and DBR lasers, FP and travelling wave semiconductor optical amplifiers, Erbium dopedfiber amplifiers, Light emitting diodes, Laser and LED dynamics, PIN and APD photodetectors.
References
• B. Saleh, M. Teich, Fundamentals of Photonics, 3rd Edition, Wiley, 2019. • A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, 6th Edition, 2006.
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE441	Antenna and Wave Propagation		3 CH
Prerequisites	Electromagnetic Fields – CCE212		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
٢	2	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Wave propagation: ground, direct and sky waves, Antenna types, Antenna parameters, Wire antennas, Loop antennas, Rectangular and circular apertures antennas, Reflector antennas, Microstrip antennas, Broadband antennas, Antenna arrays.
Laboratory

• Exploring Spectrum
• S- Parameter Measurement
• Antenna Diversity
• Dipole Antennas
• 8 volt Antenna Measurement System Manual
• Aperture Antennas
  • Folded Dipoles and Yagis
  • Microstrip antenna.

References
• Antenna Theory, Balanis, third edition. • Antenna Engineering Handbook - 3ed – Johnson.
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE442	Optical communication Systems		3 CH
Prerequisites	Communication Networks - CCE421, Electronic Devices - CCE231		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Physics of optical communication components and applications to communication systems. Ray representation in optical fibers. Topics include fiber attenuation and dispersion. Optical properties of semiconductors Emitters: laser diodes and light emitting diodes. Photo detectors: PIN and avalanche photo diode (APD).

References

- John M. Senior, "Optical Fiber Communications, Principles and Practice" Third Edition, Prentice Hall, 2009.
- Kumar, S. and Deen, M J.: Fiber Optic Communication Systems, Wiley 2014. Note: available as an e-book.
- Agrawal, G.: Fiber-Optic Communication Systems, 4th Ed., Wiley 2010

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE443	Microwave Devices and Circuits		3 CH
Prerequisites	Electromagnetic Fields – CCE212		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Electromagnetic fields in media and boundary conditions,Wave equation and basic plane wave solutions,Transmission line theory, Smith chart,Waveguides, Microwave network analysis, Matching networks, Filter design, Amplifier design. Microwave active devices: Klystrons, Travelling Wave tubes, Magnetrons, Tunnel diodes, Transferring electron devices IMPATT, TRAPATT, BARITT.

Laboratory

References			
• David Pozar, Microwave Engineering, 4th edition, John Wiley & Sons, 2012. • Samuel Y. Liao, Microwave Devices and Circuits, Publisher: Pearson India, 2000			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE444	RF Integrated Circuits Design		3 CH
Prerequisites	Electronic Circuits – CCE331		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	
Course Content			
Introduction to communication circuits design - two-port circuits - review of resonance circuits - introduction to transmission line theory - frequency response of the transmission lines - S-parameters - design of periodic structure filter networks - Smith chart - power gain and stability of two-port networks - matching networks design - effect of noise on the feedback - noise in communication systems - electrical noise - calculation of noise of the two-port networks - design of low noise amplifiers - design of power amplifiers - modulation and transmission circuits - transmitters and mixers circuits - oscillators analysis in case of stability - negative resistance oscillators - differential oscillators - voltage controlled oscillators.			
Laboratory			
References			
• Thomas H. Lee, The Design of CMOS Radio-Frequency Integrated Circuits, 2nd edition, 1998. • BehzadRazavi, RF Microelectronics, 2nd Edition, Pearson • Tony Chan Carusone, David Johns, Kenneth Martin, analog Integrated Circuits, 5th Edition, Wiley.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE445	Photonics Micro-Systems		3 CH
Prerequisites	Electromagnetic Fields – CCE212, Optical Communication Systems – CCE442		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Symmetric and asymmetric single mode dielectric waveguide, 2D waveguide and the effective index method, propagation in Multimode guide, the Multimode interference MMI structures, Integrated optics IO splitters and directional couplers, IO filters and multiplexers, MEMS technology, Micro-mirrors and micro-lenses, Optical MEMS switches, Fibre lens, Variable optical attenuators, Multilayer filter design, Tuneable MEMS filters.

Laboratory

References

- Solgaard Photonic microsystems: Micro and nanotechnology applied to optical devices and systems. Springer Science & Business Media; 2009.
- Garmire E, Hammer JM, Kogelnik H, Zernike F. Integrated optics. Springer Science & Business Media; 2013.
- Reed GT, Knights AP. Silicon photonics: an introduction. John Wiley & Sons; 2004.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE446	RADAR Systems		3 CH
Prerequisites	Electromagnetic Fields – CCE212, Antenna and Wave Propagation – CCE441		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Fundamental components of radar systems and its applications. Radar range equation. Radar Parameters. Radar cross - section predictions and fluctuations. Noise and clutter. Probability of detection and false alarm. Pulsed and SFCW radar systems. FMCW radar systems. MTI Radars. Doppler radar. Radar antennas. Phased Arrays. Basic radar measurements.

Laboratory
• Explaining components of radar systems. • Radar range equation: Low PRF Radar Equation (using MATLAB). • Low PRF Radar Equation (using MATLAB). • Surveillance Radar Equation (using MATLAB). • Radar Equation with Jamming (using MATLAB): 1. Self-Screening Jammers (SSJ). 2. Burn-Through Range. 3. Stand-Off Jammers (SOJ) • Radar Cross Section (RCS) (using MATLAB): 1. RCS Dependency on Aspect Angle and Frequency. 2. RCS Dependency on Polarization. 3. RCS of Simple Objects. 4. RCS Prediction methods. • Pulsed and Continuous Wave (CW) Radars, Range, Range Resolution, Doppler Frequency. • Radar Losses, Transmit and Receive Losses, Antenna Pattern Loss and Scan Loss, Processing Loss. • FM radar systems, MTI Radars.
References
• M. Skolnik, Introduction to Radar Systems, McGraw - Hill, 3rd. Ed., 2001. • BassemMahafza, Radar Signal Analysis and Processing Using Matlab, Chapman and Hall/CRC, 2008.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE447	Bioelectromagnetics		3 CH
Prerequisites	Electromagnetic Fields – CCE212		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Fundamentals of electromagnetics - Penetration of RF/microwaves into biological tissues -Skin effect - The near field of an antenna - RF/Microwave interaction mechanisms in biological materials - Effects of radio frequency fields on the nervous system, the brain and spinal cord, the blood-brain barrier, and cells and membranes - Thermal therapy - Dielectric and inductive heating - EM-Wave protecting absorbers - Ferrite absorbers - RF/Microwave Delivery Systems for Therapeutic Applications.

Laboratory

References
• Cynthia Furse, Douglas A. Christensen, Carl H. Durney, James Nagel (2019). Basic introduction to bioelectromagnetics. (3rded.), CRC Press. • Vorst, Rosen, A., &Kotsuka, Y. (2006). RF/microwave interaction with biological tissues. John Wiley & Sons. https://doi.org/10.1002/0471752053

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE251	Logic Circuits Design	3 CH
Prerequisites		

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content
Number systems, conversion between different number systems. Binary operations. Boolean Algebra laws, De Morgan Laws. Logic operations, logic gates. Methods of representation of logic functions truth table, S.O.P and P.O.S. K-map realization. Minimization of multiple-output Logic Functions. Half adders. full adders/ Subtractor. Decoders and Encoders. Data selectors Multiplexer and DE multiplexers.Comparators. Project.

Laboratory
• Number System • Logic gates • Half Adder / Full Adder • Simplification of Boolean Function using K-Map TechniquesDecoder/ Encoder • MUX /De MUX • Project

References
• M.V. Subramanyam, "Switching theory and logic design", Laxmi Pub., 2005. • Mano, M.M &Kime,C.R, ”Logic and Computer Design Fundamentals 2nd ed., Englewood cliffs, NJ:Prentice hall,2000. • Nelson, V.P, Nagel, H.T., Carroll, B.D.and Irwin, J.D.”Digital Logic Circuit Analysis and Design”, NJ: Prentice Hall,1995. • Warkely, J.F, “Digital Design: Principles and Practices”2nd ed. Engel wood cliffs, NJ: Prentice Hall , 2000. • Mano , M.M.” Digital Design” 2nd .

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE252	Advanced Logic Circuits Design		2CH
Prerequisites	Logic Circuits Design – CCE251		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Basic latches and flip flop. Counters and shift registers. Basic PLD architects. Finite state machine design. Logic minimization and optimization using EDA tools. FPGA design. VHDL basics. Project.

Laboratory

- Satisfy the transition and truth table for all types of Flip Flops
- SynchronousCounter Principles design
- Shift Register Circuit Analysis and Design
- Apply logic design technique for PLD.
- Basic of VHDL hard ware language.
- Project

References

- M.V.Subramanyam, "Switching theory and logic design", Laxmi Pub., 2005.
- Mano, M.M&Kime,C.R, ”Logic and Computer Design Fundamentals 2nd ed., Englewood cliffs, NJ:Prentice hall,2000.
- Nelson,V.P,Nagel,H.T.,Carroll,B.D.and Irwin,J.D., ”Digital Logic Circuit Analysis and Design”,NJ: Prentice Hall,1995.
- Warkely,J.F , “Digital Design: Principles and Practices”2nd ed. Engel wood cliffs, NJ: Prentice Hall ,2000.
- Volnei A. Pedroni, "Circuit design with VHDL", 2004 MassahusettsInstitue of technology.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE351	Computer Organization and Architecture		3 CH
Prerequisites	Advanced Logic Circuits Design – CCE252		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	

125	5

Course Content

The course presents Von Newman and Harvard Architectures, Computer arithmetic, Design of ALU and pipelined processor, Control unit, Instruction repertoires (RISC, CISC), RAM access, Interrupt circuits, Bus synchronization, I/O devices, Channels, Memory architectures, Connection of computer peripherals, large computer systems (parallel processing, array processors, interconnect networks, multiprocessors).

Laboratory

- Introduction to programming concept, and assembly language.
- Demonstrates the use of the LODS and STOS instruction to convert an upper-case string to its lower-case value.
- Explaining SMPCACHE simulator.
- Influence of cache coherence protocols.
- Influence of mapping, and word wide.
- Influence of numbers of words by block (block size).
- Influence of numbers of cache sets (for set-associative caches).
- Influence of replacement policies.
- Influence of cache size (blocks in cache).
- Influence of schemes for bus arbitration.
- Influence of number of processors

References

- William Stallings, Computer Organization and Architecture, 10th edition Prentice Hall, 2016.
- D.A. Patterson, J.L. Hennessy. Computer Organization and Design, The Hardware-Software Interface, Fifth Edition
- Hamachi, carl, Computer organization and embedded systems. 2012.
- V. Rajaraman and T. Radhakrishnan, Computer Organization & Architecture, PHI Learning Private Limited, New Delhi, 2007.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE352	Microprocessors and Applications		3 CH
Prerequisites	Computer Programming – CCE161, Computer Organization and Architecture – CCE351		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

This course is an introduction to microprocessor and microcontroller hardware and software. Assembly language instructions and programming, troubleshooting, and input/output techniques are studied. Computer-based program editing, and assembly techniques are used. Students practice with laboratory applications.

Laboratory

- Introduction to Microprocessor and Basic Setup
- Basic Programming in Assembly Language
- Register Transfer and Micro Operations
- Using the ALU and Basic Input/Output Operations
- Digital Components and BUS Systems
- Timer and Interrupt Programming
- Serial Communication Interfaces
- ADC and DAC Implementations
- Implementing PWM for Motor Control
- Embedded Project Development and Debugging

References

- SearchCreators. (2023). Microcontroller and Embedded System - 21CS43: 2018-2023 Yearly Question Papers. Retrieved from http://searchcreators.org/mc_es_question_papers/.
- Hossain, M. S., & Ali, A. M. (2020). Real-time power theft monitoring and detection system with Arduino ATMega328P microcontrollers. Energy Reports, 6, 291-296. https://doi.org/10.1016/j.egyr.2020.11.002
- EduVark. (2023). Microcontroller VTU Question Papers. Retrieved from https://eduvark.com/microcontroller-vtu-question-papers-220763.html

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE353	Computer Networks	3 CH
Prerequisites	Electrical Communications – CCE321	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	1

Required SWL	Equivalent ECTS
125	5

Course Content

Network layers (Physical layer - Data link layer - MAC Sublayer - Network layer - Transport layer - Application layer - Network security) , TCP / IP Network protocol, Routing protocols, (protocol principles- protocol verification- HDLC, and PPP), Network Design, Network Management, Congestion, Examples of LAN's and WAN's, High Speed Networks, Other Network Protocols.

Laboratory

- Networks Cabling (Theoretical)
- Networks Cabling (Practical)
- IP Addressing
- Introduction to Packet Tracer 5.3 and Simple 5 PC's network
- Building a LAN with HUPs and Switches
- Router Configuration Using Packet Tracer 1
- Router Configuration Using Packet Tracer
- Static Route Configuration on Router-Part
- Static Route Configuration on Router-Part 2
- Standard access control list (ACL) configuration in packet tracer
- Extended access control list (ACL) configuration in packet tracer
- Wireless connection using packet tracer

References

- James F Kurose and Keith W Ross, Computer Networking:A Top-Down Approach, Seventh edition, 2016
- Andrew S. Tanenbaum and David Wethecall, Computer Networks, Pearson, 5th. Ed, 2010

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE451	Computer and Network Security	2 CH
Prerequisites	Computer networks – CCE353	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	0

Required SWL	Equivalent ECTS
75	3

Course Content

Overview of computer and network security and methods of defense, Attacks and threats, Secure encryption systems (symmetric and public key encryption schemes, AES (advanced encryption standard), RSA standard, Security protocols (key distribution, authentication, and digital signature schemes, Software security (protection from viruses and similar programs, design of secure operating systems, database security), Network security (IP security and the IPSec protocol, firewalls, web security, electronic mail security, network management security aspects). security issues in wireless technologies and mobile computing

Laboratory

References

- Cryptography and Network Security (4th Edition), Joseph MiggaKizza, Computer Network Security, Feb 18, 2003.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE452	Selected Topics in Computer networks and Security		3 CH
Prerequisites	Computer Networks – CCE353		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Selected topics in recent developments in Computer networks and Security will be presented in this course. Course material will reflect the needs of the graduating students.
Laboratory
References
Textbooks, periodicals and journals related to the selected topics.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE453	Introduction to Network Operations and Management		3 CH
Prerequisites	Embedded System – CCE482, Database Systems – CCE462		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Network management: Goals, Organization, Functions. Basic foundations: Standards, Models, Languages. Simple Network Management Protocol (SNMP). Network management applications. Software Defined Networking (SDN). Different types of networks according to size and function, Campus networks, Data center networks. Load balancing and distribution. Traffic engineering and management.
References

- Alexander Clemm, Network Management Fundamentals, Cisco Press, 2007.
- Mani Subramanian, Network Management: Principles and Practices, Pearson, 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE161	Computer Programming	2 CH
Prerequisites		

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	0	1
Required SWL		Equivalent ECTS
100		4

Course Content

Review on the main concept of the computer programming, introduction to arrays and its operations, addresses and pointers and its operations, memory management : New and Delete, pointers to objects, structures, Built- in functions in the programming language used, user-define functions, calling the functions, passing arguments to functions, the returning values from functions, overloaded functions, classes, introduction to object-oriented programming. Fundamentals of MATLAB.

Laboratory

- The students should prepare a complete program design.
- Write an example python programs for array.
- Write an example python programs for pointers.
- Write an example python programs for functions.
- Program for calling the functions.
- Program for passing arguments to functions.

References

- Choi, B. (2021). Learn Python Basics on Windows. In: Introduction to Python Network Automation. Apress, Berkeley, CA.
- "Cheng, C., & Jackson, M. (2016). Python. Somerville, Mass.: Candlewick Press.
- Moses, B. (2017). Python. Cardiff: Candy Jar Books.
- Al Sweigart, (2015). Automate the Boring Stuff with Python. USA
- Fitzpatrick and Ledeczi, Computer Programming with MATLAB,

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE361	Data Structure and Algorithms		2 CH
Prerequisites	Computer Programming – CCE161		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Data types and representation, Analyze the efficiency of algorithms using Big O notation.,Problem-solving techniques, data structures representation in storage and memory allocation, linear lists, stacks, queues, de-queues, memory allocation, trees, graphs, searching and sorting algorithms and their analysis, hashing, programming project.Choose the appropriate data structure for a given problem.Implement algorithms using your chosen programming language. Apply data structures and algorithms to solve real-world problems.

Laboratory

- Build Arrays using C++/Python language.
- Build linked lists using C++/Python language.
- Build stacks using C++/Python language.
- Build queues using C++/Python language.
- Build searching and sorting algorithms and their analysis to Arrays.
- Build trees using C++/Python language.
- Apply searching and sorting algorithms and their analysis to trees.
- Build graphs using C++/Python language.

References

- SartajSahni, Data Structures and Algorithms, and applications in C++, McGraw-Hill, 1st. Ed., 1988.
- A Textbook of Data Structures and Algorithms, Volume 1,by G. A. VijayalakshmiPai,released January 2023,Publisher(s): Wiley-ISTE,ISBN: 9781786308696
  - A Textbook of Data Structures and Algorithms, Volume 3,by G. A. VijayalakshmiPai, released January 2023,Publisher(s): Wiley-ISTE,ISBN: 9781786308924

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE362	Database Systems		3 CH
Prerequisites	Computer Programming – CCE161		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	

125	5

Course Content

File-systems Vs database systems. Concepts of Database Systems and Architecture.Different types of databases. The Database Management System (DBMS). Database models. Relational database concepts. Entity- relationship models and diagrams. Conceptual Database Design, Logical Database Design for Relation Model, Physical Database Design for Relational Database, Functional dependencies, Structured Query Language (SQL), Database Application Using Postgres/MySQL, Database Administration, Distributed Databases.

Laboratory

- Setting up database management system (MySql)
- Creating database
- Creating tables
- Use advanced DDL commands
- Database update (Drop and Alter Table)
- Using simple SQL statements
- Order by , join SQL statements
- Set operations
- Nesting of queries
- Aggregate functions in SQL

References

- Database System Concepts,SeventhEdition,AviSilberschatz,Henry F. Korth,S. Sudarshan(2019),Publisher:McGraw-Hill,ISBN 9780078022159
- Database Design and Implementation: Second Edition by Edward Sciore (Author),Publisher : Springer; February , 2020),ISBN : 3030338355

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE461	Big-Data Analytics	2 CH
Prerequisites	Database Systems – CCE462	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	0	1

Required SWL	Equivalent ECTS
75	3

Course Content

Definition and taxonomy of big data. Challenges, trends, and applications. Big data technologies and tools.The Hadoop ecosystem. The Map-reduce paradigm. Big Data Storage and Analytics. Big data analytics machine learning algorithms. Graph analytics. Big data visualization.

Laboratory

- Technologies for Handling Big Data: Installation and configuration of Hadoop.
- Learning about Hadoop and its ecosystem which includes HDFS, and MapReduce.
- over the entire framework of MapReduce and uses of MapReduce.
- Understanding Big Data Technology Foundations: This module covers the big data stack
- Using Hadoop to store data: This includes an entire module of HDFS, HBase and their respective ways to store and manage data along with their commands.
  - Learn NoSQL Data Management : This module covers all about NoSQL including document databases, relationships, graph databases, schema less databases, CAP Theorem etc.

References

- BalamuruganBalusamy, NandhiniAbirami, SeifedineKadry, Big Data: Concepts, Technology, and Architecture Wiley, 2021.
- B. Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley, 2014.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE462	Cloud Computing	3 CH
Prerequisites	Computer Networks – CCE353	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	1

Required SWL	Equivalent ECTS
125	5

Course Content

Cloud computing concepts, Cloud computing characteristics, Cloud computing models, techniques, and architectures. Infrastructure as a Service (IaaS): resource virtualization, server, storage, network. Platform as a Service (PaaS): Cloud platform and management. Software as a Service (SaaS): web services, web OS, Case studies. Cloud-based software systems. Cloud issues: provider lock-in, security. Key cloud service providers and platforms. Creating own cloud services. Cloud deployment and service models, cloud infrastructure, migration to cloud computing environments.

Laboratory

- Installation and configuration of Hadoop/Euceliptus etc.
- Service deployment and Usage over cloud.
- Management of cloud resource
- Using existing cloud characteristics and Service models
- Cloud Security Management.
  - Performance evaluation of services over cloud

References
• Douglas Comer, The Cloud Computing Book The Future of Computing Explained, CRC Press, 2021 • Thomas Erl, Eric Monroy, Cloud Computing: Concepts, Technology, Security, and Architecture, Pearson; 2nd edition, 2023

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE463	Operating Systems	3 CH
Prerequisites	Microprocessors and Applications – CCE352	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content
Types of operating systems, functions of operating systems, process states, memory management, virtual memory, processor management, process scheduling, multiprocessor systems, device management, deadlock prevention, file systems, system resilience, network and distributed operating systems, real time systems, programming project.
Laboratory
• Basics of OS, Linux, processes. • Building multi-threaded and multi-process applications. • Building a custom shell, process lifecycle management. • Synchronization. • New scheduler in xv6 (or Linux) • Copy-on-write fork in xv6 (or Linux) • Understanding features of modern file systems. • Building a new user space file system
References
• A. Dhotre, Operating Systems, Technical Publications Pune, India, 2008. • ABRAHAM SILBERSCHATZ, OPERATING SYSTEM CONCEPTS, 9th Edition, Wiley, USA, 2013. • William Stallings , Operating Systems : Internal and Design Principles, 7th Edition, Pearson-2012

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10 %	40%

CCE464	Software Engineering	2 CH
Prerequisites	Data Structure and Algorithms – CCE361	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
75		3

Course Content

The principles of software engineering, SDLC SW Life Cycle model. Selection of life cycle model Agile and plan-driven process .Software production processes:Software Design, Software Implementation, Software Testing and Debugging, Software Deployment and Maintenance, object-oriented design, Unified Modelling Language (UML), software design, software systems verification and validation, the basics of software management and quality assurance-documentation and reports, project design.

Laboratory

References

- Ian Sommerville, K.K. Aggarwal and Yogesh Singh, Software Engineering, 10th Edition ,Publisher : Pearson (March 24, 2015),ISBN : 0133943038
- Clean Architecture: A Craftsman's Guide to Software Structure and Design,1st Edition,by Robert Martin ,Publisher : Pearson; 1st edition (September 10, 2017),ISBN : 0134494164
- Systems Analysis and Design: An Object-Oriented Approach with UML ,by Alan Dennis (Author), Barbara Wixom , David Tegarden ,Publisher : John Wiley & Sons Inc; 6th edition (14 April 2021),ISBN : 111955991X

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE465	Data Mining	2 CH
Prerequisites	Big-Data Analytics – CCE461	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
100		4

Course Content

Introduction to data mining process. Data preprocessing: cleaning, integration, reduction, transformation, discretization. Data warehousing.Classification: k-nearest neighbors, multiple linear regression, logistic regression, decision tree,bayes classification, rule-based classification,

support vector machine, anomaly detection. Cluster analysis. Web mining: text and web-page preprocessing, inverted index, web meta-search,social network analysis, web crawling. Data mining tools. Applications of data mining to various application domains.

Laboratory

- Build Data Warehouse and Explore WEKA
- Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
- Demonstrate performing classification on data sets.
- Demonstrate performing clustering on data sets.
- Demonstrate performing Regression on data
- Demonstrate web-mining.

References

- CharuAggrawal, Data Mining: The Textbook, Springer, 2015
- Jared Dean, Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners, Wiley 1st Edition, 2014
- , Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson, 2013

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE466	Object-Oriented Programming	3 CH
Prerequisites	Computer programming – CCE161	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	0	2

Required SWL	Equivalent ECTS
125	5

Course Content

Object-oriented programming principles and techniques using C++. Classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features. Mapping of UML design to C++ implementation and object-oriented considerations for software design and reuse. Relation of C++ to GUI, databases, and real-time programming.

Laboratory

- Using C++, write programs for classes then execute these programs to see the output.
- Using C++, write examples for overloading, data abstraction, information hiding.
- Encapsulation, inheritance, polymorphism.
- File processing, templates, exceptions, container classes.
- Mapping of UML design to C++ implementation and object-oriented considerations for software design.

- Apply C++ to GUI, databases, and real-time programming.

Reference

- Robert Lafore, Object-Oriented Programming in C++, Fourth Edition, 2002.
- Brett D. McLaughlin, Gary Pollice, and Dave West, Head First Object-Oriented Analysis and Design, O'Reilly Medi, 1st Edition, 2006.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE467	Selected Topics in Distributed and Mobile Computing	3 CH
Prerequisites	Cloud Computing – CCE462	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	2	0

Required SWL	Equivalent ECTS
125	5

Course Content

Selected topics in recent developments in Distributed and Mobile Computing will be presented in this course. Course material will reflect the needs of the graduating students.

Laboratory

References

- Paola Flocchini, Giuseppe Prencipe, Nicola Santoro, Distributed Computing by Mobile Entities Current Research in Moving and Computing, Springer, 2019.
- Unmesh Joshi, Patterns of Distributed Systems, Addison-Wesley Professional; 1st edition, 2023

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE468	Mobile and Web Application Development	3 CH
Prerequisites	Database Systems – CCE462	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	2	0

Required SWL	Equivalent ECTS
125	5

Course Content

HTML – CSS – JavaScript – PHP – MySQL – Web Design –Web Development – Introduction to Mobile Development for Android – Introduction to Mobile Development for iOS.

Laboratory

References

- Jon Duckett, Web Design with HTML, CSS, JavaScript and jQuery Set, Wiley, 2014.
- Shaun Lewis and Mike Dunn, Native Mobile Development: A Cross-Reference for iOS and Android,1st edition, O'Reilly Media, 2019.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE481	Computer Vision	2 CH
Prerequisites	Computer Programming – CCE161	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	0	1

Required SWL	Equivalent ECTS
75	3

Course Content

Basics of image processing techniques and algorithms: image preprocessing, filters, image enhancement, edge detection, image segmentation. Applications: Object Recognition, Face Detection, Autonomous Vehicles, Convolutional Neural Networks (CNNs), Video Surveillance, Augmented Reality, Medical Image Analysis, Drone Imagery, Industrial Automation, Gesture Recognition.

Laboratory

- Introduction to Python and OpenCV
- Image Preprocessing Techniques
- Implementing Filters for Image Enhancement
- Edge Detection Algorithms
- Image Segmentation Techniques
- Autonomous Vehicle Navigation Systems
- Object Detection with Pre-trained Models
- Real-time Video Processing
- Face Recognition using Deep Learning
- Implementing Convolutional Neural Networks from Scratch
- Advanced Applications Using CNN
- Medical Image Analysis Techniques

References

- Vedaldi, A., &Soatto, S. (2021). *Computer Vision: Foundations and Applications*. Cambridge University Press.
- Culjak, I., Tralic, D., &Grgic, S. (2020). *Introduction to Deep Learning for Computer Vision: Building Neural Networks from Scratch*. Academic Press.
- Zhou, S. K., Rueckert, D., &Fichtinger, G. (2020). *Handbook of Medical Image Computing and Computer Assisted Intervention*. Elsevier.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE482	Embedded Systems		3 CH
Prerequisites	Computer Programming – CCE161		
Number of weekly Contact Hours			
Lecture 2	Tutorial 1	Laboratory 1	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to embedded systems. FPGA Structure: architecture, configurable logic blocks, routing, lookup tables, memory and I/O blocks. FPGA design flow.Systematic coverage of the PIC18 family of Microcontrollers. Assembly language and C language programming and interfacing techniques. Separate chapters on programming and interfacing the PIC with peripherals - Includes information on how to interface the PIC with LCD, keyboard, ADC, DAC, Sensors, Serial Ports, Timers, DC and Stepper Motors.

Laboratory

- Write a program to toggle all the led to port and with some time delay using ARM7.
- Write a program to interface LCD with ARM7
- Write a program to interface 4*4 matrix keypad with ARM7
- Write a program for interfacing LED and PWM and to verify the output in the ARM7
- Write a program to interface Stepper motor with ARM7
- Write a program for interfacing of DC motor with ARM7
- Write a program to study and characteristics of the programmable gain amplifier (PGA)
- Write a Program realization of low pass, high pass and band pass filters and their characteristics
- Write a program to interface ADC and DAC with PSOC
- Digital function implementation using digital blocks
- Counter for blinking LED
- PWM
- Digital buffer and digital inverter

References

- Tim Wilmshurs, Designing Embedded Systems with PIC Microcontrollers, 2009.
- Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey, PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Prentice Hall, 2008.
- Wayne Wolf, FPGA - Based System Design, Prentice Hall, 2004.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE483	Internet of Things	3 CH
Prerequisites	Embedded System – CCE482 –, Database Systems – CCE362	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	2	1

Required SWL	Equivalent ECTS
125	5

Course Content

Introduction to IoT. Components of an IoT Architecture, hardware platforms, low power devices, sensors, relevant wireless technologies (Wi-Fi, Bluetooth, BLE, Zigbee, Z-Wave) and networking protocols (M2M - Machine to Machine-, LoRa, IPv6, 6LowPAN), security and privacy concepts, IoT device programming and debugging, cloud integration, IoT-based applications, remote health monitoring and emergency notification systems, and transportation systems, Mobile and ubiquitous services: home services, travel and business services, consumer services.

Laboratory

- Setup of a Wireless Sensor
- Setup of simple embedded systems
- Integrating and Interconnecting Smart Objects
- Building the Web of Things
- Security measures
- IoT device programming and debugging.
- IoT-based application.

References

- Fundamentals of Wireless Sensor Networks - Theory and Practice, Wiley, 2010.
- Interconnecting Smart Objects with IP – The Next Internet, J.-P. Vasseur and A.Dunkels, Morgan Kaufmann, 2010.
- Building the Web of Things, Dominique Guinard, and VladTrifa, 2016.
- Wireless Positioning Technologies and Applications, Second Edition, Alan Bensky, Artech House, 2016.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE484	Computational Intelligence	
Prerequisites	Probability and Statistics – BAS113, Computer Programming – CCE161	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	0	2
Required SWL		Equivalent ECTS
125		5

Course Content

Definitions, learning theory, soft-computing paradigm. Fuzzy systems: Fuzzy logic, approximate reasoning, fuzzy control. Neural networks:machine learning using neural networks, supervised and unsupervised learning, competitive learning, reinforcement learning, neuro-dynamic programming, neuro-fuzzy systems. Evolutionary computation: genetic algorithms, genetic programming, genetic optimization, machine learning using genetic algorithms. Particle swarm optimization. Bayes networks. Artificial immune systems.Rough theory. Granular computing. Chaos theory. Applications: intelligent control systems, object recognition, applications in mobile robots, face recognition, pattern recognition.

Laboratory

- Fuzzy system software setup
- Fuzzy system applications
- Neural network software setup
- Neural networks applications
- Object recognition tools
- Face recognition tools
- Machine learning tools

References

- Engelbrecht A. (2007). Computational Intelligence: An Introduction (2nd ed.), John Willey and Sons.
- Raman Kumar, Recent Advances in Computational Intelligence, Springer, 2009.
- Yue Wu, Xinglong Zhang, PengfeiJia, Recent Advances in Machine Learning and Computational Intelligence, MDPI, 2023.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE485	Microcontrollers and Applications	3 CH
Prerequisites	Microprocessors and Applications – CCE352	

Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory

2	0	2
Required SWL		Equivalent ECTS
125		5

Course Content

Difference between microprocessors and microcontrollers, General architecture of microcontrollers, Architecture of one of the available microcontrollers, its assembly, Programming with either C or Basic, Input and output of data, Timers, Counters, and Interrupts, Software and hardware applications. Dealing with A/D and D/A, A complete project to control a simple process like controlling temperature or the speed of a motor.

Laboratory

- Experimenting with the assembly language of the used microcontrollers, or the high level language used with the simulator.
- 0Experimenting with the assembly language of the used microcontrollers, or the high level language used with the simulator.
- Experimenting with the assembly language of the used microcontrollers, or the high level language used with the simulator.
- Experimenting with the assembly language of the used microcontrollers, or the high level language used with the simulator.
- Experiment on dealing with interrupts.
- Experiment on dealing with Timers, and Counters.
- Doing a complete course project to use the microcontroller in controlling a physical variable like temperature or pressure, and display that variable. The A/D, and D/A must be used in this project.

References

- Danny Cansey, Muhammed Ali Mazidi, PIC Microcontrollers and Embedded Systems Using Assembly and C, Pearson Prentice Hall, 2007.
- Lucio Di Jasio, Tim Wilmshurst, Dogan Ibrahim, PIC Microcontrollers, Know it all, Elsevier Inc, 2008.
- Giladi, Ran. Network processors: architecture, programming, and implementation. Morgan Kaufmann, 2008.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE486	Artificial Intelligence and its Applications	3 CH
Prerequisites	Probability and Statistics – BAS113, Computer Programming – CCE161	

Number of weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	1
Required SWL		Equivalent ECTS

125	5

Course Content

Search: Graph search, Constraint satisfaction, Games; Machine learning: Decision trees, Neural Networks; Knowledge representation and inference: Propositional and first order logic, Rule - based systems, Fuzzy logic systems.ABC: Artificial Intelligence, Big Data and Cloud Computing.Artificial Intelligence vs. Machine Learning vs. Deep Learning.Smart City with AI. Applications of AI in Healthcare Industry.

Laboratory

- Experiments using Matlab: Neural Networks and Fuzzy logic toolboxes. Apply one of the AI techniques on a real problem or a game and introduce this work written on paper and /or stored on a floppy or compact disk. A maximum of three students are allowed to join in one project. Projects shouldn't be repeated, if it happens, the time of submission is taken into consideration. Three parameters are considered in the evaluation of a project:
- The originality of the project's idea.
- The understanding of the used techniques.
- The level of implementation of the project.

References

- Stuart and Peter Norving, Artificial Intelligence: a modern approach Russel, Prentice Hall, 2nd. Ed., 2003.
- BrahimLejdel, EliseoClementini, LouaiAlarabi, Artificial Intelligence and Its Applications, 2021
- S. KanimozhiSuguna, Artificial Intelligence (AI): Recent Trends and Applications, CRC Press, 2021.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE487	Fundamentals of Deep Learning		3 CH
Prerequisites	Probability and Statistics – BAS113, Computer Programming – CCE161		
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to deep learning and its underlying theory. Architectures commonly associated with deep learning: Basic Neural Networks (NN), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN). Methods to train and optimize the architectures. Methods to perform effective inference. Range of applications.

Laboratory			
References			
• Ian Goodfellow, YoshuaBengio, Aaron Courville. Deep Learning. MIT Press, 2016. online version • SandroSkansi, Introduction to Deep Learning. Springer, 2018.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

CCE491	Communications and Computers Graduation Project (1)	2 CH
Prerequisites	After completing 101 CH	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
1	0	3
Required SWL		Equivalent ECTS
100		4
Course Content		
This capstone project lets students apply prior learning to solve an industry or community problem. It considers real-world constraints like cost, environment, ethics, and safety. Students explore solutions, assess feasibility, and create a high-level design.Then, students will perform research work to explore different approaches and reach an initial high-level design or system architecture and specifications. A final report details findings and plans the detailed design phase for Project 2		
Assessment Criteria		
Student Activities	Mid-Term Exam	Practical Exam	Final/Oral Exam
50%	0%	0%	50%

CCE492	Communications and Computers Graduation Project (2)	3 CH
Prerequisites	Communications and Computers Graduation Project (1)	
Number of weekly Contact Hours		
Lecture	Tutorial	Laboratory
0	0	6
Required SWL		Equivalent ECTS
125		5
Course Content		
Project 2 builds on Project 1's design. Students refine the plan, verify it, and create a working prototype. This phase ends with complete design documents, drawings, and a materials list. . At		

the end of Project 2, students are asked to submit a dissertation or project report and go through an oral examination after delivering a presentation of their work.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final/Oral Exam
50%	0%	0%	50%

Courses offered by Basic Sciences in Communications and Computers Engineering

No.	Code	Course Name
1	BAS211	Mathematics (3)
2	BAS213	Mathematics (4)
3	BAS311	Mathematics (5)

Graduate's Attributes Vs Program's Competencies Matrix

		Program Graduate's Attributes (GA)									
		GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10
Program's Competencies	A1	■			■						
	A2		■					■			
	A3	■	■				■	■			
	A4	■	■	■				■			
	A5		■					■			
	A6	■		■	■			■			■
	A7			■	■	■			■	■	■
	A8									■	
	A9		■					■	■		■
	A10				■	■			■		
	B1	■	■			■		■		■	
	B2	■	■			■	■	■		■	■
	B3	■	■	■		■	■	■		■	
	B4	■	■		■					■	■
	B5				■	■		■		■	■
	C1a	■						■		■	
	C1b	■	■					■			
	C2a	■	■	■							
	C2b	■	■			■	■	■			■
	C3a	■	■					■		■	
	C3b	■	■					■		■	
	C4a	■	■			■		■		■	
	C4b	■	■			■		■	■	■	

Learning Outcomes of Communications and Computers Engineering Graduate

1. Knowledge and Understanding

By the end of the B.Sc. program, the graduate of Communications and Computers Engineering Program should be able to:

Code	Learning Outcome
1.1	Explain advanced topics in electronics and communications engineering.
1.2	Describe the fundamentals and concepts of emerging topics in electronics and communications and related fields.
1.3	Recognize the social and environmental impacts of different technologies in electronics and communications.
1.4	Describe scientific developments and technologies in the field.
1.5	Acquire the fundamentals and ethics of scientific research.

2. Intellectual Skills

By the end of the B.Sc. program, the graduate of Communications and Computers Engineering Program should be able to:

Code	Learning Outcome
2.1	Analyze and evaluate information in the field and apply it to solve problems.
2.2	Identify and investigate specialized problems and propose multiple solutions, especially in the absence of complete data.
2.3	Integrate diverse knowledge to solve professional problems.
2.4	Formulate research questions and write a scientific study around a research problem.
2.5	Plan for the development of electronics and communications systems and components.

3. Professional Skills

By the end of the B.Sc. program, the graduate of Communications and Computers Engineering Program should be able to:

Code	Learning Outcome
3.1	Design and simulate electronics and communications systems using specialized software tools.
3.2	Write and evaluate technical reports.
3.3	Design electronic circuits and make measurements and required tests to evaluate its performance.
3.4	Read the data sheets and evaluate the specifications of components and devices.

4. General and Transferable Skills

By the end of the B.Sc. program, the graduate of Communications and Computers Engineering Program should be able to:

Code	Learning Outcome
4.1	Communicate effectively with others and share ideas.
4.2	Use information technology to support professional practice.
4.3	Acquire self-assessment skills and determine personal learning needs.
4.4	Work in a team and lead teams in diverse professional contexts.
4.5	Manage time efficiently.
4.6	Acquire lifelong self-learning skills.

Learning Outcomes of Communications and Computers Engineering Program Vs Graduate Attributes Matrix

			Program Graduate's Attributes (GA)									
			GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10
Learning Outcomes (LOs)	Knowledge and Understanding	1.1	■				■					■
		1.2	■						■			
		1.3					■	■				
		1.4	■			■	■		■			
		1.5			■	■				■	■	■
	Intellectual Skills	2.1		■								
		2.2		■					■			
		2.3		■				■				
		2.4		■						■	■	
		2.5		■			■		■			
	Professional Skills	3.1						■	■			
		3.2					■				■	
		3.3	■	■			■		■			
		3.4										
	General and Transferable Skills	4.1			■	■	■				■	■
		4.2						■	■			
		4.3			■					■		■
		4.4			■	■	■				■	■
		4.5										■
		4.6		■				■		■		

Courses VS Teaching and Learning Methods of Communications and Computers Engineering Program

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
-	University Elective (1)	■		■	■	■				■		
-	University Elective (2)	■		■	■	■				■		
-	University Elective (3)	■		■	■	■				■		
-	University Elective (4)	■		■	■	■				■		
BAS111	Mathematics (1)	■	■				■				■	
BAS112	Mathematics (2)	■	■				■				■	
BAS113	Probability and Statistics	■	■				■				■	
BAS121	Vibration and Waves	■	■				■		■		■	
BAS122	Electricity and Magnetism	■	■				■		■		■	
BAS131	Engineering Chemistry	■	■				■		■		■	
BAS141	Statics	■	■				■				■	
BAS142	Dynamics	■	■				■				■	
BAS143	Engineering Drawing (1)	■	■	■					■			
TRN2x1	Field training (1)			■	■	■		■				■
TRN3x1	Field Training (2)			■	■	■		■				■
-	Engineering Economy and Project Management Elective	■	■		■	■			■	■	■	■
-	Structures and Properties of Materials Elective Courses	■	■		■	■			■	■	■	
-	Engineering Technology Elective Courses	■	■		■	■			■	■	■	■
-	Spatial Perception and Design Elective Courses	■	■		■	■			■	■	■	
BAS211	Mathematics (3)	■	■				■				■	
BAS213	Mathematics (4)	■	■				■				■	
BAS311	Mathematics (5)	■	■				■				■	
CCE161	Computer Programming	■	■			■	■	■	■		■	
CCE211	Electrical Circuits (1)	■	■			■	■	■	■		■	
CCE214	Electrical Circuits (2)	■	■			■	■	■	■		■	
CCE212	Electromagnetic Fields	■	■			■	■	■	■		■	
CCE251	Logic Circuits Design	■	■			■	■	■	■		■	
CCE213	Electrical Measurements and Instrumentation	■	■			■	■		■		■	
CCE231	Electronic Devices	■	■			■	■	■	■		■	
CCE252	Advanced Logic Circuits Design	■	■			■	■	■	■		■	
CCE221	Signal Analysis	■	■			■	■	■	■		■	
CCE215	Modeling and System Analysis	■	■			■	■		■		■	
CCE321	Electrical Communications	■	■			■	■		■		■	

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
CCE331	Electronic Circuits	■	■			■	■	■	■		■	
CCE341	Optoelectronics	■	■			■	■				■	
CCE351	Computer Organization and Architecture	■	■			■	■	■	■		■	
CCE311	Control Systems	■	■			■	■	■	■		■	
CCE352	Microprocessors and Applications	■	■			■	■	■	■		■	
CCE332	Digital Circuit design	■	■			■	■	■			■	
CCE353	Computer Networks	■	■			■	■	■	■		■	
CCE322	Digital Signal Processing	■	■			■	■	■	■		■	
Communications Engineering Minor Requirements												
CCE361	Data Structure and Algorithms	■	■			■	■	■	■		■	
CCE481	Computer Vision	■	■			■	■	■	■		■	
CCE482	Embedded Systems	■	■			■	■	■	■		■	
CCE451	Computer and Network Security	■	■			■	■	■			■	
CCE323	Digital Communication Systems	■	■			■	■	■	■		■	
CCE421	Communication Networks	■	■			■	■	■	■		■	
CCE441	Antenna and Wave Propagation	■	■			■	■	■	■		■	
CCE442	Optical communication Systems	■	■			■	■	■			■	
CCE422	Information and Coding Theory	■	■			■	■	■			■	
CCE443	Microwave Devices and Circuits	■	■			■	■	■			■	
CCE423	Mobile communications	■	■			■	■	■	■		■	
CCE491	Communications and Computers Graduation Project (1)			■	■	■	■	■	■	■	■	■
CCE492	Communications and Computers Graduation Project (2)			■	■	■	■	■	■	■	■	■
Communications Engineering Elective (1)												
CCE431	Integrated Circuits Design	■	■		■	■	■	■	■	■	■	
CCE424	Telephony Systems	■	■		■	■	■	■	■	■	■	
CCE425	Acoustics	■	■		■	■	■	■		■	■	
Communications Engineering Elective (2)												
CCE432	VLSI Technology	■	■		■	■	■	■		■	■	
CCE426	Satellite Communication	■	■		■	■	■	■		■	■	
CCE427	Selected Topics in Communication Systems	■	■		■	■	■	■		■	■	
Communications Engineering Elective (3)												
CCE444	RF Integrated Circuits Design	■	■		■	■	■	■		■	■	
CCE445	Photonics Micro-Systems	■	■		■	■	■	■		■	■	
CCE446	Radar Systems	■	■		■	■	■	■	■	■	■	
CCE447	Bioelectromagnetics	■	■		■	■	■	■		■	■	
Computers Engineering Minor Requirements												
CCE361	Data Structure and Algorithms	■	■			■		■	■		■	
CCE481	Computer Vision	■	■			■		■	■		■	
CCE482	Embedded Systems	■	■			■		■	■		■	

Code	Course Title	Lectures	Tutorials	Cooperative education	Self–study	Reports and Researches	Problem Solving	Projects	Laboratory	Online Learning	Hybrid Education	Field Visits
CCE451	Computer and Network Security	■	■			■		■			■	
CCE362	Database Systems	■	■			■	■	■	■		■	
CCE461	Big-Data Analytics	■	■			■	■	■	■		■	
CCE462	Cloud Computing	■	■			■	■	■	■		■	
CCE463	Operating Systems	■	■			■	■	■	■		■	
CCE464	Software Engineering	■	■			■	■	■			■	
CCE483	Internet Of Things	■	■			■	■	■	■		■	
CCE465	Data Mining	■	■			■	■	■			■	
CCE491	Communications and Computers Graduation Project (1)			■	■	■	■	■	■	■	■	■
CCE392	Communications and Computers Graduation Project (2)			■	■	■	■	■	■	■	■	■
Computers Engineering Elective (1)												
CCE466	Object-Oriented Programming	■	■		■	■	■	■	■	■	■	
CCE484	Computational Intelligence	■	■		■	■	■	■	■	■	■	
CCE485	Microcontrollers and Applications	■	■		■	■	■	■	■	■	■	
Computers Engineering Elective (2)												
CCE452	Selected Topics in Computer networks and Security	■	■		■	■	■	■		■	■	
CCE453	Introduction to Network Operations and Management	■	■		■	■	■	■		■	■	
CCE486	Artificial Intelligence and its Applications	■	■		■	■	■	■	■	■	■	
Computers Engineering Elective (3)												
CCE467	Selected Topics in Distributed and Mobile Computing	■	■		■	■	■	■		■	■	
CCE468	Mobile and Web Application Development	■	■		■	■	■	■		■	■	
CCE487	Fundamentals of Deep Learning	■	■		■	■	■	■		■	■	

- **Competencies VS Courses Matrix for Communications and Computers Engineering Program**

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1a	C1b	C2a	C2b	C3a	C3b	C4a	C4b
-	University Elective (1)																							
-	University Elective (2)																							
-	University Elective (3)																							
-	University Elective (4)																							
NUB111	History of Engineering					■		■																
NUB112	Modern history of Egypt					■		■																
NUB113	History of Civilizations					■		■																
NUB114	Fundamentals of Engineering	■		■																				
NUB121	Report Writing and Communication Skills							■	■		■													
NUB122	Climate Change, Energy and Water Issues			■	■																			
NUB123	Scientific Thinking							■		■	■													
NUB131	Professional Legislations and Engineering Ethics				■				■		■													
NUB132	Literature and Arts							■	■	■														
NUB133	Human Rights							■	■		■													
NUB134	Professional Ethics				■				■		■													
NUB141	Building Safety and Fire Protection	■			■																			
NUB142	Entrepreneurship and Startups							■		■	■													
NUB143	Business Administration							■		■	■													
NUB144	Principle of General Management							■		■	■													
BAS111	Mathematics (1)	■																						
BAS112	Mathematics (2)	■																						
BAS113	Probability and Statistics		■																					
BAS121	Vibration and Waves	■																						
BAS122	Electricity and Magnetism	■																						
BAS131	Engineering Chemistry	■																						
BAS141	Statics		■																					
BAS142	Dynamics		■																					
BAS143	Engineering Drawing (1)								■	■														
TRN2x1	Field training (1)				■		■	■																
TRN3x1	Field Training (2)				■		■	■																
-	Engineering Economy and Project Management Elective																							
-	Structures and Properties of Materials Elective Courses																							
-	Engineering Technology Elective Courses																							

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1a	C1b	C2a	C2b	C3a	C3b	C4a	C4b
-	Spatial Perception and Design Elective Courses																							
CCE312	Software Project Management	■			■						■		■	■										
CCE216	Properties of Electrical Materials		■		■						■	■		■										
GME141	Production Engineering	■			■						■		■	■										
CCE111	Electrical Installations and Construction Equipment				■				■		■		■	■										
BAS211	Mathematics (3)	■	■																					
BAS213	Mathematics (4)	■	■																					
BAS311	Mathematics (5)	■				■																		
CCE161	Computer Programming		■											■		■								
CCE211	Electrical Circuits (1)	■											■		■									
CCE214	Electrical Circuits (2)		■									■	■				■							
CCE212	Electromagnetic Fields	■	■												■									
CCE251	Logic Circuits Design			■									■						■	■				
CCE213	Electrical Measurements and Instrumentation		■												■		■				■			
CCE231	Electronic Devices												■		■		■							
CCE252	Advanced Logic Circuits Design												■	■					■				■	
CCE221	Signal Analysis										■	■			■									
CCE215	Modeling and System Analysis	■							■				■	■										
CCE321	Electrical Communications										■				■									
CCE331	Electronic Circuits												■		■		■							
CCE341	Optoelectronics	■	■												■									
CCE351	Computer Organization and Architecture												■					■						
CCE311	Control Systems	■	■										■											
CCE352	Microprocessors and Applications												■	■						■				■
CCE332	Digital Circuit design												■		■		■							
CCE353	Computer Networks			■										■				■					■	
CCE322	Digital Signal Processing		■								■	■			■									
Communications Engineering Minor Requirements																								
CCE361	Data Structure and Algorithms	■											■		■									■
CCE481	Computer Vision																			■				■
CCE482	Embedded Systems													■		■								
CCE451	Computer and Network Security			■										■				■					■	
CCE323	Digital Communication Systems									■			■		■								■	
CCE421	Communication Networks									■			■	■								■		
CCE441	Antenna and Wave Propagation	■											■				■						■	
CCE442	Optical communication Systems	■											■				■				■			
CCE422	Information and Coding Theory									■	■		■		■								■	

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1a	C1b	C2a	C2b	C3a	C3b	C4a	C4b
CCE443	Microwave Devices and Circuits	■											■				■				■			
CCE423	Mobile communications																		■		■			
CCE491	Communications and Computers Graduation Project (1)	■		■						■		■	■	■		■	■	■			■	■	■	■
CCE492	Communications and Computers Graduation Project (2)	■		■						■		■	■	■		■	■	■			■	■	■	■
Communications Engineering Elective (1)																								
CCE431	Integrated Circuits Design												■	■									■	
CCE424	Telephony Systems												■						■				■	
CCE425	Acoustics					■				■									■				■	
Communications Engineering Elective (2)																								
CCE432	VLSI Technology													■	■						■			
CCE426	Satellite Communication													■			■				■			
CCE427	Selected Topics in Communication Systems													■					■		■			
Communications Engineering Elective (3)																								
CCE444	RF Integrated Circuits Design	■											■				■				■			
CCE445	Photonics Micro-Systems												■								■		■	
CCE446	Radar Systems																		■		■		■	
CCE447	Bioelectromagnetics					■							■						■				■	
Computers Engineering Minor Requirements																								
CCE361	Data Structure and Algorithms	■											■		■									■
CCE481	Computer Vision																			■				■
CCE482	Embedded Systems													■		■								■
CCE451	Computer and Network Security			■										■				■					■	
CCE362	Database Systems	■									■			■						■				
CCE461	Big-Data Analytics												■											■
CCE462	Cloud Computing										■				■									■
CCE463	Operating Systems	■									■			■						■				
CCE464	Software Engineering	■					■							■						■				
CCE483	Internet Of Things												■										■	
CCE465	Data Mining	■									■			■						■				
CCE491	Communications and Computers Graduation Project (1)	■		■						■		■	■	■		■	■	■			■	■	■	■
CCE392	Communications and Computers Graduation Project (2)	■		■						■		■	■	■		■	■	■			■	■	■	■
Computers Engineering Elective (1)																								
CCE466	Object-Oriented Programming	■									■			■						■				
CCE484	Computational Intelligence													■						■				■
CCE485	Microcontrollers and Applications												■	■						■				■

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	C1a	C1b	C2a	C2b	C3a	C3b	C4a	C4b
Computers Engineering Elective (2)																								
CCE452	Selected Topics in Computer networks and Security			■										■				■					■	
CCE453	Introduction to Network Operations and Management												■							■			■	
CCE486	Artificial Intelligence and its Applications													■						■				■
Computers Engineering Elective (3)																								
CCE467	Selected Topics in Distributed and Mobile Computing													■					■		■			
CCE468	Mobile and Web Application Development												■	■						■				■
CCE487	Fundamentals of Deep Learning													■						■				■

- **Targeted Sustainable Development and Egyptian Cabinet Goals**

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
-	University Elective (1)																	
-	University Elective (2)																	
-	University Elective (3)																	
-	University Elective (4)																	
BAS111	Mathematics (1)				■					■								
BAS112	Mathematics (2)				■					■								
BAS113	Probability and Statistics				■					■								■
BAS121	Vibration and Waves				■			■		■								
BAS122	Electricity and Magnetism				■			■		■								
BAS131	Engineering Chemistry				■		■			■			■					
BAS141	Statics				■					■								
BAS142	Dynamics				■					■								
BAS143	Engineering Drawing (1)				■					■								
TRN2x1	Field training (1)				■				■	■								
TRN3x1	Field Training (2)				■				■	■								
-	Engineering Economy and Project Management Elective																	
-	Structures and Properties of Materials Elective Courses																	
-	Engineering Technology Elective Courses																	
-	Spatial Perception and Design Elective Courses																	
BAS211	Mathematics (3)				■													
BAS213	Mathematics (4)				■													
BAS311	Mathematics (5)				■													
CCE161	Computer Programming				■													
CCE211	Electrical Circuits (1)				■													
CCE214	Electrical Circuits (2)				■													
CCE212	Electromagnetic Fields				■													
CCE251	Logic Circuits Design				■													
CCE213	Electrical Measurements and Instrumentation				■													
CCE231	Electronic Devices				■													
CCE252	Advanced Logic Circuits Design				■													
CCE221	Signal Analysis				■													
CCE215	Modeling and System Analysis				■													
CCE321	Electrical Communications				■													
CCE331	Electronic Circuits				■													
CCE341	Optoelectronics				■					■								
CCE351	Computer Organization and Architecture				■													
CCE311	Control Systems				■													
CCE352	Microprocessors and Applications				■					■								
CCE332	Digital Circuit design				■													
CCE353	Computer Networks				■					■								
CCE322	Digital Signal Processing				■													

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
Communications Engineering Minor Requirements																		
CCE361	Data Structure and Algorithms				■													
CCE481	Computer Vision				■					■								
CCE482	Embedded Systems				■					■								
CCE451	Computer and Network Security				■													
CCE323	Digital Communication Systems				■													
CCE421	Communication Networks				■									■				
CCE441	Antenna and Wave Propagation				■					■				■				
CCE442	Optical communication Systems				■													
CCE422	Information and Coding Theory				■													
CCE443	Microwave Devices and Circuits				■					■				■				
CCE423	Mobile communications				■					■				■				
CCE491	Communications and Computers Graduation Project (1)			■	■		■	■	■	■		■	■	■	■	■		■
CCE492	Communications and Computers Graduation Project (2)			■	■		■	■	■	■		■	■	■	■	■		■
	Communications Engineering Elective (1)																	
	Communications Engineering Elective (2)																	
	Communications Engineering Elective (3)																	
CCE431	Integrated Circuits Design				■					■								
CCE424	Telephony Systems				■											■		
CCE425	Acoustics				■													
CCE432	VLSI Technology				■					■								
CCE426	Satellite Communication				■					■				■		■		
CCE427	Selected Topics in Communication Systems				■					■								
CCE444	RF Integrated Circuits Design				■					■				■				
CCE445	Photonics Micro-Systems				■					■								
CCE446	Radar Systems				■					■				■	■	■		
CCE447	Bioelectromagnetics				■					■				■	■	■		
Computers Engineering Minor Requirements																		
CCE361	Data Structure and Algorithms				■					■								
CCE481	Computer Vision				■					■								■
CCE482	Embedded Systems				■					■								
CCE451	Computer and Network Security				■					■								
CCE362	Database Systems				■													
CCE461	Big-Data Analytics				■					■								
CCE462	Cloud Computing				■					■								
CCE463	Operating Systems				■													
CCE464	Software Engineering				■					■								■
CCE483	Internet Of Things				■					■								■
CCE465	Data Mining				■					■								
CCE491	Communications and Computers Graduation Project (1)			■	■		■	■	■	■		■	■	■	■	■		■
CCE392	Communications and Computers Graduation Project (2)			■	■		■	■	■	■		■	■	■	■	■		■

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
	Computers Engineering Elective (1)																	
	Computers Engineering Elective (2)																	
	Computers Engineering Elective (3)																	
CCE466	Object-Oriented Programming				■					■								
CCE484	Computational Intelligence				■													
CCE485	Microcontrollers and Applications				■					■								
CCE452	Selected Topics in Computer networks and Security				■													
CCE453	Introduction to Network Operations and Management				■					■								
CCE486	Artificial Intelligence and its Applications				■					■								
CCE467	Selected Topics in Distributed and Mobile Computing				■													
CCE468	Mobile and Web Application Development				■					■								
CCE487	Fundamentals of Deep Learning				■					■								

Program 4: Mechatronics and Intelligent Machines Engineering Program

- ## Program Description

Mechatronics and Intelligent Machines Engineering Program is a multidisciplinary field of science that includes a combination of mechanical engineering, electronics, computer engineering, telecommunications engineering, systems engineering and control engineering. As technology advances, the subfields of engineering multiply and adapt. This program can enrich the student's basic theoretical and practical knowledge of mechatronics system components, and design methodologies of mechatronics systems.

- ## Career Prospects

The graduate of the program is expected to get a job in one of the following positions:

1. Embedded systems
2. Projects using Heavy earthmoving equipment and hydraulic and pneumatic machines,
3. Sales engineer for robotics and automation,
4. Automated manufacturing and production systems,
5. Control engineer,
6. Maintenance engineer,
7. Robotics and automation industry,
8. Business Intelligence Engineering and supply chains.

- ## Relation to Sustainable Development Goals

☒ GOAL 1: No Poverty	☒ GOAL 2: Zero Hunger	☒ GOAL 3: Good Health & Well-being	☒ GOAL 4: Quality Education	☒ GOAL 5: Gender Equality	☒ GOAL 6: Clean Water & Sanitation
☒ GOAL 7: Affordable & Clean Energy	☒ GOAL 8: Decent Work & Economic Growth	☒ GOAL 9: Industry, Innovation & Infrastructure	☒ GOAL 10: Reduced Inequality	☒ GOAL 11: Sustainable Cities & Communities	☒ GOAL 12: Responsible Consumption & Production
☒ GOAL 13: Climate Action	☒ GOAL 14: Life Below Water	☒ GOAL 15: Life on Land	☒ GOAL 16: Peace & Justice Strong Institutions	☒ GOAL 17: Partnerships to achieve. the Goal	

- ## Program Concentrations

1. Autotronics: The concentration is to incorporate elements of mechanical, electrical, electronics, software and safety engineers as applied to the design, manufacture, and operation of automobiles.
2. Robotics and Artificial Intelligence: The concentration of this area is to integrate Artificial Intelligence with the industrial manipulators and mobile robots to perform tasks that require intelligence, perception, and decision-making.
3. Industrial Automation: The concentration of this area is to enhance efficiency, productivity, and reliability in manufacturing and other industrial processes.
4. Advanced Manufacturing: The concentration of this area is to improve efficiency, reduce costs, and increase flexibility in production, leads to the creation of more complex and customized products, as well as sustainable and resource-efficient manufacturing practices.
5. Business Intelligence Engineering: The concentration of this area is the use of technology, processes, and tools to collect, analyze, and present business data to support decision-making within an organization.

- ## Program Competences

According to the National Academic Reference Standards (NARS-2018), the competences for Graduates from NHADA University and all Engineering Programs, graduate must be able to (A-Level):

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A2. Develop and conduct appropriate experimentation and/or simulation, analyse and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

A5. Practice research techniques and methods of investigation as an inherent part of learning.

A6. Plan, supervise and monitor implementation of engineering projects.

A7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.

A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

In addition to the Competencies for all Engineering Programs, the Basic Mechanical Engineering graduate must be able to (B-Level):

B1. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.

B2. Carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.

B3. Select conventional mechanical equipment according to the required performance.

B4. Adopt suitable national and international standards and codes to design, build, operate, inspect and maintain mechanical equipment and systems.

In addition to the Competencies for the Basic Mechanical Engineering, graduate must be able to (D Level):

D1. Synthesize and integrate mechatronic subsystems to create custom solutions for different engineering problems while dealing with technical uncertainties.

D2. Integrate a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline.

D3. Put the necessary specifications measuring instruments, workshops and describing the different variants of mechatronic equipment such as Robotics, CNC machines, CAD/CAM systems, pneumatic and hydraulic equipment, etc. for purpose of purchasing and contracting.

D4. Distinguish the layout and the key parameters to the field of the concentration within the mechatronics and automation engineering as listed below.

Concentration	Graduate attributes
Industrial Automation	4a. Demonstrate proficient knowledge and skills in industrial automation systems, including PLC programming, HMI design, SCADA systems, and industrial networking.
Autotronics	4b. Demonstrate a comprehensive understanding of automotive electrical systems, including wiring diagrams, circuits, sensors, actuators, and control modules.
Advanced Manufacturing	4c. Demonstrate a comprehensive understanding of advanced manufacturing processes, including additive manufacturing, subtractive manufacturing, CNC machining, and robotic automation.
Artificial Intelligence and Robotics	4d. Develop a solid understanding of AI principles, including machine learning, deep learning, neural networks, and natural language processing.
Business Intelligence Engineering	4e. Demonstrate proficiency in data analysis techniques and visualization tools to extract insights from large datasets and communicate findings effectively to stakeholders.

- **Graduate Attributes**
  - Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.
  - Use the basic theoretical and practical knowledge of mechatronic and automation system components in his/her practical field.
  - Use the state-of-the-art technologies of the multidisciplinary specialization of Mechatronics and automation engineering program to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability.
  - Identify, formulate and solve fundamental engineering problems.
  - Design a system, component, or process to find affordable and reliable solutions, to improve the daily quality of life.
  - Conduct Research and Development (R&D) activities to create innovative mechatronic solutions having direct impact on industrial, commercial, and social scales.
  - Solve problems in the areas of integrated mechanics, electronics, computers, and software systems.
  - Analyze and investigate the inter-disciplinary characteristics of mechanical, electrical, and hydraulic systems.
  - Design, develop, and maintain safety critical mechatronic systems.
  - Apply the learned management and business skills to effectively contribute and compete in local, regional and international markets.
  - Engage in self- and life- long learning.
  - Work within a multidisciplinary team during the analysis, design and implementation phases of mechatronics engineering projects.

- Work effectively in multidisciplinary teams, leveraging their diverse skill sets to tackle complex engineering challenges and communicate technical concepts to non-technical stakeholders.
- Understand the ethical implications of their work in mechatronics and adhere to professional standards and codes of conduct, considering societal impact, safety, and environmental sustainability in their engineering practice.
- Communicate complex technical concepts, both orally and in writing, to diverse audiences, including colleagues, clients, and the broader community.
- Have the potential to take on leadership roles in engineering projects and organizations, demonstrating entrepreneurship, innovation, and the ability to drive positive change in the field of mechatronics.

• Required Courses

To get a Bachelor of Science Degree in this program and to satisfy the Program Competences, the following set of courses need to be completed.

• List of Mechatronics and Intelligent Machines Engineering Program Requirements Courses

Course Title	Weight			Contact Hours				%
	CH	ECTS	SWL	Lec	Tut	Lab	TT	
University Requirements	11	18	450	12	0	0	12	8 %
Faculty of Engineering Requirements	33	55	1375	24	19	8	51	23 %
Major Requirements of Mechatronics and Intelligent Machines Engineering	58	97	2425	45	24	19	88	40 %
Minor Requirements of Mechatronics and Intelligent Machines Engineering	42	70	1750	27	14	26	67	29 %
Total	144	250	6250	108	57	53	218	100%

Major Requirements of Mechatronics and Intelligent Machines Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
CCE171	Computing in Engineering	2	4	100	2	1	0	3	-
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
BME251	Thermodynamics (1)	3	5	125	2	2	0	4	BAS131
MIM211	Measurement and Instrumentation	3	5	125	2	2	1	5	-
BME211	Theory of Machines	3	5	125	2	2	0	4	BAS142
BME26٢	Fluid Mechanics and Aerodynamics	2	4	100	2	0	1	3	BME251
CCE272	Electrical and Electronic Circuits	3	5	125	2	2	1	5	BAS122
MIM213	Sensors and Measurement Systems	2	3	75	2	0	1	3	MIM211
CCE273	Digital Logic and Microcontrollers	2	3	75	2	0	1	3	CCE171
MIM221	Modeling and Simulation of Mechatronic Systems	3	5	125	2	1	2	5	BAS113
BME241	Strength of Materials	2	4	100	2	1	0	3	
CCE274	Introduction to Embedded Systems and Interfacing	3	5	125	2	1	2	5	CCE171
MIM214	Electrical Power and Machines	3	5	125	2	1	2	5	CCE272
MIM311	Power Electronics and Motor Drives	3	5	125	2	2	1	5	MIM214
BME351	Heat Transfer	3	5	125	2	0	2	4	BME251
BME311	Mechanical Vibrations	3	5	125	2	2	0	4	-
BME321	Machine Elements Design	3	5	125	2	2	0	4	-
BME411	Machine Construction	3	5	125	2	2	0	4	BAS141
CCE471	Computer Vision in Mechatronic Systems	2	3	75	2	0	1	3	MIM322
MIM481	MIM Graduation Project (1)	2	4	100	1	0	3	4	101 CH MIM381
MIM411	Industrial Project Management	2	3	75	2	1	0	3	-
MIM412	Maintenance Planning and Scheduling	2	4	100	2	1	0	3	-
CCE371	Object-Oriented Computer Programming	2	3	75	2	0	1	3	CCE171
Total		**58**	**97**	**2425**	**45**	**24**	**19**	**88**	

Minor Requirements of Mechatronics and Intelligent Machines Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
MIM321	Introduction to Industrial Automation	3	5	125	2	1	1	4	
MIM322	Design of Mechatronics Systems	3	5	125	2	1	2	5	MIM111
MIM323	Industrial Robotics	3	5	125	2	1	2	5	BME241
MIM324	Hydraulics and Pneumatics Control	3	5	125	2	1	1	4	
MIM325	Intelligent Mechatronic Control	3	5	125	2	1	2	5	MIM221
-	MIM Elective (1)	3	5	125	2	1	2	5	
MIM381	Capstone	1	2	50	0	1	1	2	MIM322
MIM421	Cyber-Physical Systems	3	5	125	2	1	1	4	CCE274
MIM422	Artificial Intelligence for Mechatronic Systems	3	5	125	2	2	1	5	MIM221
-	MIM Elective (2)	3	5	125	2	1	2	5	
MIM423	Industrial Communications and Networks Systems	2	3	75	2	0	1	3	
-	MIM Elective (3)	3	5	125	2	1	2	5	
-	MIM Elective (4)	3	5	125	2	1	2	5	
-	MIM Elective (5)	3	5	125	2	1	1	4	
MIM482	MIM Graduation Project (2)	3	5	125	1	0	4	5	MIM481
Total		**42**	**70**	**1750**	**27**	**14**	**25**	**66**	

Elective Courses of Mechatronics and Intelligent Machines Engineering is distributed in five electives.

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Elective 1 Select 3 Credit hrs. (one course)									
MIM331	Industrial Automation	3	5	125	2	1	2	5	MIM321
MIM341	Introduction to Automotive	3	5	125	2	1	2	5	
MIM351	Advanced Machining Processes	3	5	125	2	1	2	5	
MIM361	Advanced Robotics Analysis and Control	3	5	125	2	1	2	5	
MIM371	Business Analytics and Management	3	5	125	2	1	2	5	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Elective 2 Select 3 Credit hrs. (one course)									
MIM431	Process Instrumentation and Control	3	5	125	2	1	2	5	MIM331
MIM441	Automotive Engines and Fuel Systems	3	5	125	2	1	2	5	MIM341
MIM451	CNC Operations	3	5	125	2	1	2	5	MIM351
MIM461	Mobile Robotic Systems	3	5	125	2	1	2	5	MIM361
CCE472	Data Mining and Visualization	3	5	125	2	1	2	5	MIM371
Elective 3 Select 3 Credit hrs. (one course)									
MIM432	PLC and HMI (Human-Machine Interface)	3	5	125	2	1	2	5	MIM331
MIM442	Automotive Mechatronic Systems	3	5	125	2	1	2	5	MIM341
MIM452	Ceramics and Polymers	3	5	125	2	1	2	5	MIM351
MIM462	Human-Robot Interaction	3	5	125	2	1	2	5	MIM361
CCE473	Database Management	3	5	125	2	1	2	5	MIM371
Elective 4 Select 3 Credit hrs. (one course)									
MIM433	Automation Systems and Supervisory Control	3	5	125	2	1	2	5	MIM331
MIM443	Road Vehicle Dynamics	3	5	125	2	1	2	5	MIM341
MIM453	Additive Material Technology	3	5	125	2	1	2	5	MIM351
MIM463	Perception and Learning for Robotics	3	5	125	2	1	2	5	MIM361
MIM471	Supply Chain Management	3	5	125	2	1	2	5	MIM371
Elective 5 Select 3 Credit hrs. (one course)									
MIM434	Quality Control	3	5	125	2	1	1	4	MIM331
MIM444	Design of Autonomous Systems	3	5	125	2	1	1	4	MIM341
MIM454	Non-Traditional Machining	3	5	125	2	1	1	4	MIM351
MIM464	Selected Topics in Robotics and Artificial intelligence	3	5	125	2	1	1	4	MIM361
MIM472	Decision making and governance	3	5	125	2	1	1	4	MIM371

Mechatronics and Intelligent Machines Engineering Concentrations Requirements Courses.

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Pool of MIM Elective Courses for 'Industrial Automation" Concentration									
MIM331	Industrial Automation	3	5	125	2	1	2	5	MIM321
MIM431	Process Instrumentation and Control	3	5	125	2	1	2	5	MIM331
MIM432	PLC and HMI (Human-Machine Interface)	3	5	125	2	1	2	5	MIM331
MIM433	Automation Systems and Supervisory Control	3	5	125	2	1	2	5	MIM331
MIM434	Quality Control	3	5	125	2	1	1	4	MIM331
Pool of MIM Elective Courses for 'Autotronics' Concentration									
MIM341	Introduction to Automotive	3	5	125	2	1	2	5	
MIM441	Automotive Engines and Fuel Systems	3	5	125	2	1	2	5	MIM341
MIM442	Automotive Mechatronic Systems	3	5	125	2	1	2	5	MIM341
MIM443	Road Vehicle Dynamics	3	5	125	2	1	2	5	MIM341
MIM444	Design of Autonomous Systems	3	5	125	2	1	1	4	MIM341
Pool of MIM Elective Courses for "Advanced Manufacturing" Concentration									
MIM351	Advanced Machining Processes	3	5	125	2	1	2	5	MIM322
MIM451	CNC Operations	3	5	125	2	1	2	5	MIM351
MIM452	Ceramics and Polymers	3	5	125	2	1	2	5	MIM351
MIM453	Additive Material Technology	3	5	125	2	1	2	5	MIM351
MIM454	Non-Traditional Machining	3	5	125	2	1	١	٤	MIM351
Pool of MIM Elective Courses for 'Artificial Intelligence and Robotics' Concentration									
MIM361	Advanced Robotics Analysis and Control	3	5	125	2	1	2	5	MIM323
MIM461	Mobile Robotic Systems	3	5	125	2	1	2	5	MIM361
MIM462	Human-Robot Interaction	3	5	125	2	1	2	5	MIM361
MIM463	Perception and Learning for Robotics	3	5	125	2	1	2	5	MIM361
MIM464	Selected Topics in Robotics and Artificial intelligence	3	5	125	2	1	1	4	MIM361

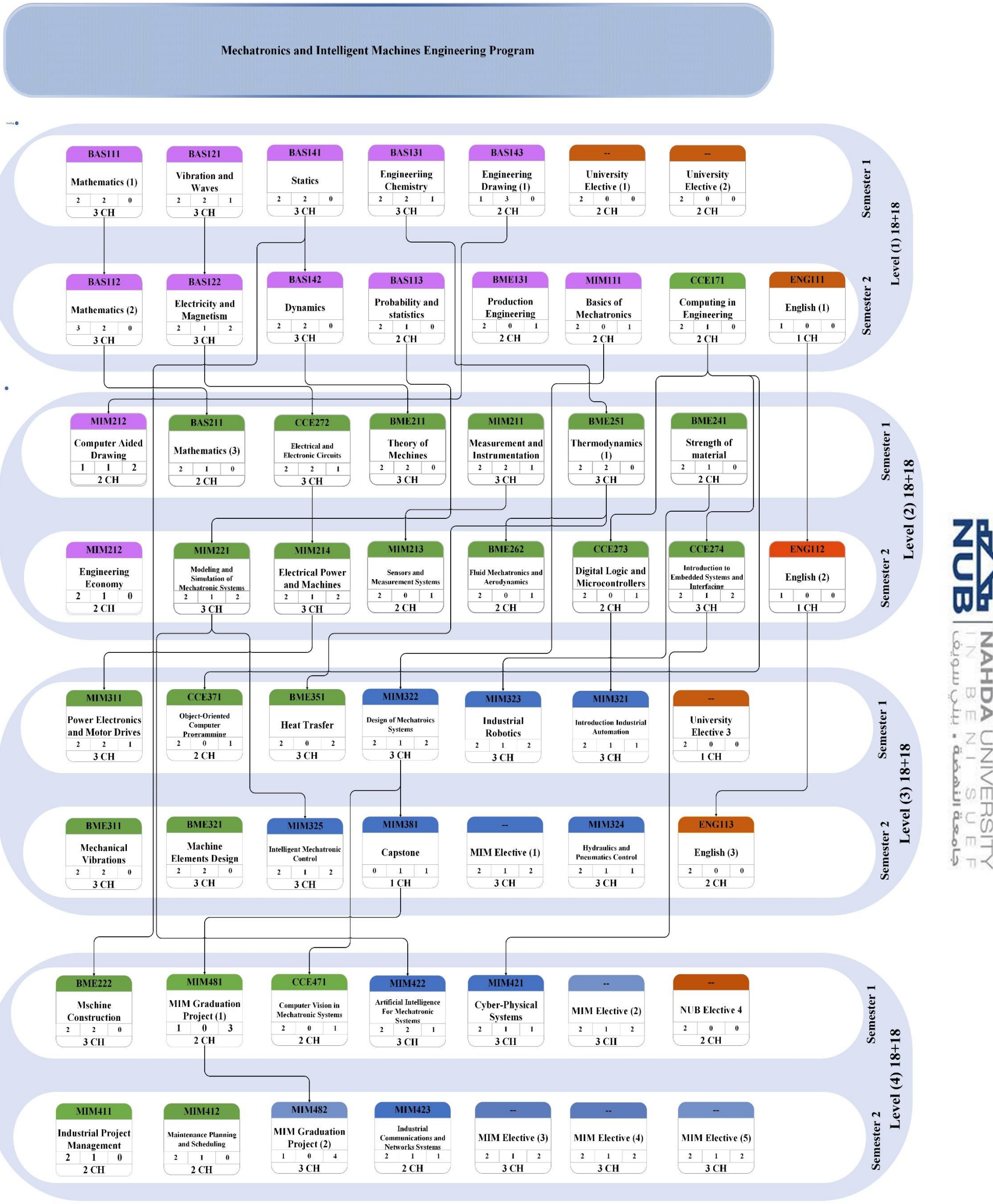
Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Pool of MIM Elective Courses for 'Business Intelligence Engineering' Concentration									
MIM371	Business Analytics and Management	3	5	125	2	1	2	5	
CCE472	Data Mining and Visualization	3	5	125	2	1	2	5	MIM371
CCE473	Database Management	3	5	125	2	1	2	5	MIM371
MIM473	Supply Chain Management	3	5	125	2	1	2	5	MIM371
MIM474	Decision making and governance	3	5	125	2	1	١	٤	MIM371

- **Proposed Study Plan**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 1									
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS121	Vibration and Waves	3	5	125	2	2	1	5	
BAS141	Statics	3	5	125	2	2	0	4	
BAS131	Engineering Chemistry	3	5	125	2	2	1	5	
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
-	University Elective (1)	2	3	75	2	0	0	2	
-	University Elective (2)	2	3	75	2	0	0	2	
Total		**18**	**30**	**750**	**13**	**11**	**2**	**26**	
Semester 2									
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
BAS142	Dynamics	3	5	125	2	2	0	4	BAS141
BAS113	Probability and Statistics	2	3	75	2	1	0	3	
MIM111	Basics of Mechatronics	2	3	75	2	0	1	3	
BME131	Production Engineering	2	3	75	2	0	1	3	
CCE171	Computing in Engineering	2	4	100	2	1	0	3	
ENG111	English (1)	1	2	50	1	0	0	1	
Total		**18**	**30**	**750**	15	7	4	26	
Semester 3									
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
BME251	Thermodynamics (1)	3	5	125	2	2	0	4	BAS131
MIM211	Measurement and Instrumentation	3	5	125	2	2	1	5	
MIM٢12	Computer Aided Drawing	2	3	75	1	1	2	4	BAS143
BME211	Theory of Machines	3	5	125	2	2	0	4	BAS142
BME241	Strength of Materials	2	4	100	2	1	0	3	
CCE272	Electrical and Electronic Circuits	3	5	125	2	2	1	5	BAS122
Total		**18**	**30**	**750**	**13**	**11**	**4**	**27**	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 4									
MIM213	Sensors and Measurement Systems	2	3	75	2	0	1	3	MIM211
MIM214	Electrical Power and Machines	3	5	125	2	1	2	5	CCE272
MIM221	Modeling and Simulation of Mechatronic Systems	3	5	125	2	1	2	5	BAS113
CCE273	Digital Logic and Microcontrollers	2	3	75	2	0	1	3	CCE171
BME26٢	Fluid Mechanics and Aerodynamics	2	4	100	2	0	1	3	BME251
MIM21٦	Engineering Economy	2	3	75	2	1	0	3	
CCE274	Introduction to Embedded Systems and Interfacing	3	5	125	2	1	2	5	CCE171
ENG112	English (2)	1	2	50	1	0	0	1	ENG111
Total		**18**	**30**	**750**	**15**	**4**	**9**	**28**	
Semester 5									
MIM321	Introduction to Industrial Automation	3	5	125	2	1	1	4	CCE273
MIM322	Design of Mechatronics Systems	3	5	125	2	1	2	5	MIM111
MIM323	Industrial Robotics	3	5	125	2	1	2	5	BME241
CCE371	Object-Oriented Computer Programming	2	3	75	2	0	1	3	CCE271
MIM311	Power Electronics and Motor Drives	3	5	125	2	2	1	5	MIM214
BME351	Heat Transfer	3	5	125	2	0	2	4	BME251
-	University Elective (3)	1	2	50	2	0	0	2	
Total		**18**	**30**	**750**	**14**	**5**	**9**	**28**	
Semester 6									
BME311	Mechanical Vibrations	3	5	125	2	2	0	4	
MIM324	Hydraulics and Pneumatics Control	3	5	125	2	1	1	4	
MIM325	Intelligent Mechatronic Control	3	5	125	2	1	2	5	MIM221
BME321	Machine Elements Design	3	5	125	2	2	0	4	
MIM381	Capstone	1	2	50	0	1	1	2	MIM322
-	MIM Elective (1)	3	5	125	2	1	2	5	
ENG113	English (3)	2	3	75	2	0	0	2	ENG112
Total		**18**	**30**	**750**	**12**	**8**	**6**	**26**	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 7									
BME411	Machine Construction	3	5	125	2	2	0	4	BAS141
CCE471	Computer Vision in Mechatronic Systems	2	3	75	2	0	1	3	MIM322
MIM421	Cyber-Physical Systems	3	5	125	2	1	1	4	CCE274
MIM422	Artificial Intelligence for Mechatronic Systems	3	5	125	2	2	1	5	MIM221
-	MIM Elective (2)	3	5	125	2	1	2	5	
MIM481	MIM Graduation Project (1)	2	4	100	1	0	3	4	101 CH MIM381
-	University Elective (4)	2	3	75	2	0	0	2	
Total		**18**	**30**	**750**	**13**	**6**	**8**	**27**	
Semester 8									
MIM411	Industrial Project Management	2	3	75	2	1	0	3	
MIM412	Maintenance Planning and Scheduling	2	4	100	2	1	0	3	
MIM423	Industrial Communications and Networks Systems	2	3	75	2	0	1	3	
-	MIM Elective (3)	3	5	125	2	1	2	5	
-	MIM Elective (4)	3	5	125	2	1	2	5	
-	MIM Elective (5)	3	5	125	2	1	1	4	
MIM482	MIM Graduation Project (2)	3	5	125	1	0	4	5	MIM481
Total		**18**	**30**	**750**	**13**	**5**	**11**	**28**	


Mechatronics and Intelligent Machines Engineering Program
Level (1) 18+18
Semester 1
BAS111 Mathematics (1) 2 2 0 3 CH
BAS121 Vibration and Waves 2 2 1 3 CH
BAS141 Statics 2 2 0 3 CH
BAS131 Engineeriing Chemistry 2 2 1 3 CH
BAS143 Engineering Drawing (1) 1 3 0 2 CH
-- University Elective (1) 2 0 0 2 CH
-- University Elective (2) 2 0 0 2 CH
Semester 2
BAS112 Mathematics (2) 3 2 0 3 CH
BAS122 Electricity and Magnetism 2 1 2 3 CH
BAS142 Dynamics 2 2 0 3 CH
BAS113 Probability and statistics 2 1 0 2 CH
BME131 Production Engineering 2 0 1 2 CH
MIM111 Basics of Mechatronics 2 0 1 2 CH
CCE171 Computing in Engineering 2 1 0 2 CH
ENG111 English (1) 1 0 0 1 CH
Level (2) 18+18
Semester 1
MIM212 Computer Aided Drawing 1 1 2 2 CH
BAS211 Mathematics (3) 2 1 0 2 CH
CCE272 Electrical and Electronic Circuits 2 2 1 3 CH
BME211 Theory of Mechines 2 2 0 3 CH
MIM211 Measurement and Instrumentation 2 2 1 3 CH
BME251 Thermodynamics (1) 2 2 0 3 CH
BME241 Strength of material 2 1 0 2 CH
Semester 2
MIM212 Engineering Economy 2 1 0 2 CH
MIM221 Modeling and Simulation of Mechatronic Systems 2 1 2 3 CH
MIM214 Electrical Power and Machines 2 1 2 3 CH
MIM213 Sensors and Measurement Systems 2 0 1 2 CH
BME262 Fluid Mechatronics and Aerodynamics 2 0 1 2 CH
CCE273 Digital Logic and Microcontrollers 2 0 1 2 CH
CCE274 Introduction to Embedded Systems and Interfacing 2 1 2 3 CH
ENG112 English (2) 1 0 0 1 CH
Level (3) 18+18
Semester 1
MIM311 Power Electronics and Motor Drives 2 2 1 3 CH
CCE371 Object-Oriented Computer Programming 2 0 1 2 CH
BME351 Heat Trasfer 2 0 2 3 CH
MIM322 Design of Mechatroics Systems 2 1 2 3 CH
MIM323 Industrial Robotics 2 1 2 3 CH
MIM321 Introduction Industrial Automation 2 1 1 3 CH
-- University Elective 3 2 0 0 1 CH
Semester 2
BME311 Mechanical Vibrations 2 2 0 3 CH
BME321 Machine Elements Design 2 2 0 3 CH
MIM325 Intelligent Mechatronic Control 2 1 2 3 CH
MIM381 Capstone 0 1 1 1 CH
-- MIM Elective (1) 2 1 2 3 CH
MIM324 Hydraulics and Pneumatics Control 2 1 1 3 CH
ENG113 English (3) 2 0 0 2 CH
Level (4) 18+18
Semester 1
BME222 Mschine Construction 2 2 0 3 CH
MIM481 MIM Graduation Project (1) 1 0 3 2 CH
CCE471 Computer Vision in Mechatronic Systems 2 0 1 2 CH
MIM422 Artificial Intelligence For Mechatronic Systems 2 2 1 3 CH
MIM421 Cyber-Physical Systems 2 1 1 3 CH
-- MIM Elective (2) 2 1 2 3 CH
-- NUB Elective 4 2 0 0 2 CH
Semester 2
MIM411 Industrial Project Management 2 1 0 2 CH
MIM412 Maintenance Planning and Scheduling 2 1 0 2 CH
MIM482 MIM Graduation Project (2) 1 0 4 3 CH
MIM423 Industrial Communications and Networks Systems 2 1 1 2 CH
-- MIM Elective (3) 2 1 2 3 CH
-- MIM Elective (4) 2 1 2 3 CH
-- MIM Elective (5) 2 1 2 3 CH
MIM
TRN 2x1 Field Training (1) 0 5 8 0 CH
TRN 3x1 Field Training (2) 0 5 8 0 CH
- The maximum allowed study duration is 8 academic years
- Cumulative GPA at any main semester < 2.0
- 10 Weeks of Field
- Training can be Started at the end of level 2 (Sophomore level)
University Req. 11 CH
Program. Major Req 58 CH
Faculty Req. 33 CH
Program. Minor Req 42 CH
Course Code
Course Title
Lec Tut Lab
CH

- **Mechatronics and Intelligent Machines Engineering Program Course Content**

Courses offered by Mechatronics and Intelligent Machines Engineering Program (MIM)

MIM111	Basics of Mechatronics		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content
Introduction to mechatronics systems: definitions, impact on industry and the techno commercial benefits, mechatronics system hierarchy, basic mechatronics modules. Mechatronics design methodology: traditional approaches, V-model, nested, simplified examples. Essential tools for the mechatronics design approach using the V- model: MATLAB/SIMULINK, PROTEUS VSM, SOLID WORKS packages with examples. Basic mechatronics modules and its relation to the hierarchy of the mechatronic systems. Design and implementation of the Discrete Event Mechatronics Module (DE-MM): Choice of sensors, actuators, controller, implementation in the form of mini projects
Laboratory
References
• "Mechatronics: Principles and Applications" by Godfrey C. Onwubolu (2018) • "Mechatronics: Principles and Applications" by Mahalik (2005)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	4٠%

MIM211	Measurement and Instrumentation		3 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Characteristics of Sensors, Flow rate Measurement Principles, Orifice-Meter, Venturi-Meter, Coriolis Flow Meter, Turbine Flow Meter, Rotameter, Velocity Measurements, Pitot Tube, Vane Anemometer, Hot Wire Anemometer, Laser Doppler Anemometer, Particle Image Velocimetry, Pressure Measurement, Manometer, Bourdon Tube Gauge, Piezoelectric Sensor, Temperature Measurement, Thermometer, Thermocouple, Thermistor, Optical Pyrometer, Rotational Speed Meters, Tachometer, Torque Measurement, Strain Gauges, Gas Analysis, Electro-Chemical Gas Analyzer, Accuracy, Precision, Statistical Methods Error Analysis and Uncertainty.
Laboratory
• Statical Analysis of Calibration Data of a Pressure Gauge. • Probability Analysis of Scattered Data Obtained Randomly for An Experimental Error. • Using the Temperature Measurement Bench for Calibrating a Thermocouple and Resistance Thermometers. • Temperature Measurements Using the Optical Pyrometer. • Calibrating Different Kinds of Pressure Transducers Fitted on an Experimental pressure Measurement Bench. • Using the Dead Weight Tester to Calibrate a Bourdon Tube Pressure Gauge. • Calibrating Different Kinds of Flow Meters Fitted on an Experimental Flow Measurement Bench. • Using the Pitot Tube to Measure the Distribution Over the Tube Cross Section of the Velocity of air Flowing Inside the Tube • Using the Orsat Apparatus to Analyze the Products of Combustion Gases Products
References
• Sawhney, A. K., A Course in Mechanical Measurements and Instrumentation, Dhanpat and Sons, Delhi, 1989. • Doebelin, Erest O., Measurement Systems Applications and Design, McGraw Hill, 1990. • Holman, J. P., Experimental Methods for Engineers, McGraw Hill, 1999.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	10%	20%	40%

MIM21٦	Engineering Economy		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Origins of engineering economy, Principles of engineering economy, Design and manufacturing processes and EE, Cost estimation and cost terminology, Accounting, Balance sheet, Profit loss statement, Concept of equivalence, Money time relationships, Simple and compound interest rates, Single amounts and uniform series, Increasing and decreasing gradient, Application of money, Time relationships, Present value, Internal rate of return, External rate of return, Payback period, Evaluation of alternatives for different useful life and study period, Depreciation methods, Replacement analysis, Determination of the economic life of challenger and defender, Engineering economy techniques for evaluation of public projects.
Laboratory

References
• 'Engineering Economy' – 7th Edition Authors: Leland T. Blank & Anthony J. Tarquin. McGraw-Hill - ISBN 0073376301 • 'Basics of Engineering Economy', Anthony J. Tarquin. McGraw-Hill – ISBN 978–0–07–340129–4 ISBN 0–07–340129–3 (hard copy : alk. paper) • 'Engineering Economy Analysis', Newman, Lavelle and Eschenbach, Engineering Press (8th edition).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM213	Sensors and Measurement Systems	2 CH
Prerequisites	Measurement and Instrumentation – MIM211	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	-	1
Required SWL		Equivalent ECTS
75		3

Course Content
Fundamentals of sensors and measurement systems. Instrument types and performance Characteristics. Intelligent sensors. Sensor technologies. Temperature measurement. Pressure measurement. Flow measurement. Level measurement. Mass, force, and torque measurement. Translational motion, vibration, and shock Measurement. Rotational motion transducers.
Laboratory
• Temperature Sensor Calibration and Characterization • Pressure Sensor Performance Analysis • Proximity Sensor Testing and Optimization

- Optical Sensor Calibration and Alignment
- Accelerometer Calibration and Dynamic Response Analysis
- Strain Gauge Application and Measurement
- Force and Torque Sensor Calibration
- Data Acquisition and Signal Processing

Sensor Fusion for Robotics Applications

References

- A. S. Morris, R. Langari, Measurement and Instrumentation: Theory and Application, third edition, Elsevier Inc. (2021).
- Walter Lang, Sensors and Measurement Systems, River Publishers (2021).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM214	Electrical Power and Machines		3 CH
Prerequisites	Electrical and Electronic Circuits – CCE272		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Power system components: Generation, transmission, distribution, substations, DC Machines: Construction, operation, characteristics (motors and generators) Starting, speed control, applications, Transformers: Construction, operation, equivalent circuits, regulation, AC Machines: Three-phase induction motors: Construction, operation, types, characteristics, speed control, Special Machines: Stepper motors, brushless DC motors, servomotors, universal motor.

Laboratory

- Transformer Testing and Analysis
- Induction Motor Performance Testing
- Generator Operation and Synchronization
- Power System Protection and Relay Testing

References

- "Electric Machinery Fundamentals" by Stephen J. Chapman (2017)
- "Electrical Machines, Drives, and Power Systems" by Theodore Wildi and Muhammad H. Rashid (2013)
- "Electric Machinery and Transformers" by Bhag S. Guru and Huseyin R. Hiziroglu (2001)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM311	Power Electronics and Motor Drives		3 CH
Prerequisites	Electrical Power and Machines – MIM214		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to power electronics, devices and circuits. Rectifier circuits. AC Voltage controllers & AC static switches. DC to DC Converters. PWM inverters. DC motor Drives. AC motor Drives.

Laboratory

- DC-DC Converter Design and Analysis
- Inverter Control and PWM Techniques
- Motor Drive Performance Testing
- Power Semiconductor Devices Characterization

References

- "Power Electronics: Converters, Applications, and Design" by Ned Mohan, Tore M. Undeland, and William P. Robbins (2003)
- "Power Electronics Handbook: Devices, Circuits, and Applications" by Muhammad H. Rashid (2018)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM411	Industrial Project Management		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Definitions used in project management, The project life cycle, Project stages, Relationships and responsibilities of the different project parties, The Art and Science of Project Leadership. Building Team Culture and Personal Authority. Foundation principles of project management. Agile and waterfall development process. Project productivity, Quality management.

Laboratory			
References			
• Eric Verzuh - The Fast Forward MBA in Project Management, Wiley (2021) • Project Management Institute - A Guide to the Project Management Body of Knowledge (PMBOK (R) Guide) (PMBOK® Guide)-Project Management Institute (2021).			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM412	Maintenance Planning and Scheduling		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	
Course Content			
Introduction and concepts in maintenance management, Maintenance organization, Types of maintenances: preventive, predictive, programed, emergency, repair, etc. Maintenance planning and scheduling, spare parts management, and control. Total Productive Maintenance (TPM), maintenance information system, maintenance cost, maintenance safety. Different approaches to evaluate Overall Equipment Effectiveness (OEE) and understanding Six Major Equipment Losses.			
Laboratory			
References			
• Nyman, D., & Levitt, J. (2001). Maintenance planning, scheduling, and coordination. Industrial Press Inc.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM221	Modeling and Simulation of Mechatronic Systems	3 CH
Prerequisites	Probability and statistics – BAS113	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content

Introduction to systems and their classifications, open loop and closed loop systems, Mathematical Modeling fundamentals of: mechanical systems including: mechanical vibration fundamentals such as: natural frequency, underdamping, overdamping, etc. Modeling using block diagrams or any other relevant method. Control systems analysis: plant and system responses in the time and frequency domains .Using software packages such as MATLAB. Industrial controllers (P, PI, PID etc.) and their corresponding specifications and effect on the system. The control system analysis tools and performance evaluation (e.g. steady state error, stability and performance indices). P, PI, and PID controller tuning using Zeigler-Nichols

Laboratory

- Introduction to Simulation Software: introduced to simulation software commonly used in mechatronic systems, such as MATLAB/Simulink, LabVIEW, or SolidWorks.
- Modeling Mechanical Systems:
- Modeling Electrical Systems
- Integration of Mechanical and Electrical Systems:

References

- "Modeling and Simulation of Mechatronic Systems: With Applications" by Annalisa Milella Donato Di Paola, and Grazia Cicirelli (2019).
- "Mechatronics: Principles and Applications" by Godfrey Onwubolu (2018).
- "Modeling and Simulation of Mechatronic Systems using Simscape" by Nassim Khaled (2017).
- "Mechatronics: A Foundation Course" by Clarence W. de Silva (2016).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM321	Introduction to Industrial Automation		3 CH
Prerequisites	Digital Logic and Microcontrollers – CCE273		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Definition and scope of industrial automation - Historical evolution of automation - Sensors and actuators - Control systems - Types of automation (fixed, programmable, flexible, integrated)- Supervisory Control and Data Acquisition (SCADA) - Distributed Control Systems (DCS) - Introduction Programmable Logic Controllers (PLC) - Industrial IoT (IIoT) and Smart Factories - Basics of Motion Control Systems.

Laboratory

- PLC Programming Basics
- Sensor Integration and Data Acquisition
- HMI (Human-Machine Interface) Design
- PLC Networking and Communication
- Introduction to Industrial Robotics

References

- "Industrial Automation: Hands-On" by Frank Lamb (2013)
- "Introduction to Industrial Automation and Control" by R.K. Rajput (2017)
- "Industrial Automation and Robotics: An Introduction" by A.K. Gupta (2014)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM322	Design of Mechatronics Systems		3 CH
Prerequisites	Basics of Mechatronics – MIM111		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Mechatronic product development process, Product requirements and needs (customer and engineering requirements/specifications), design constraints, modular mechatronic systems and hierarchy. Mechatronics design methodology: traditional approaches, VDI 2206, V-model, nested Vmodel, simplified examples and case studies. Selections of mechanisms, actuators, sensors, and controllers, actuator and motor sizing. Essential tools for the mechatronics system design using the V-model: MATLAB/SIMULINK, LabVIEW, PROTEUS VSM, SOLIDWORKS, microcontrollers, etc. packages. Design and implementation of mechatronic systems via mini-projects

Laboratory

- Demonstration and presentation of at least two mechatronic systems.
- Performing some experiments on some basic components.

Using an ADDA card to control two types of systems through a PC, based system.

References

- Bhasker, J., VHDL Primer, 3rd Ed., Person Education, 1999.
- Alciatore, D. G. and Histand, M.B., Introduction to Mechatronics and Measurement Systems, McGraw Hill, 2003.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	40%	-

MIM323	Industrial Robotics	3 CH
Prerequisites	Strength of Materials – BME241	

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	2

Required SWL	Equivalent ECTS
125	5

Course Content

Introduction to robotics: history of robotics, types of robotics (Serial, parallel, walking, bipedal, etc.), robotics applications, Transformation. Kinematics analysis: generalized coordinates, rotation representations, Euler angles, rotation matrix, homogeneous transformation matrix, Denavit Hartenberg rules, forward and inverse kinematics, Jacobian matrix, singularities. Trajectory planning: trajectory generation problem, joint and Cartesian planning, cubic polynomial, higher order polynomials. Dynamics analysis: joint space dynamics, Newton-Euler algorithm, inertia tensor, Lagrange equations, inverse and forward dynamics. Control: computed torque techniques, joint space control, PD control stability, trajectory tracking.

Laboratory

Industrial Robotics 1st Edition by Harry Colestock (Author)
References
• Ulrich Nehmzow, Mobile Robotics: A Practical Introduction, Springer Verlag, 1999. • Murphy, Robin R., Introduction to Al Robotics, MIT Press, 2000. • Jadran Lenarcic and Federico Thomas, Advances in Robot Kinematics: Theory and Applications, Kluwer Academic Publishers, 2002.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	20%	40%

MIM324	Hydraulics and Pneumatics Control	3 CH
Prerequisites	-	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	1
Required SWL		Equivalent ECTS
125		5

Course Content
Physical principles and fundamentals of fluidic control systems, applications of pneumatic and hydraulic systems. Hydraulic control system components: power units, reservoirs, filters, piping and hoses, accumulators, pumps (positive versus non-positive displacement pumps, vane pumps, gear pumps, variable displacement pumps, piston pumps, swashplate pumps, pump control systems), valves, actuators (motors and cylinders), hydraulic and electrohydraulic circuits design, interfacing and control. Case studies from industry, heavy and earthmoving equipment. Pneumatic systems: service unit, compressors (piston, screw, rotary), filters, air dryers, lubricators, pressure regulation valves, control valves, etc., electro-pneumatic circuits design and control using sequential approaches.
Laboratory
• Basic Hydraulic System Setup such as pumps, cylinders, valves, and reservoirs, and learn how to connect them using hydraulic hoses and fittings. • Pneumatic Control Circuits: different types of pneumatic circuits, such as single-acting and double-acting cylinders • Hydraulic and Pneumatic Actuators: various types of hydraulic and pneumatic actuators, such as hydraulic cylinders, hydraulic motors, pneumatic cylinders, and rotary actuators. • Fluid Power Control with PLCs • Troubleshooting and Maintenance
References
• Anthony Esposito, Fluid Power with Applications, Prentice Hall, 2003.
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	20%	40%

MIM325	Intelligent Mechatronic Control		3 CH
Prerequisites	Modeling and Simulation of Mechatronic Systems – MIM221		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Automatic control fundamentals, review on poles and zeros in the S-Plane, PID controller design and tuning techniques, design controllers using root locus, state space modelling: basics and Canonical forms (controllable and observable canonical forms), conversion from state space to transfer function and transfer function to state space, stability in state space form, state feedback controller design pole placement, observers, and observer design. Digital control and discrete systems: Introduction, digitization, analysis of discrete systems, Z-transform, pulse transfer function, stability in Z-domain, fundamentals of digital control systems design. Fuzzy logic control, neural network control in Mechatronic systems.

Laboratory

- Fuzzy Logic Control Implementation
- Neural Network-Based Control Design
- Reinforcement Learning for Mechatronic Systems
- Integrated Control of Mechatronic Systems

References

- K. Ogata, Modern Control Engineering, Pearson, 5th. Ed., 2009.
- El- Hawary, M., Control System Engineering, Prentice Hall, 1984.
- Franklin, G.F. and Ponell, D., Digital Control of Dynamic Systems, Addison Wesley, 1992.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM421	Cyber-Physical Systems		3 CH
Prerequisites	Introduction to Embedded Systems and Interfacing – CCE274		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Cyber Physical System Introduction, Sensors and Actuators for Physical Processes, System Modeling, Model based Design, and Timed-Automata, Real-time Scheduling with Resource-constrained Platform, Feedback Control for Computing Systems, Networked System Composition, Applications of Cyber-Physical Systems in robotics, medical devices, and smart manufacturing plants.

Laboratory

- Sensor Integration and Data Fusion
- Real-Time Embedded Systems Development
- Networked Control Systems Implementation
- System Integration and Testing:

References

- "Cyber-Physical Systems: A Computational Perspective" by Rajeev Alur and Luca Carloni (2016)
- "Cyber-Physical Systems: Foundations, Principles and Applications" edited by Houbing Song, Danda B. Rawat, Sabina Jeschke, and Christian Brecher (2016)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM422	Artificial Intelligence for Mechatronic Systems		3 CH
Prerequisites	Modeling and Simulation of Mechatronic Systems – MIM221		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to artificial intelligence (AI) and its applications in mechatronic engineering. Fundamentals of machine learning and deep learning. AI algorithms and techniques relevant to mechatronic systems, such as neural networks, genetic algorithms, and fuzzy logic. Integration of AI techniques with mechatronic systems for optimization, control, and decision-making. AI-based sensing and perception for autonomous mechatronic systems. AI-driven design and optimization of mechatronic components and systems. Case studies and real world applications of AI in mechatronic engineering, such as robotics, automation, and smart manufacturing. Ethical considerations and challenges in the deployment of AI in mechatronic systems.

Laboratory

- Machine Learning for Sensor Data Processing
- Reinforcement Learning for Robot Control
- Deep Learning for Image Processing in Robotics
- Natural Language Processing for Human-Robot Interaction

References

- Ahmad, Rizwan, et al. "Artificial intelligence applications in mechatronics." International Journal of Advanced Robotic Systems 15.4 (2018)
- Chang, Chia-Hung, et al. "Integration of artificial intelligence and mechatronics—A review." Sensors and Actuators A: Physical 259 (2017)

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM423	Industrial Communications and Networks Systems	2 CH
Prerequisites	-	

Number of Weekly Contact Hours

Lecture	Tutorial	Laboratory
2	1	1

Required SWL	Equivalent ECTS
75	3

Course Content

Introduction: signaling, data communication, protocols, layered architecture, network standards. Industrial network standards and protocols: EIA-232, EIA-485, DH-485 and industrial local area networks, industrial Ethernet, Power over Ethernet (PoE), fiber optics, Modbus, Modbus+, Modbus/TCP, HART, AS-I, Device Net, Controller Area Network (CAN) and CAN bus, Field Bus, Profibus, TCP/IP. ZigBee wireless sensor and control network: IEEE 802.15.4 protocol, addressing, routing, ZigBee RF4CE. Industrial network security: vulnerabilities, threat detection, risk assessment, monitoring and control, standards and regulations, securing industrial networks. Applications

Laboratory
• data communication • protocols • layered architecture • network standards
References
• Industrial Communication Technology Handbook" edited by Richard Zurawski (2005) • "Industrial Ethernet: A Pocket Guide" by John Rinaldi (2004) • "Industrial Communication Systems" by Jürgen Jasperneite, Peter Neumann, and Michael Weber (2011) Garold Oberlender

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM331	Industrial Automation	3 CH
Prerequisites	Introduction to Industrial Automation, MIM321	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content
Industrial Processes: Understanding different industrial processes - Applications of automation in various industries. Automation Components: Basic components (sensors, controllers, actuators) - PLC Architecture and Working Principle. Ladder Logic Programming Basics - PLC Inputs, Outputs, and Communication - Fieldbus Protocols (Modbus, Profibus, DeviceNet, etc.) - Industrial Ethernet (Profinet, EtherNet/IP) - Automation System Benefits.
Laboratory
• PLC Programming Basics • Sensor Integration and Data Acquisition • HMI (Human-Machine Interface) Design • PLC Networking and Communication Introduction to Industrial Robotics
References
• "Industrial Automation: Hands-On" by Frank Lamb (2013) • "Introduction to Industrial Automation and Control" by R.K. Rajput (2017) • "Industrial Automation and Robotics: An Introduction" by A.K. Gupta (2014)
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM431	Process Instrumentation and Control		3 CH
Prerequisites	Industrial Automation, MIM331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Instrumentation Basics: Types of sensors and transducers - Measurement principles (temperature, pressure, flow). Control Systems: Feedback and feedforward control - PID controllers - Tuning of control loops. Signal conditioning, signal transmission, process control, Process Instrumentation: Detailed study of instruments in industrial processes - Calibration and maintenance.

Laboratory

- Calibration and Testing of Instrumentation Devices
- PID Controller Tuning and Optimization
- PLC Programming for Process Control
- HMI Design and Visualization for Process Monitoring
- Safety Instrumented Systems (SIS) Implementation

References

- "Process Control: Modeling, Design, and Simulation" by B. Wayne Bequette (2003)
- "Process Dynamics and Control" by Dale E. Seborg, Duncan A. Mellichamp, Thomas F. Edgar, and Francis J. Doyle III (2010)

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM432	PLC and HMI (Human-Machine Interface)		3 CH
Prerequisites	Industrial Automation, MIM331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
PLC Fundamentals: Programming languages (Ladder Logic, Function Block Diagram) - Input and output modules. HMI Design: Principles of HMI design - Creating user-friendly interfaces. Integration: Connecting PLCs and HMIs - Hands-on programming exercises.
Laboratory
• Advanced PLC Programming Techniques • HMI Design and Development • PLC-HMI Integration and Communication: • Simulation and Testing of PLC-HMI Systems
References
• "Programmable Logic Controllers: Principles and Applications" by John W. Webb and Ronald A. Reis (2016) • "PLC Programming using RSLogix: Understanding Ladder Logic and the Studio Platform" by Gary Dunning (2017)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	20%	40%

MIM433	Automation Systems and Supervisory Control		3 CH
Prerequisites	Industrial Automation, MIM331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Overview of Automation Systems: Integrated automation solutions -Distributed control systems. Supervisory Control and Data Acquisition (SCADA): SCADA architecture and components - Real-time monitoring and control. Case Studies: Implementation of automation systems in industries - Troubleshooting and optimization.
Laboratory
References
• Dorrell, David, and Andrew Remenyte-Prescott. "Supervisory control and data acquisition (SCADA) systems: An overview of research trends and applications." (2019): • Cacace, Francesco, et al. "Cybersecurity challenges in supervisory control and data acquisition (SCADA) systems: (2020): 101733.
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM434	Quality Control		3 CH
Prerequisites	Industrial Automation, MIM331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction to Quality Control, Quality Management Systems, The elements of a quality management system, Quality planning,Statistical Process Control, Inspection and Testing, Corrective and Preventive Actions, Root cause analysis, Corrective action plans, Preventive action plans, Quality Tools and Techniques, Advanced Quality Control Topics, Six Sigma, Lean manufacturing, Total Quality Management (TQM), Quality function deployment (QFD)
Laboratory
• Measurement Systems Analysis (MSA) • Statistical Process Control (SPC) • Design of Experiments (DOE) • Six Sigma Methodology
References
• "Introduction to Statistical Quality Control" by Douglas C. Montgomery (2017) • "Total Quality Management: Key Concepts and Case Studies" by Subburaj Ramasamy (2018)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM341	Introduction to Automotive		3 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Ground vehicle types. Vehicle main structure. Engine: types, starting system, fuel supply system and ignition system. Clutch: dry friction, wet friction, hydraulic torque converter. Transmission: manual transmission, automatic transmission. Differential and final drive. Tires: construction and manufacturing methods. Wheels: Wheel alignments and angles. Braking systems: types, components, and actuation. Suspension systems: types, components, construction. Steering system: types, powered assisted systems. Introduction to automotive advanced technologies.

Laboratory

- Engine: types
- Starting system
- Fuel supply system
- Ignition system.
- Clutch

References

- Automotive Technology: Principles, Diagnosis, and Service" by James D. Halderman (2020)
- "Automotive Mechanics" by William H. Crouse and Donald L. Anglin (2015)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM441	Automotive Engines and Fuel Systems	3 CH
Prerequisites	Introduction to Automotive, MIM341	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content

Classification of internal combustion engines, Standard Otto and Diesel cycles, Actual working cycles, Standard air and fuel cycles. Combustion in spark ignition engines, Combustion periods, Ignition points, Flammability limits, Detonation, Flame propagation, Pressure rise, Combustion chambers. Combustion in compression ignition engine. Friction and lubrication, Lubrication system, Lubricating oil and additives properties, Oil consumption, Oil filters. Engine cooling. Objectives of fuel systems. Classification of fuel systems. Fuel requirement at different operating conditions. Spark ignition and compression ignition engines fuel calibration. Mechanical and Electronic injection systems of spark ignition and compression ignition engines. Procedures for testing of injection systems.

Laboratory

- Spark ignition and compression ignition
- Engines fuel calibration.
- Mechanical and Electronic injection systems of spark ignition and compression ignition engines. Procedures for testing of injection systems.

References

- "Automotive Technology: Principles, Diagnosis, and Service" by James D. Halderman (2020)
- "Automotive Mechanics" by William H. Crouse and Donald L. Anglin (2015)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM442	Automotive Mechatronic Systems	3 CH
Prerequisites	Introduction to Automotive, MIM341	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content

Introduction to Mechatronics, Sensors, transducers, and Actuators in automotive systems. Basics of Applied electronics in modern vehicles: signal condition of sensors, drive circuits of actuators. Automotive systems, smart chassis, X-By-Wire, etc. Electric drive vehicles. Autonomous vehicles and its infrastructure. Introduction to microcontrollers. (Project based lab).

Laboratory

- Engine Control Unit (ECU) Diagnostics
- Vehicle Dynamics Testing and Analysis
- Advanced Driver Assistance Systems (ADAS) Calibration
- Hybrid and Electric Vehicle (HEV/EV) Powertrain Testing
- Vehicle Communication Network Diagnosis

References

- "Automotive Mechatronics: Operational and Practical Issues" by B. T. Fijalkowski and Dawid Szynowski (2011)
- "Automotive Mechatronics: Automotive Networking, Driving Stability Systems, Electronics" by Konrad Reif (2015)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM443	Road Vehicle Dynamics		3 CH
Prerequisites	Introduction to Automotive, MIM341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Steering Systems: Steering mechanisms, equivalent steering gear ratio, design, Steering of dependent and independent suspension. Concepts of neutral, oversteer and understeer vehicles, vehicle directional stability. Vehicle comfort criteria: sources of vibration inputs. International standards limit of human response to in-vehicle vibrations.

Laboratory

- Vehicle Handling Characteristics Testing
- Braking Performance Testing
- Suspension System Analysis
- Tire Testing and Analysis
- Vehicle Dynamics Simulation

References

- "Vehicle Dynamics: Theory and Application" by Reza N. Jazar (2008)
- "Road Vehicle Dynamics: Fundamentals and Modeling" by Georg Rill and Wolfgang Wiedemann (2012)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM444	Design of Autonomous systems		3 CH
Prerequisites	Introduction to Automotive, MIM341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to autonomous systems: autonomous versus automatic systems, automated and autonomous human-centered technical systems, semi-autonomy, and autonomous behavior. Perception: multi-sensor fusion, localization, navigation and mapping, obstacle recognition and

detection. Planning and actuation: task decomposition, reactive behavior, preplanned knowledge and skill-based behavior. Knowledgebase: facts and procedures, acquisition, exploration, skill transfer, learning. Autonomous systems architecture: behavioral principles, expert systems, knowledge-bases, multi-level control concepts. Applications of autonomous systems.

Laboratory

- Autonomous Navigation and Path Planning
- Sensor Fusion and Perception
- Machine Learning for Autonomous Systems

References

- Beni, Gerardo, and Jing Wang. Swarm Intelligence in Autonomous Robotics. Springer, 2008.
- Thrun, Sebastian, Wolfram Burgard, and Dieter Fox. Probabilistic Robotics. MIT Press, 2005.
- LaValle, Steven M. Planning Algorithms. Cambridge University Press, 2006.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
20%	20%	20%	40%

MIM351	Advanced Machining Processes	3 CH
Prerequisites		

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content

Introduction, Different manufacturing Processes identifying, Common characteristics of traditional machining, Machining definitions and Characteristics, Working and Auxiliary Motions in Machine Tools, Concept of Speed, Feed, Depth of Cut, and Machining Time calculations, Element of Machining processes Types of cutting process, Lathe operations, Considerations for Machining Operations, Single Point cutting tool, Tool signature, Different types of cutting tools, Drilling operations, Drilling tool nomenclature, Milling operations, Grinding operations, Chip mechanism and types, Cutting tool Life, Boring, Trepanning, Reaming, Gear Manufacturing Operations, Broaching.

Laboratory

- Electrical Discharge Machining (EDM)
- Abrasive Jet Machining (AJM)
- Ultrasonic Machining (USM)
- Electrochemical Machining (ECM)

- Laser Machining and Additive Manufacturing

References

- "Advanced Machining Processes of Metallic Materials: Theory, Modelling and Applications" by Wit Grzesik (2008)
- "Advanced Machining Processes" by Hassan El-Hofy (2005)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM451	CNC operations		3 CH
Prerequisites	Advanced Machining Processes, MIM351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction, Understanding of machining process procedure, Differences between Machines with and without CNC system, Basics of Machining Operations, Working and Auxiliary Motions in Machine Tools, Types and Materials of Cutting Tools, Concepts of Speed, Feed, Depth of Cut, and Machining Time, Calculations and Selection of Machining Parameters, CNC Lathe Components Fillet Operation, Grooving Operation, Drilling Operation (Cycles), Combine Operations, ARTCAM, Powermill, , Fusion 360. Basics of Milling and Drilling Operations, Working and Auxiliary Motions in Machine Tools, Types and Materials of Cutting Tools (Cutters and Twist Drillers), Concepts of Speed, Feed, Depth of Cut, and Machining Time, Calculations and Selection of Machining Parameters, Milling operations: Rapid Motion, Motion with Feed, Plane Functions, Cutter Compensating, Circular Interpolation, Drilling canned cycle, Tapping

Laboratory

- CNC Programming Fundamentals
- CNC Machine Setup and Tooling
- Advanced CNC Machining Techniques
- CNC Machine Calibration and Maintenance
- CNC Machining Optimization and Process Improvement

References

- "CNC Machining Handbook: Building, Programming, and Implementation" by Alan Overby (2013)
- "CNC Programming Techniques: An Insider's Guide to Effective Methods and Applications" by Peter Smid (2019)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM452	Ceramics and Polymers		3 CH
Prerequisites	Advanced Machining Processes, MIM351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to the non-metal and non-polymer class of materials, including glass, Ceramics and binding materials. Principles of glasses: glassy status, structure, thermodynamics, examples of glass viscosity and brittleness, density and thermal strain, heat capacity and heat transfer, failure, dispersion and optic glasses, absorption, Ligandenfeld theory, coloration, ionic construction, electric conduction, dielectric loss, chemical resistance, corrosion, aging, dissolution, permeability, diffusion. Principles of ceramics: review on atomic structure characteristics. Principles of adhesive agents and construction materials: physical and chemical principles of multi material systems, Portland cements, other cements, calk, Testing and standardization, development of mineral, adhesive agents.

Laboratory

- Ceramic processing techniques such as powder compaction, sintering, and glazing.
- Prepare ceramic samples using various processing methods and characterize their properties using techniques such as X-ray diffraction (XRD), scanning electron microscopy (SEM), and mechanical testing.

References

- "Introduction to Ceramics" by W.D. Kingery, H.K. Bowen, and D.R. Uhlmann (1976)
- "Ceramic Materials: Science and Engineering" by C. Barry Carter and M. Grant Norton (2013)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM453	Additive Material Technology		3 CH
Prerequisites	Advanced Machining Processes, MIM351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

General overview, Definition of Additive Manufacturing, Additive Manufacturing Technologies for Metallic Materials: Feedstocks, processes, applications Metallurgical aspects for additive Additive manufacturing technologies for Polymers, Additive manufacturing Technologies for Ceramics, The Generic AM Process, CAD, Cura, The Generic AM Process, Automated Fabrication (Autofab), Freeform Fabrication or Solid Freeform Fabrication, Additive Manufacturing or Layer-Based, Rapid Prototyping, Stereolithography or 3D Printing, Computer-Aided Engineering/Technologies (CAX), Liquid Polymer Systems, Discrete Particle Systems, Molten Material Systems, Solid Sheet Systems, Heat Sources.

Laboratory

- Set up and calibrate additive manufacturing machines such as 3D printers
- Print Quality Assessment and Optimization
- Post-Processing Techniques for Additive Manufacturing Parts
- Advanced Additive Manufacturing Applications

References

- "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing" by Ian Gibson, David W. Rosen, and Brent Stucker (2014)
- "Additive Manufacturing: 3D Printing for Prototyping and Manufacturing" by Andreas Gebhardt (2016)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM454	Non-Traditional Machining		3 CH
Prerequisites	Advanced Machining Processes, MIM351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction, Different between traditional and nontraditional machining, Mechanical non-traditional machining: Ultra-sonic machining (USM), Water Jet Machining (WJM), Air Jet Machining (AJM) and Abrasive Water Jet Machining (AWJM), Chemical non-traditional machining: Chemical milling (CHM), Electrical non-traditional machining: Electro-chemical machining (ECM), Thermal non-traditional machining: Electrical Discharge Machining (EDM), Wire Electrical Discharge Machining (WEDM), Laser Beam Machining (LBM) and Plasma Beam Machining (PBM), Practicing on Lasre, and Plasma CNC machines.
Laboratory
• Electrochemical Machining (ECM) • Ultrasonic machining techniques for machining hard and brittle materials such as ceramics, glass, and advanced composites ultrasonic machining techniques for machining hard and brittle materials such as ceramics, glass, and advanced composites • Abrasive jet machining processes for precision material removal using high-velocity abrasive particles
References
• "Nontraditional Machining Processes: Research Advances" by J. Paulo Davim (2013) • "Non-Traditional Machining Handbook" by Arthur J. W. Brooks (2007)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM361	Advanced Robotics Analysis and Control		3 CH
Prerequisites	Industrial Robotics, MIM323		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Review on kinematics of open-kinematic chains and serial robots, Analysis of the robot workspace, kinematic analysis of: complex chain robots such as tree structure robots with fixed and float bases, closed-kinematic chains, parallel robots, Dynamic analysis of open-kinematic chains and serial robots, complex chain robots such as tree structure robots with fixed and float bases, closed-kinematic chains, parallel robots. Geometric calibration of robots, Motion, Compliant and force control in robotics
Laboratory

- Kinematic analysis of robotic manipulators using simulation software such as MATLAB or ROS
- Dynamic modeling and simulation of robotic systems to analyze their motion and control behavior
- Implementt various control algorithms for robot manipulators, such as PID control, computed torque control, and adaptive control.

References

- "Robot Modeling and Control" by Mark W. Spong, Seth Hutchinson, and M. Vidyasagar (2005)
- "Robotics: Modelling, Planning and Control" by Bruno Siciliano and Lorenzo Sciavicco (2009)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM461	Mobile Robotic Systems		3 CH
Prerequisites	Advanced Robotics Analysis and Control, MIM361		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to mobile robots, types, Principle of mobile robot locomotion and its types, Steering mechanisms. Types of mobile robots: ground robots (wheeled and legged robots), aerial robots, underwater robots and water surface robots. Kinematics of wheeled mobile robot, degree of freedom and bots. Dynamics of mobile robot, Computer based dynamic. Motion control of mobile robots: Motion controlling methods, kinematic control, dynamic control and cascaded control. Swarm robots, cooperative and collaborative robots, mobile manipulators, autonomous mobile robots. This course will include projects on mechanical Design of a mobile robot, integration of a mobile robot Robot design, Actuator sizing, system Modeling, and implementations

Laboratory

- Kinematics of wheeled mobile robot, degree of freedom and bots.
- Dynamics of mobile robot, Computer based dynamic.
- Motion control of mobile robots: Motion controlling methods, kinematic control, dynamic control and cascaded control. Swarm robots

References

- "Introduction to Autonomous Robots" by Nikolaus Correll, Bradley Hayes, and Gregory

Dudek (2019) • "Mobile Robotics: A Practical Introduction" by Ulrich Nehmzow (2012)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

MIM462	Human-Robot Interaction	3 CH
Prerequisites	Advanced Robotics Analysis and Control, MIM361	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	2
Required SWL		Equivalent ECTS
125		5

Course Content
Evolution of HRI, robot hardware (sensors (vision, audio, tactile sensors, etc.) and actuators, robot software (Software architecture, Software-implementation platform, Machine learning, and Computer vision), application of HRI such as collaborative robots, self-driving cars, remotely operated robots, service robots (cleaning robots, delivery robots, tour guide robots, receptionist robots, security robots, and robots for sales promotion), robots for learning, robots for entertainment (an adaptive personal space using adaptive neural fuzzy inference system or ANFIS), Modeling Human-Robot Interaction with GOMS technique (Goals, Operations, Methods, and Selection rules), Nonverbal Interaction, and facial expression recognition, Verbal Interaction (Automatic Speech Recognition (ASR)), Emotion, Behavioral Perception Architecture for Human-Robot Interaction, case study (Human-Robot Interface for end effectors)
Laboratory
• Robot hardware • Modeling Human-Robot
References
• "Human-Robot Interaction: An Introduction" by Kerstin Dautenhahn (2017) • "Human-Robot Interaction" edited by Cynthia Breazeal (2016)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM463	Perception and Learning for Robotics		3 CH
Prerequisites	Advanced Robotics Analysis and Control, MIM361		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Perception and Decision-Making in Robotics Overview, understanding of basic machine learning concepts, stochastic gradient descent for neural networks, reinforcement learning basics and fundamentals, Bayesian Filtering, deep Reinforcement learning, computer vision, Sensors and Sensor fusion, Kalman filters, localization, Pose Estimation, Learning based approaches to Depth and Motion Estimation. Using ROS to apply this course contents on Robotics

Laboratory

- basic machine learning
- gradient descent for neural networks

References

- "Probabilistic Robotics" by Sebastian Thrun, Wolfram Burgard, and Dieter Fox (2005)
- "Computer Vision: Algorithms and Applications" by Richard Szeliski (2010)

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM464	Selected Topics in Robotics and Artificial intelligence		3 CH
Prerequisites	Advanced Robotics Analysis and Control, MIM361		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Selected topics in recent directions and applications in Robotics and Artificial intelligence will be presented in this course

Laboratory

References			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM371	Business Analytics and Management		3 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to Business Analytics, business intelligence analytics, data analytics lifecycle. Real data-driven businesses, importance of analytics to business decision-making, types of analytics used to solve business problems. Relationship between project management and business analysis: Data handling, queries and reports to discover patterns and generate information associated with products, services and customers, business analytics uses data and models to explain the performance of a business and how it can be improved. This course discusses the benefits of employing analytics and a structured approach to problem-solving in management.

Laboratory

- data analytics lifecycle.
- Real data-driven businesses

References

- Business Analytics: Data Analysis & Decision Making" by S. Christian Albright, Wayne L. Winston, and Christopher J. Zappe (2020)
- "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett (2013)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM471	Supply Chain Management		3 CH
Prerequisites	Business Analytics and Management, MIM371		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Concept of value-driven supply chains; design and management of effective supply chains; emphasis on current practice and recent trends. Coordinating supply chain: sales & operations planning, bullwhip effect.
Laboratory
• current practice and recent trends
References
• Chopra, Sunil, and Peter Meindl. Supply Chain Management: Strategy, Planning, and Operation. Pearson, 2019. • Simchi-Levi, David, et al. Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies. McGraw-Hill Education, 2019.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM472	Decision making and governance		3 CH
Prerequisites	Business Analytics and Management, MIM371		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	١	
Required SWL		Equivalent ECTS	
125		5	

Course Content
The course entails an in-depth exploration of management control and performance measurement systems. It focuses on stages of the decision-making process, how to make decisions quickly within government/business institutions and governance of the decision-making process.
Laboratory
• Depth exploration of management control
References

- "Thinking, Fast and Slow" by Daniel Kahneman (2011)
- "Governance and Decision-Making: A Sociological Introduction" by Anne Petersen and Lars Bo Kaspersen (2013)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

MIM381	Capstone		1 CH
Prerequisites	Design of Mechatronics Systems – MIM322		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
0	1	1	
Required SWL		Equivalent ECTS	
50		2	

Course Content

In this course, students are required to form teams, tackle challenging practical or research problems, and develop effective solutions for them, in which they integrate what they have learned through the program. This course is aimed at cultivating the following skills: problem formulation and analysis, system design and implementation, planning, time management, teamwork, research, self-learning, oral communication, and technical writing. Project topics are encouraged to be linked to the community, interdisciplinary, or at the technology cutting edge.

References

Laboratory

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	-	50%	-

MIM481	MIM Graduation Project (1)		2 CH
Prerequisites	After completing 101 CH ,Capstone – MIM381		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	3	
Required SWL		Equivalent ECTS	
100		4	

Course Content			
This course represents the first part of the graduation project, where the students work in the graduation projects under the supervision of faculty members. The graduation project should be linked with the Mechatronics concentrations.			
References			
Laboratory			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	-	50%	-

MIM482	MIM Graduation Project (2)		3 CH
Prerequisites	MIM Graduation Project (1) – MIM481		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	4	
Required SWL		Equivalent ECTS	
125		5	

Course Content			
This course represents the first part of the graduation project, where the students work in the graduation projects under the supervision of faculty members. The graduation project should be linked with the Mechatronics concentrations.			
References			
Laboratory			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	-	50%	-

Courses offered by Basic Science Depratment Engineering in Mechatronics and Intelligent Machines Engineering

No.	Code	Course Name
1	BAS111	Mathematics (3)
2	BME211	Theory of Machines
3	BME241	Strength of Materials
4	BME321	Machine Elements Design
5	BME411	Machine Construction
6	BME311	Mechanical Vibrations
7	BME251	Thermodynamics (1)
8	BME26٢	Fluid Mechanics and Aerodynamics
9	BME351	Heat Transfer

BME211	Theory of Machines		3 CH
Prerequisites	Dynamics – BAS142		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Mechanisms: Definitions, open-chain and closed-chain systems, constraints, degrees of freedom, steering mechanisms, inversions of mechanisms. Kinematics of machines: position analysis, velocity analysis, acceleration analysis. Kinetics of machines: equilibrium of machines, D'Alembert's principle, force analysis, power analysis, inertia-effects and flywheel design. Synthesis of mechanisms. Cams: Types of cams, cam design, kinematics and kinetics of cam. Gears: Concept of gear motion, transmission, gear geometry and gear trains. Rotation matrix, homogeneous transformation matrix, direct and inverse kinematics

Laboratory

References

- "Theory of Machines" by R.S. Khurmi and J.K. Gupta
- "Theory of Machines and Mechanisms" by John J. Uicker, Gordon R. Pennock, and Joseph E. Shigley

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

BME241	Strength of Materials		2 CH
Prerequisites	Theory of Machines – BME211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content
Introduction, principles of mechanical properties, problems of engineering materials, testing types of mechanical properties, common methods of static and dynamic testing: tension, compression, bending, shear, hardness, impact, creep and fatigue. types of fracture, non-destructive testing of materials.
Laboratory
References
• "Mechanics of Materials" by Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, and David F. Mazurek (2020). • "Strength of Materials" by R.K. Bansal (2019). • "Mechanics of Materials" by James M. Gere and Barry J. Goodno (2018). • "Strength of Materials" by Timoshenko, S. P., and Gere, J. M. (2017).

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME321	Machine Elements Design		3 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction to Design Concepts, General Concepts of (Deflection, Buckling and Thermal Stresses), Design for Fatigue, Design of Machine Elements (Bolts, Power Screws, Rivets, Keys, Welded Joints, Springs), Design of Power Transmission Elements (Shafts, Couplings,

Gears, Belt Drives, Chain Drives), Selection of Bearings, Design of Pressure Cylinders. Use of interactive Finite Element computer programs for problem solving is illustrated and used.
Laboratory
References
• Shigley, M., Mechanical Engineering Design, McGraw Hill, 1997. • Orlov, P., Fundamentals of Machine Design, MIR Publisher, 1998. • Jain, R. K., Machine Design, Khanna Publishers, 1999.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

BME411	Machine Construction		3 CH
Prerequisites	Statics – BAS141		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	-	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Loading Diagrams, General concepts of Stress and Strain, Types of Stresses (Normal Stresses and Shear Stresses), Combined Stresses, Theories of Elastic Failure, and Safety Factor. Constructional details as affected by manufacturing, assembly, and strength considerations, Connections (Centering, Flanged, Riveted, Keyed, Splined, Screwed), Power Screw and its joints, Seals, Springs, Stress Concentrations, Reverse Engineering.
Laboratory
References
• Orlove, Fundamentals of Machine Design, MIR Publisher, 1977. • Shigly, Machine Design, McGraw Hill Co., 1999.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

Courses offered by Communication and Computer Engineering in Mechatronics and Intelligent Machines Engineering

No.	Code	Course Name
1	CCE171	Computing in Engineering
2	CCE272	Electrical and Electronic Circuits
3	CCE273	Digital Logic and Microcontrollers
4	CCE274	Introduction to Embedded Systems and Interfacing
٥	CCE371	Object-Oriented Computer Programming
٦	CCE472	Data Mining and Visualization
٧	CCE473	Database Management

CCE171	Computing in Engineering		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	-	
Required SWL		Equivalent ECTS	
100		4	

Course Content

The course covers numbering systems and its operations, computational thinking, problem solving, Abstraction, Problems Analysis, algorithms, flowcharts, Introduction to C++: elementary data types and related operations, type casting, variables, scope of variables, expressions syntax, semantics, assignment statements, input-output statements. Boolean expressions, relational operators, logical operators, Increment/Decrement Operators, operator precedence, control structures, repetition structures.

Laboratory

- The Problems Analysis, the problems solving, determine the input, the output and the processing of the problems.
- Design the algorithms and flowcharts for the problems.

The students should prepare a complete program design using C++ Programming Language.

References

- Peter Van-Roy, SeifHaridi, Concepts, techniques, and models of computer programming, MIT Press USA, 2004.
- Bjarne Stroustrup, the C++ Programming Language, Pearson Education, 4th Edition, 2013.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE272	Electrical and Electronic Circuits		3 CH
Prerequisites	Electricity and Megnetism – BAS122		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Electrical Circuits variables and elements, Simple resistive circuits, Analysis of electrical circuits, ohm's law, Kirchhoff's laws, series parallel equivalent, star delta transformation, source transformation, Network theorems: Mesh current method, Nodal voltage method, Thevenin's equivalent, Norton's equivalent, superposition principles. Sinusoidal steady state analysis, Phasor diagram representation, Applications of network theorems on alternating current circuits, Electric power in alternating current circuits, complex power calculations, power factor, circuits with nonlinear resistances voltage doubler, clipping, rectification, regulation. Transistor operation and models: analog amplifier, digital gates. Op- Amp model. Op-Amp applications: Inverting, non-inverting, buffer, adder, subtractor, integrator, differentiator, electronic analogue computation, I to V and V to I converters. Comparators. Schmitt trigger. Analog and Digital signals. A/D and D/A converters

Laboratory

- Ohm's Law and DC Circuits:
- AC Circuits:
- Passive Components:

Circuit Simulation and Design:

References

- "Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku, 2000
- "Electric Circuits" by James W. Nilsson and Susan Riedel
- "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CVE273	Digital Logic and Microcontrollers		2 CH
Prerequisites	Computing in Engineering – CCE171		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Introduction to digital systems and number representation. Combinational systems and sequential logic. Counter design and registers. Synchronous sequential design. Microprocessor applications, memory and I/O systems. Microcontrollers: features, architecture and programming model. Introduction to assembly language and microcontroller programming. Addressing modes, assembling and linking programs. Timer/counter programming. ADC, DAC, and sensor interfacing.
Laboratory
• Sequential Logic Circuits: covers sequential logic circuits, including flip-flops (e.g., D flip-flops, JK flip-flops) • Microcontroller Programming and Interfacing introduced to microcontrollers, such as Arduino or PIC microcontrollers, and learn how to program them using a high-level language like C or C++:
References
• "Digital Design: Principles and Practices" by John F. Wakerly (2017) • "Digital Electronics: Principles and Applications" by Roger L. Tokheim (2016) • "Digital Systems: Principles and Applications" by Ronald J. Tocci, Neal S. Widmer, and Greg Moss (2015)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE274	Introduction to Embedded Systems and Interfacing		3 CH
Prerequisites	Computing in Engineering – CCE171		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction: the importance of microcontrollers, the roles and functions of microcontrollers. Acquaintance with microcontrollers and their simulators and debuggers. Understanding different addressing modes. Programming, debugging, and simulating assembly language programs. Developing a prototype for an embedded system. Interrupts and serial, I/O. Memory Expansion. Microcontroller interfaces. Interfacing techniques. Interfacing requirements. A typical microcontroller system is utilized in this course with typical software-based applications. Interfacing with USB, I2C, SPI, CAN, LIN.
Laboratory
References
• Hintz, K. and Tabak, D., Microcontrollers: Architecture, Implementation and Programming, McGraw Hill, 1992. • Bhasker, J., VHDL Primer, 3rd Ed., Person Education, 1999. • Douglass, Bruce Powel, Real- Time Design Patterns: Robust Scalable Architecture for Real-Time Systems, Addison Wesley Professional: Book and CD- ROM Ed., 2002.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE371	Object-Oriented Computer Programming		2 CH
Prerequisites	Computing in Engineering – CCE171		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Structured and object-oriented programming paradigms. Classes, Objects, Methods, Interfaces, Polymorphism, Inheritance, Data hiding, Constructors, Destructors, Access specifiers, Operator overloading, Function overloading, Virtual functions, Friend functions, Abstract classes, Implementation of dynamic data structures, Template functions and classes, Graphical User Interface (GUI) programming, Graphics, Event-driven programming, Concurrency and multi-threaded programming.
Laboratory

- Using C++, write programs for classes then execute these programs to see the output.
- Using C++, write examples for overloading, data abstraction, information hiding.
- Encapsulation, inheritance, polymorphism.
- File processing, templates, exceptions, container classes.
- Mapping of UML design to C++ implementation and object-oriented considerations for software design.

References

- Robert Lafore, Object-Oriented Programming in C++, Fourth Edition, 2002.
- Brett D. McLaughlin, Gary Pollice, and Dave West, Head First Object-Oriented Analysis and Design, O'Reilly Medi, 1st Edition, 2006.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE471	Computer Vision in Mechatronic Systems		2 CH
Prerequisites	Design of Mechatronics Systems – MIM322		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	-	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content

Basics of image processing techniques and algorithms: image preprocessing, filters, image enhancement, edge detection, image segmentation. Basics of computer vision techniques: Lighting, optics, Camera model, Camera calibration and surface reconstruction, stereo camera system - transfer standards, correlation and stereo vision. Applications: interior surveillance, bar code scanning, object recognition, 3D scanning, 3D tracking.

Laboratory

- The analysis of the patterns in visual images with the view to understanding the objects

References

- Pedram Azad, TiloGockle, R. Dillmann, Computer Vision: Principles and Practice, Elektor Electronics Publishing, 2008.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	-	40%

CCE472	Data Mining and Visualization		3 CH
Prerequisites	Business Analytics and Management, MIM371		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduces Data Mining and Visualization topics in both theory and application. Data science topics include database and API connections, data preparation and manipulation, and data structures. Model fitting, tuning and prediction, end-to-end problem solving, feature engineering and feature selection, overfitting, generalization, classification, regression, dimensionality reduction and clustering. Covers software packages for statistical analysis, data visualization and machine learning. Introduces best practices related to source control, system architecture, cloud computing frameworks and modules, security, emerging financial technologies and software process.

Laboratory

- API connections, data preparation and manipulation
- Data structures. Model fitting, tuning and prediction, end-to-end problem solving,

References

- "Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei (2011)
- "Introduction to Data Mining" by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar (2005)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

CCE473	Database Management		3 CH
Prerequisites	Business Analytics and Management, MIM371		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduces databases, data analysis, and machine learning topics. Covers data modeling, relational databases, SQL queries, data mining, non-relational databases, and data warehouses. Introduces data analysis tools for visualization, regression, supervised and unsupervised techniques including principal component analysis and clustering. Term project includes implementation of data model, database, visualization and data analysis, Data Governance.
Laboratory
• , data analysis, and machine learning topics.
References
• "Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei (2011) • "Introduction to Data Mining" by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar (2005)

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

- **Competencies VS Courses Matrices for Mechatronics and Intelligent Machines Program**

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	D4a	D4b	D4c	D4e
-	University Elective (1)																						
-	University Elective (2)																						
-	University Elective (3)																						
-	University Elective (4)																						
NUB111	History of Engineering					■		■															
NUB112	Modern history of Egypt					■		■															
NUB113	History of Civilizations					■		■															
NUB114	Fundamentals of Engineering	■		■																			
NUB121	Report Writing and Communication Skills							■	■		■												
NUB122	Climate Change, Energy and Water Issues			■	■																		
NUB123	Scientific Thinking							■		■	■												
NUB131	Professional Legislations and Engineering Ethics				■				■		■												
NUB132	Literature and Arts							■	■	■													
NUB133	Human Rights							■	■		■												
NUB134	Professional Ethics				■				■		■												
NUB141	Building Safety and Fire Protection	■			■																		
NUB142	Entrepreneurship and Startups							■		■	■												
NUB143	Business Administration							■		■	■												
NUB144	Principle of General Management							■		■	■												
BAS111	Mathematics (1)	■																					
BAS112	Mathematics (2)	■																					
BAS113	Probability and Statistics		■																				
BAS121	Vibration and Waves	■																					
BAS122	Electricity and Magnetism	■																					
BAS131	Engineering Chemistry	■																					
BAS141	Statics		■																				
BAS142	Dynamics		■																				
BAS143	Engineering Drawing (1)								■	■													
TRN2x1	Field training (1)				■		■	■															
TRN3x1	Field Training (2)				■		■	■															
-	Engineering Economy and Project Management Elective																						
-	Structures and Properties of Materials Elective Courses																						
-	Engineering Technology Elective Courses																						
-	Spatial Perception and Design Elective Courses																						
MIM216	Engineering Economy	■			■						■		■	■									
MIM111	Basics of Mechatronics		■		■						■	■	■										
GME141	Production Engineering	■			■						■		■	■									

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	D4a	D4b	D4c	D4e
MIM112	Computer Aided Drawing				■				■		■	■	■										
CCE171	Computing in Engineering	■													■								
BAS211	Mathematics (3)	■	■																				
BME251	Thermodynamics (1)	■	■									■		■									
MIM211	Measurement and Instrumentation	■			■							■											
BME211	Theory of Machines	■	■									■											
BME262	Fluid Mechanics and Aerodynamics		■				■					■			■								
CCE272	Electrical and Electronic Circuits	■	■											■		■							
MIM213	Sensors and Measurement Systems				■	■								■									
CCE273	Digital Logic and Microcontrollers			■			■		■														
MIM221	Modeling and Simulation of Mechatronic Systems		■									■			■	■							
BME241	Strength of Materials											■	■					■					
CCE274	Introduction to Embedded Systems and Interfacing			■			■		■				■				■						
MIM214	Electrical Power and Machines		■				■																
MIM311	Power Electronics and Motor Drives		■				■																
BME351	Heat Transfer		■									■			■								
BME311	Mechanical Vibrations		■									■	■	■									
BME321	Machine Elements Design				■							■	■										
BME411	Machine Construction		■		■								■										
CCE471	Computer Vision in Mechatronic Systems			■			■		■														
MIM481	MIM Graduation Project (1)	■																					
MIM411	Industrial Project Management					■		■			■												
MIM412	Maintenance Planning and Scheduling	■										■	■	■	■		■						
CCE371	Object-Oriented Computer Programming	■											■					■					
MIM321	Introduction to Industrial Automation	■	■																■				
MIM322	Design of Mechatronics Systems		■	■		■						■	■			■	■	■					
MIM323	Industrial Robotics		■	■	■								■							■		■	
MIM324	Hydraulics and Pneumatics Control		■									■							■				
MIM325	Intelligent Mechatronic Control	■	■									■	■						■				
MIM381	Capstone	■																					
MIM421	Cyber-Physical Systems	■					■				■					■	■						
MIM422	Artificial Intelligence for Mechatronic Systems						■				■						■					■	
MIM423	Industrial Communications and Networks Systems			■										■		■	■	■		■			
MIM482	MIM Graduation Project (2)	■									■	■	■			■	■						
-	MIM Elective (1)																						
-	MIM Elective (2)																						
-	MIM Elective (3)																						
-	MIM Elective (4)																						

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	D4a	D4b	D4c	D4e
-	MIM Elective (5)																						
MIM331	Industrial Automation																■	■	■				
MIM431	Process Instrumentation and Control																		■				
MIM432	PLC and HMI (Human-Machine Interface)															■	■		■				
MIM433	Automation Systems and Supervisory Control															■	■		■				
MIM434	Quality Control															■	■	■	■				
MIM341	Introduction to Automotive															■	■			■			
MIM441	Automotive Engines and Fuel Systems																■			■			
MIM442	Automotive Mechatronic Systems															■		■		■			
MIM443	Road Vehicle Dynamics															■		■		■			
MIM444	Design of Autonomous Systems															■	■			■			
MIM351	Advanced Machining Processes																■	■			■		
MIM451	CNC Operations																■				■		
MIM452	Ceramics and Polymers															■	■				■		
MIM453	Additive Material Technology															■	■				■		
MIM454	Non-Traditional Machining															■	■				■		
MIM361	Advanced Robotics Analysis and Control																■	■				■	
MIM461	Mobile Robotic Systems															■		■				■	
MIM462	Human-Robot Interaction															■			■			■	
MIM463	Perception and Learning for Robotics															■			■			■	
MIM464	Selected Topics in Robotics and Artificial intelligence																■	■				■	
MIM371	Business Analytics and Management																■						■
CCE472	Data Mining and Visualization															■		■					■
CCE473	Database Management																■						■
MIM471	Supply Chain Management															■	■						■
MIM472	Decision making and governance															■							■

- **Targeted Sustainable Development Goals**

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
-	University Elective (1)																	
-	University Elective (2)																	
-	University Elective (3)																	
-	University Elective (4)																	
BAS111	Mathematics (1)				■					■								
BAS112	Mathematics (2)				■					■								
BAS113	Probability and Statistics				■					■								■
BAS121	Vibration and Waves				■			■		■								
BAS122	Electricity and Magnetism				■			■		■								
BAS131	Engineering Chemistry				■		■			■			■					
BAS141	Statics				■					■								
BAS142	Dynamics				■					■								
BAS143	Engineering Drawing (1)				■					■								
TRN2x1	Field training (1)				■				■	■								
TRN3x1	Field Training (2)				■				■	■								
-	Engineering Economy and Project Management Elective																	
-	Structures and Properties of Materials Elective Courses																	
-	Engineering Technology Elective Courses																	
-	Spatial Perception and Design Elective Courses																	
CCE171	Computing in Engineering				■				■									
BAS211	Mathematics (3)				■													
BME251	Thermodynamics (1)							■								■		
MIM211	Measurement and Instrumentation											■	■					
BME211	Theory of Machines								■	■								
BME26٢	Fluid Mechanics and Aerodynamics							■	■									
CCE272	Electrical and Electronic Circuits									■		■			■			
MIM213	Sensors and Measurement Systems											■			■			
CCE273	Digital Logic and Microcontrollers				■					■								
MIM221	Modeling and Simulation of Mechatronic Systems								■	■								■
BME241	Strength of Materials								■	■								
CCE274	Introduction to Embedded Systems and Interfacing				■								■					
MIM214	Electrical Power and Machines								■	■								
MIM311	Power Electronics and Motor Drives							■					■					
BME351	Heat Transfer							■								■		
BME311	Mechanical Vibrations								■	■							■	

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
BME321	Machine Elements Design				■				■	■								
BME411	Machine Construction				■				■	■			■					
CCE471	Computer Vision in Mechatronic Systems									■			■		■	■		
MIM481	MIM Graduation Project (1)				■	■					■							■
MIM411	Industrial Project Management				■				■		■							
MIM412	Maintenance Planning and Scheduling								■	■								
CCE371	Object-Oriented Computer Programming									■					■			
MIM321	Introduction to Industrial Automation								■	■								
MIM322	Design of Mechatronics Systems									■			■					
MIM323	Industrial Robotics								■	■		■						
MIM324	Hydraulics and Pneumatics Control									■			■					
MIM325	Intelligent Mechatronic Control								■			■						
MIM381	Capstone										■						■	■
MIM421	Cyber-Physical Systems				■	■			■	■							■	■
MIM422	Artificial Intelligence for Mechatronic Systems								■	■								
MIM423	Industrial Communications and Networks Systems				■					■						■		
MIM482	MIM Graduation Project (2)				■	■			■		■							■
-	MIM Elective (1)																	
-	MIM Elective (2)																	
-	MIM Elective (3)																	
-	MIM Elective (4)																	
-	MIM Elective (5)																	
MIM331	Industrial Automation								■	■		■	■					
MIM431	Process Instrumentation and Control									■			■					
MIM432	PLC and HMI (Human-Machine Interface)											■	■					
MIM433	Automation Systems and Supervisory Control								■	■		■	■					
MIM434	Quality Control						■	■	■	■		■	■					
MIM341	Introduction to Automotive							■		■						■		
MIM441	Automotive Engines and Fuel Systems							■					■					
MIM442	Automotive Mechatronic Systems								■	■								
MIM443	Road Vehicle Dynamics			■								■						
MIM444	Design of Autonomous Systems								■	■		■	■					
MIM351	Advanced Machining Processes								■	■								
MIM451	CNC Operations								■	■								
MIM452	Ceramics and Polymers							■	■					■				
MIM453	Additive Material Technology							■	■					■				
MIM454	Non-Traditional Machining								■	■		■						
MIM361	Advanced Robotics Analysis and Control								■	■						■		

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
MIM461	Mobile Robotic Systems								■	■		■	■			■		
MIM462	Human-Robot Interaction				■							■						
MIM463	Perception and Learning for Robotics				■				■			■						
MIM464	Selected Topics in Robotics and Artificial intelligence								■			■	■					
MIM371	Business Analytics and Management	■							■								■	■
CCE472	Data Mining and Visualization				■				■									■
CCE473	Database Management				■				■									
MIM471	Supply Chain Management								■	■								
MIM472	Decision making and governance								■	■		■	■					■

Program 5: Electrical Power and Renewable Energy Engineering Program (EPRE)

- ## Program Description

The Electrical Power and Renewable Energy Engineering Program (EPRE), is designed to qualify its graduates for both fundamental and modern trends in electrical power and renewable energy systems, design, operation and control. The program is structured in a hierarchical manner based on strong mathematical and physics background while moving gradually up to fundamental electrical engineering subjects. Then, reaching to the major specialty courses of power systems design, operation, installation, control, and economics. The program pays significant attention to renewable electrical energy resources as well as the smart grid operation and control with the objective of environmental conservation and economical aspects. The program adapts the updated approaches and methodology in teaching, learning activities and assessment with focus on achieving balance among academic background and professional skills of the graduates. Students in the program are centered of focus by implanting self-learning attitude, peer discussions, and courses embedded engineering skills. The assessment techniques are devised in a way to avoid passing the courses unless the student gets the required Competencies.

The Electrical Power and Renewable Energy Engineering Program is specialized in teaching all the courses related to Electrical Power and Renewable Energy Engineering, including courses for renewable energy systems, photovoltaic energy, solar energy, wind energy, energy transmission and distribution systems, energy systems analysis, generation and operation economics, power system protection, automatic control systems, electrical machines, power electronics, measurements and instrumentation, and graduation project. The Electrical Power and Renewable Energy Engineering Program is also specialized in research and specialized studies in the field of electrical power and renewable energy engineering. After completing the study of the courses mentioned in the list (144 credit hours) below, the students receive a bachelor's degree in electrical power and renewable energy engineering.

- ## Career Prospects

This program is an electrical program that covers different topics to serve future engineers to understand the electrical power and renewable energy sources, how they work, and how to use them in different applications. Electricity is the main reason for technological progress in all aspects of life. All factories, companies and institutions need operational and maintenance engineers. Energy engineers are responsible for operation, maintenance, control, and protection of electrical network, which consists of generation, transmission, and distribution. Energy engineers play an important role in running the factories that use electricity in manufacturing.

Also, Energy engineers play an important role in running the hospitals, touristic, educational, and administrative buildings is a sizable market for the graduates of the program in engineering contracting field. The renewable energy engineer also plays a key role in operating and maintaining renewable energy plants such as wind power plants and solar power plants, photovoltaic, solar thermal, hydro, fuel cell, energy storage systems and the modern related technologies spread throughout the world.

- ## Relation to Sustainable Development Goals

□ GOAL 1: No Poverty	□ GOAL 2: Zero Hunger	□ GOAL 3: Good Health & Well-being	☒ GOAL 4: Quality Education	□ GOAL 5: Gender Equality	☒ GOAL 6: Clean Water & Sanitation
☒ GOAL 7: Affordable & Clean Energy	□ GOAL 8: Decent Work & Economic Growth	☒ GOAL 9: Industry, Innovation & Infrastructure	□ GOAL 10: Reduced Inequality	☒ GOAL 11: Sustainable Cities & Communities	□ GOAL 12: Responsible Consumption & Production
☒ GOAL 13: Climate Action	□ GOAL 14: Life Below Water	□ GOAL 15: Life on Land	□ GOAL 16: Peace & Justice Strong Institutions	□ GOAL 17: Partnerships to achieve the Goal	

- ## Program Concentrations

There are no specified concentrations in this Program.

- ## Program Competences

According to the National Academic Reference Standards (NARS-2018), the competences for Graduates from NHADA University and all Engineering Programs, graduate must be able to (A-Level):

A1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A2. Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A3. Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
A5. Practice research techniques and methods of investigation as an inherent part of learning.
A6. Plan supervises and monitors implementation of engineering projects.
A7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
A8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
A9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies

In addition to the competences for all Engineering Programs (A-Level), the competences for the Basic Electrical Engineering Programs, Graduate must be able to (B-Level):

B1. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of: generation, transmission and distribution of electrical power systems.
B2. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.
B3. Design and implement elements, modules, sub-systems or systems using technological and professional tools.
B4. Estimate and measure the performance of an electrical/electronic system and circuit under specific input excitation and evaluate its suitability for a specific application.
B5. Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

In addition to the competences for all Engineering Programs (A-Level), the competences for the Basic Electrical Engineering Programs (B-Level), the competences for the Electrical Power and Renewable Energy Engineering Program, graduate must be able to (D-Level):

D1. Identify, analyze and evaluate the energy's conversion processes and management techniques.
D2. Analyze the performance of electric power and renewable energy generation, control and distribution systems.
D3. Design of electrical power and renewable energy systems using appropriate materials via both traditional and computer-aided tools.
D4. Test and evaluate the performance and suitability of electrical power and renewable energy systems.

D5. Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer-controlled systems.

D6. Apply modern techniques, skills and engineering tools to electrical power and renewable energy engineering systems.

- ## Graduate Attributes

The graduates of the Electrical Power and Renewable Energy Engineering program must be able to:

- Recognize his/her role in promoting the electrical power and renewable energy field and contribute to the envelopment of the profession and the community.
- Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
- Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
- Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
- Use techniques, skills and modern engineering tools necessary for engineering practice.
- Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies.
- Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
- Design of electrical power and renewable energy systems using appropriate materials via both traditional and computer-aided tools.
- Identify, analysis and evaluate the energy's conversion processes and management techniques.
- Distinguish the layout for Power generation stations and their related distribution network.

- ## Required Courses

- ## List of Electrical Power and Renewable Energy Engineering Program

Course Title	Weight			Contact Hours				%
	CH	ECTS	SWL	Lec	Tut	Lab	TT	
Nahda University Requirements	11	18	450	11	0	0	11	**8%**
Faculty of Engineering Requirements	33	64	1600	24	27	24	75	**23%**
Major Requirements of Electrical Power and Renewable Energy Engineering Program	60	100	2500	44	30	18	92	**42%**
Minor Requirements of Electrical Power and Renewable Energy Engineering Program	40	68	1700	25	15	25	65	**27%**
Total	**144**	**250**	**6250**	**104**	**72**	**67**	**243**	**100**

Major Requirements of Electrical Power and Renewable Energy Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
BAS213	Mathematics (4)	2	3	75	2	1	0	3	BAS211
BME251	Thermodynamics (1)	3	5	125	2	2	0	4	BAS131
BME261	Fluid and Aerodynamics	3	5	125	2	2	1	5	BAS142
BME351	Heat Transfer	3	5	125	2	0	2	4	BME251
CCE161	Computer Programming	2	4	100	2	0	1	3	
EPR161	Energy Resources and Renewable Energy	2	4	100	2	1	0	3	
CCE211	Electrical Circuits (1)	3	5	25	2	2	1	5	BAS122
EPR211	Electric and Magnetic Fields	2	3	75	2	1	0	3	BAS112, BAS122
EPR212	Energy Conversion	2	3	75	2	1	0	3	BAS122
EPR213	Electric Circuits (2)	3	5	125	2	2	1	5	CCE211
EPR214	Electrical and Electronic Measurements	3	5	125	2	1	2	5	CCE211
EPR221	Direct Current Machines and Transformers	3	5	125	2	2	1	5	EPR211, CCE211
EPR241	Fundamentals of Electronic Circuits	3	5	125	2	2	1	5	CCE211
EPR321	Alternating Current Machines	3	5	125	2	2	1	5	EPR221, CCE214
EPR331	Electrical Power Engineering	3	5	125	2	1	1	4	EPR211, CCE211
EPR341	Power Electronics (1)	3	5	125	2	2	1	5	EPR241, EPR213
EPR351	Modelling and Simulation of Engineering Systems	3	5	125	2	0	2	4	BAS213
EPR332	Economics of Generation, Transmission, and Operation	3	5	125	2	2	0	4	EPR331
EPR342	Power Electronics (2)	3	5	125	2	2	1	5	EPR341
EPR352	Automatic Control Systems	3	5	125	2	2	1	5	EPR351
EPR431	Power System Analysis	3	5	125	2	2	0	4	EPR331
Total		**60**	**100**	**2500**	**44**	**31**	**17**	**92**	

Minor Requirements of Electrical Power and Renewable Energy Engineering

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
EPR361	Fundamentals of Photovoltaics	3	5	125	2	1	2	5	EPR241
EPR362	Renewable Energy (1)	3	5	125	2	2	1	5	EPR161 ,BME261, BME351
EPR363	Renewable Energy (2)	3	6	150	2	2	1	5	EPR362, EPR3٦1
EPR491	Utilization and Management of Electrical Energy	3	5	125	2	2	0	4	EPR321
EPR433	High Voltage Engineering	3	4	100	2	0	2	4	EPR431
EPR434	Power System Protection	3	5	125	2	2	1	5	EPR214, EPR432
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
EPR455	Industrial Control and SCADA Systems	3	5	125	2	2	1	5	EPR352
EPR481	EPR Graduation Project (1)	3	5	125	1	0	5	6	101 CH
EPR482	EPR Graduation Project (2)	3	5	125	0	0	6	6	EPR481
-	EPR Elective (1)	3	5	125	2	1	2	5	
-	EPR Elective (2)	3	5	125	2	0	2	4	
-	EPR Elective (3)	2	4	100	2	1	0	3	
-	EPR Elective (4)	2	4	100	2	1	0	3	
Total		**40**	**68**	**1700**	**25**	**15**	**25**	**65**	

Elective Courses of Electrical Power and Renewable Energy Engineering is distributed in five electives

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Elective 1 Select 2 Credit hrs. (one course)									
EPR461	Storage Energy Technologies	3	5	125	2	1	2	5	EPR342, EPR362
EPR462	Ocean Energy	3	5	125	2	2	0	4	BME261
EPR463	Biomass and waste Conversion Technology	3	5	125	2	1	2	5	BME351
EPR464	Renewable Energy Resources Interfacing	3	5	125	2	2	0	4	EPR342, EPR362
EPR465	Artificial Intelligence Applications in Renewable Energy Systems	3	5	125	2	1	2	5	EPR352, EPR363
EPR466	Selected Topics in Renewable Energy	3	5	125	2	1	2	5	
Elective 2 Select 2 Credit hrs. (one course)									
EPR421	Electric Drives	3	5	125	2	0	2	4	EPR342, EPR321
EPR432	Electrical Distribution Systems Installations	3	5	125	2	1	2	5	
EPR451	Digital Control Systems	3	5	125	2	2	0	4	EPR352
EPR452	Microcontroller Applications in Power Engineering	3	5	125	2	0	2	4	CCE251
EPR453	Computer Applications in Power Engineering	3	5	125	2	0	2	4	EPR431
EPR454	Selected Topics in Control Systems	3	5	125	2	2	0	4	
Elective 3 Select 2 Credit hrs. (one course)									
EPR435	Smart Grid	2	4	100	2	1	0	3	EPR431
EPR471	Energy Management Essentials	2	4	100	2	1	0	3	EPR214
EPR472	Renewable Energy and Buildings	2	4	100	2	1	0	3	EPR362
EPR473	Renewable Energy Management	2	4	100	2	1	0	3	EPR363
EPR474	Thermal Power Plants	2	4	100	2	1	0	3	BME351, BME261

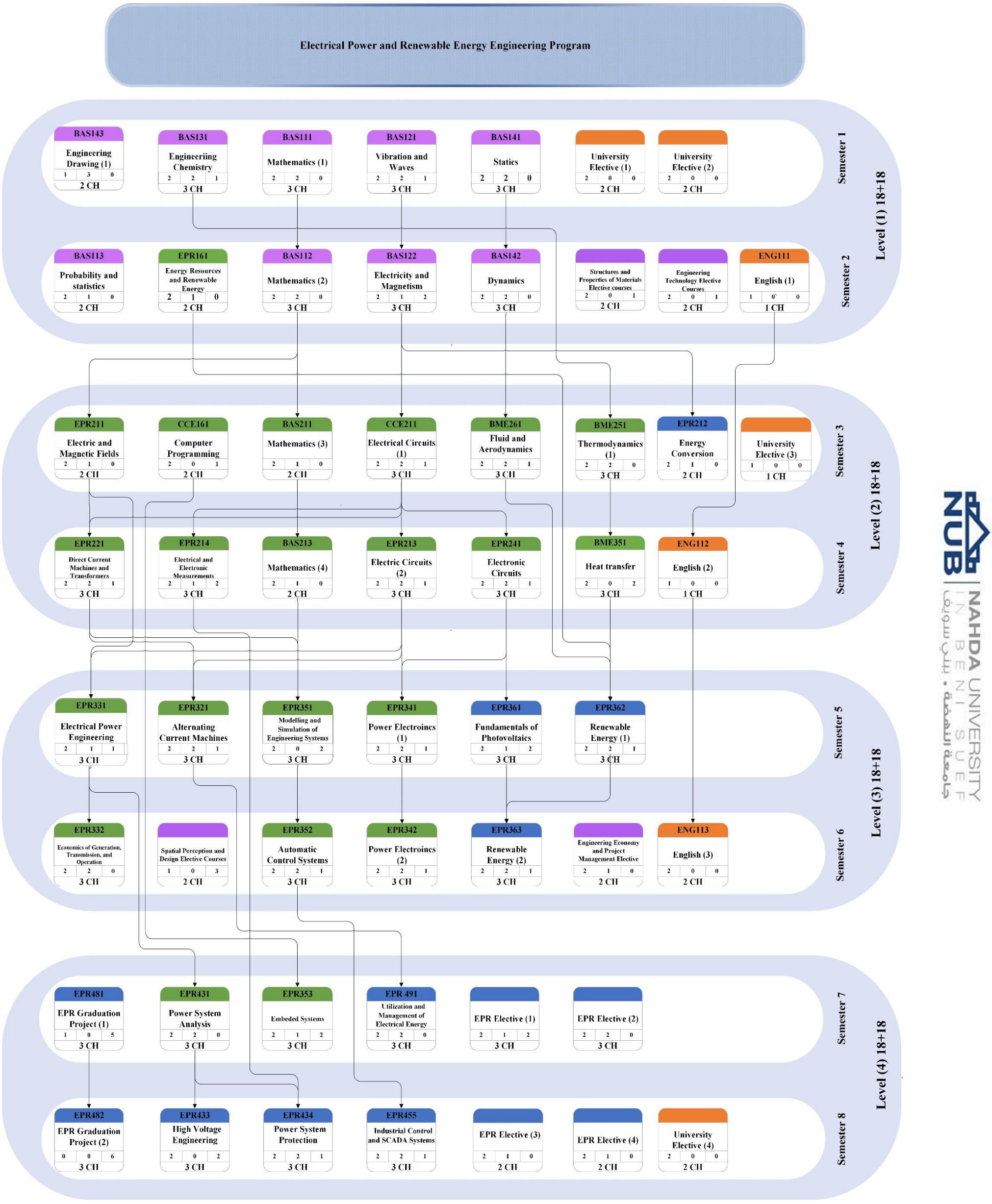
Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
EPR475	Selected Topics in Energy Management	2	4	100	2	1	0	3	
Elective 4 Select 2 Credit hrs. (one course)									
EPR353	Microprocessor-Based Automated Systems	2	4	100	2	0	1	3	CCE161
EPR436	Power Distribution Systems	2	4	100	2	0	1	3	EPR432
EPR492	Power Quality for Energy Applications	2	4	100	2	0	1	3	EPR331, EPR342
EPR493	Environmental Impact of Projects	2	4	100	2	0	1	3	
EPR494	Quality Systems and Assurance	2	4	100	2	0	1	3	BAS122
EPR495	Applications of Nanotechnology in Renewable Energy Systems	2	4	100	2	0	1	3	EPR331, EPR362, EPR363
EPR496	Selected Topics in Quality Control	2	4	100	2	0	1	3	

- **Proposed Study Plan**

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 1									
BAS111	Mathematics (1)	3	5	125	2	2	0	4	
BAS121	Vibration and Waves	3	5	125	2	2	1	5	
BAS141	Statics	3	5	125	2	2	0	4	
BAS131	Engineering Chemistry	3	5	125	2	2	1	5	
BAS143	Engineering Drawing (1)	2	4	100	1	3	0	4	
	University Elective (1)	2	3	75	2	0	0	2	
	University Elective (2)	2	3	75	2	0	0	2	
Total		**18**	**30**	**750**	**13**	**11**	**2**	**26**	
Semester 2									
BAS112	Mathematics (2)	3	5	125	2	2	0	4	BAS111
BAS113	Probability and Statistics	2	3	75	2	1	0	3	
BAS122	Electricity and Magnetism	3	5	125	2	1	2	5	BAS121
BAS142	Dynamics	3	5	125	2	2	0	4	BAS141
EPR161	Energy Resources and Renewable Energy	2	4	100	2	1	0	3	
	Engineering Technology Elective Courses	2	3	75	2	0	1	3	
	Structures and Properties of Materials Elective Courses	2	3	75	2	0	1	3	
ENG111	English (1)	1	2	50	1	0	0	1	
Total		**18**	**30**	**750**	**15**	**7**	**4**	**26**	
Semester 3									
BAS211	Mathematics (3)	2	3	75	2	1	0	3	BAS112
BME251	Thermodynamics (1)	3	5	125	2	2	0	4	BAS131
BME261	Fluid and Aerodynamics	3	5	125	2	2	1	5	BAS142
CCE161	Computer Programming	2	4	100	2	0	1	3	
CCE211	Electrical Circuits (1)	3	5	125	2	2	1	5	BAS122
EPR211	Electric and Magnetic Fields	2	3	75	2	1	0	3	BAS112, BAS122
EPR212	Energy Conversion	2	3	75	2	1	0	3	BAS122
	University Elective (3)	1	2	50	1	0	0	1	
Total		**18**	**30**	**750**	**15**	**8**	**4**	**27**	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 4									
BAS213	Mathematics (4)	2	3	75	2	1	0	3	BAS211
BME351	Heat Transfer	3	5	125	2	0	2	4	BME251
EPR213	Electric Circuits (2)	3	5	125	2	2	1	8	CCE211
EPR214	Electrical and Electronic Measurements	3	5	125	2	1	2	5	CCE211
EPR221	Direct Current Machines and Transformers	3	5	125	2	2	1	5	EPR211, CCE211
EPR241	Fundamentals of Electronic Circuits	3	5	125	2	2	1	5	CCE211
ENG112	English (2)	1	2	50	1	0	0	1	ENG111
Total		**18**	**30**	**750**	**13**	**8**	**7**	**28**	
Semester 5									
EPR321	Alternating Current Machines	3	5	125	2	2	1	5	EPR221 EPR213
EPR331	Electrical Power Engineering	3	5	125	2	1	1	4	EPR211 EPR213
EPR341	Power Electronics (1)	3	5	125	2	2	1	5	EPR241 EPR213
EPR351	Modelling and Simulation of Engineering Systems	3	5	125	2	0	2	4	BAS213
EPR361	Fundamentalsof Photovoltaics	3	5	125	2	1	2	5	EPR241
EPR362	Renewable Energy (1)	3	5	125	2	2	1	5	EPR161 BME261 BME351
Total		**18**	**30**	**750**	**12**	**8**	**8**	**28**	

Code	Course Title	Credits			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Semester 6									
EPR332	Economics of Generation, Transmission, and Operation	3	5	125	2	2	0	4	EPR331
EPR342	Power Electronics (2)	3	5	125	2	2	1	5	EPR341
EPR352	Automatic Control Systems	3	5	125	2	2	1	5	EPR351
EPR363	Renewable Energy (2)	3	5	125	2	2	1	5	EPR362 EPR361
	Engineering Economy and Project Management Elective	2	3	75	2	1	0	3	
	Spatial Perception and Design Elective Courses	2	3	75	1	0	3	4	
ENG113	English (3)	2	3	75	2	0	0	2	ENG112
Total		**18**	**30**	**750**	**13**	**9**	**6**	**28**	
Semester 7									
EPR431	Power System Analysis	3	5	125	2	2	0	4	EPR331
CCE482	Embedded Systems	3	5	125	2	1	2	5	CCE161
EPR481	EPR Graduation Project (1)	3	5	125	1	0	5	6	101 CH
EPR491	Utilization and Management of Electrical Energy	3	5	125	2	2	0	4	EPR321
	EPR Elective (1)	3	5	125	2	1	2	5	
	EPR Elective (2)	3	5	125	2	0	2	4	
Total		**18**	**30**	**750**	**11**	**6**	**11**	**28**	
Semester 8									
EPR433	High Voltage Engineering	3	4	100	2	0	2	4	EPR431
EPR434	Power System Protection	3	5	125	2	2	1	5	EPR214, EPR432
EPR455	Industrial Control and SCADA Systems	3	5	125	2	2	1	5	EPR352
EPR482	EPR Graduation Project (2)	3	5	125	0	0	6	6	EPR481
	EPR Elective (3)	2	4	100	2	1	0	3	
	EPR Elective (4)	2	4	100	2	1	0	3	
	University Elective (4)	2	3	75	2	0	0	2	
	Total	**18**	**30**	**750**	**12**	**6**	**10**	**28**	


Electrical Power and Renewable Energy Engineering Program
Level (1) 18+18
Semester 1
BAS143 Engineering Drawing (1) 1 3 0 2 CH
BAS131 Engineeriing Chemistry 2 2 1 3 CH
BAS111 Mathematics (1) 2 2 0 3 CH
BAS121 Vibration and Waves 2 2 1 3 CH
BAS141 Statics 2 2 0 3 CH
University Elective (1) 2 0 0 2 CH
University Elective (2) 2 0 0 2 CH
Semester 2
BAS113 Probability and statistics 2 1 0 2 CH
EPR161 Energy Resources and Renewable Energy 2 1 0 2 CH
BAS112 Mathematics (2) 2 2 0 3 CH
BAS122 Electricity and Magnetism 2 1 2 3 CH
BAS142 Dynamics 2 2 0 3 CH
Structures and Properties of Materials Elective courses 2 0 1 2 CH
Engineering Technology Elective Courses 2 0 1 2 CH
ENG111 English (1) 1 0` 0 1 CH
Level (2) 18+18
Semester 3
EPR211 Electric and Magnetic Fields 2 1 0 2 CH
CCE161 Computer Programming 2 0 1 2 CH
BAS211 Mathematics (3) 2 1 0 2 CH
CCE211 Electrical Circuits (1) 2 2 1 3 CH
BME261 Fluid and Aerodynamics 2 2 1 3 CH
BME251 Thermodynamics (1) 2 2 0 3 CH
EPR212 Energy Conversion 2 1 0 2 CH
University Elective (3) 1 0 0 1 CH
Semester 4
EPR221 Direct Current Machines and Transformers 2 2 1 3 CH
EPR214 Electrical and Electronic Measurements 2 1 2 3 CH
BAS213 Mathematics (4) 2 1 0 2 CH
EPR213 Electric Circuits (2) 2 2 1 3 CH
EPR241 Electronic Circuits 2 2 1 3 CH
BME351 Heat transfer 2 0 2 3 CH
ENG112 English (2) 1 0 0 1 CH
Level (3) 18+18
Semester 5
EPR331 Electrical Power Engineering 2 1 1 3 CH
EPR321 Alternating Current Machines 2 2 1 3 CH
EPR351 Modelling and Simulation of Engineering Systems 2 0 2 3 CH
EPR341 Power Electroincs (1) 2 2 1 3 CH
EPR361 Fundamentals of Photovoltaics 2 1 2 3 CH
EPR362 Renewable Energy (1) 2 2 1 3 CH
Semester 6
EPR332 Economics of Generation, Transmission, and Operation 2 2 0 3 CH
Spatial Perception and Design Elective Courses 1 0 3 2 CH
EPR352 Automatic Control Systems 2 2 1 3 CH
EPR342 Power Electroincs (2) 2 2 1 3 CH
EPR363 Renewable Energy (2) 2 2 1 3 CH
Engineering Economy and Project Management Elective 2 1 0 2 CH
ENG113 English (3) 2 0 0 2 CH
Level (4) 18+18
Semester 7
EPR481 EPR Graduation Project (1) 1 0 5 3 CH
EPR431 Power System Analysis 2 2 0 3 CH
EPR353 Embeded Systems 2 1 2 3 CH
EPR 491 Utilization and Management of Electrical Energy 2 2 0 3 CH
EPR Elective (1) 2 1 2 3 CH
EPR Elective (2) 2 2 0 3 CH
Semester 8
EPR482 EPR Graduation Project (2) 0 0 6 3 CH
EPR433 High Voltage Engineering 2 0 2 3 CH
EPR434 Power System Protection 2 2 1 3 CH
EPR455 Industrial Control and SCADA Systems 2 2 1 3 CH
EPR Elective (3) 2 1 0 2 CH
EPR Elective (4) 2 1 0 2 CH
University Elective (4) 2 0 0 2 CH
EPR
TRN 2x1 Field Training (1) 0 5 8 0CH
TRN 3x1 Field Training (2) 0 5 8 0 CH
- The maximum allowed study duration is 8 academic years
- Cumulative GPA at any main semester < 2.0
- 4 Weeks of Field
- Training can be Started at the end of level 2 (Sophomore level)
University Req. 11 CH
Program. Major Req 60 CH
Faculty Req. 33 CH
Program. Minor Req 40 CH
Course Code
Course Title
Lec Tut Lab
CH

- **Electrical Power and Renewable Energy Engineering Program Courses Content**

Courses offered by Electrical Power and Renewable Energy Engineering Program (EPRE)

EPR111	Materials of Electrical Science		2 CH
Prerequisites			
Number of weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	1	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Atoms and atomic structure of conducting materials, Materials Classification, Conductors, High/low - Resistive Materials, Semiconductors, Insulators, Magnetic Materials: B-H curve for different magnetic materials, magnetic losses, reduction of losses, Ferro-resonance, Study and Measurement of Electrical, Magnetic, and Optical Properties of Materials, Materials for Electronic Components, Materials used in electrical power and renewable energy systems and energy storage systems.
Laboratory
• Conductivity (σ) of insulators, semiconductors, and conductors' materials. • Mechanical characteristics of insulators, semiconductors, and conductors' materials. • Magnetic characteristics of materials: B-H curve for different magnetic materials. • Magnetic losses, reduction of losses, Ferro-resonance. • Materials used in electrical power and renewable energy systems and energy storage systems.
References
• S. O. Kasap, Principles of Electrical Engineering Materials, McGraw - Hill, 2000. • J. Dekker, Electrical Engineering Materials, Prentice Hall, 1970.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR161	Energy Resources and Renewable Energy		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	٠	
Required SWL		Equivalent ECTS	
100		4	

Course Content
Overview of energy use and related issues, Identifying all energy resources: thermal, chemical, nuclear, kinetic, gravitational field, magnetic field, electric field. Rank and classification of different energies. Regenerative energy resources: solar, wind, biomass, wave energy, geothermal. Energy transfer, conversion, transmission, and storage. Climate change and sustainability issues. Cautionary and safety measures.
References
• Chapman. Stephen J. 'Electric machinery fundamentals' © The McGraw-Hill Companies, 7th ed, ISBN 0--07246523, 2020. • Rolf E. Hummel Understanding material science Springer 2016. • Charles K. Alexander, Matthew N. O. Sadiku., 'Fundamentals of electric circuits', The McGraw-Hill Companies, 5th ed, TK454.A452, 2013. • William H. Hayt and John A. Buck Engineering Electromagnetic 8th Edition McGraw Hill 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR211	Electric and Magnetic Fields		2 CH
Prerequisites	Mathematics (2) - BAS112, Electricity and Magnetism - BAS122		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	١	٠	
Required SWL		Equivalent ECTS	
75		3	

Course Content
Vector analysis, Electrostatic Fields, Coulomb’s law, Electric field intensity, Electric flux, Gauss’s law, Divergence, Electric energy and potential, Electric conductors, Electrical resistance, Dielectric materials, Electrical capacitance, Poisson’s equation, Laplace’s equation. Steady magnetic fields, Static magnetic fields, Biot-Savart Law, Ampere’s law, Convolution theorem, Stokes Theorem, Magnetic field intensity, Magnetic forces and torques, Magnetic materials, Magnetic circuits, Inductance. Time varying magnetic fields, Maxwell’s equations.
References
• William H. Hayt, JR, Engineering Electromagnetics, McGraw Hill Pub. 9th Edition 2017. • Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford university press, 7th edition, 2017. • John D. Kraus, Electromagnetics, McGraw Hill Pub. 8th Edition 2010.
Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR212	Energy Conversion		2 CH
Prerequisites	Electricity and Magnetism – BAS122		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	١	٠	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Fundamentals of Energy conversion, Photovoltaic Energy Conversion, Energy Conversion in Fuel Cells, Fuel and Combustion, Thermoelectric Power Generation, Magneto Hydrodynamic Power Generation, Thermo Ionic Power Generation, Electro Ionic Power Generation, Electro Chemical Power Generation, Electromechanical Power Generation, Nuclear Power Generation, Illumination Engineering, Electric Traction Systems, Environmental Effects of Energy Resources.

References

- Chapman. Stephen J. 'Electric machinery fundamentals' © The McGraw-Hill Companies, 7th ed, ISBN 0--07246523, 2020.
- Rolf E. Hummel Understanding material science Springer 2016.
- Charles K. Alexander, Matthew N. O. Sadiku., 'Fundamentals of electric circuits', The McGraw-Hill Companies, 5th ed, TK454.A452, 2013.
- William H. Hayt and John A. Buck Engineering Electromagnetic 8th Edition McGraw Hill 2010.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR213	Electric Circuits (2)		3 CH
Prerequisites	Electrical Circuits (1) - CCE211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

AC power analysis, Three - phase Circuits, Magnetic circuits, Mutual Inductance, Resonance Circuits, Introduction to Frequency Selective Circuits, Laplace Transform in Electric Circuits, Transfer Function, Fourier Series in Electric Circuits, Fourier Transform in Electric Circuits, Two Port Networks, Circuit Analysis using PSPICE Software.

Laboratory

- Phase circuits.
- Using PSPICE SW: Transient analysis of AC circuits.
- Using PSPICE SW: Transfer function.
- Using PSPICE SW: Frequency response.

References

- J. David Irwin & R. Mark Nelms, Engineering Circuit Analysis, 11th Edition, John Wiley &Sons, 2019. ISBN: 9781118957509
- James W. Nilsson, Electric Circuits, 10th Edition, Pearson prentice Hall, 2018.
- F. P. Yatsko and D. M. Hata, Circuits: Principles, Harcourt Brace College Publishers, 1992

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40 %

EPR214	Electrical and Electronic Measurements		3 CH
Prerequisites	Electrical Circuits (1)-CCE211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Measurement errors, Accuracy, Reproducibility, Statistical analysis, Static Calibration, Resolution and Precision, Dynamic Response, Moving coil and iron instruments, Electro-dynamic instruments, Induction type instruments, Current and voltage measurement instruments, Measurement units and standards, Measurement of power, current, potential transformers, energy and charge, Measurements of frequency and power factor, Measurements of loading effect and nonelectrical parameters, Cathode Ray Oscilloscope applications, DC and AC bridges, Resistance and capacitance measurements, Locating of cable faults, Strain gauges, temperature, Displacement, velocity and acceleration transducers, Force and pressure transducers, Light transducers, Data converters, Voltage to frequency converters, Digital measurements devices: Digital AVO meters, Digital frequency meters, Measurement of Solar Radiation, Measurement of wind speed and direction.

Laboratory

- Errors in experimental data.
- Basic Statistical Sampling.
- Voltmeter Calibration using the Potentiometer.
- Oscilloscope operation and Measurements
- Function Generator.
- Measuring frequency and phase shift with the oscilloscope.
- Measurement of Radiation Solar
- Measurement of Speed & Direction Wind

References

- H S. Kalsi, Electronic Instrumentation and Measurements, 4th edition, McGraw Hill, March 25, 2019.
- G N Srinivas and S Narasimha, Electrical and Electronic Measurements and instrumentation, Jul 4, 2018.
- Gupta J.B, A Course in Electronic and Electrical Measurements and Instrumentation, S.K. Kataria and Sons, Delhi, 2012.
- A K Sawhney 2014, Electrical and Electronic Measurements and Instrumentation, Nineteenth Revised Edition 2011 Reprint 2014, Dhanpat Rai & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR221	Direct Current Machines and Transformers		3 CH
Prerequisites	Electrical Circuits (1)-CCE211, Electromagnetic Fields-EPR211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

DC Machines: the generation of EMF torque, construction of DC machine, the magnetic circuit of the DC machine, armature windings, armature reaction, methods of excitation, load characteristics of DC generators and motors, efficiency, testing of dc machines. Transformers: transformer construction, fundamental laws, equivalent circuits, transformer efficiency, transformer testing, transformer connections and harmonics, auto transformers and tap changers, parallel operation, transformer cooling.

Laboratory

- Characteristics of Separately - excited, Shunt and Compound DC Generators and Motors.
- Separation of Iron, Friction Losses, and Estimation of Parameters of DC Machines.
- Speed Control of DC Motors.
- Study of Excitation Phenomena in Single - Phase Transformers.

- Open Circuit and Short Circuit Tests of Single - Phase Transformers.
- Load Test and Parallel Operation of Single - Phase Transformers.
- Back - to - Back Testing of Single-Phase Transformers.

References

- Fitzgerald A. E., Kingsley C., Umans S. D. Electric Machinery McGraw-Hill Publishers, 7th edition, 2014.
- Sen P. C. Principles of Electric Machines and Power Electronics 3rd editions J. Wiley Publishers, 2014.
- Chapman S. J. Electric Machinery Fundamentals McGraw-Hill Publishers, 5th edition, 2011.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR321	Alternating Current Machines	3 CH
Prerequisites	Direct Current Machines and Transformers - EPR221, Electric Circuits (2) - EPR213	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Rotating fields of single and three phase machines. Synchronous machines: construction, fundamental laws, basic tests, synchronous motors, power formulae, stability and damper bars, synchronization of machines, transient performance. Permanent Magnet Synchronous Generators and Switched Reluctance Machine. Induction machines: construction, principles of operation, torque, slip characteristics, conditions, and methods of starting of three phase induction motor, speed control of three phase induction motor, induction generator, testing of three phase induction motor.

Laboratory

- Three-phase synchronous generator testing
- Synchronization of a three-phase machine to an infinite busbar
- Synchronous motors
- Power angle characteristic of synchronous generator
- Three-phase induction motor testing (1) & (2)
- Three-phase induction regulator
- The synchronous - induction motor

References

- Fitzgerald A. E., Kingsley C., Umans S. D. Electric Machinery McGraw-Hill Publishers, 7th edition, 2014.
- Sen P. C. Principles of Electric Machines and Power Electronics 3rd editions J. Wiley Publishers, 2014.
- Chapman S. J. Electric Machinery Fundamentals McGraw-Hill Publishers, 5th edition, 2011.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR421	Electric Drives	3 CH
Prerequisites	Alternating Current Machines - EPR321, Power Electronics (2) - EPR342	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	٠	2
Required SWL		Equivalent ECTS
125		5

Course Content

Elements of drive systems, requirements of drive systems, Criteria for selecting drive components, DC motor drives, regenerative braking and quadrant operation, Induction motor drives, slip power recovery, Doubly Fed Induction Machine drive, performance analysis of induction motor drives with variable voltage or current source and variable frequency supply and field-oriented control, synchronous motor drives, Permanent Magnet Synchronous Machine drive: Stepper motor drives. Basics of testing and maintaining major components of a drive system.

Laboratory

- 1-phase Half & Full Controlled Converter.
- Characteristics of 1-phase Cycloconverter.
- The construction of a three-phase induction motor with the help of a model.
- The starters of three phase induction motors.
- Tthe power modulator & control unit.
- To perform the Speed control of DC shunt Motor by Armature control. 7. To Start DC shunt motor by using three-point starter.
- To obtain the Speed control of DC shunt Motor by Field control.
- To study the detailed structure of wind power station.

References

- J. Pyrhonen, V. Hrabovcova, and R. S. Semken, Electrical Machine Drives Control: An Introduction, Wiley, 2016.
- M. H. Rashid, Power electronics: circuits, devices, and applications, Pearson Prentice Hall, 4th edition, 2014.
- Pimal K. Bose, Modern Power Electronics and AC Drives, Prentice Hall PTR, Inc. 2002.

- Rashid, M.H., Power Electronics, Circuits, Devices And Applications, Prentice Hall, 1995.
- Ramshaw, R. and Van Heeswijk, R.G., Energy Conversion, Sanders College Publishers, 1990.
- Bose, B.K., Power Electronics and AC Drives, Prentice Hall, 1986.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR331	Electrical Power Engineering		3 CH
Prerequisites	Electromagnetic Fields - EPR211, Electric Circuits (2) - EPR213		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to electric power system, power system components, applications of high voltage in electric power system, overhead transmission lines: parameter calculation, modeling, performance, and mechanical design, electric power distribution, underground cables, Determination of faults in underground cables, design of electrical distribution systems, earthing and safety, Introduction to power system planning. Introduction to high voltage DC transmission system.

Laboratory

- Overhead AC transmission Line Performance Characteristics.
- Electrolytic Tank Model for Assessment of Underground Cable Electric Fields.
- Balancing of Unbalanced Three - Phase Loads.
- Measurement of Earth Resistance.
- Monopolar, Homopolar and Bipolar DC Transmission Systems.

References

- High Voltage Engineering M.S. Naidu, and V. Kamaraju, 2018.
- Electric Power Transmission and Distribution P.J. Freeman 2016.
- Power System Analysis Hadi Saadat 2014.
- HVDC Transmission, S. Kamakshaiah& V. Kamaraju, Tata McGraw hill education

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR332	Economics of Generation, Transmission, and Operation		3 CH
Prerequisites	Electrical Power Engineering - EPR331		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	٠	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Load curves, Variation in demand, Load diversity. Power plant layout, Main equipment, Auxiliaries, Bus-bar arrangements. Power plant economics: Capital cost, Operating cost, Fixed charge rate, Selection of plant and size and unit size, Operation and economics of spinning reserve, economic analysis of a transmission system, tariffs, power factor, all-thermal generation allocation problem, hydro-thermal coordination, new energy resources. Transmission access fees assessment and calculations.

References

- Weber, C., Möst, D., & Fichtner, W. (2024). Economics of power systems: Fundamentals for sustainable energy transitions. Springer.
- Tanaka, M., Conejo, A. J., & Siddiqui, A. S. (2023). Economics of power systems. Springer.
- Kirschen, D. S., & Strbac, G. (2018). Fundamentals of power system economics. John Wiley & Sons.
- Berrie, T. W., Power System Economics, Peregrinus Publishers, 1998.
- Elgerd, O., Electric Energy System Theory: An Introduction, McGraw Hill, 1991.
- Glover, J. and Sarma, M., Power System Analysis and Design, PWS Publishers, 1987.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR333	AutoCAD Electrical Drawing		2 CH
Prerequisites	Engineering Drawing (1) - BAS143		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	٠	3	
Required SWL		Equivalent ECTS	
75		3	

Course Content

This course covers the indispensable core topics for working with the AutoCAD Electrical software and electrical terminology. In this course, you will learn how to use many of the powerful electrical drawing creation tools in the software. You will create schematic drawings (ladder logic

and point to point), panel drawings, and PLC-I/O circuits using automated commands for symbol insertion, component tagging, wire numbering, and drawing modification. In addition, you are introduced to methods of customizing electrical symbols, circuits, and databases. Other topics covered include title block linking, reporting tools, templates, and project files.

References

•Mastering AutoCAD 2019 and AutoCAD LT 2019. by George Omura (Author), Brian C. Benton (Author)
•Adobe Photoshop CC Classroom in a Book (2019 Release) by Andrew Faulkner (Author), Conrad Chavez (Author) Photographic Rendering with V-Ray for Sketchup by Brian Bradley,2014.
•Mastering AutoCAD 2019 and AutoCAD LT 2019. by George Omura (Author), Brian C. Benton (Author.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR431	Power System Analysis	3 CH
Prerequisites	Electrical Power Engineering - EPR331	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	٠
Required SWL		Equivalent ECTS
125		5

Course Content

Symmetrical components: Symmetrical components, Unsymmetrical faults on transmission lines. Synthesis of unsymmetrical phasor diagrams from their symmetrical components, The symmetrical components of unsymmetrical systems, Power in terms of symmetrical components, Positive, negative, and zero phase sequence networks, Unsymmetrical faults: Shunt faults, Series faults, Network matrices: Network topology, System admittance and system impedance matrices, Load flow solutions and control: Load flow equations, The Gauss-Seidel method, Newton-Raphson method and approximations, De-coupling methods, Regulating transformers.

References

- P.S.R. Murty, Power Systems Analysis Elsevier Science & Technology, ISBN: 9780081012345, 2nd Edition June 9, 2017
- John J. Grainger, William D. Stevenson Power Systems Analysis, McGraw-Hill Education, ISBN 9781259008351, 2016
- Hadi Saadat, Milwaukee School of Engineering, Power System Analysis, McGraw-Hill Companies, USA, 1999.
- Elgerd, O., Electric Energy System Theory: An Introduction, McGraw Hill, 1991.

- Gross, C.A., Power System Analysis, John Wiley, 1980.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR432	Electrical Distribution Systems Installations		3 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction of electric installation design, engineering drawings and documents, Wiring system, symbols, schematic diagram and work scope. Load estimation. Primary and Secondary distribution system configurations and design. Codes and standards of electrical installations. Power distribution in residential and public buildings, Illumination technologies installations, Installation of electrical components, Electrical hazards, Inspection and testing, Design of emergency and earthing systems, Voltage drop calculations, Short circuit calculations, Protection of distribution systems, LV switchgear: functions & selection.

Laboratory

- Illumination test
- AUTOCAD 2D Design Drawings (Lighting, Sockets, Power and light current systems)
- AUTOCAD 2D Shop Drawings (Lighting, Sockets, Power and light current systems)

References

- Rahmani-Andebili, M. (2023). Power System Analysis: Practice Problems, Methods, and Solutions. Springer Nature.
- Tleis, N. D. (2020). Power Systems Modelling and Fault Analysis: Theory and Practice. Elsevier.
- Gupta, B. R. (2019). Power System Analysis. S.K. Kataria and Sons.
- El-Hawary, M. E. (1995). Electrical Power Systems: Design and Analysis. IEEE Press.
- Stevenson, W. D., Elements of Power System Analysis- Third Edition, McGraw Hill, 1995.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR433	High Voltage Engineering		3 CH
Prerequisites	Power System Analysis - EPR431		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	٠	2	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Introduce Basic Components of High and Extra High voltage AC power System Components, Electrostatic Fields and their Effects on Human Beings. Breakdown in Gases, Liquids and Solids. Power Insulated Cables, Types, Sizing and Selectivity. Earthing Systems, Definition, Important, Types and Design Rules. Introduction to the Generation of High Voltages and Currents, Measurement of High Voltages and Currents. The Overvoltage Phenomenon and Insulation Coordination in Electric Power Systems. Non-Destructive Testing of Materials and Electrical Apparatus.

Laboratory

- Layout of High Voltage Lab.
- Measure Earth Resistance of High Voltage Lab and High-Tension Supply Pole.
- Study Breakdown of Air Using 100 KV AC Test set and Using Sphere to Sphere Gaps, Sphere to Plane Gap, Point to Plane Gap.
- Generation of HVDC with 140 KV, DC Set-Up.
- Generation and Measurements Positive and Negative Impulse Voltage Waveforms Using 280 KV, 2 Stages and 1.96 KJ Impulse Test Set.
- Generation of Switching Waves (Positive and Negative) With Two Stages, 280 KV Impulse Generator.
- 100 KVA Motorized Fully Automatic Insulating Oil Testing Machine.
- Measurements of Partial Discharge Using Test Set.

References

- Rizk, Farouk AM, and Giao N. Trinh. High voltage engineering. CRC Press, 2018.
- Naidu, Motukuru S. High voltage engineering. Tata McGraw-Hill Education, 2013.
- C. L WADHWA, "High Voltage Engineering," 2nd edition, 2007.
- Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering," 3rd edition, 2006.
- E. Kuffel and W.S. Zaengl, "High Voltage Engineering Fundamentals," 2nd edition, 2002.
- Mazen Abdel-Salam, Hussein Anis, Ahdab El-morshedy and Roshdy Radwan, "High Voltage Engineering, Theory and Practice," 2nd edition, 2000.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR434	Power System Protection		3 CH
Prerequisites	Power System Analysis - EPR431, Electrical and Electronic Measurements - EPR214		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Effects of Short-circuits on power systems. Basic elements of protection gear, Current and potential transformers, Protective relays, Electromechanical and static relays. Circuit breakers, Types, Construction, Performance, and ratings. Types of electromechanical relays, Differential protection of power systems, Protection of ring main systems, Protection of parallel feeders. Protection relaying philosophy. Transmission line protection, Compensating distance relaying. Rotating machinery protection: Relay protection for AC generators, Loss of field relay protection, Power transformer protection, Relay input sources.

Laboratory

- Study of electromechanical & numerical type IDMT over current relay
- Study of directional over current relay
- Study of earth fault relay
- Study of numerical type differential relay
- Study the application of numerical type over current relay for distribution feeder protection and synchrophasor assisted current differential relay for transmission/distribution line protection.
- Study of transmission line fault detection, classification and location estimation using distance relays by simulating different faults on the WSCC 9-bus test power system through PSCAD/EMTDC software or MATLAB/Simulink
- Study of Power Swing and its impact on distance relaying-based transmission line protection scheme through PSCAD/EMTDC software or MATLAB/Simulink

References

- Flurscheim, C. H., Power Circuit Breaker: Theory and Design, IEE Power Eng. Series, 2018.
- Horwitz, S. H. and Phadke, A. G., Power System Relaying, John Wiley, 2016.
- Rao. S. S, Switchgear & Protection, Khann Publishers, 2013
- Deshpande, M. V., Switchgear and Protection, Tata McGraw Hill Co., 1991.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR435	Smart Grid	2 CH
Prerequisites	Power System Analysis-EPR431	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
100		4

Course Content

This course will present and discuss fundamental principles, concepts, contexts, issues, applications and future developments of Smart grids and sustainable Energy Systems from the multidisciplinary perspectives. The course will provide a detailed analysis of technical and technology aspects of Sustainable Energy Systems and smart grids, including energy conversions, smart metering infrastructure, demand side management, electric vehicles, and transition from conventional to renewable energy resources in different sectors.

References

- A B M Shawkat Ali , “Smart Grids; Opportunities, Developments and Trends”

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR436	Power Distribution Systems	2 CH
Prerequisites	Electrical Distribution Systems Installations - EPR432	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	1	0
Required SWL		Equivalent ECTS
100		4

Course Content

Distribution systems- load characteristics- Power distribution planning- carrying capacity and short circuit calculations- Distribution Systems control- monitoring- Distribution systems economics - Distribution panels and feeding systems design.

References

- Mishra, M. K. (2023). Power Quality in Power Distribution Systems: Concepts and Application. CRC Press.
- Sallam, A. A., & Malik, O. P. (2020). Electric Distribution Systems. IEEE Press.
- Resener, M., Rebennack, S., Pardalos, P. M., & Haffner, S. (Eds.). (2020). Handbook of Optimization in Electric Power Distribution Systems. Springer International Publishing.

- Sivanagaraju, S., & Satish, G. (2015). Electric Power Transmission and Distribution. Pearson Education India.
- Pansini, A. J. (2005). Guide to Electrical Power Distribution Systems. CRC Press.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR241	Fundamentals of Electronic Circuits		3 CH
Prerequisites	Electrical Circuits (1) - CCE211		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

PN Junctions, Bipolar Junction Transistor (BJT), and Metal Oxide Semiconductor Field Effect Transistors (MOSFETs): construction and operation, I-V equation, biasing, circuit applications. Logic gates using CMOS. Operational Amplifiers (OP-AMPs): difference amplifier, OP-AMP specifications, frequency characteristics. OP- AMP applications: adder, subtractor, integrator, differentiator, electronic analogue computation, I to V and V to I converters, comparators, Schmitt trigger, OP-AMP oscillators. Sensors and transducers. Digital to Analog Converters (DACs) and Analog to Digital Converters (ADCs).

Laboratory

- Characterization of PN junction diodes and Zener diodes.
- Half wave and full wave rectifier circuits and peak detectors.
- AC and dc characterization of bipolar junction transistors.
- AC and dc characterization of Junction field effect transistors.
- AC and dc characterization of Metal oxide semiconductor field effect transistors.
- Characterization of logic gates.

References

- Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits, Oxford University Press, 7th Edition, 2014. (or 8th Edition, 2019).
- M. Morris Mano and Michael D. Ciletti, Digital Design, Pearson, 5th Ed., 2013.
- Donald A. Neamen., Microelectronics Circuit Analysis and Design, McGraw Hill, 2009.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR341	Power Electronics (1)	3 CH
Prerequisites	Fundamentals of Electronic Circuits -EPR241, Electric Circuits (2) -EPR213	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Introduction to power electronics, Power electronics devices: power diodes, thyristors, power transistors, Characteristics, Parallel and series operations, protection circuits, rectifier circuits, Line frequency converters: single-phase and three-phase circuits, Effect of source inductance, Dual converters, and introduction to HVDC transmission system. AC voltage controllers: single-phase AC thyristor controller, three-phase controller, static switches, and static tap changer.

Laboratory

- Characteristics of Thyristors and Triacs.
- Experimentation on Single - Phase Semi converters and Full Converters Feeding Resistive Loads.
- Experimentation on Three - Phase Semi converters and Full Converters Feeding Resistive Loads.
- Power Factor Improvement Using Extinction Angle, Symmetrical Angle and Pulse - Width - Modulation Control.
- Experimentation on Single - Phase and Three - Phase AC Switches.
- Phase and Integral - Cycle Control of Single-Phase Resistive Loads.
- Single Phase Controllers with Resistive and Inductive Loads.
- Three - Phase Half - Wave and Full - Wave Controllers with Resistive Loads.
- Experimentation on Step - Down and Step - Up Choppers with RL Loads.
- Experimentation on Single - Phase and Three - Phase Inverters.
- Characteristics of a DC Motor Fed by Phase - Controlled Rectifier Using SCR's.
- Characteristics and Speed Control of a DC Motor Fed by Bridge Rectifier.

References

- N. Mohan, T. M. Undeland, and W.P. Robbins Power Electronics: Converters, Applications and Design, John Wiley, 3rd edition, 2015.
- M. H. Rashid, Power electronics: circuits, devices, and applications, Pearson Prentice Hall, 4th edition, 2014.
- D. W. Hart, Power Electronics, McGraw-Hill International Edition, 2011

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR342	Power Electronics (2)		3 CH
Prerequisites	Power Electronics (1) - EPR341		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Dc to Dc Converters: buck, boost, buck-boost, Cuk DC/DC converters. Quadrants of operation of DC to DC converters. Inverters: half-bridge, full-bridge, single-phase and three- phase bridge inverters, PWM modulation techniques. Applications: uninterruptible power supply (UPS), induction heating. Interfacing of Solar energy, Wind energy with utility grid. Voltage Source Converters "VSC", Applications in AC and DC systems.

Laboratory

- Full wave-controlled rectifier circuits
- Half controlled three-phase controlled rectifiers
- Fully controlled three-phase controlled rectifiers
- D.C. choppers.

References

- N. Mohan, T. M. Undeland, and W.P. Robbins Power Electronics: Converters, Applications and Design, John Wiley, 3rd edition, 2015.
- M. H. Rashid, Power electronics: circuits, devices, and applications, Pearson Prentice Hall, 4th edition, 2014.
- D. W. Hart, Power Electronics, McGraw-Hill International Edition, 2011

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR351	Modelling and Simulation of Engineering Systems		٣ CH
Prerequisites	Mathematics (4) - BAS213		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction to control systems: open loop systems, closed loop systems, concepts and examples. block diagram algebra, transfer functions. modeling in state space; State - space representation of

scalar differential equation systems, State - space representation of transfer function systems. Mathematical modeling of linear dynamic systems; Modeling of Mechanical system, electrical system, Electromechanical system, Fluid system and Thermal system.

Laboratory

- Introduction to Matlab.
- Plotting response curves using Matlab.
- Transformation of mathematical models of dynamic systems using Matlab.
- Matlab representation of systems in block diagram form.
- Impulse response analysis of dynamic systems using Matlab.

References

- B. Kuo, F. Golnaraghi, Automatic Control Systems McGraw-Hill Education, 10th edition, 2017.
- K. Ogata, Modern Control Engineering Prentice Hall, 6th edition,2010.
- MATLAB control toolbox guide.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	20%	40%

EPR352	Automatic Control Systems		3 CH
Prerequisites	Modelling and Simulation of Engineering Systems - EPR351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Transient and steady state response analysis of continuous time feedback control systems; Routh's stability criterion; Error analysis of stable control systems; Effects of integral and derivative control actions; Control systems analysis and design by root locus method, Control systems analysis and design by frequency response method, Bode Diagrams, PID controllers, Lead, Lag, Lag - Lead compensation.

Laboratory

- Transient response analysis using Matlab.
- Root locus analysis and design using Matlab.
- Frequency response analysis and design using Matlab.
  - Position control system.
  - Speed control system.
  - Thermal control system.
  - Level control system.

- Pressure control system.

References

- B. Kuo, F. Golnaraghi, Automatic Control Systems McGraw-Hill Education, 10th edition, 2017.
- K. Ogata, Modern Control Engineering Prentice Hall, 6th edition,2010.
- MATLAB control toolbox guide.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR353	Microprocessor-Based Automated Systems		2 CH
Prerequisites	Computer Programming - CCE161		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	٠	1	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Numbering systems and Data representations. Basic principles of microprocessors and microcontrollers. Instruction set and microcontroller programming. Microcontroller peripherals: Digital I/O ports, Interrupts, Timer, EEPROM, Analogue ports. Signal conditioning circuits and Interfacing circuits with external devices such as seven segments, switches, and relays. Applications such as look up tables, alarming system, Pulse Width Modulation (PWM), speed control, temperature control.

Laboratory

- Peripheral Interface Adapter (PIA)
- Microprocessor/DAC interfacing and applications

References

- Ming-Bo Lin, “Principles and Applications of Microcomputers: 8051 Microcontroller Vol. I Assembly-Language Programming, CreateSpace Independent Publishing Platform,2016.
- Julio Sanchez, Maria P. Canton, “Microcontrollers: High performance systems and programming,” CRC press, Taylor & Francis group, NW, 2014.
- Tim Wilmshurst, “Designing Embedded Systems with PIC Microcontrollers, principles and applications,” Newnes, 2nd edition, 2009.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
٣٠%	٢٠%	١٠%	٤٠%

EPR451	Digital Control Systems		3 CH
Prerequisites	Automatic Control systems-EPR352		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	٠	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Z-Transform and pulse transfer function. Representation of a digital system using difference equations. The stability of a digital system. Designing a digital controller from a continuous controller. Implementation a digital filter. Representation of a system in digital state space. Design and tuning of a digital PID controller. Designing a digital controller using pole placement and polynomial equations. Simulation of a digital system. Robustness of a control design-Digital optimal control.

References

- Hemchandra M. S., Digital Control Applications Illustrated with MATLAB, 1st Edition, CRC Press, 2015
- M. Sami Fadali and Antonio Visioli, “Digital Control Engineering: Analysis and Design”, Academic Press (Elsevier) 2nd edition, 2013.
- Norman S. Nise, “Control Systems Engineering”, Chapter 13, John Wiley & Sons, 6th edition, 2011.
- Edited by William S. Levine, Control Systems Fundamentals, CRC Press Taylor & Francis Group, Section IV – Digital Control, 2011.
- Ioan D. Landau and Gianluca Zito, “Digital Control Systems: Design, identification, and Implementation”, Springer-Verlag 2006.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR452	Microcontroller Applications in Power Engineering		3 CH
Prerequisites	Computer Programming-CCE161		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Review of number systems. Introduction to microcontroller. Microcontroller architecture. Instruction set and microcontroller programming. Microcontroller peripherals: Digital I/O ports, Interrupts, Timers, Counters, Analogue ports, PWM channels, and comparators. I/O device interfacing with external devices. Some practical applications: speed control of a dc motor, light control, …. etc.

Laboratory

PART –A (At least 6 experiments are mandatory) Assembly Language Programming experiments using 8051 Trainer kit and Arduino.

- Data transfer/exchange between specified memory locations.
- Largest/smallest from a series.
- Sorting (Ascending/Descending) of data.
- Addition / subtraction / multiplication / division of 8/16 bit data.
- Sum of a series of 8 bit data and Multiplication by shift and add method.
- Square / cube / square root of 8 bit data.
- Matrix addition and LCM and HCF of two 8 bit numbers.
- Code conversion – Hex to Decimal/ASCII to Decimal and vice versa.

PART –B (At least 4 experiments are mandatory) Interfacing experiments using 8051 Trainer kit and interfacing modules.

- Time delay generation and relay interface.
- Display (LED/Seven segments/LCD) and keyboard interface.
- ADC interface and DAC interface with wave form generation.
- Stepper motor and DC motor interface.
- Realization of Boolean expression through port.

PART –C (At least 2 experiments are mandatory) Programming / interfacing experiments with IDE for 8051/PIC/MSP/Arduino/Raspberry Pi based interfacing boards/sensor modules (Direct downloading of the pre-written ALP/‘C’/Python programs can be used).

- Relay control
- Distance measurement.
- Temperature measurement / Digital Thermometer
- Txr-Rxr interface.
- Alphanumeric LCD display interface.
- Simple project work including multiple interfaces.

References

- Julio Sanchez, Maria P. Canton,” Microcontrollers: High performance systems and programming,” CRC press, Taylor & Francis group, NW, 2014.
- Tim Wilmshurst, “Designing Embedded Systems with PIC Microcontrollers, principles and applications, “Newnes, 2nd edition, 2009.
- Milan Verle, “PIC microcontrollers programming in C,”MikroElektronika, 2009.
- Nebojsa Matic, “PIC microcontrollers for beginners too,” on-line free:

http://www.mikroelektronika.co.yu/english/product/books/picbasicbook/00.htm.

- Microchip technology Inc. PIC16F8X data sheet.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR453	Computer Applications in Power Engineering		3 CH
Prerequisites	Power System Analysis-EPR431		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	0	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Introduction: Power system matrices, Input and transfer matrices, Admittance matrices of the bus bars, Impedance matrices, Circuits representation, Programming, Large system simulation and programming, Short circuit calculations, Power flow studies concepts and methods, Approximate and fast methods, Separation methods, Distribution factors, Transfer methods, Optimal performance, Generation control, Error analysis, simulation of power system components and stability analysis, Application of some computer packages.

Laboratory

The laboratory is well equipped to meet the requirements of undergraduate as well as graduate studies and research work. Practical demonstrations by lab experiments for power system generation, transmission, and distribution concepts. Students are familiarized with the use of digital computers in the different aspects of power system analysis by using different software programs such as ETAP, PTI, and PSCAD.

List of Software used in the Lab

- PTI Software
- PC network
- ETAP Software
- PTI Software
- PSCAD Software

References

- P.S.R. Murty Power Systems Analysis Elsevier Science Technology ISBN 9780081012345 2nd Edition June 9 2017.
- John J. Grainger William D. Stevenson Power Systems Analysis McGraw Hill Education ISBN 9781259008351 2016.

- Nazementz, John W.; Hammer Jr. William E. and Sadowski, Randa P., Computer Integrated Manufacturing Systems: Selected Readings, Industrial Engineering and Management Press, 1985.
- Eric Teicholz, CAD/CAM Handbook, McGraw Hill Book Co., 1985.
- Groover, Mikell P.; Emory, W. and Zimmers, Jr., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall Inc., 1984.
- Gross, C. A., Power Systems Analysis, John Wiley, 1979.
- Stagg, G. W. and El-Abiad, A. H., Computer Methods in Power Systems, McGraw Hill, 1968.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR454	Selected Topics in Control Systems		3 CH
Prerequisites	Determined according to course contents		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Selected Topics in Control Systems

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR455	Industrial Control and SCADA Systems		3 CH
Prerequisites	Automatic Control Systems-EPR352		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Industrial control, Detecting sensors and actuating elements, Relay logic and their applications, Programmable logic controllers (PLCs) and their types, Construction and hardware configuration and descriptions of PLCs, Programming and testing basic/advanced functions, Industrial applications using PLC, SCADA, Types of SCADA, Application of SCADA software, Different packages available with I/O structure, Features of SCADA software, Creating SCADA

application, Database of Tags and Editing graphic display with animation, Data Entry / Start Stop command, Analog entry.

Laboratory

- Lab (1): Identify detecting sensors and actuating elements using available elements in the Lab.
- Lab (2): Simulation of relay logic and their applications using SIEMENS software Package.
- Lab (3): Discussion with the student about PLCs and their types.
- Lab (4): Recognize the main components of PLC using SIEMENS students' kits inside the lab.
- Lab (5): Identify the construction and hardware configuration of PLC using SIEMENS students' kits inside the lab.
- Lab (6): Simulation of basic PLC functions and their applications using SIEMENS software Package.
- Lab (7): Simulation of PLC Timers functions and their applications using SIEMENS software Package and SIEMENS student kit.
- Lab (8): Simulation of PLC Counters functions and their applications using SIEMENS software Package and SIEMENS student kit.
- Lab (9): Simulation of PLC math operations functions and their applications using SIEMENS software Package.
- Lab (10): Simulation of PLC industrial project using SIEMENS software Package and Practical implementation of PLC industrial project using SIEMENS student kit.
- Lab (11): Creating database of tags for a new SCADA application.
- Lab (12): Creating and Editing graphic display with animation.
- Lab (13): Data entry and start stop command.

References

- Thomas, M.S. and McDonald, J.D., "Power system SCADA and smart grids", CRC press, 2017.
- Bolton W., "Programmable logic controllers", Newnes, 2015.
- McCrady, S.G., "Designing SCADA application software: a practical approach", Elsevier, 2013.
- Jack H., "Automating manufacturing systems with PLCs", Lulu. Com, 2010.
- Collins K., "PLC programming for industrial automation", Exposure, 2007.
- Boyer, S.A., "Supervisory control and data acquisition", Isa, 1999.
- Reis, R.A. and Webb John, W., "Programmable logic controllers: principles and applications", Prentice Hall, 1998.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR161	Energy Resources and Renewable Energy		2 CH
Prerequisites	-		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Overview of energy use and related issues, Identifying all energy resources: thermal, chemical, nuclear, kinetic, gravitational field, magnetic field, electric field. Rank and classification of different energies. Regenerative energy resources: solar, wind, biomass, wave energy, geothermal. Energy transfer, conversion, transmission, and storage. Climate change and sustainability issues. Cautionary and safety measures.

References

- Chapman. Stephen J. 'Electric machinery fundamentals' © The McGraw-Hill Companies, 7th ed, ISBN 0--07246523, 2020.
- Rolf E. Hummel Understanding material science Springer 2016.
- Charles K. Alexander, Matthew N. O. Sadiku., 'Fundamentals of electric circuits', The McGraw-Hill Companies, 5th ed, TK454.A452, 2013.
- William H. Hayt and John A. Buck Engineering Electromagnetic 8th Edition McGraw Hill 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR361	Fundamentals of Photovoltaics		3 CH
Prerequisites	Fundamentals of Electronic Circuits - EPR241		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	١	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Sunlight energy and radiation measurement, Principles of solar cell operation, structure, electrical and optical characteristics, equivalent circuit, Types of PV, Energy balance in stand-alone PV systems, the estimated cost and payback times for the various technologies, feed-in tariffs and other incentives, Standards, calibration and testing of PV modules, PV system monitoring. Safety

considerations in PV. Site assessment. System design. Maximizing efficiency. Social and environmental aspects of PV systems. Maintenance of PV systems.
References
• McMordie, R.K. ed., 2021. Solar Energy Fundamentals. Routledge. • Reinders, A., Verlinden, P., Van Sark, W. and Freundlich, A., 2017. Photovoltaic solar energy: from fundamentals to applications. John Wiley & Sons. • Mackay, M.E., 2015. Solar energy: An introduction. Oxford University Press, USA.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR362	Renewable Energy (1)		3 CH
Prerequisites	Energy Resources and Renewable Energy - EPR161, Fluid and Aerodynamics- BME261, Heat Transfer - BME351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	1	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Introduction to solar, wind, biodiesel, Biomass, Geothermal and, Hydrogen Energy. Power in the wind, Power extracted by turbine blades, Wind turbine power curve, Estimation of annual energy, Types of grid-connected wind turbines, Environmental impacts of wind turbines. Photovoltaic Systems: The solar resource, Estimation of irradiance and radiation, The Electric characteristics of solar cells, Types of solar cells, Modules and arrays, Mismatch in connected cells, islanded and Grid connected PV systems, Estimation of annual energy.
Laboratory
• Sun beam tracking. • Partial shading of solar panels. • Wind speed measuring and its statistical analysis. • Characteristic curve of a wind turbine. • Different features of a wind generator.
References
• Kalogirou, S.A., 2023. Solar energy engineering: processes and systems. Elsevier. • Letcher, T. ed., 2023. Wind energy engineering: a handbook for onshore and offshore wind turbines. Elsevier. • Goswami, D.Y., 2022. Principles of solar engineering. CRC press. • Wald, L., 2021. Fundamentals of solar radiation. CRC Press. • Burton, T.L., Jenkins, N., Bossanyi, E., Sharpe, D. and Graham, M., 2021. Wind energy

handbook. John Wiley & Sons.
- Okedu, K.E., Tahour, A. and Aissaoui, A.G. eds., 2020. Wind Solar Hybrid Renewable Energy System. BoD–Books on Demand.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR363	Renewable Energy (2)	3 CH
Prerequisites	Fundamentals of Photovoltaics-EPR361, Renewable Energy (1) - EPR362	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	2	1
Required SWL		Equivalent ECTS
125		5

Course Content

Definition of hydrogen energy, uses, recent applications. Definition of fuel cells and their types, electrical circuit. The working principle of electric vehicles: - Design - Analysis - Control - Calibration - Operating characteristics - Electric Vehicle charging - Smart charging - Engine basics - Types of electric motors - Engine operation - Four-wheel drive. Classification of geothermal resources, Basics of geothermal wells and drilling, resource capacity estimation and measurement. Applications of geothermal energy.

Laboratory

- Testing of Fuel cells
- Electrical characteristics and equivalent circuit of Fuel cells
- Testing of Batteries used for electric Vehicles.
- Testing of electric motors used for electric Vehicles.
- Control circuits for electric Vehicles.

References

- Renewable Energy, Combined Edition (Volumes 1, 2, and 3), Richard A. Dunlap, Dalhousie University, 2020.
- Renewable Energy Devices and Systems with Simulations in MATLAB® and ANSYS, Frede Blaabjerg and Dan M. Ionel, 2017

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR461	Storage Energy Technologies		3 CH
Prerequisites	Power Electronics (2) - EPR342, Renewable Energy (1) - EPR362		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Energy Storage Systems, Comparative Ratings and Properties, Electrochemical Energy Storage, Energy Storage by Means of Super-capacitors, Conventional Batteries and Flow Batteries, Superconducting Magnetic Energy Storage, Energy Storage Systems Based on Compressed Air, Hydropower and Pumped Storage Facilities, Flywheel Systems, Energy Storage Based on Hydrogen, System Arrangements and Applications (The Battery Management System (BMS)). Applications of Energy Storage Technology in the Power Generation. Introduction to Modeling of Several Types of Energy Storage Systems.

Laboratory

- Checking the battery voltage.
- Charging and discharging of batteries while detecting state of charge (SoC) and depth of discharge (DoD).
- Detecting the End of Charge (EoC).

References

- John Twidell and Tony Weir, Renewable Energy Resources, third edition, from Routledge, 2015.
- Zafirakis D., "Overview of energy storage technologies for renewable energy systems. In: Stand-alone and hybrid wind energy systems technology, energy storage and applications", Kaldellis JK, editor. Woodhead Publishing; 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR462	Ocean Energy		3 CH
Prerequisites	Fluid and Aerodynamics - BME261		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Water Renewable Energy Resources, Tidal Energy Principles and Relation to Wind, Classification of Tidal Energy Resources, Tidal Energy Utilization, Installation of Turbines for Tidal Energy, Turbines Performance Analysis with Tidal Energy, Energy Storage Techniques with Tidal Energy, Wave Energy Principles, and Utilization, Wave Energy Classification, Wave Energy Turbines, Water and Air Columns, Operation of Wave Energy Turbines, Performance of Wave Energy Turbines, Column Separation, Energy Storage Techniques, Wave Energy Utilization in Egypt, Case Studies.

References

- Renewable Energy by Godfrey Boyle, Oxford University Press, 2004
- John Twidell and Tony Weir, Renewable Energy Resources, third edition, from Routledge, 2015.
- Twidell, John & Weir, Tony (2006): «Renewable energy resources». Taylor & Francis. •Tushar K. Ghosh & Mark A. Prelas (2011): «Energy resources and systems. Volume 2: Renewable resources». Springer.
- Paul Breeze & Aldo Vieira (et all.) (2009): «Renewable energy focus handbook». Elsevier

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR463	Biomass and Waste Conversion Technology		3 CH
Prerequisites	Heat Transfer - BME351		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Characterization of Waste, Types of Biomass, Biomass Properties, Pre-Treatment of Biomass, Thermo-Chemical Processes, Fast and Slow Pyrolysis, Gasification, Transesterification, Design of Gasifiers, Drying and Devolatilization, Heat and Mass Transfer across Small and Large Biomass Particles, Combustion, Chemical Kinetics, Types of Reactors, Incinerators, Bio-Chemical Conversion, Anaerobic Digestion and Fermentation, Operation of Biomass Boilers and Stoves, Use of Bio-Fuels in Internal Combustion Engines and Gas Turbines, Emissions, Cost Considerations.

Laboratory

- Mass and Energy balance of gasification process
- Mass and Energy balance of transesterification process
- Mass and Energy balance of fermentation process
- Conversion from feedstock vegetable oils to biodiesel

- Properties of biogas, bioethanol and biodiesel.

References

- Rajeef Singh, Vishal Prasad, Barkha Vaish, Advances in Waste-to- Energy Technologies, CRC press, 2019.
- John Twidell and Tony Weir, Renewable Energy Resources, third edition, from Routledge, 2015.
- Grady, J.L., and Chen, G.J. Bioconversion of waste biomass to useful products. United States: N. p., 1998. Web.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR464	Renewable Energy Resources Interfacing		3CH
Prerequisites	Power Electronics (2) - EPR342, Renewable Energy (1) - EPR362		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Storage technologies: Supper Capacitors: structure, ratings, characteristics, use with the wind power plant, fuel cells, Superconducting magnetic energy storage (SMES): structure, operation, Batteries: types, characteristics and operation, charge and discharge, Flywheels energy storage. Interface technologies: Concept of Distributed Generation, Type of interface, Interconnection standards, static synchronous generators, control of active power and voltage regulation, Wind turbines and photovoltaic interface topologies.

References

- Roland Wengenmayr and Thomas Bührke, Renewable Energy: Sustainable Energy Concepts for the Future, Wiley-VCH, 2015.
- John Twidell and Tony Weir, Renewable Energy Resources, third edition, from Routledge, 2015.
- Gilbert M. Masters, Renewable and efficient electric power systems, John Wiley & sons Pub., USA, 2014. Thomas Ackermann, Wind Power in Power Systems, 2nd Edition, CRC Press Taylor & Francis Group, 2012.
- Zafirakis D., “Overview of energy storage technologies for renewable energy systems. In: Stand-alone and hybrid wind energy systems technology, energy storage and applications”, Kaldellis JK, editor. Woodhead Publishing; 2010.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR465	Artificial Intelligence Applications in Renewable Energy Systems		3 CH
Prerequisites	Automatic Control Systems - EPR352, Renewable Energy (2) - EPR363		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	١	٢	
Required SWL		Equivalent ECTS	
125		5	

Course Content

This course presents the application of machine learning and deep learning techniques for renewable energy system modeling, forecasting, and optimization for efficient system design. Also highlighted are intelligent data, renewable energy informatics systems based on supervisory control and data acquisition, and intelligent condition monitoring of Renewable systems. Provides both experimental and real datasets with great potential in the Renewable energy sector, which apply AI algorithms to obtain economic and environmental forecasting of the renewable energy.

Laboratory

- Build a digital twin model,
- Hindcast validation
- Reinforcement learning
- Agent Exploration in Action

References

- Advances in Artificial Intelligence for Renewable Energy Systems and Energy Autonomy, Valeriy Kharchenko, 2023.
- Artificial Intelligence for Renewable Energy Systems, S. Balamurugan, 2022.
- Artificial Intelligence in Renewable Energetic Systems: Smart Sustainable Energy Systems, Mustapha Hatti, 2018.
- Renewable Energy Devices and Systems with Simulations in MATLAB® and ANSYS, Frede Blaabjerg and Dan M. Ionel, 2017.

Assessment Criteria

Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR466	Selected Topics in Renewable Energy		3 CH
Prerequisites	Determined according to course contents		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	2	
Required SWL		Equivalent ECTS	
125		5	

Course Content
Selected topics in Renewable Energy.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR471	Energy Management Essentials		2 CH
Prerequisites	Electrical and Electronic Measurements-EPR214		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content
Energy efficiency and electricity, Energy Efficiency standards and practical considerations Diagnostics through electrical measurement, Selecting relevant measuring instruments, Energy saving opportunities, Motor-related savings opportunities, Lighting, Power factor correction and harmonic filtering, Load management and smart panels, Introduction to building management systems, Evaluating energy savings, Achieving sustainable performance.

References

- A. P. Rositter, Energy Management and Efficiency for the Process Industry, 10th Edition, John Wiley & Sons, New Jersy, 2015. ISBN: 978-1118838259.
- Stevin Fawkes, Energy Efficiency: he Definitive Guide to the Cheapest, Cleanest, Fastest Source of Energy, 1st Edition, Routledge, New-York, 2013. ISBN: 978-1409453598.
- Energy Conservation Center Japan, TOTAL ENERGY MANAGEMENT HANDBOOK, NOVEMBER 2005.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR472	Renewable Energy and Buildings		2 CH
Prerequisites	Renewable Energy (1)-EPR362		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

This course introduces renewable energy systems. It covers the fundamental concepts of energy and radiation with specific solar energy applications and photovoltaic, electrical energy storage systems, and thermal energy and storage. The second part covers the basic science of wind energy systems and their electrical system designs. The third part covers the bioenergy systems from resources to final products and conversion technologies. It finally introduces other promising energy sources.

References

- Kanoğlu, M., Çengel, Y.A. and Cimbala, J.M., 2020. Fundamentals and applications of renewable energy. McGraw-Hill Education.
- Krarti, M., 2020. Energy audit of building systems: an engineering approach. CRC press.
- Duffie, J.A., Beckman, W.A. and Blair, N., 2020. Solar engineering of thermal processes, photovoltaics and wind. John Wiley & Sons.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR473	Renewable Energy Management		3 CH
Prerequisites	Renewable Energy (2)-EPR363		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Renewable Energy Management course focuses on renewable energy systems and energy efficiency and their potential for societies. Students get acquainted with renewable energy management related topics such as bioenergy and geothermal, solar energy, wind energy and hydropower, energy management, and others.

References

- Beggs, Clive "Energy: Management, Supply and Conservation" Butterworth-Heinemann, 2009.
- Vilnis Vesma "Energy Management Principles and Practice. A Companion to BS EN 16001", 2009.
- Capehart B.L., Turner W.C. and Kennedy W.J., "Guide to Energy Management" The Fairmont Press Inc., 2006.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR474	Thermal Power Plants		2 CH
Prerequisites	Heat Transfer-BME351, Fluid and Aerodynamics-BME261		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	١	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Rankine Cycle Processes Calculations, and Methods. Thermal Efficiency, Superheat, Reheat, Regenerative Rankine Cycles, Regeneration with an Open Type Feed Water Heater, Regeneration with a Closed Type Feed Water Heater, Fire Tube Boilers, Construction and Operation, Water Tube Boilers, Superheaters, Economizers, Air Heaters, Steam Generator Losses and Efficiency, Impulse Turbines, Reaction Turbines, Types of Condensers, Deaerators, Ejectors, Construction of Feed Water Heaters, Steam Pipes and Steam Traps, Cooling Towers, Natural Draft and Forced Draft, Water Pumps.

References

- Er.R.K. Rajput, A Text Book of Power Plant Engineering, Laxmi publications (P) LTD, 2016.
- Rasul, Mohammad, ed. Thermal power plants. BoD–Books on Demand.
- De Souza, Gilberto Francisco Martha. Thermal power plant performance analysis. London: Springer.
- Madejski, Paweł, ed. "Thermal power plants: new trends and recent developments.".
- Cole, H., Thermal Power Cycles, Edward Arnold, 1991.
- El Wakil, M. M., Power Plant Technology, McGraw Hill Co., 1988.
- Domkundwor, S., Power Plant Engineering, Hanpat Ruixson, 1981.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR475	Selected Topics in Energy Management		2 CH
Prerequisites	Determined according to course contents		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content			
Selected Topics in Energy Management			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR481	EPR Graduation Project (1)		3 CH
Prerequisites	After Completing 101 CH		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
1	0	5	
Required SWL		Equivalent ECTS	
125		5	

Course Content			
The project is to explore a chosen topic and define the problem. After introductory lectures, students will perform research to explore different approaches to the problem at hand to perform system level analysis to explore project feasibility and reach an initial system architecture and specifications. The output of Project 1 is a report outlining the project feasibility results and laying the ground for the detailed design and implementation phase to be conducted in Project 2.			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

EPR482	EPR Graduation Project (2)		3 CH
Prerequisites	EPR Graduation Project (1) - EPR481		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
٠	0	6	
Required SWL		Equivalent ECTS	
125		5	

Course Content

The aim of Project 2 is to conduct detailed design and verification based on the preliminary system design specifications reached in Project 1. Once the design and verification are complete, this should be followed by prototype implementation and testing. The outcome of Project 2 is a complete design, fully verified using standard verification tools and presented in the form of professional design documents, design drawings accompanied with bill of materials, dissertation, and an oral examination.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
50%	0%	0%	50%

EPR491	Utilization and Management of Electrical Energy		3 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	2	0	
Required SWL		Equivalent ECTS	
125		5	

Course Content

Electric meter types and Tariffs, Electric lighting technology – Electric heating and welding, Electrical traction, and electrical transportation systems (elevators, electrical stairs, electric cars, trains, etc.), Energy efficiency technologies: efficient energy management, energy conservation, energy management in industrial systems.

References

- Cretì, A., & Fontini, F. (2019). Economics of Electricity: Markets, Competition and Rules. Cambridge University Press
- Kothari, D. P., & Nagrath, I. J. (2018). Modern Power System Analysis. McGraw Hill Education.
- Gupta, J. B. (2009). Utilization of electric power & electric traction. S. K. Kataria & Sons
- Laithwaite, E.R. and Freris, L. L., Electric Energy: Its Generation Transmission and User, McGraw Hill Co., 1984.

- Wood, A.J. and Woolenberg, B. F., Power Generation, Operation and Control, John Wiley, 1984.

Hancock, N.N., Electric Power Utilization, Pitman Publishers, 1967.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR492	Power Quality for Energy Applications		2 CH
Prerequisites	Electrical Power Engineering - EPR331, Power Electronics (2) - EPR342		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Analysis and characterization of electric Power Quality: Power Outage, Harmonics, Unbalance, Distortion, Voltage Sag, and Flicker. Standards of power quality and grid interconnection. Shunt and series compensation of various power quality events. Design of passive power filters. Instantaneous real and imaginary power theory and its application into custom power devices. Active filters: types, operation and control. Instantaneous real & imaginary power theory and applications on conditioning. PQ analyzers, parameters analyzed. PQ monitoring and management.

References

- Paulo Robioro, Time-Varying Power Quality Issues, Florida State University, 2016.
- C. Sankaran, 'Power Quality ' CRC Press, Washington dc, 2012.
- Arindam Ghosh and Gerard Ledwich, "Power quality enhancement using custom power devices", Springer Science & Business Media, 2012.
- Mahesh Kumar, NPTEL Course on Power Quality in Power Distribution Systems, web link http://nptel.ac.in/courses/108106025.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR493	Environmental Impact of Projects		2 CH
Prerequisites			
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	

100	4

Course Content

Conflicts between developments, economics and environments. Defining emissions sources, Impacts, standards and precautions. Water, air and soil pollution and measurements. Assessing the impacts on health, social, cultural and economic activities. Procedures of the environmental impact assessment: Screening, Scoping, defining impacts, comparing alternatives, Plans for mitigation and alleviation, Environmental auditing. Public participation. Environmental impact statement and reporting, Contents and forms. Solar site assessment, wind assessment, and bioenergy with required exercises using current industry tools to assess the viability of the resource. Examples for assessing the impacts of Solar, wind,…. etc. resources projects on the environment and impacts of different activities.

References

- Environmental Impact assessments methodology, second edition, Y. Anjaneyulu, 2018.
- John Glasson, Riki Therivel and Andrew Chadwick, Introduction to environmental impact assessment, Routledge, 2005.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR494	Quality Systems and Assurance		2 CH
Prerequisites	Probability and Statistics-BAS113		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content

Quality evolution, Quality assurance, Cost of quality, Quality systems for: design, development, purchasing, and Planning, Quality organization, Training, Quality Management Systems, ISO 9000 and ISO 14000 principles, other certification (CE mark, OSHA, … etc.), Employee participation programs.

References

- Nessren Mohamed Zamzam, quality systems and assurance, Course Notes, 2022.
- Indroniceanu, A. (2017). The three-dimensional approach of Total Quality Management, an essential strategic option for business excellence. Amfiteatru Economic, 19(44), 61-78.
- Sower, V. E. (2010). Essentials of quality with cases and experiential exercises. John Wiley & Sons.

- Gryna, Frank M., Quality Planning and Analysis, McGraw Hill Book Co., 2001.
- Juran, Joseph M. and Blanton, Godfery A., Juran's Quality Control Handbook, McGraw Hill Book Co., 2000.

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

EPR495	Applications of Nanotechnology in Renewable Energy Systems	2 CH
Prerequisites	Fundamentals of Photovoltaics-EPR361, Renewable Energy (1)-EPR362, and Renewable Energy (2)-EPR363	

Number of Weekly Contact Hours		
Lecture	Tutorial	Laboratory
2	0	1
Required SWL		Equivalent ECTS
100		4

Course Content

This course includes the definition of nanotechnology, advantages and disadvantages and its main applications. Applications of nanotechnology in renewable energy devices such as photovoltaic cells, fuel cells, biomass generators, batteries, and wind turbines blades. How nanotechnology makes a huge revolution in the size and design of renewable energy devices utilized for energy conversion and storage, environmental monitoring, as well as green engineering of environmentally friendly materials.

Laboratory

- Nanotechnology in Solar Energy
- Nanotechnology in Wind Energy
- Nanotechnology in Hydrogen Energy
- Nanotechnology in Bioenergy
- Nanotechnology in Batteries and Supercapacitors

References

- Nanotechnology Applications for Solar Energy Systems, Mohsen Sheikholeslami, 2023.
- Applications of Nanomaterials in Energy Systems, Eleftheria C Pyrgioti, Ioannis F Gonos, Diaa-Eldin A Mansour, 2023.
- Advanced Nanomaterials and Their Applications in Renewable Energy, Jingbo Louise Liu, Sajid Bashir, 2015

Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
30%	20%	10%	40%

EPR496	Selected Topics in Quality Control		2 CH
Prerequisites	Determined according to course contents		
Number of Weekly Contact Hours			
Lecture	Tutorial	Laboratory	
2	1	0	
Required SWL		Equivalent ECTS	
100		4	

Course Content			
Selected Topics in Quality Control			
Assessment Criteria			
Student Activities	Mid-Term Exam	Practical Exam	Final Exam
40%	20%	0%	40%

Courses offered by Basic Sciences Department in Electrical Power and Renewable Energy Engineering

No.	Code	Course Name
1	BAS211	Mathematics (3)
2	BAS213	Mathematics (4)
3	BME251	Thermodynamics (1)
4	BME351	Heat Transfer
5	BME261	Fluid and Aerodynamics

Courses offered by Communications and Computers in Electrical Power and Renewable Energy Engineering

No.	Code	Course Name
1	CCE161	Computer Programming
2	CCE211	Electrical Circuits (1)
3	CCE482	Embedded Systems

- **Competencies VS Courses Matrices for Electrical Power and Renewable Energy Engineering Program**

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	D1	D2	D3	D4	D5	D6
-	University Elective (1)																					
-	University Elective (2)																					
-	University Elective (3)																					
-	University Elective (4)																					
NUB111	History of Engineering					■		■														
NUB112	Modern history of Egypt					■		■														
NUB113	History of Civilizations					■		■														
NUB114	Fundamentals of Engineering	■		■																		
NUB121	Report Writing and Communication Skills							■	■		■											
NUB122	Climate Change, Energy and Water Issues			■	■																	
NUB123	Scientific Thinking							■		■	■											
NUB131	Professional Legislations and Engineering Ethics				■				■		■											
NUB132	Literature and Arts							■	■	■												
NUB133	Human Rights							■	■		■											
NUB134	Professional Ethics				■				■		■											
NUB141	Building Safety and Fire Protection	■			■																	
NUB142	Entrepreneurship and Startups							■		■	■											
NUB143	Business Administration							■		■	■											
NUB144	Principle of General Management							■		■	■											
BAS111	Mathematics (1)	■																				
BAS112	Mathematics (2)	■																				
BAS113	Probability and Statistics		■																			
BAS121	Vibration and Waves	■																				
BAS122	Electricity and Magnetism	■																				
BAS131	Engineering Chemistry	■																				
BAS141	Statics		■																			
BAS142	Dynamics		■																			
BAS143	Engineering Drawing (1)								■	■												
TRN2x1	Field training (1)				■		■	■								■						■
TRN3x1	Field Training (2)				■		■	■								■						■
-	Engineering Economy and Project Management Elective																					
-	Structures and Properties of Materials Elective Courses																					

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	D1	D2	D3	D4	D5	D6
-	Engineering Technology Elective Courses																					
-	Spatial Perception and Design Elective Courses																					
EPR391	Project Management and Economics for Electrical Engineering	■			■						■				■	■						
EPR111	Materials of Electrical Science		■		■						■		■		■							
GME141	Production Engineering	■			■						■		■	■								
EPR333	AutoCAD Electrical Drawing				■				■		■		■	■								
BAS211	Mathematics (3)	■	■																			
BAS213	Mathematics (4)	■	■																			
BME251	Thermodynamics (1)	■	■											■		■						
BME261	Fluid and Aerodynamics															■	■			■		
BME351	Heat Transfer		■									■			■							
CCE161	Computer Programming		■											■		■						
EPR161	Energy Resources and Renewable Energy											■			■	■						
CCE211	Electrical Circuits (1)	■											■		■							
EPR211	Electric and Magnetic Fields														■	■	■					
EPR212	Energy Conversion											■			■	■						
EPR213	Electric Circuits (2)											■		■		■						
EPR214	Electrical and Electronic Measurements														■	■	■		■		■	
EPR221	Direct Current Machines and Transformers											■	■					■				
EPR241	Fundamentals of Electronic Circuits											■	■		■							
EPR321	Alternating Current Machines											■	■					■				
EPR331	Electrical Power Engineering											■	■									
EPR341	Power Electronics (1)											■	■									
EPR351	Modelling and Simulation of Engineering Systems															■	■				■	
EPR332	Economics of Generation, Transmission, and Operation											■	■			■	■	■				
EPR342	Power Electronics (2)											■	■		■							
EPR352	Automatic Control Systems												■		■			■				
CCE482	Embedded Systems													■		■						
EPR431	Power System Analysis												■		■			■				
EPR361	Fundamentals of Photovoltaics											■	■					■		■		
EPR362	Renewable Energy (1)														■			■		■		
EPR363	Renewable Energy (2)														■			■		■		
EPR433	High Voltage Engineering																■		■	■		
EPR434	Power System Protection																		■	■	■	

Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	D1	D2	D3	D4	D5	D6
EPR455	Industrial Control and SCADA Systems													■		■						
EPR491	Utilization and Management of Electrical Energy																■				■	■
EPR481	EPR Graduation Project (1)											■	■	■	■	■	■	■	■	■	■	■
EPR482	EPR Graduation Project (2)											■	■	■	■	■	■	■	■	■	■	■
	EPR Elective (1)																					
	EPR Elective (2)																					
	EPR Elective (3)																					
	EPR Elective (4)																					
EPR461	Storage Energy Technologies											■										
EPR462	Ocean Energy												■	■				■				
EPR463	Biomass and waste Conversion Technology													■		■	■	■				
EPR464	Renewable Energy Resources Interfacing								■													
EPR465	Artificial Intelligence Applications in Renewable Energy Systems																		■		■	■
EPR466	Selected Topics in Renewable Energy													■	■					■		
EPR421	Electric Drives																	■	■	■		
EPR432	Electrical Distribution Systems Installations																■	■	■	■		
EPR451	Digital Control Systems												■		■			■				
EPR452	Microcontroller Applications in Power Engineering															■	■	■				
EPR453	Computer Applications in Power Engineering																	■			■	■
EPR454	Selected Topics in Control Systems											■	■		■			■				
EPR435	Smart Grid														■		■		■	■		
EPR471	Energy Management Essentials																■	■	■	■		
EPR472	Renewable Energy and Buildings																				■	■
EPR473	Renewable Energy Management																	■			■	■
EPR474	Thermal Power Plants													■		■	■	■				
EPR475	Selected Topics in Energy Management															■		■				
EPR353	Microprocessor-Based Automated Systems													■		■						
EPR436	Power Distribution Systems												■				■	■	■			
EPR492	Power Quality for Energy Applications																■	■	■			
EPR493	Environmental Impact of Projects											■										
EPR494	Quality Systems and Assurance															■						
EPR495	Applications of Nanotechnology in Renewable Energy Systems																					■
EPR496	Selected Topics in Quality Control																■	■		■		

- **Targeted Sustainable Development Goals**

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
-	University Elective (1)	■																
-	University Elective (2)	■																
-	University Elective (3)	■																
-	University Elective (4)	■																
BAS111	Mathematics (1)		■															
BAS112	Mathematics (2)		■															
BAS113	Probability and Statistics			■														
BAS121	Vibration and Waves		■															
BAS122	Electricity and Magnetism		■															
BAS131	Engineering Chemistry		■															
BAS141	Statics			■														
BAS142	Dynamics			■														
BAS143	Engineering Drawing (1)									■	■							
TRN2x1	Field training (1)					■		■	■				■	■				
TRN3x1	Field Training (2)					■		■	■				■	■				
-	Engineering Economy and Project Management Elective																	
-	Structures and Properties of Materials Elective Courses																	
-	Engineering Technology Elective Courses																	
-	Spatial Perception and Design Elective Courses																	
BAS211	Mathematics (3)				■													
BAS213	Mathematics (4)				■													
BME251	Thermodynamics (1)				■		■	■		■			■					
BME261	Fluid and Aerodynamics									■				■				
BME351	Heat Transfer				■		■	■		■				■				
CCE161	Computer Programming								■	■		■						
EPR161	Energy Resources and Renewable Energy				■			■						■				
CCE211	Electrical Circuits (1)				■			■						■				
EPR211	Electric and Magnetic Fields				■			■						■				
EPR212	Energy Conversion				■			■						■				
EPR213	Electric Circuits (2)				■			■						■				

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
EPR214	Electrical and Electronic Measurements				■			■						■				
EPR221	Direct Current Machines and Transformers				■			■						■				
EPR241	Fundamentals of Electronic Circuits				■					■								
EPR321	Alternating Current Machines				■			■						■				
EPR331	Electrical Power Engineering				■			■						■				
EPR341	Power Electronics (1)				■			■		■		■						
EPR351	Modelling and Simulation of Engineering Systems				■			■		■		■						
EPR332	Economics of Generation, Transmission, and Operation				■			■	■					■				
EPR342	Power Electronics (2)				■			■		■		■						
EPR352	Automatic Control Systems				■			■		■				■				
CCE482	Embedded Systems				■			■		■		■						
EPR431	Power System Analysis				■			■						■				
EPR361	Fundamentals of Photovoltaics				■			■				■		■				
EPR362	Renewable Energy (1)				■			■				■		■				
EPR363	Renewable Energy (2)				■			■				■		■				
EPR433	High Voltage Engineering				■			■						■				
EPR434	Power System Protection				■			■						■				
EPR455	Industrial Control and SCADA Systems				■			■						■				
EPR491	Utilization and Management of Electrical Energy				■			■		■		■		■				
EPR481	EPR Graduation Project (1)				■			■		■		■		■				
EPR482	EPR Graduation Project (2)				■			■		■		■		■				
	EPR Elective (1)																	
	EPR Elective (2)																	
	EPR Elective (3)																	
	EPR Elective (4)																	
EPR461	Storage Energy Technologies				■			■				■		■				
EPR462	Ocean Energy				■			■				■		■				
EPR463	Biomass and waste Conversion Technology				■			■						■				
EPR464	Renewable Energy Resources Interfacing				■			■		■		■		■				

Code	Course Title	G.1	G.2	G.3	G.4	G.5	G.6	G.7	G.8	G.9	G.10	G.11	G.12	G.13	G.14	G.15	G.16	G.17
EPR465	Artificial Intelligence Applications in Renewable Energy Systems				■			■		■		■		■				
EPR466	Selected Topics in Renewable Energy				■			■		■		■		■				
EPR421	Electric Drives				■			■		■		■						
EPR432	Electrical Distribution Systems Installations				■			■		■		■						
EPR451	Digital Control Systems				■			■		■		■						
EPR452	Microcontroller Applications in Power Engineering				■			■		■		■						
EPR453	Computer Applications in Power Engineering				■			■		■		■						
EPR454	Selected Topics in Control Systems				■			■		■		■						
EPR435	Smart Grid				■			■		■		■		■				
EPR471	Energy Management Essentials				■			■		■		■		■				
EPR472	Renewable Energy and Buildings				■			■		■		■		■				
EPR473	Renewable Energy Management				■			■		■		■		■				
EPR474	Thermal Power Plants				■			■				■		■				
EPR475	Selected Topics in Energy Management				■			■				■		■				
EPR٣٥٣	Microprocessor-Based Automated Systems				■			■				■		■				
EPR436	Power Distribution Systems				■			■										
EPR492	Power Quality for Energy Applications				■			■		■		■		■				
EPR493	Environmental Impact of Projects				■			■						■				
EPR494	Quality Systems and Assurance				■			■		■		■		■				
EPR495	Applications of Nanotechnology in Renewable Energy Systems				■			■		■		■		■				
EPR496	Selected Topics in Quality Control				■			■						■				

مرفقات باللغة العربية

قسم الهندسة المعمارية

مقررات القسم باللغة العربية

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
DAE111	أسس التصميم	3	5	125	1	5	0	5	
DAE211	استوديو التصميم الإبداعي	3	5	125	1	5	0	5	DAE111
DAE212	استوديو تصميم العمارة والمسكن	3	5	125	1	5	0	6	DAE211
DAE311	استوديو تصميم أنماط المباني والتشريعات	3	5	125	1	5	0	6	DAE212
DAE312	استوديو التصميم التقني المعماري	3	5	125	1	5	0	6	DAE311
DAE411	استوديو تصميم التأهيل المعماري المستدام	3	5	125	1	5	0	6	DAE312
DAE412	التصميم الداخلي بتقنية الواقع الافتراضي	3	5	125	1	4	0	5	
DAE413	العمارة الرقمية وتقنيات التصميم - المستوى الأول	2	4	100	2	0	0	2	DAE312 10١CH
DAE414	العمارة الرقمية وتقنيات التصميم - المستوى الثاني	6	11	275	2	10	0	12	DAE411 DAE413
DAE221	الإنشاء المعماري (١): نظم الإنشاء التقليدية	3	5	125	1	4	0	5	
DAE222	الإنشاء المعماري (٢): أعمال التشطيبات والإنشاءات الخشبية	3	5	125	1	4	0	5	DAE221
DAE321	الإنشاء المعماري (٣): نظم الإنشاء والتشطيبات المتقدمة	3	5	125	1	4	0	5	DAE222
DAE322	التصميم التنفيذي (١): تنسيق وترميز الرسومات التنفيذية	3	5	125	1	4	0	6	DAE321
DAE421	التصميم التنفيذي (٢): التفاصيل وجداول الكميات	3	5	125	1	4	0	6	DAE322
DAE422	الرسومات التنفيذية المتقدمة/نظم نمذجة معلومات البناء والمستندات التنفيذية	3	5	125	1	0	3	4	DAE421 DAE351
DAE142	تاريخ الفنون والعمارة (١): الحضارات القديمة	2	3	75	2	0	0	2	
DAE241	تاريخ الفنون والعمارة (٢): العمارة الإسلامية والعمارة الغربية	2	3	75	2	0	0	2	DAE142
DAE242	نظريات العمارة المعاصرة وأساليب	2	3	75	2	0	0	2	DAE241

	التصميم								
DAE151	الاتصال البصري في العمارة	3	5	125	1	4	0	5	
DAE251	تقنيات العمارة الرقمية (١) وتاريخ العمارة والتصميم الرقمي	3	5	125	1	0	4	5	DAE151
DAE252	تقنيات العمارة الرقمية (٢) وتاريخ العمارة والتصميم الرقمي	3	5	125	1	0	4	5	DAE251
DAE253	البرمجة في العمارة	2	4	100	2	0	2	4	
DAE353	الذكاء الاصطناعي في التصميم المعماري	2	4	100	1	0	3	4	
DAE461	استوديو الوسائط الرقمية	2	3	75	1	2	0	3	
Total		68	115	2875	30	70	16	116	

المتطلبات الثانوية لبرنامج هندسة العمارة الرقمية

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
DAE141	السلوك الإنساني والبيئة المبنية	1	2	50	1	0	0	1	
DAE231	العمارة المستدامة	3	5	125	2	2	0	4	
DAE331	تنسيق المواقع	3	5	125	1	3	0	4	
DAE332	مقدمة في التخطيط العمراني والتصميم والإسكان	3	5	125	2	2	0	4	DAE331
DAE351	نمذجة معلومات البناء	3	5	125	2	0	2	4	DAE252
DAE352	التصميم المعماري الحاسوبي	2	3	75	2	0	0	2	
DAE354	استوديو التصميم البارامتري	3	6	150	2	0	2	4	DAE252
DAE451	التصميم والتصنيع الرقمي	3	5	125	2	0	2	4	DAE353
DAE361	التركيبات الفنية في المباني	2	3	75	1	2	0	3	
CCE372	أنظمة الصوت والإضاءة في المباني	2	3	75	1	2	0	3	
CVE213	تحليل البنية التحتية للهندسة المعمارية	2	4	100	2	1	0	3	
CVE346	الخرسانة المسلحة والأساسات للهندسة المعمارية	2	3	75	2	1	0	3	
CVE453	الهياكل الفولاذية للهندسة المعمارية	2	3	75	2	1	0	3	
	المتطلبات الثانوية (اختياري أ)	2	3	75	1	0	2	3	
	المتطلبات الثانوية (اختياري ب)	2	3	75	1	2	0	3	
	المتطلبات الثانوية (اختياري ج)	2	3	75	1	2	0	3	
Total		37	61	1525	25	18	8	51	

يتم توزيع المقررات الاختيارية لبرنامج هندسة العمارة الرقمية على ثلاث مقررات اختيارية

Code	Course Title	Weight			Contact Hours				Prerequisites
		CH	ECTS	SWL	Lec	Tut	Lab	TT	
Architecture Elective (A) Select 2 Credit hrs. (one course)									
DAE323	الأنظمة القائمة على المعرفة الرقمية	2	3	75	1	0	2	3	
DAE324	نظم معلومات المباني الذكية	2	3	75	1	0	2	3	
DAE325	نظم تكامل المباني المتقدمة/نمذجة معلومات البناء والمستندات التنفيذية	2	3	75	1	0	2	3	
Architecture Elective (B) Select 2 Credit hrs. (one course)									
DAE431	العمارة والثقافة والتراث	2	3	75	1	2	0	3	
DAE432	الإسكان	2	3	75	1	2	0	3	
DAE433	تاريخ ونظريات التخطيط	2	3	75	1	2	0	3	
DAE434	مقدمة في التخطيط العمراني الإقليمي	2	3	75	1	2	0	3	
Architecture Elective (C) Select 2 Credit hrs. (one course)									
DAE462	التشريعات المعمارية والعمرانية والاستدامة	2	3	75	1	2	0	3	
DAE463	التسويق الرقمي	2	3	75	1	2	0	3	
DAE464	التحكم الحراري	2	3	75	1	2	0	3	
DAE465	العمارة الرقمية المستدامة	2	3	75	1	0	2	3	
DAE466	دراسات الجدوى للمشروعات المعمارية والعمرانية	2	3	75	1	2	0	3	