Section 3

Communication and Computer Engineering Program (CCE)

Based on Credit Hours System (CHS)

September 2013

1. INTRODUCTION

Computers have become a fact of our daily life. Computer Illiteracy is now an issue as is reading and writing illiteracy. Industrial development and population growth can not be achieved without well prepared population as well as expertise in electronics, communications and computer engineering. The digital gap between nations need to be both bridged and when so, will allow to all innovative minds to come up with true breakout inventions to man kind as was the wheel and electricity. Egypt with its geographic location and size of population and available expertise allow it to play the role of a focal point distributor to a communication and computer engineering program to all of the Arab world as well as African countries. Therefore, the Faculty of Engineering at Cairo University, the oldest and one of the most prestigious schools in engineering in the Arab world is has established a Communications and Computer Engineering (CCE) Program based on the credit hours system (CHS). This program will prepare the engineers to take the lead for their countries into the digital society.

2. PROGRAM MISSION

The mission of the Communications and Computer Engineering Program at Cairo University is to provide the highest standard of excellence in higher education while pursuing continuous quality improvement. The goal of the program is to provide the community with communications and computer innovative graduates capable of effectively using the scientific and technical knowledge developed as undergraduates for the betterment of society. The problem-solving, teamwork, and oral communications skills developed by the graduates of CCE Program will also contribute to achieving this goal. The program supports this mission by providing students with appropriate curricula and educational experiences. The curricula remain current through continuous assessment by employers, faculty, and students. Students obtain a broad education necessary to understand the impact of communications and computer engineering solutions in a global, societal, and cultural context.

The CCE bachelor-degree program allows a plan that will necessarily be highly structured during the first six semesters and relatively flexible during the upper four semesters. The program provides a laboratory-based curriculum that combines hands-on practice with the appropriate basic electrical and electronic theory. It is application-oriented and is designed to prepare well rounded graduates who can succeed in one or more of the fields related to communications and computer engineering technology.

3. EDUCATIONAL OBJECTIVES

The new program has four main educational objectives that are summarized as follows:

1- In-Depth Knowledge: To provide students with a strong foundation and understanding of the fundamental knowledge prerequisite for the practice of, or for advanced study in, communications or computer engineering, including its scientific principles, rigorous analysis, and creative design, embedded and real time systems as well as intelligent machines and applications.

2- Out-Breadth Education: To provide students with the broad education, including knowledge of diverse important current issues in communications or computer engineering, necessary for productive careers in the public or private sectors, or for the pursuit of graduate education.
3- Professionalism: To develop skills for clear communication and responsible teamwork, and to inculcate professional attitudes and ethics, so that graduates are prepared for the complex modern work environment and for lifelong learning.
4- Creativity: To provide an environment that enables students to pursue their goals in an innovative program that is rigorous and challenging, open and supportive.

4. PROGRAM LEARNING OUTCOMES

To prepare the student for the Program Educational Objectives to be achieved, a set of Program Outcomes that describes what students are expected to know and are able to do by the time of graduation, have been adopted.

In order to satisfy quality assurance while attaining our objectives the expected program outcomes as referenced to the ABET standards are defined as follows:

1. Ability to apply knowledge of mathematics, science and engineering.
2. Ability to design and conduct experiments as well as analyze and interpret data.
3. Ability to design a system, component or process to meet desired needs.
4. Ability to function on multi-disciplinary teams.
5. Ability to identify, formulate and solve engineering problems.
6. Understanding of professional and ethical responsibility.
7. Ability to communicate effectively.
8. Broad education necessary to understand the impact of engineering solutions in a global-societal context.
9. Recognition of the need for, and an ability to engage in life-long learning.
10. Knowledge of contemporary issues.
11. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

The above outlined objectives are specifically translated into the intended learning outcomes ILOs as follows:

INTENDED LEARNING OUTCOMES of the Program	
I. Subject-specific skills: the main subject skills which successful students will acquire *from the program overall. Students will be able to:*	
1. Apply knowledge of mathematics, science and engineering to analyze and solve communication and electronic engineering problems. (ABET a)	All of the core courses contribute to the implementation of basic sciences.
2. Design and conduct simulations in different parallel and distributed process related disciplines both offline and in real time. (ABET b)	ELCN301 (Electronics-3), CMPN407 (Modeling and Simulation, CMPN449 (Real Time Computing)

3. Design special circuitry and application using embedded systems, specific algorithms including wireless and mobile applications (such as antennas, and automated vehicles). (ABET c)	ELCN404 (Control-2), ELCN321 (VLSI systems), ELCN436 (Mobile Communication), CMPN211 (Micro-processors Systems-2), CMPN406 (Wireless mobile networks)
4. Design a communication system. (ABET c)	ELCN416 (Communications-4)
5. Design an intelligent system. (ABET c)	CMPN402 (Machine Intelligence)
6. Identify and specify a communication and computer engineering problem. (ABET e)	This is covered and developed in all core communication and computer engineering courses.
7. Identify concepts, analysis techniques, and development tools used in solving communication or computer engineering problems (ABET e)	This is covered and developed in all core communication and computer engineering courses.
8. Use the techniques, skills and modern engineering tools necessary for engineering practice. (ABET e)	All level 2 courses and higher implement a mini-project using different tools.
II. <u>Intellectual or cognitive skills</u>: the skills which successful students will acquire *from the program overall. Students will be able to:*	
1. Analyze, Interpret and use data including those arising from simulations. (ABET b)	ELCN203 (Signal Analysis), CMPN302 Design and Analysis of Algorithms
2. Identify, analyze and solve communication and computer engineering problems. (ABET e)	Core discipline courses
3. Effectively use different computer programming languages and software tools such as visual studio, general databases such as Oracle and mathematical software, such as Matlab, for solving communication and computer engineering problems. (ABET k)	All compulsory courses e.g. CMPN202 (Database)
4. Recognize the need for, and have the ability to engage in life-long learning. (ABET i)	Lifelong learning is typically covered in the projects in the 400 level courses. Contemporary issues such as safety, environment and globalization are covered in some GEN courses and seminars which are arranged by the department with industrial and academic speakers.
III. <u>General skills:</u> the main general skills which successful students will acquire *from the program overall*.	
1. Students will be able to function effectively within multi-disciplinary teams. (ABET d)	All mini-projects given in courses require team work.
2. Students will be able to effectively communicate orally with other professionals and in meetings by asking questions, conducting conference calls, presenting a project and answering questions. (ABET g)	Specifically covered through ELCN380, CCE380 (seminar-2) and industrial training.
3. Students will be able to effectively communicate in writing through effective e-mail as well as written reports. (ABET g)	Through all e-learning courses material as courses are being added incrementally currently e.g. CMPN102, CMPN402.

5. MARKET NEEDS ASSESSMENT

The Egyptian government has a goal aiming at building of the information society. The latest releases show the advancement of Egypt with respect to the world evaluation index to place it within the top 100 countries. Therefore, it is expected that youth will realize not only the importance of the communications and computer engineering discipline but also the rising potential employment opportunities within a world of rising unemployment in many other disciplines. Information Technology is a fast growing and promising investment area and Egypt is witnessing more and more investors coming to the newly established smart village as well as the rising interest in a silicon valley.

Multinational companies are seeking fresh graduates to cover the 24×7 competition for new working models. The CCE, with its English education, can help educating and graduating students from different countries. Some scholarships can be secured through the Ministry of Foreign Affairs and the Egyptian Fund for Technical Cooperation with Africa for African students to join CCE. Other scholarships can be offered from international donors and organizations such as UNDP, EU, and others which are currently co-financing the Nile Basin Initiative and its communications and information technology (CIT) programs. Those professional engineers are a goldmine for national investment. Creative professionals, a supportive government, and a healthy educational environment are the keystone to the success, and the fundamental to our future achievements.

6. PROGRAM DESCRIPTION

The CCE program offers instructions in numerous topics concerning electronics, communications and computer engineering. At the end of these courses, participants are expected to gain the knowledge of up-to-date CIT issues; design techniques of CIT as well as automated and intelligent environments, design and performance analysis techniques of communication systems, computer networks and e-applications e.g. e-business, e-health, e-gov, e-learning, etc.

The program offers a Bachelor Degree in Communication and Computer Engineering and enables the student to concentrate on either the Communication Engineering track (CCE-E) or the Computer Engineering track (CCE-C). The Bachelor Degree of the CCE program and its two internal tracks consists of a total of 180 credit hours offered over a period of 10 main semesters, the Fall and Spring semesters per academic year. The students are expected to complete the degree requirements in 10 main semesters. High caliber students may finish in 9 main semesters.

6.1 Curriculum Overview

The curriculum of the CCE program consists of 180 credits spread over 68 - 70 courses for the CCE-E track and the CCE-C track, respectively, covering topics in Humanities and Social Sciences (HSS), Basic Sciences (BS), Engineering Sciences (ES), and Applied Engineering Sciences (AS) as required by the Supreme Council of Universities (SCU) in Egypt.

The curriculum includes courses in engineering fundamentals and applications such as:

- Electronics
- Circuits
- Communication
- Control
- Logic Design
- Microprocessors
- Computer Architecture
- Operating Systems

Furthermore, the curriculum covers data structures and algorithms, advanced mathematics, physics, economics, management, marketing and humanities. In the specialized area, advanced and detailed courses are offered. Courses specific to either communications or computer engineering practice include:

- Signal Processing
- Control
- Database
- Computer Networks
- Intelligent Machines

In addition, communications and computer engineering requires hands-on laboratory experiences, electromagnetics and up-to-date skills in the use of computers for modeling and data analysis, and experience in the design of different engineering systems.

The curriculum gives the students the opportunity to select not only the major specialty but also several elective courses within the major. All in all, the student has about 10% -15% from the total credits in the bachelor degree chosen to his will. Students in the CCE program are also encouraged to participate in research through independent study projects. Moreover, the curriculum gives the students the opportunity to interact with the industrial sector and government agencies through two periods of industrial training courses in the field. In addition, students will be required to implement a design project prior to their final graduation. The following sections elaborate all program requirements and illustrate a sample plan study.

6.2 University Requirements

The main purpose of a university education is not only to prepare students for successful careers but also to provide them with the knowledge and skills to develop a rational, well-rounded and successful personal identity. Moreover, Cairo University helps students to gain an appreciative understanding of the natural and cultural environments in which they live and their roles in the society and community services.

The university requirements of the CHS bachelor programs consist of 24 credits (13.3% of total 180 credits), which are satisfied by completing twelve (12) courses:

1. Nine (9) compulsory courses equivalent to 18 credits (10.0%), as listed in Table 1a
2. Three (3) elective courses equivalent to 6 credits (13.3%), as listed in Table 1b

Table 1a Compulsory Courses of University Requirements (18 credits, 10.0% of total 180 credits)

	Code	Course Title	Credits
1	GENN001	Humanities and Engineering	2
2	GENN002	English Language	2
3	GENN004	Computers for Engineers	2
4	GENN101	Technical Writing	2
5	GENN102	Fundamentals of Management	2
6	GENN201	Communication and Presentation Skills	2
7	GENN204	Accounting	2
8	GENN210	Risk Management and Environment	2
9	GENN221	Economics	2

Table 1b Elective Courses of University Requirements (6 credits, 3.3% of total 180 credits)

	Code	Course Title	Credits	Group
1	GENN301	Ethics and Legislation(1)	2	E-1(1)
2	GENN310	Advanced Risk Management	2	
3	GENN311	Technical Writing in Arabic	2	
4	GENN321	Foreign Language	2	
5	GENN326	Marketing	2	
6	GENN327	Selections of Life-long Skills	2	
7	GENN331	Business Communication	2	
8	GENN332	Service Management	2	

Remarks:

(1) Student selects at least three (3) courses equivalent to 6 credits, such that one of the three courses should be GENN326

6.3 College Requirements

College requirements provide students with the knowledge and skills that are essential to develop a successful engineer. A college core that is common to all credit hours programs is implemented. This unified college core contains two categories of courses. The first category of college core courses includes courses of basic knowledge essential to all engineering graduates such as Mathematics, Physics, Mechanics, Graphics and Design, Manufacturing, and Chemistry. The second category includes courses that all students are required to undertake in order to develop certain intended learning outcomes common to all engineering graduates, such as Seminar, Industrial Training, and Graduation Project courses.

The college requirements of the CHS bachelor programs consist of 45 credits (25.0% of total 180 credits), which are satisfied by completing nineteen (19) compulsory courses, as listed in Table 2.

Table 2 Compulsory Courses of College Requirements (45 credits, 25.0% of total 180 credits)

	Code	Course Title	Credits
1	CHEN001	Chemistry	3
2	GENN003	Basic Engineering Design	2
3	MDPN001	Engineering Graphics	3
4	MDPN002	Fundamentals of Manufacturing Engineering	3
5	MECN001	Mechanics-1	2
6	MECN002	Mechanics-2	2
7	MTHN001	Introduction to Linear Algebra and Analytic Geometry	3
8	MTHN002	Calculus I	3
9	MTHN003	Calculus II	3
10	MTHN102	Multivariable Calculus and Linear Algebra	3
11	MTHN203	Probability and Statistics	3
12	PHYN001	Mechanics, Oscillations, Waves and Thermodynamics	3
13	PHYN002	Electricity and Magnetism	3
14	CCEN280	Seminar-1	1
15	CCEN281	Industrial Training-1	1
16	CCEN380	Seminar-2	1
17	CCEN381	Industrial Training-2	2
18	CCEN480	Graduation Project-1	1
19	CCEN481	Graduation Project-2	3

6.4 Discipline Requirements

The Communication and Computer Engineering Program is a new bachelor program based on the credit hours system under the joint umbrella of two scientific departments at the Faculty of Engineering, Cairo University; namely Electronics and Communication Department and Computer Engineering Department. Students who wish to pursue a bachelor degree in Communications and Computer Engineering have first to finish the discipline-core requirements. This should be followed by choosing one of the two internal tracks: communications engineering (CCE-E) or computer engineering (CCE-C) and finishing its associated major specialty requirements including all its compulsory and elective courses.

The discipline requirements of the CCE bachelor program consist of 73 credits (40.6% of total 180 credits), which are satisfied by completing twenty-five (25) courses, as listed in Table 3. Seven (7) of these courses are interdisciplinary courses (coded by CVE, EMP, INT, MTH, PHY), which are equivalent to 21 credits (11.7%). All the discipline core courses are compulsory, and they are designed to provide the student with the electrical and computer engineering application.

Table 3 Compulsory Courses of Discipline Requirements: Communication and Computer Engineering (73 Credits, 40.6% of total 180 Credits)

	Code	Course Title	Credits
1	CMPN101	Logic Design-1	3
2	CMPN102	Data Structures and Algorithms	3
3	CMPN103	Programming Techniques	3
4	CMPN201	Microprocessor Systems-1	3
5	CMPN202	Introduction to Database Management Systems	3
6	CMPN211	Microprocessor Systems-2	2
7	CMPN301	Computer Architecture	3
8	CMPN303	Operating Systems	3
9	CMPN405	Computer Networks-1	3
10	CVEN125	Civil Engineering	3
11	ELCN100	Laboratory	2
12	ELCN101	Electronics-1: Basic Electronic Circuits	3
13	ELCN102	Circuits-1	3
14	ELCN112	Circuits-2	3
15	ELCN201	Electronics-2: Analog and Digital Electronics	3
16	ELCN203	Signal Analysis	3
17	ELCN304	Control-1	3
18	ELCN306	Communications-1: Analogue Communications	3
19	ELCN316	Communications-2: Digital Communications	3
20	EMPN125	Electrical Power Engineering	3
21	INTN125	Mechanical Engineering	3
22	MTHN103	Differential Equations	3
23	MTHN104	Discrete Mathematics	3
24	MTHN201	Numerical Analysis	3
25	PHYN102	Modern Physics	3

6.5 Major Requirements

The program offers a major specialty in Communication and Computer Engineering which requires the successful completion of at least 38 credits (21.1% of total 180 credits), which are divided as follows.

a. CCE-E track requirements:
   a1. Seven (7) compulsory courses equivalent to 23 credits (12.8%), as listed in Table 4a.
   a2. Five (5) elective courses equivalent to 15 credits (8.3%), as listed in Table 5a.

b. CCE-C track requirements:
   b1. Ten (10) compulsory courses equivalent to 26 credits (14.4%), as listed in Table 4b.
   b2. Four (4) elective courses equivalent to 12 credits (6.7%), as listed in Table 5b.

Table 4a Compulsory Courses of Major Requirements: Communication Engineering Track CCE-E (23 credits, 12.8% of total 180 credits)

	Code	Course Title	Credits
1	ELCN205	Electromagnetics-1: Wave Propagation and Transmission Lines	3
2	ELCN301	Electronics-3: Integrated Circuits and Systems	3
3	ELCN305	Electromagnetics-2: Microwave Engineering	4
4	ELCN404	Control-2	4
5	ELCN405	Electromagnetics-3: Antennas	3
6	ELCN406	Communications-3: Wireless communications	3
7	PHYN211	Electromagnetic Fields	3

Table 4b Compulsory Courses of Major Requirements: Computer Engineering Track CCE-C (26 credits, 14.4% of total 180 credits)

	Code	Course Title	Credits
1	CMPN111	Logic Design-2	2
2	CMPN203	Software Engineering	3
3	CMPN205	Computer Graphics and Man Machine Interfacing	2
4	CMPN302	Design and Analysis of Algorithms	3
5	CMPN306	Advanced Programming Techniques	2
6	CMPN402	Machine Intelligence	3
7	CMPN403	Languages and Compilers	3
8	CMPN407	Computer Modeling and Simulation	3
9	CMPN425	Computer System Consultation	2
10	PHYN212	Electromagnetics for Computer Engineering	3

Table 5a Elective Courses of Major Requirements: Communication Engineering Track CCE-E (15 credits, 8.4% of total 180 credits)

	Code	Course Title	Credits	Group
1	ELCN314	Computer Control Systems	3	E-2E[(1)]
2	ELCN321	VLSI Systems	3	
3	ELCN323	Digital Signal Processing	3	
4	ELCN325	Acoustics	3	
5	ELCN331	Advanced Topics in Electronics-1	3	
6	ELCN351	Industrial Electronics	3	
7	ELCN416	Communications-4: Information Theory	3	
8	ELCN426	Optical Fiber Communication	3	
9	ELCN435	Advanced Topics in Antennas	3	
10	ELCN436	Mobile Communications	3	
11	ELCN441	Advanced Topics in Electronics-2	3	
12	ELCN445	Advanced Topics in Microwave and RF Eng	3	
13	ELCN446	Advanced Topics in Communications-1	3	
14	ELCN451	Advanced Topics in Electronics-3	3	
15	ELCN456	Advanced Topics in Communications-2	3	
16	ELCN466	Satellite Communications	3	
17	ELCN476	Advance Topics in Communications-3	3	

Remarks:

(1) Student selects at least five (5) courses from group E-2E equivalent to 15 credits

Table 5b Elective Courses of Major Requirements: Computer Engineering Track CCE-C (12 credits, 6.7% of total 180 credits)

	Code	Course Title	Credits	Group
1	CMPN206	Multimedia	3	E-2C[(1)]
2	CMPN341	Information Technology and Advanced Languages	3	
3	CMPN342	Computer Systems Programming	3	
4	CMPN343	Computation and Programming Theory	3	
5	CMPN401	Advanced Database Systems	3	
6	CMPN406	Wireless Mobile Networks	3	
7	CMPN415	Computer Networks-2	3	
8	CMPN426	Computer Systems Security	3	
9	CMPN441	Computer Peripherals	3	
10	CMPN442	Fault Tolerant Computing	3	
11	CMPN443	Computer Manufacturing Technology	3	
12	CMPN444	Computer Interfacing	3	

	Code	Course Title	Credits	Group
13	CMPN445	Embedded Systems	3	E-2C[(1)]
14	CMPN446	Image Processing and Computer Vision	3	
15	CMPN447	Optical Networks	3	
16	CMPN448	High Performance Computing and Parallel Programming	3	
17	CMPN449	Real Time Computing	3	
18	CMPN450	Pattern Recognition and Neural Networks	3	
19	CMPN461	Selected Topics in Computer Engineering	3	
20	CMPN462	Selected Topics in Information Technology	3	
21	CMPN463	Advanced Topics in Computer Engineering	3	

Remarks:

(1) Student selects at least four (4) courses from group E-2C equivalent to 12 credits

6.6 Conformity to SCU Requirements

The classification and categorization of the courses offered by the Communication and Computer Engineering program follow the guidelines provided by the Supreme Council of Universities (SCU), as shown in Tables 6a and 6b. The classification is based on the "Sample Study Plan and Course Sequence" described in Section 7. The categorization is given for the following five student levels according to the regulations of the credit hours system of education at the Faculty of Engineering, Cairo University:

- **Freshman**: a student who completed less than 36 credits
- **Sophomore**: a student who completed more than 35 credits but less than 72 credits
- **Junior**: a student who completed more than 71 credits but less than 108 credits
- **Senior-1**: a student who completed more than 107 credits but less than 144 credits
- **Senior-2**: a student who completed more than 143 credits

The Communication Engineering track (CCE-E) consists of 68 courses: 60 compulsory courses (159 credits) and 8 elective courses (21 credits). The Computer Engineering track (CCE-C) consists of 70 courses: 63 compulsory courses (162 credits) and 7 elective courses (18 credits). The total 180 credits of two tracks of the CCE program are distributed between lectures (LEC) and tutorials (TUT), where a tutorial is classified as a problem solving session (PSS) and/or a practical work/laboratory session (PLS). The one credit of a tutorial corresponds to 2-3 hours to provide sufficient practical training for the students. Thus, the total contact hours of learning are about 295 - 300 hrs. This point is considered to be very positive from an educational point of view.

Table 6a Conformity to Supreme Council Criterion: Track CCE-E

Category	Freshman	Sophomore	Junior	Senior-1	Senior-2	Total Credits	%
Humanities and Social Sciences	6	4	3	5	6	24	13.3
Basic Sciences	22	12	8	3	0	45	25.0
Engineering Sciences	8	12	15	23	6	64	35.6
Applied Engineering Sciences	0	11	15	8	13	47	26.1
Total	36	39	41	39	25	180	100
University Requirements	6	4	4	4	6	24	13.3
College Requirements	30	3	5	3	4	45	25.0
Discipline Requirements	0	32	26	12	3	73	40.6
Major Requirements	0	0	6	20	12	38	21.1
Total	36	39	41	39	25	180	100

Table 6b Conformity to Supreme Council Criterion: Track CCE-C

Category	Freshman	Sophomore	Junior	Senior-1	Senior-2	Total Credits	%
Humanities and Social Sciences	6	4	3	5	6	24	13.3
Basic Sciences	22	12	8	3	0	45	25.0
Engineering Sciences	8	12	15	15	3	53	29.5
Applied Engineering Sciences	0	11	15	14	18	58	32.2
Total	36	39	41	37	27	180	100
University Requirements	6	4	4	4	6	24	13.3
College Requirements	30	3	5	3	4	45	25.0
Discipline Requirements	0	32	26	12	3	73	40.6
Major Requirements	0	0	6	18	14	38	21.1
Total	36	39	41	37	27	180	100

7. SAMPLE STUDY PLAN and COURSE SEQUENCE

A sample study plan for the CCE program is presented as one recommended sequence to complete the graduation requirements over 10 main semesters, the Fall and Spring semesters per academic year. Since the program is based on the credit hours system of education, the student does not have to take the courses during the semester indicated in the study plan as long as the course prerequisites are satisfied. The CCE curriculum encourages students to interact with the industrial sector and government agencies by offering two industrial training courses in at least two summer sessions. Also, the curriculum gives the student the opportunity to select courses from a number of electives. The students will be trained on teamwork and be exposed to projects about Communication and Computer Engineering during their practical training and graduation projects.

Freshman Year Course Schedule

	Semester-1: Fall		Semester-2: Spring	
	Course Code	**CR**	**Course Code**	**CR**
1.	MECN001	2	MECN002	2(1)
2.	MTHN001	3	CHEN001	3
3.	MTHN002	3	MTHN003	3(2)
4.	PHYN001	3	PHYN002	3
5.	MDPN001 OR MDPN002	3 OR 3	MDPN002 OR MDPN001	3 OR 3
6.	GENN001 OR GENN002	2 OR 2	GENN002 OR GENN001	2 OR 2
7.	GENN004 OR GENN003	2 OR 2	GENN003 OR GENN004	2 OR 2
Semester Credit Hrs		18		18

Remarks:

(1) Course MECN002 has a prerequisite course MECN001

(2) Course MTHN003 has a prerequisite course MTHN002

CCE Program Study Plan: Track CCE-E

	Semester-3: Fall		Semester-4: Spring		Semester-5: Fall		Semester-6: Spring	
	Course Code	CR	Course Code	CR	Course Code	CR	Course Code	CR
1.	GENN101	2	GENN102	2	GENN201	2	PHYN211	3
2.	CMPN101	3	ELCN100	2	CMPN201	3	GENN221	2
3.	CMPN102	3	CMPN103	3	CMPN202	3	CMPN211	2
4.	ELCN102	3	ELCN101	3	ELCN201	3	ELCN203	3
5.	MTHN102	3	ELCN112	3	EMPN125	3	CMPN301	3
6.	PHYN102	3	MTHN103	3	INTN125	3	CMPN303	3
7.	CVEN125	3	MTHN104	3	MTHN203	3	CCEN280	1
8.	----------	------	----------	------	----------	------	ELCNXXX(2)	3
9.	----------	------	----------	------	----------	------	CCEN281(0)	1
Semester Credit Hrs		20		19		20		20+1(0)

	Semester-7: Fall		Semester-8: Spring		Semester-9: Fall		Semester-10: Spring	
	Course Code	CR	Course Code	CR	Course Code	CR	Course Code	CR
1.	GENN210	2	GENN204	2	CMPN405	3	CCEN481	3
2.	ELCN205	3	ELCN305	4	ELCN405	3	GENN3XX(1)	2
3.	ELCN301	3	ELCN316	3	ELCN406	3	ELCNXXX(2)	3
4.	ELCN304	3	ELCN404	4	CCEN480	1	ELCNXXX(2)	3
5.	ELCN306	3	ELCNXXX(2)	3	GENN3XX(1)	2	----------	------
6.	MTHN201	3	ELCNXXX(2)	3	GENN3XX(1)	2	----------	------
7.	CCEN380	1	CCEN381(0)	2	----------	-----	----------	------
Semester Credit Hrs		18		19+2(0)		14		11

Remarks:

(0) Industrial training courses to be completed in the summer sessions

(1) General elective course (group E-1, 2 credits per course): GENN301, GENN310, GENN311, GENN321, GENN326, GENN327, GENN331, GENN332

(2) Major elective course (group E-2E, 3 credits per course): ELCN314, ELCN321, ELCN323, ELCN325, ELCN331, ELCN351, ELCN416, ELCN426, ELCN435, ELCN436, ELCN441, ELCN445, ELCN446, ELCN451, ELCN456, ELCN466, ELCN476

CCE Program Study Plan: Track CCE-C

	Semester-3: Fall		Semester-4: Spring		Semester-5: Fall		Semester-6: Spring	
	Course Code	CR	Course Code	CR	Course Code	CR	Course Code	CR
1.	GENN101	2	GENN102	2	GENN201	2	PHYN212	3
2.	CMPN101	3	ELCN100	2	CMPN201	3	GENN221	2
3.	CMPN102	3	CMPN103	3	CMPN202	3	ELCN203	3
4.	ELCN102	3	ELCN101	3	ELCN201	3	CMPN211	2
5.	MTHN102	3	ELCN112	3	EMPN125	3	CMPN301	3
6.	PHYN102	3	MTHN103	3	INTN125	3	CMPN303	3
7.	CVEN125	3	MTHN104	3	MTHN203	3	CCEN280	1
8.	----------	------	----------	------	----------	------	CMPNXXX(2)	3
9.	----------	------	----------	------	----------	------	CCEN281(0)	1
Semester Credit Hrs		20		19		20		20+1(0)

	Semester-7: Fall		Semester-8: Spring		Semester-9: Fall		Semester-10: Spring	
	Course Code	CR	Course Code	CR	Course Code	CR	Course Code	CR
1.	GENN210	2	GENN204	2	CMPN402	3	CMPN425	2
2.	CMPN111	2	CMPN205	2	CMPN403	3	CCEN481	3
3.	CMPN203	3	CMPN306	2	CMPN405	3	GENN3XX(1)	2
4.	ELCN304	3	CMPN302	3	CMPN407	3	CMPNXXX(2)	3
5.	ELCN306	3	ELCN316	3	CCEN480	1	----------	------
6.	MTHN201	3	CMPNXXX(2)	3	GENN3XX(1)	2	----------	------
7.	CCEN380	1	CMPNXXX(2)	3	GENN3XX(1)	2	----------	------
8.	----------	-----	CCEN381(0)	2	----------	-----	----------	------
Semester Credit Hrs		17		18+2(0)		17		10

Remarks:

(0) Industrial training courses to be completed in the summer sessions

(1) General elective course (group E-1, 2 credits per course): GENN301, GENN310, GENN311, GENN321, GENN326, GENN327, GENN331, GENN332
(CCE-C students are advised to study the course GENN326)

(2) Major elective course (group E-2C, 3 credits per course): CMPN206, CMPN341, CMPN342, CMPN343, CMPN401, CMPN406, CMPN415, CMPN426, CMPN441, CMPN442, CMPN443, CMPN444, CMPN445, CMPN446, CMPN447, CMPN448, CMPN449, CMPN450, CMPN461, CMPN462, CMPN463

8. COURSE CONTENTS

8.1 University-Core Courses

GENN001	**Humanities and Engineering** **Compulsory, Credits: 2 (2+0+0)** **Prerequisite(s): none** History of Technology: Engineering and technology in a cultural, social, and historical context. Development of technology as a key to history of civilization in a comparative perspective - Exploring Humanities: Modes of thought found within humanities and social sciences. Humanities for Engineers: Humanities themes of increased complexity - Different work methodologies - Critical analysis of information & choice of argumentation - Work methodologies and pedagogical interest.
GENN002	**English Language** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): none** Writing clear topic sentences, well-developed supporting sentences, and concluding sentences. Editing paragraphs for punctuation & writing errors. Extracting meaning of words from reading texts. Making logical inferences from texts. Discussing opinions and thoughts about daily life topics. Planning, implementing and delivering group presentations. Skimming through and scanning text for details. Developing critical thinking skills.
GENN004	**Computers for Engineers** **Compulsory, Credits: 2 (1+0+2)** **Prerequisite(s): none** Developing basic concepts of algorithmic thinking to solve problems of relevance in engineering practice and implementing these algorithms using high-level computer language. Using data types, input/output commands, loops, control structures, functions, arrays, and other programming language constructs in a computer program. Evaluating and interpreting the results of programming work.
GENN101	**Technical Writing** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): GENN002 + 28 credits** Discovering and outlining ideas. Organizing outlines. Ways To begin the three parts of technical writing. Writing abstracts, summaries, and conclusions of long reports. The thesis statement. Forms: letters, memos, reports, scientific articles, job description, CV, references and footnotes. Selection of key words, titles, and subtitles. Editing, revising and proof-reading techniques. Electronic word processing and technical writing, vocabulary building, and basic types and patterns of argument.
GENN102	**Fundamentals of Management** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): 28 credits** Introduction to management, Historical view and evolution of concepts. Basic Managerial Functions: Planning, Strategies, Objectives, MBO;

	Organizing, Departmentation, Job Description; Elements of Human Resource Management: Staffing, Directing, Controlling. Total Quality Management, Continuous Improvement. Engineering Applications.
GENN201	**Communication and Presentation Skills** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): GENN101** Analyzing the audience. Selecting presentation topics and objectives. Recognizing different types of speeches and presentations. Overcoming nervousness and developing confidence while addressing an audience. Researching and generating information for informative presentations. Chucking presentation content. Designing effective visual aids. Using explicit and effective transitions throughout a presentation. Creating benefit statements for persuasive presentations. Using persuasive devices such as pathos and logos in speeches. Planning and delivering informative, persuasive, entertaining and inspiring presentations. Handling question and answer sessions effectively.
GENN204	**Accounting** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): 42 credits** Basic accounting concepts: Accounting terms and assumptions. Accounting Methodology: balance sheet, income statement, cash flow statement. Income Determination: Cash Effects, Basis of Accounting. Accounting ratio – measuring the performance – cost concepts – cost accumulation – cost allocation – cost/volume/profit analysis – budgets – forecasting. Cost Accounting.
GENN210	**Risk Management and Environment** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): GENN102** Risk Management: Introduction. Risk Definition. Basic Axioms Behind Risk Management. Systemic Approach to Handling Risk . Principle of Risk Management: Identification of Risks. Preliminary Risk Analysis (PRA). Risk Assessment. Risk Evaluation. Risk Control. Hierarchies of Control. Monitoring and Reviewing. Documentation. Study of a practical problem in which the student applies Basic Risk Management Environment: Environmental Systems: Local, Regional and Global. Influence of Air Pollutants on the, Environment, Water Pollutants, Industrial Waste, Hazardous Wastes, Management of Pollutant Releases, Pollution Prevention, Recycling of Waste Materials, Waste Treatment Technologies, Ultimate Disposal of Wastes, Water Treatment Technologies. Control of Air Pollution, Contaminated Land and Its Reclamation, Principals and Uses of the Environmental Risk Assessment, Environmental Risk Assessment Methodology, Environmental Impact Assessment Environmental Health Risk Assessment. National and International regulations**.**

GEN N221	**Economics** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): 42 credits** Economics as a Discipline: Economics as a Social Science, Micro-economics and Macroeconomics, Theories in Economics, Barriers to Clear Thinking in Economics. The Economic Problem: Scarcity, Resources and Production, Production Possibility Boundaries, Choices and Opportunity Costs, Resource Use (Fundamental Choices). Demand and Supply: The Mechanics of a Market. Demand and Supply, Consumers Behavior (Demand, Individual Demand and Market Demand), Properties of Demand Curves, Demand versus Quantity Demanded, Producers Behavior: Supply, Individual Supply and Market Supply, Properties of Supply Curves, Supply versus Quantity Supplied, Equilibrium of Demand and Supply, Adjustment in Market Equilibrium. Supply and Demand Analysis: Economic Analysis, Demand Shifts: Substitutes and Complements, Demand Shifts: Superior and Inferior Goods, Price Ceilings, Price Floor, Excise Taxes. Price Elasticity of Demand: Price Sensitivity, Price Elasticity of Demand, Measuring Price Elasticity of Demand with the Arc Formula, Price Elasticity of Demand and Slope, Price Elasticity of Demand and Total Revenue, Determinants of Price elasticity of Demand, Other Elasticities. Perfect Competition and Monopoly Production and Input Use: Production, Production Functions, Short-Run Functions, Long-Run Production, Choices of Inputs. Economic Costs: Economic Costs, Short-Run Costs, Short-Run Cost Curves, Long-Run Costs and Long-Run Cost Curves. Profits, Interests, and Rent. Interest Rates, Time Value of Money. Feasibility Studies. Project Economic Analysis. Depreciation. Factor Markets: Perfect and Imperfect Competition.
GENN301	**Ethics and Legislation** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): 80 credits** Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Case studies. Value Crisis in contemporary society. Nature of values: Psychological values, Societal values, Aesthetic values, Moral and ethical values. Work ethics and professional ethics. The legal rule: Mandatory and complementary. Sources of Law. Formal sources: Statutory Law, Custom, the Principles of natural Law and rules of justice. Informal sources: Jurisprudence, Doctrine. Application of Law. Holders of right; Natural persons, Juristic persons. Theory of Obligation; definition, forms. Sources of Obligations. The contract; Parties, Formation, Validity, Effect, and compensation of Damage. Introduction to Engineering Contracts. Contracting Contract.

GENN310	**Advanced Risk Management** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN210 + MTHN203** Review of the Basic Risk Axioms and Concepts. Evolution of Risk Concepts and Terminology. Financial and Industrial Risk: Comparison and Contrast. Probabilistic Nature of Risk.. System Decomposition. Legal and Regulatory Risks. Tools for Risk Assessment: Probability and Consequences: Event Tree, Fault Tree, FMECA, FEMEA, MOSAR (The French Approach), Simulation, Optimization and Operations Research. HACCP: principles and applications. HAZOP.Qualitative and Quantitative Risk Assessments (QRA). Quantitative Risk Assessment: Qualitative Aspects of System Analysis (Quantification of Basic Events. Confidence Interval. Quantitative Aspects of System Analysis. System Quantification for Dependent Events. Human Reliability. Uncertainty Quantification). Operational Risk. Reporting Risk Operations. Sectoral Risk Management. Specific Risk Topics: Risk Specific to Confined Spaces. The Special Case of BLEVE and Explosive Mixtures. Social and Psychological Risk. Social Risk Management and Social Protection. Disaster Risk Management and Vulnerability Reduction. Can Risk be a Management Style?
GENN311	**Technical Writing in Arabic** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN101 + 80 credits** Review of the Basics of Arabic Grammar and Mechanics. Writing Effective Sentences and Paragraphs Using Arabic Language. Discovering and Outlining Ideas. Writing Abstracts, Summaries, and Conclusions of Long Reports. The thesis Statement. Writing Technical Forms Using Arabic Language: Letters, Memos, Reports, Scientific Articles, Job Description, CV. Writing References and Footnotes. Selection of Key Words, Titles and Subtitles. Editing, Revising and Proofreading Techniques. Electronic Word Processing and Technical Writing. Integrating Graphs, Tables and Charts in Technical Documents. Vocabulary Building. Basic Types and Patterns of Argument: Terminology, Building Sub-Arguments of Fact and Policy. مراجعة أسس القواعد النحوية و ميكانيكيات اللغة العربية - الأخطاء الشائعة فى استخدامات اللغة العربية - كتابة جمل وفقرات صحيحة وفعالة باستخدام اللغة العربية - خلق الأفكار (التفاكر) - كتابة مقدمات، ملخصات و خاتمات التقارير - كتابة الأبحاث - أشكال الكتابة باللغة العربية: الرسائل، المذكرات، التقارير، المقالات العلمية، الوصف الوظيفي، كتابة السيرة الذاتية وتوثيق المراجع - اختيار الكلمات المفتاحية و كذلك العناوين الرئيسية والفرعية - التعرف على تقنيات التحرير و المراجعة و القراءة الاحترافية - إمكانية معالجة النصوص والكتابة الإليكترونية - الرسوم و الجداول و المخططات البيانية في الوثائق الفنية - بناء حصيلة لغوية من الكلمات والمفردات - تعلم الانماط و الأساليب الأساسية والمبدئية للنقاش من حيث المنهجية والبناء.
GENN321	**Foreign Language** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN201** Emphasizing the development of student's communicative skills to speak, listen, read and write in languages other than Arabic and English, such as

	French, German, Spanish, Italian, Japanese, Chinese, etc, and to study cultural characteristics of such foreign languages from historical, geographical, literature, economic, and social viewpoints. Topics include, but not limited to, the basics of language grammar and mechanics, writing effective sentences and paragraphs, vocabulary building, writing technical engineering documents and writing technical forms: letters, memos, reports, scientific articles, job description, resumes and curriculum vitas.
GENN326	**Marketing** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN102 + 80 credits** Introduction. The Field of Sales; Strategic Sales Force Management. The Personal Selling Process and Sales Force Organization. Profiling and Recruiting Salespeople; Selecting and Hiring Applicants, Developing the Sales Program, Sales Force Motivation, Sales Force Compensation, Expenses and Transportation; Leadership of a Sales Force, Forecasting Sales and Developing Budgets; Sales Territories, Analysis of Sales Volume, Marketing Cost & Profitability Analysis, Performance Evaluation; Ethical and Legal Responsibilities tender writing.
GENN327	**Selections of Life-Long Skills** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN201** Communicating Clearly - Managing Time and Resources - Making Decisions - Delegating Successfully - Motivating People - Managing Teams - Negotiating Successfully - Minimizing Stress - Getting Organized - Managing Changes - Interviewing People - Managing Your Career - Balancing Work and Life - Thinking Creativity and Innovation - Influencing People – Systems Thinking – Interpersonal Management Skills – Entrepreneurial Skills.
GENN331	**Business Communication** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN201** Skills for effective communication in the workplace; constructing and delivering persuasive business presentations; theoretical and experiential knowledge of argumentation and debate for informal and formal presentations; style, layout, and convention of business writing; writing business proposals, progress reports, and feasibility reports; common areas of miscommunication.
GENN332	**Service Management** **Elective (group E-1), Credits: 2 (1+1+0)** **Prerequisite(s): GENN102 + 80 credits** Role of services in the economy, The nature of services, Service quality, Service Strategy, Developing new services, The role of technology in supporting service delivery, Design of services, Capacity planning and managing queues, Quantitative methods for service management.

8.2 College-Core Courses

CHEN001	**Chemistry** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): none** Gases; Applications to gaseous law; Mass balance and heat balance in combustion processes of fuels; Solutions & separation techniques; Applications to electrochemistry; Corrosion; Water treatment; Building materials; Environmental Engineering; Selected chemical industries: fertilizers, dyes, polymers, sugar, petro-chemicals, semi-conductors, oil and fats, industrial systems; Chemical Vapor deposition.
GENN003	**Basic Engineering Design** **Compulsory, Credits: 2 (1+1+0)** **Prerequisite(s): none** Introduction to Design: Problem description and Introduction to Internet communication - Project Management: Project Management Application, Problem Solving Techniques: Problem Definition, Design Constraints - Creative Thinking and Problem Solving: Introduction to critical and creative thinking, nature of design problems - Brainstorming seminar, list of possible and impossible solutions and generating Ideas - Creative Thinking and Decision making: Product life cycles , Selection of idea (s), Final decision matrix, Justify decision - The Design Matrix: Context, purpose and requirements of engineering design - Analyze selected solution/preliminary design - Automated Design & the Positive Attitudes for Creativity - Systematic generation and evaluation of ideas.
MDPN001	**Engineering Graphics** **Compulsory, Credits: 3 (1+0+5)** **Prerequisite(s): none** Techniques and skills of engineering drawing, normal and auxiliary projections. Solid geometry. Intersections between planes and solids. Development, sectioning. Drawing and joining of steel frames. Assembly drawing of some mechanical parts.
MDPN002	**Fundamentals of Manufacturing Engineering** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): none** Engineering Materials - Elements of Manufacturing Processes, material flow, energy flow and information flow - Forming in the liquid state, Casting and molding processes - Forming in the solid state, metal forming, forming of plastics and powder metallurgy - Material Joining processes, welding, soldering and brazing, riveting, joining by mechanical elements, assembly processes - Material removal processes, metal cutting and finishing processes - Computer applications in manufacturing - Term mini-project.
MECN001	**Mechanics-1 (Statics)** **Compulsory, Credits: 2 (1+3+0)** **Prerequisite(s): none** Statics of particles, forces in three-dimensions, vector algebra; equivalent systems of forces, resultant of a group of forces, moments of forces,

	moment of a couple, reduction of a system of forces, wrench; equilibrium of rigid bodies in two dimensions, reactions at supports and connections for a 2D structure, 2D trusses, equilibrium of rigid bodies in three dimensions, reactions at supports and connections for a three dimensional structure; centroids and centers of gravity, center of gravity of 2D bodies, centroids of areas and lines, first moments of areas and lines, composite plates and wires; moments of inertia, moments of inertia of areas, second moment, or moment of inertia of an area, polar moment of inertia, radius of gyration of an area, parallel-axis theorem, moments of inertia of composite areas, product of inertia, principal axes and principal moments of inertia, moments of inertia of masses, moment of inertia of a mass, parallel axis theorem, moments of inertia of thin plates, moments of inertia of composite bodies, mass product of inertia, principal axes and principal moments of inertia.
MECN002	**Mechanics-2 (Dynamics)** **Compulsory, Credits: 2 (1+2+1)** **Prerequisite(s): MECN001** Kinematics of particles: rectilinear motion of particles, position, velocity and acceleration, uniform rectilinear motion, uniformly accelerated rectilinear motion, curvilinear motion, derivatives of vector functions, rectangular components of velocity and acceleration, relative motion, tangential and normal components of acceleration, motion of a particle in a circular path, velocity and acceleration of a particle in polar coordinates. Kinetics of particles: Newton's second law, linear momentum of a particle, equations of motion with applications in Cartesian coordinates, tangential and normal directions, polar coordinates, free vibrations of particles, simple harmonic motion; energy & momentum methods, work of a force, kinetic energy of a particle, principle of work and energy, applications, power and efficiency, potential energy, conservation of energy, principle of impulse and momentum, impulsive motion, impact, direct central impact and coefficient of restitution, oblique central impact.
MTHN001	**Introduction to Linear Algebra and Analytic Geometry** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): none** Matrix algebra, determinants, inverse of a matrix, row equivalence, elementary matrices, solutions of linear systems of equations; parabola, ellipse and hyperbola, eccentricity and conic sections; quadratic equations; solid geometry, line, plane, quadratic surfaces.
MTHN002	**Calculus I** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): none** Functions, graphing of functions, combining functions, trigonometric functions; limits and continuity; differentiation; inverse functions; exponential and logarithmic functions; inverse trigonometric functions; hyperbolic and inverse hyperbolic functions; indeterminate forms and L'Hopital's rule; Taylor and Maclaurin expansions.

MTHN003	**Calculus II** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN002** Anti-derivatives; indefinite integrals; techniques of integration; definite integrals, applications of definite integrals; functions of several variables; partial derivatives, applications for partial derivatives.
MTHN102	**Multivariable Calculus and Linear Algebra** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN001 + MTHN003** Double integrals, double integrals in polar coordinates; triple integrals, triple integrals in spherical and cylindrical coordinates; applications of double and triple integrals; line and surface integrals; vector analysis, gradient of a scalar function, divergence of a vector, curl of a vector, divergence and Stokes' theorems, vector identities; LU-factorization; vector spaces; inner product spaces; eigenvalues and eigenvectors; diagonalization of matrices; functions of matrices.
MTHN203	**Probability and Statistics** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN102** Probability axioms; probability laws; conditional probability; random variables; discrete and continuous distributions; joint distribution; computer simulation; sampling; measures of location and variability; parameter estimation, testing of hypothesis.
PHYN001	**Mechanics, Oscillations, Waves and Thermodynamics** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): none** Physics and measurements; elastic properties of solids; universal gravitation and motion of planets; fluid mechanics (statics and dynamics); oscillatory motion; wave motion, sound waves; thermo-dynamics, temperature, heat and the first law of thermodynamics, the kinetic theory of gases, heat engines, entropy and the second law of thermodynamics. Laboratory experiments on course topics.
PHYN002	**Electricity and Magnetism** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): none** Electric field; Gauss' law; electrostatic potential; capacitance and dielectrics; current and resistance; direct current circuits; magnetic fields, sources of magnetic field; Faraday's law; Maxwell's equations; inductances; magnetic properties of matter. Laboratory experiments on the course topics.
CCEN280	**Seminar-1** **Compulsory, Credits: 1 (1+0+0)** **Prerequisite(s): 72 credits + AA Approval** Talks and presentations are invited from industrial establishments relevant to the program. The guest speaker should discuss the organization, management, and recent technologies implemented in his/her industrial establishment. Students exercise writing brief technical

	reports on the guest presentation and deliver their own presentation about the topic. *The course is graded as Pass/Fail grade-system.*
CCEN380	**Seminar-2** **Compulsory, Credits: 1 (1+0+0)** **Prerequisite(s): CCEN280 + GENN201** Students will be required to present seminars on a subject assigned to (or chosen by) them about the latest technology relevant to the program. The grade depends on organization, quality, and content of both the presentation and the report prepared by the student. *The course is graded as Pass/Fail grade-system.*
CCEN281	**Industrial Training-1** **Compulsory, Credits: 1 (0+0+3)** **Prerequisite(s): 72 credits + AA Approval** Training on industrial establishments relevant to the program. Training lasts for total of 90 hours, during a period about three weeks. The program training advisor schedules at least one follow up visit to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. *The course is graded as Pass/Fail grade-system.*
CCEN381	**Industrial Training-2** **Compulsory, Credits: 2 (0+0+6)** **Prerequisite(s): CCEN281 + AA Approval** Training on industrial establishments relevant to the program. Training lasts for total of 180 hours, during a minimum period of six weeks. The program training advisor schedules at least two follow-up visits to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. *The course is graded as Pass/Fail grade-system.*
CCEN480	**Graduation Project-1** **Compulsory, Credits: 1 (0+0+3)** **Prerequisite(s): 130 credits + AA Approval** Students undertake a major project as part of the program. The aim of the project is to provide the students, who work in groups, with an opportunity to implement appropriate concepts and techniques to a particular design. Students are required to select and research the expected project to be designed and implemented in the following course Graduation Project-2. The student should give an oral presentation to be approved. *The course is graded as Pass/Fail grade-system.*

CCEN481	**Graduation Project-2** **Compulsory, Credits: 3 (1+0+6)** **Prerequisite(s): CCEN480 + AA Approval** All students undertake a major project as part of the program. The aim of the project is to provide the students, who work in groups, with an opportunity to implement the appropriate concepts and techniques to a particular design. A dissertation on the project is submitted on which the student is examined orally.

8.3 Discipline Courses

CMPN101	**Logic Design-1** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): PHYN002** Number systems and data representation - Boolean algebra - simplification of Boolean functions - logic gates - combinational and sequential logic circuits – Registers, counters, and adders – Memory
CMPN102	**Data Structures and Algorithms** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): MTHN003 + GENN004** Data types and representation – file structures- data structures representation in storage media and memory allocation- linear lists - stacks - queues - memory allocation - trees - graphs - Hashing - searching, sorting algorithms and their analysis-programming project
CMPN103	**Programming Techniques** **Compulsory, Credits: 3 (2+1+2)** **Pre-requisites: MTHN003 + GENN004** Introduction to software design - evolution and comparison of programming languages - types and characteristics of translators - structured programming - function versus object oriented programming- introduction to parallel programming- program maintenance & testing - documentation - numerical and non-numerical examples-programming project.
CMPN201	**Microprocessor Systems-1** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN101** Computer architecture - CPU architecture - fetch-decode-execute cycle - addressing modes - instruction set - memories (RAM-ROM-Cache-Flash) - memory interfacing - timing diagrams - assembly language - instruction formats - data representation - arithmetic operations
CMPN202	**Introduction to Database Management Systems** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN103** Basic database concepts - data structures and operations - data modeling - database system architecture - data definition and data manipulation

	languages - query languages including Algebra and SQL - software package training
CMPN211	**Microprocessor Systems-2** **Compulsory, Credits: 2 (1+1+2)** **Prerequisite(s): CMPN201** Program controlled and interrupt driven I/O - I/O interfacing - connection of terminals, discs and I/O ports - assembly language - macros and kernels - introduction to embedded systems.
CMPN301	**Computer Architecture** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN201** Computer arithmetic - design of ALU - pipelined ALU and processor – multiprocessors - multicomputers control unit - instruction repertoires (RISC, CISC) - interrupt circuits - bus synchronization - I/O devices - channels - memory architectures - connection of computer peripherals - Distributed Systems- parallel processors architecture - scalable computer platforms - vector processors - vectorizing compilers - systolic arrays - loosely and tightly coupled processors - symmetric and CC-NUMA multiprocessors- data flow machines - interconnecting networks - clustering - parallel programming - performance evaluation - case studies
CMPN303	**Operating Systems** **Compulsory, Credits: 3 (2+1+2)** **Pre-requisites: CMPN103 + MTHN104** Types of operating systems - functions of operating systems - process states - memory management - virtual memory - processor management - process scheduling - case study (Unix)- Real Time Operating systems- Multithreading. Multiprocessor systems - device management - deadlock prevention - file systems - system resilience - network and distributed operating systems - programming project.
CMPN405	**Computer Networks-1** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN102+CMPN201** Seven layer communication model - network architecture and protocols routing techniques and algorithms - network planning and design - Network layers, TCP / IP Network protocol, Routing protocols, Network Design, Network Management, Congestion, Examples of LAN's and WAN's, High Speed Networks, Other Network Protocols.
CVEN125	**Civil Engineering** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): MECN001** Buildings: types of buildings, items within a building, types of foundations, building materials with emphasis on concrete and testing, insulation against heat moisture, noise and pollution, Principles of fire protection, tender document.

	Surveying: Principles & applications of surveying sciences with emphasis on plane surveying, Popular techniques and engineering uses of distance, angles and height difference measurements. Applications of mapping, earthwork computations, setting out engineering structures, Integrated digital surveying and mapping using total station, Internet resources. Structures: Types of structures, loads, supports, reactions, internal forces, analysis of beams, frames, trusses. Beams subjected to moving loads.
ELCN100	**Laboratory** **Compulsory, Credits: 2 (1+0+3)** **Prerequisite(s): ELCN102 + CMPN101** Introduction about using electronic equipments (A.C. and D.C. power supplies, oscilloscopes), filter circuits, half wave and full wave rectifier circuits, oscillators, logic gates, half adder and full adder circuits, counters
ELCN101	**Electronics-1: Basic Electronic Circuits** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): PHYN002 + PHYN102** Diode circuit applications – Bipolar junction transistor (BJT) - Metal oxide semiconductor transistor (MOST): physical structure, basic configuration, I-V characteristics, biasing - small signal equivalent circuit - Biasing techniques (current source biasing) – Single stage amplifiers – Active Load.
ELCN102	**Circuits-1** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN003** Analysis of resistive circuits by simplifications – Network theorems – Analysis of circuits with AC excitation in the time domain – Analysis of AC circuits in the frequency domain – Analysis of AC circuits using circuit theorems, loop and mode analysis – Maximum power transfer – RLC circuits – Magnetically coupled circuits - Three phase circuits.
ELCN112	**Circuits-2** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): ELCN102 + MTHN102** Series and parallel resonant circuits – Application on passive filters – Two port circuits – Fourier and harmonic analysis – Application of Laplace transforms to circuit analysis – Circuit synthesis – Synthesis of lossless
ELCN201	**Electronics-2: Analog and Digital Electronics** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN101** Multistage amplifiers and composite circuits - Current mirrors – High frequency analysis and frequency response – Differential amplifiers - Feedback amplifiers - Digital logic gates – Sequential circuits (flip-flops, shift registers, counters) – Power amplifiers

ELCN203	**Signal Analysis** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): ELCN102 + MTHN102** Continuous time and discrete time signals and systems - basic system properties - Linear Time Invariant Systems – The C.T and D.T. convolution - Properties of LTI systems - Fourier Series Representation of C.T. and D.T. Periodic Signals - Parseval's relation - The C.T. Fourier Transform for periodic and aperiodic signals - Properties of continuous time F.T. – The D.T. Fourier Transform – Properties of D.T. Fourier Transform - Complex exponential and sinusoidal Amplitude Modulation- Demodulation for Sinusoidal AM - Frequency Division Multiplexing - Representation of continuous time signal by its samples - The sampling Theorem - The effect of under-sampling or aliasing - sampling with zero order hold - The Z Transform
ELCN304	**Control-1** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): MTHN102 + ELCN203** Continuous-time linear systems approach – Classification of different continuous-time control systems – Mathematical modeling of dynamic systems using Laplace Transform– Application to electrical, electronic, mechanical, power and fluid systems – Feedback control systems – Control system characteristics – Error analysis – Steady state error for the test input signal using static error coefficients – Transient response characteristics – Approximation of higher order systems to second order systems – Basic control actions– Compensation using P,PI,PD and PID controllers – Block diagram reduction –Signal flow graphs – Analysis of systems in state space – Stability of linear systems –Controllability – Observability
ELCN306	**Communications-1: Analogue Communications** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN203 + MTHN203** All Types of AM (DSB-LC, DSB-SC, SSB, VSB, QAM) – AM modulators, and demodulators, advantages and disadvantages-Synchronization circuits - AM applications: Telephone channel multiplexing and superheterodyne receiver -Angle Modulation - Narrow band angle modulated signals - Spectrum of sinusoidal signal (N.B and W.B) - Generation of wide band FM (Indirect and Direct methods)-Demodulation (slope detector, PLL) - De-emphasis and pre-emphasis filtering - compatible stereo - Intersystem comparison – Sampling process – PAM – Quantization (uniform and non-uniform) – PCM – Time division multiplexing – Delta, and adaptive delta modulation – Differential PCM – random process – Stationary and ergodic processes – Mean, correlation, and covariance functions – Power spectral density – Narrow band noise.

ELCN316	**Communications-2: Digital Communications** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN306** Baseband Pulse transmission: Matched filters, Intersymbol Interference, Nyquist Criterion for distorionless baseband binary transmission - Signal-Space Analysis: Geometric representation of signals, likelihood functions, coherent detection of signals in noise: ML and MAP decoding rules, the correlation receiver. Probability of error calculation – Pass-band Digital Transmission: Description of ASK, FSK, PSK, DPSK, QAM, MSK modulation schemes - their implementation PSD c/cs - B.W efficiency (spectral efficiency) - performance in AWGN channels.
EPMN125	**Electrical Power Engineering** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): none** Transformers – DC machines – AC machines – synchronous machines – special electrical machines (stepper motors, fixed magnet machines, two-phase servo motors) – electronic control of electrical machines –UPS systems – power distribution networks –air-conditioning- earthing – protection of electric equipment.
INTN125	**Mechanical Engineering** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): none** (Robotics) principles of Robot motion- degrees of freedom- motor control. Introduction to thermodynamics – heat transfer – air conditioning and ventilation systems – air filtering – calculation of thermal loads – fire alarm and fighting equipment – requirements specifications – acceptance criteria
MTHN103	**Differential Equations** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN003** First-order differential equations, separable, exact, linear, homogeneous and Bernoulli equations; modeling with first order differential equations; higher-order differential equations; method of undetermined coefficients; variation of parameters; modeling with higher order differential equations; series solutions; Laplace transform; properties and applications, shifting theorems, convolution theorem; solutions of differential equations using Laplace transform; Fourier series; Fourier transform.
MTHN104	**Discrete Mathematics** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): MTHN003** Numbers- generating functions – sets – groups – graphs – some combinatorics examples - Basic Mathematical logic – Introduction to formal languages and finite automata – Recursive definitions – Recurrence relations – Asymptotic analysis.

MTHN201	**Numerical Analysis** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): MTHN102 + MTHN103** Basic concepts of floating- point arithmetic- Conditioning of a problem- Numerical stability of an algorithm – Linear systems: direct methods (Gauss elimination, LU factorization, Choleski) – Iterative methods (Jacobi –Gauss-Seidle – SOR). Approximation of Functions: polynomials and piecewise polynomial interpolation, splines, discrete least squares. Nonlinear equations: Newton's method and its discrete variants, fixed point iteration. Numerical integration: Newton- Cotes formulas, Gaussian quadrature rules, composite rules. Initial value problems for ordinary differential equation: one-step methods (Runge-Kutta methods) and multistep (Adams) methods. Stiff problems
PHYN102	**Modern Physics** **Compulsory, Credits: 3(2+2+1)** **Prerequisite(s): PHYN001 + PHYN002** Introduction to quantum physics; Quantum mechanics; Atomic Physics; Molecules and solids; energy states and spectra of molecules, bonding in solids, introduction to crystalline properties of semiconductors, free electron theory of metals, band theory of solids, electrical conduction in metals, insulators and semiconductors, superconductivity. Pn junction diode, Zeener diode and tunnel diode

8.4 Major Courses: Track CCE-E

ELCN205	**Electromagnetics-1: Wave Propagation and Transmission Lines** **Compulsory, Credits: 3 (2+3+0)** **Prerequisite(s): PHYN211 + ELCN112*** ****Corequisite course, both courses may be taken in the same semester after receiving the academic approval AA*** Time varying fields and Maxwell's equations, boundary conditions at different media interface, retarded potentials, plane wave propagation in free space, plane waves in lossy media, wave polarization, Poynting vector, phase and group velocities, reflection and transmission of plane waves, TEM transmission lines, transmission line equivalent circuit, transmission line circuit theory, Smith chart, lossy transmission lines, matching techniques.
ELCN301	**Electronics-3: Integrated Circuits and Systems** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN201** IC technology – Tuned amplifiers – Noise analysis – Operational amplifiers and applications – Waveform generation – Analog IC applications (analysis and design) – Evaluation of circuit performance by computer-aided circuit simulations – Phase locked loops - Electronic circuits in radio and television – Video recording .

ELCN305	**Electromagnetics-2: Microwave Engineering** **Compulsory, Credits: 4 (3+2+1)** **Prerequisite(s): ELCN205 + ELCN112** Rectangular and circular wave guides, cavity resonators, excitation of waveguides, surface guiding and dielectric optical waveguides, analysis of microstrip and strip lines, scattering parameters, wave propagation in ferrite media, passive microwave components.
ELCN404	**Control-2** **Compulsory, Credits: 4 (3+2+1)** **Prerequisite(s): ELCN304** Root locus concept – Root locus analysis of control systems – Frequency response analysis – Bode diagrams – Frequency response specifications – Relative Stability analysis – closed loop frequency response – Design and compensation techniques – Lead and Lag compensation – Solution of State Equations - State variable controller design: Regulator problem – Pole placement using state feedback – Output feedback – Full State Observer Design – Separation Principle – Observed State feedback Controller – Discrete-Time Control Systems – Z-Transform – Pulse-Transfer Functions – Transient Response and Steady State Characteristics of Discrete-time control systems – Bilinear transformation – Stability analysis of discrete-time control systems.
ELCN405	**Electromagnetics-3: Antennas** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN205 + ELCN305*** ***Corequisite course, both courses may be taken in the same semester after receiving the academic approval AA*** Antenna fundamentals, basic antenna parameters, radiation from wire antennas, aperture antennas, radiation from microstrip antennas, antenna arrays, array polynomial, phased arrays and null steering, receiving antennas, polarization mismatch, antenna design techniques, introduction to terrestrial and extraterrestrial radio wave propagation, surface wave propagation, ionospheric propagation, microwave and millimeter wave propagation, knife-edge obstacle diffraction models, atmospheric ducts and non-standard refraction.
ELCN406	**Communications-3: Wireless Communications** **Compulsory, Credits: 3 (2+2+1)** **Prerequisite(s): ELCN316** DFT and its properties – Fading (fast, slow, and flat) – Frequency selective and non-selective – Dual Multi-Tone (DMT) – OFDM – Multi-path propagation – Delay spread values – Guard time and cyclic extension – OFDM parameters – OFDM versus single carrier modulation - Spread Spectrum – PN sequence generators – Direct sequence Spread Spectrum – Probability of error – Frequency Hopping Spread Spectrum – CDMA – DS-CDMA.

PHYN211	**Electromagnetic Fields** **Compulsory, Credits: 3 (2+0+3)** **Prerequisite(s): PHYN002 + MTHN103** Vector analysis, static electric field, steady currents, electromagnetic fields. static magnetic fields, time varying and time harmonic Maxwell's equations, wave equation and its solutions, boundary conditions, introduction to electromagnetic wave propagation
ELCN314	**Computer Control Systems** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN304** Modular structure of Programmable Logic Controllers (PLCs) – Advantages of using PLCs in Industrial Automation – PLC Programming – Ladder Logic – Handling of Inputs and Outputs in PLCs – Markers - Timers - Counters – PLC Program Development for Control Applications – Interlocking Logic – Sequential Logic - Micro processor control systems – Interfacing controllers with sensors and actuators – Programming of Control Algorithms -Three-term control using micro processors – Controller Fault Tolerance .
ELCN321	**VLSI Systems** **Elective (group E-2E), Credits: 3 (2+2+1)** **Prerequisite(s): ELCN301** Large scale MOS design – MOS circuit fabrication, design rules, power and delay estimation – Memories – Dynamic logic – Switching characteristics – Switched capacitor circuits – Complex gates – Charge coupled devices.
ELCN323	**Digital Signal Processing** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN203 + ELCN306** General Introduction - Speech Characteristics - Short time Processing - Pitch & Formants Estimation - Vector Quantization - Linear Predictive Coding - speech Coding Techniques - Speech Synthesis - Speech Recognition - Speaker Recognition - Image Coding - Video Coding - Review Projects.
ELCN325	**Acoustics** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN305** Plane and spherical waves – Simple and compound sound sources – Dynamically analogous mechanical and acoustical circuits – Acoustic transducers – Loudspeakers; types and systems – Microphone; types and systems - Measurements of sound – Acoustics and hearing – Acoustic environment outdoors – Acoustic environment indoors - Ultrasonic applications.
ELCN331	**Advanced Topics in Electronics-1** **Elective (group E-2E), Credits: 3 (2+2+1)** **Prerequisite(s): ELCN301** This course covers the most recently introduced topics in electronic systems and applications.

ELCN351	**Industrial Electronics** **Elective (group E-2E), Credits: 3 (2+2+1)** **Prerequisite: ELCN301** Data acquisition systems – Sensors – Signal Conditioning – Digitizing – Microprocessor based systems – Memory interface – I/O interfaces – Applications in industry.
ELCN416	**Communications-4: Information Theory** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** Uncertainty, information, and Entropy – Source coding – Properties of source codes: Uniquely decodable codes, Instantaneous codes, construction of instantaneous codes, The Kraft inequality - Huffman and Fano codes – Quantization - Discrete memory-less channels – Mutual information – Channel capacity - linear block codes – syndrome calculation – Cyclic codes – Convolutional coding– The code tree, trellis and state diagram - ML decoding of convolutional codes: The Viterbi algorithm - free distance of the convolutional code"
ELCN426	**Optical Fiber Communications** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN306 + ELCN205** Optical versus radio frequency communications – Optical fibers – Ray representation in optical fibers – Model analysis in step and graded index optical fibers – Signal degradation – Optical receivers – Optical properties of III – V semiconductors – Emitters: SC laser diodes, light emitting diodes – Photo detectors PIN and avalanche photo diode (APD).
ELCN435	**Advanced Topics in Antennas** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN405** Antenna fundamentals, analysis and design principles, radiation from wire antennas, aperture antennas, slot, horn and paraboloidal reflectors, radiation from microstrip antennas, antenna arrays, array polynomial, phased arrays and null steering, receiving antennas, polarization mismatch, antenna noise temperature, introduction to signal processing antennas, antenna broadbanding techniques.
ELCN436	**Mobile Communications** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** Conventional telephone systems – Traffic theory – Conventional mobile system – Frequency spectral efficiency – Methods of increasing system capacity – System architecture – Multiple access schemes – Interference in cellular systems – Hand off – Fading and Doppler in cellular system – GSM system architecture – GSM channel coding- Ciphering and modulation – System management.

ELCN441	**Advanced Topics in Electronics-2** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN301** This course covers the most recently introduced topics in electronic systems and applications.
ELCN445	**Advanced Topics in Microwave and RF Engineering** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN405** Review of transmission-line theory; planar transmission-lines and waveguides, microwave network analysis, S-parameters, discontinuities and modal analysis, impedance matching and tuning, resonators, power dividers and couplers, microwave amplifier design, stability analysis, introduction to microwave filter design techniques, modern RF & microwave CAD; measurement techniques.
ELCN446	**Advanced Topics in Communications-1** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** This course covers the most recently introduced topics in communication systems and applications.
ELCN451	**Advanced Topics in Electronics-3** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN301** This course covers the most recently introduced topics in electronic systems and applications.
ELCN456	**Advanced Topics in Communications-2** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** This course covers the most recently introduced topics in communication systems and applications.
ELCN466	**Satellite Communications** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** The Geo-stationary (GEO) orbit – The space link – Transmission losses – The link power budget – System noise – Uplink and downlink carrier-to-noise ratios – Inter-modulation noise – Pre-assigned and demand assigned FDMA – TDMA – Frame efficiency and channel capacity – CDMA – Interference between satellite circuits – Antenna gain function – Pass-band interference – Protection ratio – Coordination criterion – LEO satellites – CDMA in LEO satellite systems – Signal to interference ratio (SIR) – Spread slotted ALOHA for LEO satellites – Modified power control – Transmit permission control scheme; non-fading and fading channel – Packet admission control scheme – Power control – Multi-beam LEO satellites.

ELCN476	**Advanced Topics in Communications-3** **Elective (group E-2E), Credits: 3 (2+3+0)** **Prerequisite(s): ELCN316** This course covers the most recently introduced topics in communication systems and applications.

8.5 Major Courses: Track CCE-C

CMPN111	**Logic Design-2** **Compulsory, Credits: 2 (1+1+2)** **Prerequisite(s): CMPN101** Combinational and sequential logic circuits - applications to the design of arithmetic and logic units and counters – FPGA- PAL -PLA.
CMPN203	**Software Engineering** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN103** Software life cycle - concepts and methods of analysis - constrained system design - data, functions and relationships specifications - implementation procedures - standard specifications - reliability measures and quality assurance - integral testing - error analysis - software maintenance - documentation- project training.
CMPN205	**Computer Graphics and Man Machine Interfacing** **Compulsory, Credits: 2 (1+1+2)** **Prerequisite(s): CMPN103** Fundamentals of computer graphics - display devices - fundamentals of graphic algorithms - two dimensional graphics - polygon representation - polygon filling - polygon clipping - three dimensional graphics - back face removal - scan line and ray tracing - illumination and shading models - programming projects
CMPN302	**Design and Analysis of Algorithms** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN102 + MTHN201** Algorithms Design and analysis- examples - Techniques for designing efficient algorithms - analysis of complexity - complexity bounds of fundamental problems, graph problems and combinatorial problems – Balanced binary search trees – Dynamic programming - Divide-and-conquer - Search - Branch-and-bound - Fundamentals of parallel algorithms - Applications (approximate string matching, data compression, computational geometry) - NP-completeness - NP-hardness
CMPN306	**Advanced Programming Techniques** **Compulsory, Credits: 2 (1+1+2)** **Prerequisite(s): CMPN103 + MTHN203** Programming Techniques in Network and various Media Types – New Programming Techniques (e.g. Internet programming-Web based applications – workflow automation – multithreaded programming – intro

	to embedded programming– Languages for Internetworking programming and Data Transfer
CMPN402	**Machine Intelligence** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): MTHN201 + MTHN203** (Artificial Intelligence) Introduction to artificial intelligence concepts and definitions -state-space and search - knowledge representation - logic-production systems - semantic networks - frames - knowledge issues - inference - inheritance - nonmonotonic reasoning- uncertainty - fuzziness-game playing - AI-programming languages - Introduction to expert systems and knowledge engineering.- application fields that need intelligence (natural languages- learning-planning-robotics- decision support systems- intelligent agents – Semantic web)
CMPN403	**Languages and Compilers** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN303** Introduction to the theory of languages - evolution of computer languages and translators - formal specification of languages - context dependent and context free languages - logical structure of a compiler - lexical, syntax and semantic analysis - code generation and optimization - storage and register allocation - runtime considerations
CMPN407	**Computer Modeling and Simulation** **Compulsory, Credits: 3 (2+1+2)** **Prerequisite(s): CMPN101 + MTHN201** Introduction to modeling and simulation - application of modeling and simulation in different fields - examples of modeling and simulation of computer units (memory, discs, processors, OS) - model development - simulation techniques - simulating operational loads - analysis of results of modeling and simulating computers - testing – project
CMPN425	**Computer System Consultation** **Compulsory, Credits: 2 (1+1+2)** **Prerequisite(s): 100 Credits** Automation- Evaluation Sheets-Comparing hardware and software alternatives-certification- tender writing- tender laws-obligations and computer system and networks evaluation – H/W and S/W bench Marking, System Design.
PHYN212	**Electromagnetics for Computer Engineering** **Compulsory, Credits: 3 (2+0+3)** **Prerequisite(s): MTHN103 + CMPN103** Electromagnetic definitions and concepts, Maxwell's equations, Standard engineering electromagnetic shielding, radiation, environment, EMC applications and testing, hands on antennas, introduction to electro-magnetic wave propagation.

CMPN206	**Multimedia** **Elective (group E-2C), Credits: 3(2+1+2)** **Prerequisite(s): CMPN205** Multimedia -design and implementation of GUI- hardware interfacing- programming project.
CMPN341	**Information Technology and Advanced Languages** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN306** Paradigms of programming languages - Imperative languages - Contour diagrams - Lexical scope - Lifetime - Variable binding - Runtime stack - Types - Functional languages (ML) - List processing (Lisp) - Logic programming (Prolog) - Object-oriented programming (Java / C#).
CMPN342	**Computer Systems Programming** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN306** Functions of system software components - design of hardware drivers, loaders and linkers, compilers, assemblers, interpreters and utilities - case study of real system programming
CMPN343	**Computation and Programming Theory** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN302** Introduction - basic automata concepts - acceptors - regular expressions - sequential machines - Turing machine - universal machine - computable and non-computable functions - recursive functions - Markov algorithms - Godel numbering - computer programming languages - proof of program correctness
CMPN401	**Advanced Database Systems** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN202** Review of Database Query and Data Manipulation Languages - examples of relational, hierarchical and network database designs - distributed databases - multicopy databases – Temporal Database - database administration: security, concurrence control and performance monitoring - data compression - sizing and timing
CMPN406	**Wireless and Mobile Network** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN405** Wireless data communication – Wireless Computer Networks – Ad Hoc Networks – Mobile IP and ATM wireless networks – Mobile Networks – GSM – GPRS - CDMA- WIFI- WIMAX – 3rd generation Mobile Networks - project implementation

CMPN415	**Computer Networks-2** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN405** Theoretical foundations for building next generation Internet. To provide a detailed introduction to advanced topics in computer net-works including advanced transport layer concepts, adaptive queue management, Quality of Service fundamentals, packet scheduling, multimedia networking, content distribution networks and network measurements. Methodologies and tools in undertaking research in networking - Performance issues and QoS mechanisms in the Internet. Expertise in network programming and computer network simulation.
CMPN426	**Computer System Security** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): 100 Credits** Digital signature – Introduction to cryptography – ciphering algorithms – principles of data security – hardware and software security techniques – software protection – computer viruses – worms – Trojans – Spy wares – networks security and firewalls
CMPN441	**Computer Peripherals** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN301** Types of computer peripherals – connection of peripherals - use of channels - programming of channels - operation of channels in concurrence with CPU - synchronization and handshaking
CMPN442	**Fault Tolerant Computing** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): MTHN201 + MTHN203** Introduction to fault tolerant systems - faults and their manifestations - error detection - protective redundancy - fault tolerant software - measures of fault tolerance – case studies
CMPN443	**Computer Manufacturing Technology** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN301** This course deals with special topics in the technology of computer manufacturing specially materials, devices and computer equipment - quality control and reliability measures
CMPN444	**Computer Interfacing** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN201 + CMPN205** Basic interfacing hardware - buses and memory/peripheral connections - interrupts - synchronous and asynchronous connections - serial and parallel interfaces - analog interfaces – Analog to Digital – Digital to Analog Converters – USB- Wireless interface- special interfaces.

CMPN445	**Embedded Systems** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN201** Embedded system design process - embedded computing platform- program design and analysis- Hardware accelerators - distributed embedded architectures- system analysis and architecture design- Design example – Programming project.
CMPN446	**Image Processing and Computer Vision** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): MTHN203** Image representation - methods of image processing - enhancement - data compression - reconstruction from projection - features extraction - image analysis - pattern recognition - computer vision
CMPN447	**Optical Networks** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN405** Introduction to Optical Networks- Propagation of signals in Optical Fiber- components (couplers- multiplexers and filters-optical amplifiers- transmitters- detectors- switches- wavelength converters)- modulation and demodulation- transmission system engineering- client layers of optical layer- WDM network elements and design- control and management- photonic packet switching- design example.
CMPN448	**High Performance Computing and Parallel Programming** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN301 + CMPN302** Storage devices and Interconnects- file systems- access patterns and optimizations- low-level I/O Interfaces- scientific data libraries- special purpose I/O techniques- data management and analysis- numerical examples
CMPN449	**Real Time Computers** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN445** Introduction to real time computers - real time operation requirements - real time operating systems - data capturing and processing in real time - examples of real time applications.
CMPN450	**Pattern Recognition and Artificial Neural Networks** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN103 + MTHN201** Introduction to basic concepts for NN-single and multilayer perceptrons- learning algorithms- feedforward and feedback architectures - recurrent networks- associative memory networks- design and hardware implementation of NN- typical examples.

CMPN461	**Selected Topics in Computer Engineering** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN301** Selected topics related to the state of the art in computer engineering.
CMPN462	**Selected Topics in Information Technology** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN303** Selected topics related to the state of the art in information technology
CMPN463	**Advanced Topics in Computer Engineering** **Elective (group E-2C), Credits: 3 (2+1+2)** **Prerequisite(s): CMPN301** Selected topics related to the state of the art in computer engineering.