**Cairo University**

**Faculty of Computers and Information**

**Accredited by the National Authority for Quality Assurance and Accreditation of Education**

**Bylaws**

**Bachelor Degree Program**

in  
Computers and Information

2018

**Vision of the Faculty**

"To be the best source locally and internationally for academic education, scientific and applied research in the fields of computing, informatics, and decision support."

**Mission of the Faculty**

"The Faculty of Computers and Information is committed to providing excellent education and research to create highly competitive specialists in the fields of informatics, computing, and decision support. The faculty also offers capacity-building programs and provides technical consultations and solutions, contributing to social and economic development."

**Core Values of the Faculty**

The core values guiding the faculty's performance are represented by the acronym **MATCH**:

1. **Market Oriented**
2. **Accountability**
3. **Transparency**
4. **Competitiveness**
5. **Academic Honesty**

**Objectives**

1. Enhance the skills of the faculty's graduates and increase the competitiveness of students and researchers.
2. Continuously develop the capabilities of faculty members and their assistants.
3. Provide a standard environment and a model climate for educational and research processes.
4. Develop and support scientific research and invest it in enhancing public and local governmental services.
5. Strengthen partnership relations and programs with civil society institutions and environmental development.
6. Commit to applying quality standards and periodically evaluating institutional capacity and educational effectiveness.

**Objectives of the Amendment**

The amendment of the faculty's bylaws aims to achieve the following:

1. Build an advanced educational system that aligns with the rapid growth in the fields of computers and information.
2. Keep up with modern scientific trends in the faculty's specialized fields through updating the curriculum.
3. Provide more space for advanced practical training that meets the requirements of work in various state institutions.
4. Allow students the freedom to choose the specializations they wish to study, in line with their interests and inclinations.
5. Provide the appropriate scientific climate for faculty members and researchers to pioneer new and advanced scientific specializations.
6. Allow for the distinction between different student capabilities and enable outstanding students to achieve their scientific ambitions.

**Departments of the Faculty**

The Faculty of Computers and Information includes the following departments:

1. **Computer Science Department**
2. **Information Technology Department**
3. **Information Systems Department**
4. **Operations Research and Decision Support Department**
5. **Basic Computer Sciences Department**

**Academic Requirements and Regulations for Obtaining a Bachelor's Degree in Computers and Information**

**Article 1: Study System**

1. The study in the proposed programs is based on the credit hours system, and the academic year is divided into two regular semesters. The credit hour is the unit of measurement for determining the weight of the course.
2. The faculty council may approve the holding of intensive summer semesters for some courses based on the proposal of the scientific departments and according to the capabilities and circumstances of the faculty.
3. Obtaining a bachelor's degree requires the student to successfully pass 135 credit hours over at least eight regular semesters, divided into four academic levels.

**Article 2: Language of Instruction**

The study in the proposed programs is in both Arabic and English, according to the requirements of each course.

**Article 3: Academic Advising**

1. The faculty assigns an academic advisor from the faculty members to each group of students. The advisor is responsible for academic advising, helping students choose and register for courses, and guiding them throughout their study period at the faculty.
2. The academic advisor's opinion is consultative, and the student is responsible for the courses they register for based on their desire.

**Article 4: Registration, Dropping, and Adding Courses**

1. At the beginning of each semester, the student registers for the courses they choose through the faculty's website and during the times specified by the faculty administration before the start of the regular study, according to the following schedule:
   * **First Week:** Student registration.
   * **Second Week:** Late registration with a fine.
   * **Third and Fourth Weeks:** Course withdrawal.
2. The faculty council determines the minimum and maximum number of students for registration in each course.
3. **Number of Registration Hours:**
   * **For Regular Semesters:**
     + Minimum credit hours for registration: 9 hours (may be exceeded if the remaining hours required for graduation are less than 9).
     + Maximum credit hours for students with a GPA of 2 or higher: 18 hours.
     + Maximum credit hours for students with a GPA between 1 and 2: 15 hours.
     + Maximum credit hours for students with a GPA of 1 or less: 12 hours.
     + The maximum credit hours may be increased to 21 hours for students with a GPA of 2 or higher for graduation purposes.
   * **For Summer Semester:**
     + The summer semester is an intensive semester lasting 7 weeks, where the weekly study hours are doubled.
     + Maximum credit hours for students: 6 hours.
     + The maximum credit hours may be increased to 9 hours for graduation purposes.
4. The student may drop or add one or more courses after completing the registration procedures during the period specified by the faculty for dropping and adding, in coordination with the academic advisor and through the faculty's website.

**Article 5: Course Withdrawal**

1. The student may withdraw from one or more courses during the period specified in Article 4, provided that the number of registered hours does not fall below the minimum for registration in the semester. In this case, the student is not considered to have failed the withdrawn courses and is given a "Withdrawn" grade.
2. If the student withdraws from one or more courses after the specified period without a valid excuse accepted by the faculty council, they are considered to have failed the withdrawn courses and are given a "Fail" grade.

**Article 6: Attendance and Absence**

1. Study in the program is regular, and distance learning is not allowed. The process of monitoring student attendance is subject to the conditions and regulations set by the faculty administration.
2. To enter the final exam, the student must achieve an attendance rate of not less than 75% of lectures and exercises in each course. If the student's absence rate exceeds 25% in any course without an accepted excuse, the faculty council may prevent them from entering the final exam and give them a grade of "Zero" in the final exam. If the student presents an excuse accepted by the faculty council (within the period specified by the council), they are given a "Withdrawn" grade in the course for which the excuse was presented.
3. A student who is absent from the final exam for any course without an accepted excuse is given a grade of "Zero" in that exam and must retake the course.
4. If the student presents a valid excuse accepted by the faculty council for not attending the final exam for any course before or within two days of the exam, they are given an "Incomplete" grade in that course, provided they have obtained at least 60% of the midterm grades and have not been prevented from entering the final exams. The student with an "Incomplete" grade is allowed to take the final exam only, and the final grade is calculated based on the grade obtained in the final exam in addition to the previously obtained midterm grades. The student must take the final exam within the same academic year or the following academic year from the date of the "Incomplete" grade; otherwise, the student must retake the entire course without counting the previously obtained midterm grades.
5. If the student presents a valid excuse accepted by the faculty council for not attending the final exam for any course within two days of the exam and the condition of obtaining at least 60% of the midterm grades is not met, they are given a "Withdrawn" grade in the course.

**Article 7: Interruption of Study**

1. A student is considered to have interrupted their studies if they do not register for a semester or withdraw from all courses of the semester without an accepted excuse. In the case of an unaccepted excuse, the semester is counted within the allowed semesters for the student to pass the level they are enrolled in.
2. The student may interrupt their studies for two consecutive semesters or three non-consecutive semesters without an accepted excuse.
3. The student may apply to suspend their enrollment in the faculty according to the conditions and regulations set by the university.

**Article 8: Dismissal from the Faculty**

The student is dismissed from the faculty according to the failure opportunities stipulated in the executive regulations of the university organizing law, which are the number of years granted to the student as follows:

* **First Level Students:** Two years.
* **Second Level Students:** Two years + one exceptional year with the approval of the faculty council.
* **Third Level Students:** Two years + three exceptional years with the approval of the faculty council.
* **Fourth Level Students:** Two years + three exceptional years with the approval of the faculty council.

Note: Suspensions of enrollment that have been approved by the faculty council are not counted within the allowed years.

**Article 9: Examination System**

a. The maximum score for any course is (100) marks.

b. The minimum passing grade for a course is 50% of the total course marks, with at least 30 marks obtained in the final exam.

c. The distribution of marks for each course is as follows:

**Coursework as follows:**

* 40% for coursework, distributed as:
  + Midterm exam with a maximum of 20%.
  + Other periodic exams conducted by the course instructor, practical applications, and assignments given to students during the semester. Oral exams may also be included.

**Final Exam:**

* 60% for the end-of-semester exam.

The College Council shall determine and announce the dates for midterm and final exams in a timely manner.

d. If the final exam for a course, based on the proposal of the department councils and the approval of the College Council, includes both a written and a practical component, the student’s final exam score for that course will be the sum of the marks obtained in the written and practical tests.

**Article 10: Grading System**

1. The faculty follows the credit hours system, which is based on the course as the basic unit rather than the academic year. The grading system is based on the point system for each course, as per the following table:

**Grade** **Percentage Points**

**A+ 90%- 100% 4.0**

**A 85%-89.9% 3.7**

**B+ 80%-84.9% 3.3**

**B 75%-79.9% 3.0**

**C+ 70%-74.9 2.7**

**C 65%-69.9% 2.4**

**D+ 60%-64.9% 2.2**

**D 50%-59.9% 2.0**

**F Below 50 0.0**

1. **GPA Calculation**: The cumulative GPA is calculated as follows:
   * Multiply the grade points of each course by the credit hours of that course to get the total points for each course.
   * Sum the points of all courses the student has registered for.
   * Divide the total points by the total credit hours registered by the student to get the cumulative GPA.
2. **Overall Grade**: The overall grade is determined based on the cumulative GPA as per the following table:

**Overall Grade Cumulative GPA**

Excellent 3.5-4.0

Very Good 3.0-3.49

Good 2.5-2.99

Pass 2.0-2.49

Fail Below 2.0

|  |  |
| --- | --- |
| Fail | Below 2.0 |

1. **Honors Degree**: The student is granted an honors degree if they pass all courses in each academic level with a grade of at least "Very Good," provided that the study period does not exceed four years and the student has not failed or been prevented from taking any course during their study at the faculty or any faculty they transferred from (if applicable).

**Article 11: Failure and Retaking Courses**

If a student fails a course, they must retake the course and the exam. If they pass the course after retaking it, the actual grade obtained is recorded, provided it does not exceed "D+." The cumulative GPA is calculated based on this.

**Article 12: Organizational Provisions**

1. Each department prepares a complete description of the contents of the courses it teaches, and these contents are presented to the faculty council. After approval by the faculty council, these contents become binding for the faculty members teaching those courses.
2. The faculty council may, based on the proposal of the relevant departments, amend the registration requirements for any course and the scientific content of any course, provided that it does not exceed 25% of the basic content.

**Article 13: Transition Between Levels**

The student's level at the beginning of the academic year is determined as follows:

1. The student is enrolled in the first level upon joining the faculty and remains in the first level until they pass 27 credit hours.
2. The student moves from the first level to the second level upon passing 27 credit hours.
3. The student moves from the second level to the third level upon passing 60 credit hours.
4. The student moves from the third level to the fourth level upon passing 96 credit hours.

**Article 14: Application of the Bylaws**

1. The provisions of these bylaws apply to new students at the beginning of the academic year following their approval.
2. The provisions of the university organizing law and its executive regulations apply to matters not mentioned in these bylaws.

**Article 15: Course Coding System**

1. The code for any course consists of the department's code (in the case of courses offered by scientific departments that run programs), followed by a three-digit number as follows:
   * The leftmost digit represents the academic level.
   * The tens digit represents the specific specialization within the department's general specialization.
   * The units digit is used to distinguish courses within the same specialization that are taught at the same academic level.
2. **Department Codes**:
   * **Computer Science (CS)**
   * **Information Technology (IT)**
   * **Information Systems (IS)**
   * **Operations Research and Decision Support (DS)**
3. **Codes for Basic Computer Sciences and Summer Training Courses**:
   * **Mathematics (MA)**
   * **Statistics (ST)**
   * **Humanities (HU)**
   * **Training (TR)**
4. **Academic Level Codes**:
   * **Level 1**
   * **Level 2**
   * **Level 3**
   * **Level 4**

**Courses**

**First: General Requirements (12 Credit Hours)**

**A. Mandatory Courses**

**6 mandatory credit hours divided as follows:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Name** | **Credit Hours** | **Actual Hours** | **Course Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| HU111 | Technical Report Writing | 2 | 2 | A | None | 2 | - |
| HU112 | Ethics and Professionalism | 2 | 2 | A | None | 2 | - |
| HU113 | Creative Thinking and Communication Skills | 2 | 2 | A | None | 2 | - |

**B. Elective Courses**

**6 credit hours to be chosen by the student from the following elective courses:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code**  **Code** | **Course Name** | **Credit Hours** | **Actual Hours** | **Course Type**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| HU121 | Fundamentals of Economics | 2 | 2 | A | None | 2 | - |
| DS251 | Fundamentals of Management | 2 | 2 | A | Completion of 30 Credit Hours | 2 | - |
| HU123 | Marketing and Sales | 2 | 2 | A | None | 2 | - |
| HU114 | Fundamentals of Psychology | 2 | 2 | A | None | 2 | - |
| HU115 | Fundamentals of Sociology | 2 | 2 | A | None | 2 | - |
| HU116 | Comparative Politics | 2 | 2 | A | None | 2 | - |
| HU117 | Human Rights | 2 | 2 | A | None | 2 | - |
| HU118 | Selected Topics in Humanities | 2 | 2 | A | None | 2 | - |

**Second: Faculty Requirements (57 Credit Hours)**  
Divided into two sections:

1. **Mathematics and Basic Sciences (21 Mandatory Credit Hours) Distributed as follows:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| MA111 | Math-1 | 1.5 | 3 | Core | - | 2.5 | - |
| MA112 | Discrete Mathematics | 1.5 | 3 | Core | MA111 Math-1 | 2.5 | - |
| MA113 | Math-2 | 1.5 | 3 | Core | MA111 Math-1 | 2.5 | - |
| MA214 | Math-3 | 1.5 | 3 | Core | MA113 Math-2 | 2.5 | - |
| IT111 | Electronics | 1.5 | 3 | Core | - | 2.5 | - |
| ST121 | Probability and Statistics-1 | 1.5 | 3 | Core | MA111 Math-1 | 2.5 | - |
| ST222 | Probability and Statistics-2 | 1.5 | 3 | Core | ST121 Probability and Statistics-1 | 2.5 | - |

Core Computer Science (36 Mandatory Credit Hours) Distributed as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| CS111 | Fundamentals of Computer Science | 1.5 | 3 | Core | - | 2.5 | - |
| |  | | --- | | CS112 |  |  | | --- | |  | | Structured Programming | 1.5 | 3 | Core | CS111 Fundamentals of Computer Science | 2.5 | - |
| CS213 | Object-Oriented Programming | 1.5 | 3 | Core | CS112 Structured Programming | 2.5 | - |
| CS214 | Data Structures | 1.5 | 3 | Core | CS213 Object-Oriented Programming | 2.5 | - |
| CS251 | Introduction to Software Engineering | 1.5 | 3 | Core | CS112 Structured Programming | 2.5 | - |
| DS211 | Introduction to Operations Research and Decision Support | 1.5 | 3 | Core | CS112 Structured Programming, ST121 Probability and Statistics-1 | 2.5 | - |
| IS211 | Introduction to Database Systems | 1.5 | 3 | Core | CS112 Structured Programming | 2.5 | - |
| IS231 | Web Technology | 1.5 | 3 | Core | CS213 Object-Oriented Programming | 2.5 | - |
| IT212 | Logic Design | 1.5 | 3 | Core | |  | | --- | |  |  |  | | --- | | IT111 Electronics | | 2.5 | - |
| IT221 | Computer Networks Technology | 1.5 | 3 | Core | CS111 Fundamentals of Computer Science | 2.5 | - |
| CS321 | Algorithms Analysis and Design | 1.5 | 3 | Core | CS214 Data Structures | 2.5 | - |
| CS341 | Operating Systems | 1.5 | 3 | Core | CS214 Data Structures | 2.5 | - |

**Third: Major Requirements (63 Credit Hours)**

**Computer Science Department**

**1. Applied Sciences (39 Credit Hours)**

*(39 mandatory credit hours, divided as follows:)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| CS316 | Advanced Data Structures | 1.5 | 3 | Core | CS214 Data Structures | 2.5 | - |
| CS322 | Concepts of Programming Languages | 1.5 | 3 | Core | CS316 Advanced Data Structures | 2.5 |  |
| CS331 | Computer Organization and Architecture | 1.5 | 3 | Core | IT212 Logic Design, CS214 Data Structures | 2.5 |  |
| CS342 | Advanced Operating Systems | 1.5 | 3 | Core | CS341 Operating Systems | 2.5 |  |
| CS352 | Advanced Software Engineering | 1.5 | 3 | Core | CS251 Introduction to Software Engineering | 2.5 |  |
| CS361 | Artificial Intelligence | 1.5 | 3 | Core | CS214 Data Structures | 2.5 |  |
| CS371 | High-Performance Computing | 1.5 | 3 | Core | CS341 Operating Systems | 2.5 |  |
| IT351 | Information Theory and Data Compression | 1.5 | 3 | Core | MA214 Math-3, CS213 Object-Oriented Programming | 2.5 |  |
| IT361 | Computer Graphics | 1.5 | 3 | Core | CS112 Structured Programming | 2.5 |  |
| CS423 | Compilers | 1.5 | 3 | Core | CS322 Concepts of Programming Languages | 2.5 |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CS432 | Computation Theory | 1.5 | 3 | Core | MA112 Discrete Math, MA214 Math-3 | 2.5 |  |
| CS462 | Machine Learning | 1.5 | 3 | core | ST222 Probability and Statistics-2, MA214 Math-3, CS213 Object-Oriented Programming | 2.5 |  |
| CS472 | Cloud Computing | 1.5 | 3 | core | CS342 Advanced Operating Systems | 2.5 |  |

**3. Elective Courses (18 Credit Hours)**

Elective courses are chosen based on the student's preference, divided as follows:

* **12 credit hours** selected from the department's elective courses.
* **6 credit hours** chosen either from the department's electives or from mandatory/elective courses of another department.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| CS434 | Big Data Analysis | 1.5 | 3 | Elective | IS211 Introduction to Database Systems, CS462 Machine Learning | 2.5 | - |
| CS435 | Bioinformatics Systems | 1.5 | 3 | Elective | CS321 Algorithms Analysis and Design | 2.5 |  |
| CS436 | Mobile Computing | 1.5 | 3 | Elective | CS341 Operating Systems | 2.5 |  |
| CS453 | Software Testing and Quality Assurance | 1.5 | 3 | Elective | CS321 Algorithms Analysis and Design, CS352 Advanced Software Engineering | 2.5 |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CS454 | Software Security | 1.5 | 3 | Elective | CS321 Algorithms Analysis and Design, CS352 Advanced Software Engineering | 2.5 |  |
| CS455 | Human-Computer Interaction | 1.5 | 3 | Elective | CS321 Algorithms Analysis and Design, CS352 Advanced Software Engineering | 2.5 |  |
| CS456 | Software Design and Architecture | 1.5 | 3 | Elective | CS321 Algorithms Analysis and Design, CS352 Advanced Software Engineering | 2.5 |  |
| CS457 | Selected Topics in Software Engineering | 1.5 | 3 | Elective | CS352 Advanced Software Engineering | 2.5 |  |
| CS463 | Natural Language Processing | 1.5 | 3 | Elective | CS462 Machine Learning | 2.5 |  |
| CS464 | Semantic Web and Ontology | 1.5 | 3 | Elective | CS361 Artificial Intelligence, IS231 Web Technology | 2.5 |  |
| CS465 | Soft Computing | 1.5 | 3 | Elective | ST121 Probability and Statistics-1, MA113 Math-2 | 2.5 |  |
| CS466 | Knowledge Discovery | 1.5 | 3 | Elective | IS211 Introduction to Database Systems, CS361 Artificial Intelligence | 2.5 |  |
| |  | | --- | | CS467 |  |  | | --- | |  | | Selected Topics in Artificial Intelligence | 1.5 | 3 | Elective | CS462 Machine Learning | 2.5 |  |
| CS473 | Advanced High-Performance Computing | 1.5 | 3 | Elective | CS371 High-Performance Computing, CS342 Advanced Operating Systems | 2.5 |  |

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| --- | --- | --- | --- | --- | --- | --- |
| CS474 | Selected Topics in High-Performance Computing | 1.5 | 3 | Elective | CS473 Advanced High-Performance Computing | 2.5 |
| CS495 | Selected Topics in Computer Science-1 | 1.5 | 3 | Elective | CS322 Concepts of Programming Languages | 2.5 |
| |  | | --- | | CS496 |  |  | | --- | |  | | Selected Topics in Computer Science-2 | 1.5 | 3 | Elective | CS322 Concepts of Programming Languages | 2.5 |

**Graduation Project (6 Credit Hours)**

The graduation project is a **mandatory** requirement worth **6 credit hours**, divided as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| CS498 | Graduation Project | 6 | 12 | Mandatory | Completion of **85 credit hours** | - | - |

**Department of Information Technology**

**1. Applied Sciences (39 Credit Hours) - Mandatory Courses**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IT313 | Computer Architecture | 1.5 | 3 | Mandatory | IT212 - Logic Design | 2.5 | - |
| IT314 | Micro Controllers | 1.5 | 3 | Mandatory | IT212 - Logic Design | 2.5 |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| IT322 | Advanced Computer Networks | 1.5 | 3 | Mandatory | IT221 - Computer Networks Technology | 2.5 |  |
| IT331 | Data Communication | 1.5 | 3 | Mandatory | MA113 - Math-2 | 2.5 |  |
| IT341 | Signals and Systems | 1.5 | 3 | Mandatory | MA114 - Math-3 | 2.5 |  |
| IT342 | Digital Signal Processing | 1.5 | 3 | Mandatory | IT341 - Signals and Systems | 2.5 |  |
| IT351 | Information Theory and Data Compression | 1.5 | 3 | Mandatory | MA214 - Math-3, CS213 - Object Oriented Programming | 2.5 |  |
| IT352 | Pattern Recognition | 1.5 | 3 | Mandatory | IT341 - Signals and Systems, ST222 - Probability and Statistics-2 | 2.5 |  |
| IT361 | Computer Graphics | 1.5 | 3 | Mandatory | CS112 - Structured Programming | 2.5 |  |
| IT423 | Information and Computer Networks Security | 1.5 | 3 | Mandatory | IT322 - Advanced Computer Networks | 2.5 |  |
| IT432 | Communication Technology | 1.5 | 3 | Mandatory | IT221 - Computer Networks Technology | 2.5 |  |

**Department of Information Technology**

**2. Elective Courses (18 Credit Hours)**

Students must select:

* **12 credit hours** from the department's elective courses.
* **6 credit hours** from either the department's electives or courses (mandatory or elective) from another department.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IT443 | Image Processing | 1.5 | 3 | Elective | IT341 - Signals and Systems | 2.5 | - |
| IT444 | Multimedia Mining | 1.5 | 3 | Elective | IT352 - Pattern Recognition | 2.5 |  |
| IT415 | Machine Vision | 1.5 | 3 | Elective | IT443 - Image Processing, IT361 - Computer Graphics | 2.5 |  |
| IT416 | Robotics | 1.5 | 3 | Elective | |  | | --- | |  |  |  | | --- | | **IT314 - Micro Controllers** | | 2.5 |  |
| IT417 | |  | | --- | |  |  |  | | --- | | **Embedded Systems** | | 1.5 | 3 | Elective | IT314 - Micro Controllers | 2.5 |  |
| IT418 | Selected Topics in Embedded Systems and Robotics | 1.5 | 3 | Elective | IT314 - Micro Controllers | 2.5 |  |
| IT424 | Wireless and Mobile Networks | 1.5 | 3 | Elective | Cloud Computing Networks | 2.5 |  |
| IT425 | Cloud Computing Networks | 1.5 | 3 | Elective | Internet Programming and Protocols | 2.5 |  |
| IT426 | Internet Programming and Protocols | 1.5 | 3 | Elective | Optical Networks | 2.5 |  |
| IT427 | Optical Networks | 1.5 | 3 | Elective | IT322 - Advanced Computer Networks | 2.5 |  |
| IT428 | Wireless Sensors Networks | 1.5 | 3 | Elective | IT424 - Wireless and Mobile Networks | 2.5 |  |
| IT429 | Selected Topics in Computer Networks | 1.5 | 3 | Elective | IT322 - Advanced Computer Networks | 2.5 |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| IT433 | Cyber Security | 1.5 | 3 | Elective | IT423 - Information and Computer Networks Security | 2.5 |  |
| IT445 | Advanced Image Processing | 1.5 | 3 | Elective | IT443 - Image Processing | 2.5 |  |
| IT446 | Virtual Reality | 1.5 | 3 | Elective | Advanced Pattern Recognition | 2.5 |  |
| IT447 | Speech Processing | 1.5 | 3 | Elective | IT443 - Image Processing, IT361 - Computer Graphics | 2.5 |  |
| IT448 | Selected Topics in Multimedia | 1.5 | 3 | Elective | |  | | --- | | IT342 - Digital Signal Processing |  |  | | --- | |  | | 2.5 |  |
| IT453 | Advanced Pattern Recognition | 1.5 | 3 | Elective | IT352 - Pattern Recognition | 2.5 |  |
| IT454 | Human Language Technology | 1.5 | 3 | Elective | Concurrency and Parallel Computing | 2.5 |  |
| IT462 | Advanced Computer Graphics | 1.5 | 3 | Elective | IT352 - Pattern Recognition | 2.5 |  |
| IT463 | Computer Animation | 1.5 | 3 | Elective | IT361 - Computer Graphics | 2.5 |  |
| IT471 | Ubiquitous Computing | 1.5 | 3 | Elective | IT322 - Advanced Computer Networks, CS112 - Structured Programming | 2.5 |  |
| IT472 | Concurrency and Parallel Computing | 1.5 | 3 | Elective | IT313 - Computer Architecture, CS112 - Structured Programming | 2.5 |  |
| IT473 | Intelligent and Quantum Computing | 1.5 | 3 | Elective | IT313 - Computer Architecture, CS214 - Data Structures | 2.5 |  |
| IT495 | |  | | --- | | Selected Topics in Information Technology-1 |  |  | | --- | |  | | 1.5 | 3 | Elective | Completion of 60 Credit Hours | 2.5 |  |
| IT496 | Selected Topics in Information Technology-2 | 1.5 | 3 | Elective | Completion of 60 Credit Hours | 2.5 |  |

Graduation Project (6 Credit Hours):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IT498 | Graduation Project | 6 | 12 | |  | | --- | |  |  |  | | --- | | Mandatory | | Completion of 85 Credit Hours | - | - |

**Information Systems Department**

1. **Applied Sciences (39 Credit Hours)**
   * 39 mandatory credit hours, divided as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IS312 | Database Management  Systems | 1.5 | 3 | Mandatory | Introduction to Database Systems (IS211), Object Oriented Programming (CS213) | 2.5 | - |
| IS313 | Data Warehousing | 1.5 | 3 | Mandatory | Introduction to Database Systems (IS211) | 2.5 |  |
| IS321 | File Management and Processing | 1.5 | 3 | Mandatory | Data Structures (CS214) | 2.5 |  |
| IS322 | Information Retrieval | 1.5 | 3 | Mandatory | |  | | --- | |  |  |  | | --- | | Introduction to Database Systems (IS211), Probability and Statistics-2 (ST222) | | 2.5 |  |
| IS332 | |  | | --- | |  |  |  | | --- | | Analysis and Design of Information Systems | | 1.5 | 3 | Mandatory | Introduction to Database Systems (IS211) | 2.5 |  |
| IS333 | Web-based Information Systems Development | 1.5 | 3 | Mandatory | Web Technology (IS231) | 2.5 |  |
| IS341 | Business Process Management | 1.5 | 3 | Mandatory | Analysis and Design of Information Systems (IS332) | 2.5 |  |
| CS352 | Advanced Software Engineering | 1.5 | 3 | Mandatory | Introduction to Software Engineering (CS251) | 2.5 |  |
| CS361 | Artificial Intelligence | 1.5 | 3 | Mandatory | Data Structures (CS214) | 2.5 |  |
| IS414 | Managing and Modeling Big Data | 1.5 | 3 | Mandatory | Database Management Systems (IS312) | 2.5 |  |
| IS422 | Data Mining | 1.5 | 3 | Mandatory | Information Retrieval (IS322) | 2.5 |  |
| IS434 | Service-Oriented Architecture | 1.5 | 3 | Mandatory | Web-based Information Systems Development (IS333) | 2.5 |  |
| CS462 | Machine Learning | 1.5 | 3 | Mandatory | Probability and Statistics-1 (ST121), Math-3 (MA214), Object Oriented Programming (CS213) | 2.5 |  |

Elective Courses for Students (12 credit hours):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IS331 | Fundamentals of Information Systems | 1.5 | 3 | Elective | Introduction to Database Systems (IS211 | 2.5 | - |
| IS415 | Cloud Database | 1.5 | 3 | Elective | Database Management Systems (IS312) | 2.5 |  |
| IS416 | Distributed Database | 1.5 | 3 | Elective | |  | | --- | | Database Management Systems (IS312) |  |  | | --- | |  | | 2.5 |  |
| IS417 | Selected Topics in Database | 1.5 | 3 | Elective | |  | | --- | |  |  |  | | --- | | Database Management Systems (IS312) | | 2.5 |  |
| IS423 | |  | | --- | |  |  |  | | --- | | Business Process Mining | | 1.5 | 3 | Elective | Enterprise Mobile Applications Development | 2.5 |  |
| IS424 | Selected Topics in Data Engineering | 1.5 | 3 | Elective | Business Process Management (IS341) | 2.5 |  |
| IS435 | Usability Engineering | 1.5 | 3 | Elective | Database Management Systems (IS312) | 2.5 |  |
| IS436 | Enterprise Mobile Applications Development | 1.5 | 3 | Elective | Web Technology (IS231) | 2.5 |  |
| IS437 | Information Systems Development Methodologies | 1.5 | 3 | Elective | Selected Topics in Advanced Information Systems | 2.5 |  |
| IS438 | Management Information Systems | 1.5 | 3 | Elective | Geographical Information Systems | 2.5 |  |
| IS439 | Selected Topics in Advanced Information Systems | 1.5 | 3 | Elective | Analysis and Design of Information Systems (IS332) | 2.5 |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| IS442 | Geographical Information Systems | 1.5 | 3 | Elective | Database Management Systems (IS312) | 2.5 |  |
| IS443 | Information Systems Quality Assurance | 1.5 | 3 | Elective | Information Systems Audit and Control | 2.5 |  |
| IS444 | Information Systems Security and Risk Management | 1.5 | 3 | Elective | Enterprise Information Systems | 2.5 |  |
| IS445 | Information Systems Audit and Control | 1.5 | 3 | Elective | Analysis and Design of Information Systems (IS332) | 2.5 |  |
| IS446 | Enterprise Information Systems | 1.5 | 3 | Elective | |  | | --- | | Web-based Information Systems Development (IS333) |  |  | | --- | |  | | 2.5 |  |
| IS447 | Information Systems Project Management | 1.5 | 3 | Elective | Selected Topics in Information Systems-1 | 2.5 |  |
| IS448 | E-Business | 1.5 | 3 | Elective | Analysis and Design of Information Systems (IS332) | 2.5 |  |
| IS449 | Selected Topics in Information Systems Engineering | 1.5 | 3 | Elective | Web-based Information Systems Development (IS333) | 2.5 |  |
| IS495 | Selected Topics in Information Systems-1 | 1.5 | 3 | Elective | Analysis and Design of Information Systems (IS332) | 2.5 |  |
| IS496 | Selected Topics in Information Systems-2 | 1.5 | 3 | Elective | Analysis and Design of Information Systems (IS332) | 2.5 |  |

Graduation Project (6 Credit Hours):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| IS498 | Graduation Project | 6 | 12 | |  | | --- | |  |  |  | | --- | | Mandatory | | Completion of 85 Credit Hours | - | - |

**Department of Operations Research and Decision Support**

**Compulsory Courses (39 Credit Hours)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| DS312 | Decision Support and Future Studies Methodologies | 1.5 | 3 | Mandatory | Introduction to Operations Research and Decision Support (DS211) | 2.5 | - |
| DS313 | Computational Intelligence | 1.5 | 3 | Mandatory | - | 2.5 |  |
| DS321 | Linear and Integer Programming | 1.5 | 3 | Mandatory | Math-2 (MA113), Introduction to Operations Research and Decision Support (DS211) | 2.5 |  |
| DS322 | Information Retrieval | 1.5 | 3 | Mandatory | |  | | --- | |  |  |  | | --- | | Linear and Integer Programming (DS321) | | 2.5 |  |
| DS323 | |  | | --- | |  |  |  | | --- | | Dynamic Programming and Stochastic Modeling | | 1.5 | 3 | Mandatory | Linear and Integer Programming (DS321) | 2.5 |  |
| DS331 | System Modeling and Simulation | 1.5 | 3 | Mandatory | Object Oriented Programming (CS213) | 2.5 |  |
| DS341 | Learning From Data | 1.5 | 3 | Mandatory | Probability and Statistics-2 (ST222) | 2.5 |  |
| DS352 | Production and Operations Management | 1.5 | 3 | Mandatory | Decision Support and Future Studies Methodologies (DS312) | 2.5 |  |
| CS361 | Artificial Intelligence | 1.5 | 3 | Mandatory | Multi-objective Programming | 2.5 |  |
| DS414 | Game Theory | 1.5 | 3 | Mandatory | Data Structures (CS214) | 2.5 |  |
| DS415 | Decision Theory | 1.5 | 3 | Mandatory | Probability and Statistics-2 (ST222), Linear and Integer Programming (DS321) | 2.5 |  |
| DS424 | Multi-objective Programming | 1.5 | 3 | Mandatory | Non Linear Programming (DS322) | 2.5 |  |
| DS425 | Network Modeling and Optimization | 1.5 | 3 | Mandatory | Dynamic Programming and Stochastic Modeling (DS323) | 2.5 |  |

**Elective Courses (Based on Student's Choice)**

**12 Credit Hours from Department Elective Courses**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| DS342 | Data Analytics | 1.5 | 3 | Elective | Strategic Decision Making | 2.5 | - |
| DS343 | Probabilistic Reasoning | 1.5 | 3 | Elective | Probability and Statistics-2 (ST222) | 2.5 |  |
| DS344 | Forecasting and Predictive Analytics | 1.5 | 3 | Elective | |  | | --- | | Learning From Data (DS341) |  |  | | --- | |  | | 2.5 |  |
| DS416 | Strategic Decision Making | 1.5 | 3 | Elective | |  | | --- | |  |  |  | | --- | | Linear and Integer Programming (DS321) | | 2.5 |  |
| DS432 | |  | | --- | |  |  |  | | --- | | System Dynamics Modeling | | 1.5 | 3 | Elective | Crisis Management | 2.5 |  |
| DS433 | Agent-Based Modeling and Complex Systems | 1.5 | 3 | Elective | Service Management | 2.5 |  |
| DS453 | Crisis Management | 1.5 | 3 | Elective | System Modeling and Simulation (DS331) | 2.5 |  |
| DS454 | Service Management | 1.5 | 3 | Elective | Decision Support and Future Studies Methodologies (DS312) | 2.5 |  |
| DS456 | Project Management | 1.5 | 3 | Elective | Introduction to Operations Research and Decision Support (DS211) | 2.5 |  |
| DS495 | Selected Topics in Operations Research and Decision Support-1 | 1.5 | 3 | Elective | Completion of 60 Credit Hours | 2.5 |  |
| DS496 | Selected Topics in Operations Research and Decision Support-2 | 1.5 | 3 | Elective | Completion of 60 Credit Hours | 2.5 |  |

Graduation Project (6 Credit Hours):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course**  **Name** | **Credit**  **Hours** | **Actual**  Hours | **Course**  **Type** | **Prerequisite** | **Lecture** | **Tutorials/Labs** |
| DS498 | Graduation Project | 6 | 12 | |  | | --- | |  |  |  | | --- | | Mandatory | | Completion of 85 Credit Hours | - | - |

**Fourth: Field Training (3 Credit Hours)**

* **Course Code**: 301
* **Duration**: One month before graduation
* **Required Field Training**: The student is required to attend a **Field Training** program, which counts for **3 compulsory credit hours**. This training can be undertaken during any summer break after the student has completed **60 credit hours**.

**Additional Details:**

* A **faculty member** will be designated as the **trainer supervisor** and will work with a team of **supporting faculty members** to monitor the participants in the training.
* Annual evaluations of the trainees will be carried out according to **criteria determined by the faculty council**.
* **Note**: The grades for this course are **not included in the calculation of the student's GPA**.

**Attachment 1 & 2:**

* These attachments contain the course contents and a proposed study plan, respectively.

**First: General requirements (12) credit hours**

**A. Compulsory provisions**

**6) Compulsory credit hours divided as follows:**

HU111: Technical Report Writing

Prerequisite: None

The basic rudiments of report writing – the rationale for report writing – the

structure of reports and such details as physical appearance and linguistic style –

writing reports.

HU112: Ethics and Professionalism

Prerequisite: None

Critical examination of ethical problems associated with computer science and

engineering – legal and quasi-legal (i.e. policy and regulative) issues – Process

of ethical decision-making – Privacy and confidentiality – Computer crime –

Professional codes and responsibilities – Software piracy – Impact of computers

on society.

HU113: Creative Thinking and Communication Skills

Prerequisite: None

Meta-cognition (thinking about thinking) – Edward do Bono's CoRT (cognitive

research trust) program of learning thinking – Vertical and lateral thinking

approaches – Creative thinking tools like Brainstorming, Tony Buzan's Mind

mapping and Edward do Bono's Six Thinking hats.

Theories of communication – How to translate theories into complete strategies

to communicate with diverse audience – Written Communications: Memoranda,

Letters, Executive summaries, Business and research reports – Oral

Communications: Listening, Presentation skills, Interviewing, Conducting

meetings, Interpersonal communication – Negotiation – Intercultural

communication – Importance of communication in team building.

**B- Elective courses**

**6) Hours chosen by the student from among the following elective courses:**

HU121: Fundamentals of Economics

Prerequisite: None

Concept of economics – the economic problem – Theory of demand including:

utility theory – theory of production – theory of cost – theory of firm including:

pricing theory – Economics of education – Economics of science and

technology – Economics of automation including: computerization.

DS251: Fundamentals of Management

Prerequisite: Passing 30 Credit Hours

History of Management – planning, fundamentals of planning – making

decisions – strategic planning – plans and planning tools – Organizing and

managing human resources – Influencing – leadership – controlling –

Production management and control – Quality management – Management of

service industries – accounting for risk – and economic analysis.

HU123 Marketing and Sales

Prerequisite: None

Define marketing – Marketing process – Market analysis: customer base;

competition – Best practices and lessons learned – Business research and

forecasting tools and techniques – Trend analysis: economics; social; political;

environmental; technology – Technology assessment practices and techniques –

Presentation skills; Sales and advertising practices – Customer satisfaction

strategies – Marketing and branding techniques – Product portfolio analysis –

Global trade and international operations – Pricing strategies – Managing

marketing through: customer relationships – social responsibility – marketing

ethics – E-Commerce Application and Implementation through Business

Models and Technology Essentials.

HU114: Fundamentals of Psychology

Prerequisite: None

Research methods – social and emotional development – neurobiological

foundations of behavior – learning – memory – personality – stress and its

effect on well-being – abnormal behavior and pathology, and social psychology

– Abnormal behavior. General principles of psychology as they are applied to work – relationships and self. Includes perception, learning, development –

motivation – emotion – therapy – communication – attitudes.

HU115: Fundamentals of Sociology

Prerequisite: None

Basic concepts – Basic examination of major theoretical perspectives –

Structural functionalism – Symbolic interactionism – conflict theory – Types of

Society: Tribal, agrarian, industrial, Post-industrial – Culture – Social networks

– Social institutions – Deviance – Education – Religion – Race and ethnicity –

Social class – Socialization – Gender identity – Social construction of the family

– Community – Health – Social processes – Social change – Social Problems –

Social demography.

HU116 Comparative Politics

Prerequisite: None

Central concepts and methods in comparative studies – Political development

and democratization – revolution – political culture – Comparison of different

countries with respect to the founding principles of: Political system – Electoral

system – Parities – Interest organizations – Parliament – Government – Public

administration – Policy processes – Political economy. Internationalization.

HU117 Human Rights

Prerequisite: None

Definition of human rights – historical development of the concept of human

rights – culture relativism versus universally accepted human rights standards –

various human rights: personal, political, civil, social, economical …etc. –

covering human rights within official international organizations – influence of

business and global economic restructuring on human rights – monitoring

human rights – human rights violations.

HU118 Selected Topics in Humanities

Prerequisite: None

This course aims at introducing students to interesting topics in humanities that

need to be identified in a responsive manner to current time.

**Second: College requirements (57 credit hours)**

**Divided into two parts:**

**1 Sports and basic sciences: - 2**

**21) Compulsory credit hours divided as follows:**

MA111: Math-1

Prerequisite: None

Functions – Limits and Continuity – Definition of the derivative –Higher order

derivatives – the chain rule – implicit differentiation – differentials – parametric

differentiation – nth- derivative of a function and Leibentiz theorem. Roll`s

theorem and the mean value theorem – Taylor and Maclaurin series –

indeterminate forms and L`Hopital rule –maximum and minimum values –

curve sketching. Anti-derivative and indefinite Integral–Techniques of

integration- Definite integrals–the fundamental theorem of calculus – improper

integrals-Area between curves – solids of revolution – arc length – surface areas

of revolution.

MA112: Discrete Mathematics

Prerequisite: Math-1

Foundations of discrete mathematics as they apply to computer science –

focusing on providing a solid theoretical foundation for further work. Topics

include functions – relations – sets – simple proof techniques – Boolean algebra

– propositional logic – digital logic – elementary number theory – fundamentals

of counting.

MA113: Math-2

Prerequisite: Math-1

Partial Differentiation – First Order Differential Equations – Second and Higher

Order Linear Ordinary Differential Equations – Laplace Transform – Multiple

Integral – Line and surface integral.

MA214: Math-3

Prerequisite: Math-2

Matrices: Linear equations and matrices – Solution of linear systems – Matrix

Eigen-value problem – Cayley-Hamilton theorem and its applications.

Determinants: Properties of determinants – Inverse of a matrix using

determinants. Infinite Series: Definition – Properties of infinite series – some

important series – Tests for convergence and divergence of series – Sum test –

nth term test, limit comparison test – D`Alembert test – Cauchy test – Maclaurin

test – Alternating series – Power series – Taylor series for two variables – Using

series to get limits of functions. Fourier analysis: Fourier theorem – Analytic

Geometry: straight line – Conic Sections – Solid geometry.

IT111: Electronics

Prerequisite: None

Basic electrical circuits – Columb`s law – Gauss law – Capacitors – Resistors –

Inductors – Kirchhoff’s law – Basic circuit theory and circuit analysis –

Fundamentals of three phase circuits and transformers – Fundamentals of

semiconductor devices – P-N Junction diode – Bipolar junction and field effect

transistors structures – Semiconductor devices and circuits – Fundamentals of

filters – Power supply and Rectification – Amplifiers – Integrated Circuits and

VLSI.

ST121 Probability and Statistics - 1

Prerequisite: Math–1

Define statistics (types of data – types of statistics – population versus sample-

Measurement’s levels) – Describing Data (Frequency tables – Graphic

Presentation – Numerical Measures – Displaying and Exploring Data) – Survey

of Probability Concept (Rules of probability – Conditional probability- Total

Probability Theory and Bays Rule) – Random Variables and its probability

distribution with some properties – Discrete probability distribution (Binomial –

Poisson – Negative Binomial – Geometric- Hyper geometric) – Continuous

Probability distribution (Normal – Exponential).

ST222: Probability and Statistics-2

Prerequisites: Probability and Statistics-1

Sampling Distribution (distribution of mean) – Central limit theorem – Concept

of estimation theory – Point estimation – some properties (maximum likelihood

method – Moment method) – Interval estimation (population mean and

variance – two population mean and variance) – concept of testing hypothesis

(population mean and variance – two population mean and variance) – chisquare

test – Introduction to Correlation and Regression.

**Basic Computer Science (36) credit hours - 2**

**36) compulsory credit hours divided as follows:**

CS111: Fundamentals of Computer Science

Prerequisite: None

Introduction to computer and information systems – Types of computers –

Computer hardware and software components – Data representation and

number systems – Introduction to networking – Introduction to internet –

Algorithm development – algorithm representation – flowcharts – stepwise

refinement – problem solving methods and tools.

CS112: Structured Programming

Prerequisite: Fundamentals of Computer Science

Structured program development: problem solving decision structure –

repetition structures – Top-down and stepwise refinement – Subprograms:

Procedures and functions – Structured data types: one/two dimension arrays –

strings – Dynamic data structures (pointers) – Recursion.

CS213: Object Oriented Programming

Prerequisite: Structured Programming

Concepts of object-oriented programming – use of classes – fundamentals of

object-oriented design- Encapsulation – Data Abstraction – Polymorphism –

and Inheritance – analysis of algorithms – basic searching and sorting

techniques.

CS214: Data Structures

Prerequisite: Object Oriented Programming

Binary tree – binary search tree – balanced tree – simple graphs – and hash

tables. Quadratic and sub-quadratic linear sorting algorithms – asymptotic

complexity. (e.g., quick sort – merge sort – heap sort – insertion sort – selection

sort and count Built-in data structures. Stacks – queues – linked lists – and tree

structures. Sorting algorithms – searching algorithms – and hashing. Abstract

data types (ADT).

CS251: Introduction to Software Engineering

Prerequisite: Structured Programming

Software crisis – Software process models – Agile software development –

Analysis – Requirements engineering – Use case model – Design principles –

UML – Tools and Methods – Basic design patterns – Introduction to testing –

Unit testing – Version control.

DS211: Introduction to Operations Research and Decision Support

Prerequisites: Structured Programming

Probability and Statistics-1

Principles of problem identification and definition, model formulation, solution

approaches, analysis and implementation – linear programming – integer

programming – networks – project management – simulation models – solution

approaches of these models with the help of relevant software packages will be

covered – introduction to decision support systems (DSS) – principles of

computer modeling languages, applications and use of integrated software

packages.

IS211: Introduction to Database Systems

Prerequisite: Structured Programming

What is and Why a database – Relational Model – Relational Algebra – SQL –

The Entity-Relationship (ER) Model – Mapping ER Model to Relations.

IS231 Web Technology

Prerequisite: Object Oriented Programming

Introduction to Internet Concepts – Front End Development: HTML – CSS –

JS. – Backend Development: Web Development Platforms: J2EE – PHP –

Content Management Systems: Drupal – Joomla – Introduction to Web

Development Frameworks: Laravel – Symfony.

IT212: Logic design

Prerequisites: Electronics

Basic logic concepts: Logic states – number systems – Boolean algebra – basic

logical operations – gates and truth tables. Combinational logic: Minimization

techniques – multiplexers and de-multiplexers – encoders – decoders – adders

and subtractors – comparators – programmable logic arrays and memories – design with MSI – logic families – tri-state devices. Sequential logic: Flip flops

– mono-stable multi-vibrators – latches and registers – Counters.

IT221: Computer Networks Technology

Prerequisite: Fundamentals of Computer Science

Introduction to computer networking – the Internet basic concepts – Internet

Protocol (IP) – Socket programming – TCP and UDP protocols – the internet

FTP – SMTP – and Peer to peer applications and DNS.

CS321: Algorithms Analysis and Design

Prerequisite: Data Structures

Algorithm concept: computational analysis and complexity. Design methods –

divide and conquer – backtracking – binary search – merge sort – quick sort –

selection – matrix multiplication – the greedy method. Dynamic programming:

shortest paths – optimal search trees. Backtracking. NP-hard and NP-complete

problems.

CS341: Operating Systems

Prerequisite: Data Structures

Computer-system structures – Types of operating systems – Operating Systems

structures- system components and services – Interrupt Handling – Virtual

machines – Processes and threads – Process management – CPU scheduling:

Scheduling concepts and algorithms – Memory management – File systems –

Disk scheduling – Virtual memory.

**Third: Specialization requirements (63 credit hours)**

**Department of Computer Science**

**1 Applied Sciences (39) credit hours - 3**

**39) Compulsory credit hours divided as follows:**

CS316: Advanced Data Structures

Prerequisite: Data Structures

Dynamic optimality – memory hierarchy – hashing – dynamic graphs – and

strings (searching for phrases in giant text). Indexing of unstructured data –

Btree B+ tree B\* tree.

CS322: Concepts of Programming Languages

Prerequisite: Advanced Data Structures

Different types of programming languages – programming languages

implementation methods – Declarative programming – Functional Programming

– Describing Syntax and Semantics – BNF notations and Parse Trees –

denotational and operational semantics- names – Binding – Lifetime – and

scope – Data Types – type checking – Expressions and Assignment Statements

– side effect – short-circuit evaluation – Subprograms – Parameter passing –

lambda expressions – concurrency.

CS331: Computer Organization and Architecture

Prerequisite: Logic Design

Data structures

Computer organization fundamentals – Modern processor – memory and

peripherals design and organization – Modern computer design principles – and

levels of abstraction – Instruction set architecture design and implementation –

Computer hardware-software interface – Computer performance-based design –

Computer processor design – data path and control – Instruction pipelining –

Parallel computer paradigms – instruction set architectures and design –

Architecture-oriented programming – Power and energy aware computing –

Tools and simulation for computer design and performance enhancement.

CS342: Advanced Operating Systems

Prerequisite: Operating Systems

System support for Internet-scale computing – Operating system for different

platforms: cell phones – multi-core – parallel systems – distributed systems –

clouds.

CS352: Advanced Software Engineering

Prerequisite: Introduction to Software Engineering

Software architecture – Architectural styles – Service oriented architectures –

Advanced design patterns – Software quality assurance – Reviews – Refactoring

– Testing – Software Configuration management – Software evolution and

maintenance.

CS361: Artificial Intelligence

Prerequisite: Data structures

Knowledge Representations: Predicate Calculus – Structured Representations –

Network Representations. State Space Search: simple search – heuristic search –

reasoning with uncertain or incomplete knowledge – constraints satisfaction

problem.

CS371: High performance computing

Prerequisite: Operating Systems

The need for parallel processing and the limitations of uniprocessors – Basic

concepts of parallel processing and their impact on computer architecture –

Various kinds of system architectures – design methodologies – communication

networks for parallel computers – various programming models – performance

evaluation – parallelizing techniques – parallel algorithms and resource

management of parallel and distributed systems.

IT351: Information Theory and Data Compression

(Prerequisite(s) and Description are in Information Technology courses

part)

IT361: Computer Graphics

(Prerequisite(s) and Description are in Information Technology courses

part)

CS423: Compilers

Prerequisite: Concepts of Programming Languages

Basic concepts – Lexical analysis – Regular expressions – Context-free

grammars. Parsing – Top-down parsers – Predictive parsers – LR parsers –

Shift-reduce parsers. Semantic analysis – Intermediate code generation – Code

generation – Code optimization.

CS432: Computation Theory

Prerequisite: Discrete Mathematics

Math-3

Regular languages – Regular expressions – Properties of regular expressions.

Proofs. Finite automata – Non-deterministic finite automata – Deterministic

finite automata. Transformation of regular expressions to finite automata –

Transformation of DFAs to NFAs. Transformation of finite automata to regular

expressions – Context-free grammars – Push-down automata – Parsing – Turing

machines – Complexity theory-down automata – Parsing – Turing machines –

Complexity theory.

CS462: Machine Learning

Prerequisite: Probability and Statistics-2

Math-3

Object Oriented Programming

Linear Regression – Polynomial Regression – Logistic Regression –

Regularization – Machine Learning System Design – Naive Bayes – Support

Vector Machines – Decision Trees – Unsupervised Learning – Recommender

Systems – Application Examples such as (Recommender Systems) and Project.

CS472: Cloud Computing

Prerequisite: Advanced Operating Systems

Introduction to distributed systems - Overview of Cloud Computing;

Advantages – History – Characteristics – Service and Deployment Models–

concepts of cloud computing services – such as Infrastructure as a Service

(IaaS) – Platform as a Service (PaaS) and Software as a Service (SaaS) –

Virtualization Concepts – Migration Approaches – Resource Management .

**Elective courses are determined based on the student’s desire and are divided as follows: - 3**

**12) Hours chosen by the student from the following elective courses affiliated with the department. )**

**6) Hours chosen by the student either from the following elective courses affiliated with the department, or from)**

**Compulsory or elective courses belonging to another department.**

CS434: Big Data Analysis

Prerequisite: Introduction to Database systems

Machine learning

Map Reduce – Clustering algorithms for high-dimensional data – predictive

analytics – Dimensionality reduction – Application of machine learning

algorithms for analyzing structure of large graphs like social network graphs –

Technologies for extracting important properties of large datasets.

CS435: Bioinformatics Systems

Prerequisite: Algorithms Analysis and Design

Biological background related to bioinformatics -the genome, protein and motif

databases – DNA replication-motifs finding algorithms- local and global

pairwise sequence alignment – scoring matrices - introduction to multiple

sequence alignment – genome assembly algorithms – microarray gene

expression databases- applications on microarrays datasets- genome

compression.

CS436: Mobile Computing

Prerequisite: Operating Systems

Mobile systems and devices – Mobile operating systems – Types of mobile

devices – Application development – Mobile application development with

sensors of mobile and controllers of mobile – Mobile integration with embedded

and internet of things systems – Mobile development project.

CS453: Software Testing and Quality Assurance

Prerequisite: Algorithms Analysis and Design

Advanced Software Engineering

Quality: how to assure it and verify it – the need for a culture of quality.

Avoidance of errors and other quality problems – Inspections and reviews.

Testing: verification and validation techniques – Process assurance versu Product assurance – Quality process standards – Product and process assurance

– Problem analysis and reporting.

CS454: Software security

Prerequisite: Algorithms Analysis and Design

Advanced Software Engineering

Software design process – choices of programming languages – operating

systems – databases and platforms for building secure systems; common

software vulnerabilities – such as buffer overflows and race conditions –

auditing software – proving properties of software – and the benefits of open

and closed source development.

CS455: Human Computer Interaction

Prerequisite: Algorithms Analysis and Design

Advanced Software Engineering

Relationship between people and machine – the role of human factors and

psychology. Motivation for usability. Principles of interaction – interface design

issues. Command languages – menus – windows – icons – error messages –

response time. Physical interaction – devices – interaction styles and techniques.

The design process and user models. Interface evaluation – rapid prototyping –

iterative refinement. Natural language and voice interfaces – text-to-speech

technology.

CS456: Software Design and Architecture

Prerequisite: Algorithms Analysis and Design

Advanced Software Engineering

Study of design patterns – Frameworks and architectures – Survey of current

middleware architectures – Design of distributed systems using middleware –

Component based design – Measurement theory and appropriate use of metrics

in design – Designing for software qualities attributes – Measuring internal

qualities and complexity of software – Evaluation and evolution of designs –

Basics of software evolution – reengineering – reverse engineering.

CS457: Selected Topics in Software Engineering

Prerequisite: Advanced Software Engineering

This course aims at introducing students to novel topics in software engineering

that need to be identified in a responsive manner as technology evolve and

develop.

CS463: Natural Language Processing

Prerequisite: Machine Learning

Introduction – Language Models – Text Classification – Information Retrieval –

Information Extraction – Morphological Analysis and the Lexicon Phrase

Structure Grammars – Parsing – Context Free Grammar – Augmented grammar

rules – Semantic interpretation – Machine Translation Systems – Statistical

Machine Translation.

CS464: Semantic Web and Ontology

Prerequisite: Artificial Intelligence

Web technology

Introduction Semantic web – Descriptive logic – Describing web resources in

RDF Ontology development – Ontology development – Ontology language –

Web ontology language OWL – OWL API – Rule Interchange Format RIF –

Query language. Semantic Portals – applying Semantic Web technologies to the

Social Web.

CS465: Soft Computing

Prerequisite: Probability and Statistics-1

Math-2

Genetic Algorithms – Chromosomes – Population – Fitness functions –

Crossover – Mutation – Binary bit chromosomes – Floating point array

chromosomes – Schema theory – Fuzzy logic – Fuzzy systems – Fuzzy

operators – Fuzzy rule-based systems – Neural networks – Feed forward neural

networks – Back propagation algorithm – Bias – Scaling – Proof of Delta rule –

Performance issues – Hybrid systems – Feature selection – Training of NNs

with GAs – Evolution of fuzzy rule-based systems – Genetic programming –

Immune systems – Evolution strategy.

CS466: Knowledge Discovery

Prerequisite: Introduction to Database Systems

Artificial Intelligence

Knowledge discovery in databases – Data mining – Data cleaning and

preparation – Mining association rules – Classification – Prediction – Clustering

– Web mining – Applications of web mining – Mining advanced databases.

CS467: Selected Topics in Artificial Intelligence

Prerequisite: Machine learning

This course aims at introducing students to novel topics in artificial intelligence

that need to be identified in a responsive manner as technology evolve and

develop.

CS473: Advanced High performance computing

Prerequisite: High performance computing

Advanced Operating Systems

Quick Overview about Parallel Processing Concepts – Fundamental Design

Issues in Parallel Computing – Synchronization, Scheduling – Job Allocation –

Job Partitioning – Dependency Analysis – Mapping Parallel Algorithms onto

Parallel Architectures – Performance Analysis of Parallel Algorithms – Parallel

programming Models – shard Memory – Message Passing – Fundamental

Limitations Facing Parallel Computing – Bandwidth Limitations – Latency

Limitations, Latency Hiding/Tolerating Techniques and their limitations –

Power-Aware Computing and Communication.

CS474: Selected Topics in High Performance Computing

Prerequisite: Advanced High Performance Computing

This course aims at introducing students to novel topics in High Performance

Computing that need to be identified in a responsive manner as technology

evolve and develop.

CS495: Selected Topics in Computer Science – 1

Prerequisites: Concepts of Programming Languages

This course aims at introducing students to novel topics in computer science that

need to be identified in a responsive manner as technology evolve and develop.

CS496: Selected Topics in Computer Science – 2

Prerequisites: Concepts of Programming Languages

This course aims at introducing students to novel topics in computer science that

need to be identified in a responsive manner as technology evolve and develop.

**Project (6) credit hours - 3**

**6) Compulsory hours divided as follows**

CS498: Graduation Project

Prerequisite: Passing 85 Credit Hours

This course will continue for two semesters. In the first semester; a group of

students will select one of the projects proposed by the department and analyze

the underlying problem. In the second semester; the design and implementation

of the project will be conducted.

**Information Technology Department**

**1 Applied Sciences (39) credit hours - 3**

**39) Compulsory credit hours divided as follows:**

IT313: Computer Architecture

Prerequisite: Logic Design

Design principles associated with modern computer architectures – performance

and cost considerations – architectural features influenced by high level

languages – networking and security considerations – processor implementation

strategies – micro-programming – pipelining, CISC and RISC – vector

processors – memory hierarchy and architectures – I/O and bus subsystems –

special purpose architectures – parallel processing – distributed systems.

IT314: Micro Controllers

Prerequisite: Logic Design

Microcontroller Basics – Microcontroller Components – Processor Core –

Memory – Digital I/O – Analog I/O – Interrupts – Timer – Communication

Interfaces – SCI – SPI – IIC – Development Cycle – Assembly Language

Programming – Debugging – Hardware Switch Keypad – Potentiometer –

Phototransistor – Position – Numeric Display – Multiplexed – Switching Loads

– Motors.

IT322: Advanced Computer Networks

Prerequisites: Computer Networks Technology

Data communication

Introduction to Network Architectures – LANs/MANs topologies – transmission

– and protocols – Medium Access Control (MAC) protocols – Ethernet types

and technologies – Internet routing protocols – Transport network protocols –

Introduction to Data Center Networks – Fundamentals of Network/Internet

management and measurements – Introduction to Software Defined Networks –

Introduction to Cloud-based Networks – Content distribution networks – IT331: Data communication

Prerequisite: Math-2

Basic concepts of data communications – Layered architecture of

communication protocols – OSI reference model – TCP/IP protocol suite –

Guided/unguided transmission media – Analog/digital data transmission –

Encoding techniques – Multiplexing techniques – Error detection and correction

– Data link protocol.

IT341: Signals and Systems

Prerequisite: Math-3

Signals Applications – Signals Definitions and Classifications – Signals’ Power

and Energy – Basic Signals – Systems and Systems’ Properties – Linear and

Time-Invariant (LTI) Systems – Fourier series – Fourier transform for

continuous and discrete time signals – Sampling theorem – Laplace transform –

Z-Transform – Transfer function – State apace representation – Filters design

and applications.

IT342: Digital Signal Processing

Prerequisite: Signals and Systems

Discrete-Time Signals– Discrete-Time Systems – Linear Time Invariant

Systems – Linear Constant-Coefficient Difference Equations – Discrete time

Fourier Transform Theorems- Z-Transform – Properties of the Region of

Convergence of the z-Transform – The Inverse Z-Transform – Discrete Fourier

Series- Discrete-Fourier Transform: – Sampling of Continuous-Time Signals –

Reconstruction of a Band limited Signal from Its Samples –Block Diagram and

Signal Flow graph representation– Basic Structures of IIR and FIR Systems–

Filter Design Techniques – Design of Discrete-Time IIR Filters from

Continuous-Time Filters – Design of FIR Filters by Windowing – Optimum

Approximation of FIR Filters.

IT351: Information Theory and Data Compression

Prerequisite: Math-3

Object Oriented Programming

Introduction to Data Compression Approaches – Dictionary based compression

approach – Introduction to information theory and Entropy calculation –

Shannon theorem and its applications – Huffman Coding approaches –

Arithmetic Coding Approaches – Quantization with application – Prediction

Coding techniques – Transform Coding and DCT – Compression of Color

images – JPEG Compression and its building blocks – Video basics – MPEG Compression and its building blocks – Motion Estimation and compensation in

Video.

IT352: Pattern Recognition

Prerequisite: Probability and Statistics-2

Signals and Systems

Feature Extraction approaches (Geometrical – Statistical – Transformational –

texture based) – Intentionality Reduction techniques – Feature Selection

Techniques – Linear discriminant Analysis – Bayesian Classifier – Neural

Network Classifier – Hidden Markov Model Classifier – Similarity Measures –

Basic clustering techniques.

IT361: Computer Graphics

Prerequisites: Structured Programming

Introduction to Computer Graphics – Overview of Graphics systems – Line

drawing algorithms – Circle drawing algorithms – Ellipse drawing algorithms –

Area filling algorithms – Polygon filling algorithms – Line clipping algorithms

– Polygon clipping algorithms – Two dimensional transformations – (translation

– rotation – scaling – general transformations – composite transformations) –

Three dimensional object representation and Projections – Three dimensional

modeling and transformations (translation – rotation – scaling – sheer –

reflection – composite) – Three dimensional Viewing and Camera Model.

IT423: Information and Computer Networks Security

Prerequisite: Advanced Computer Networks

Basic concepts of information and network security – Hash functions/algorithms

– Classical encryption techniques – Public and Private Key Cryptography –

Basic and Advanced Encryption – Authentication – Hashing – Symmetric and

asymmetric crypto – Digital Signature and Authentication – Application

Security (email security) – Network security and Firewalls – Web Security –

Introduction to digital steganography and watermarking techniques.

IT432: Communication Technology

Prerequisite: Computer Networks Technology

Communication technology concepts and terminology – Optical Circuit/ Packet/

Burst Switching – Passive Optical Networks – RFID Technology – Internet of

Things Technologies – Wireless Communication Fundamentals – 3G/4G/5G

Communication Fundamentals – Recent Trends in Communication IT443: Image processing

Prerequisite: Signals and Systems

Image sampling and quantization – Zooming in and zooming out – Overview of

image processing systems – Point operations – Spatial filters – Image transform

– Filters in frequency domain – Image noise reduction – Image restoration –

Image segmentation – Image classification accuracy evaluation – Morphological

operations – Application field.

IT444: Multimedia Mining

Prerequisite: Pattern Recognition

Data Collection and Pre-processing – Multimedia Mining Techniques – Image

and Video Mining – Audio and Speech Mining – Text Mining.

**Elective courses are determined based on the student’s desire and are divided as follows: - 3**

**12) Hours chosen by the student from the following elective courses affiliated with the department. )**

**6) Hours chosen by the student either from the following elective courses affiliated with the department, or from)**

**Compulsory or elective courses belonging to another department.**

IT415: Machine Vision

Prerequisite: Image Processing

Computer Graphics

Fundamentals of image formation – Camera imaging geometry – Feature

detection and matching – Multiview geometry including stereo – Motion

estimation and tracking – and classification – Methods for depth recovery from

stereo – Camera calibration – Image stabilization – Automated alignment (e.g.

panoramas) – Tracking – and action recognition.

IT416: Robotics

Prerequisite: Micro Controllers

Theory and application of mathematical models to analyze the kinematics and

dynamics of robot mechanisms or their components using vector algebra –

differential equations – and computer simulations – robot vehicle kinematics –

robot arm kinematics – and robot dynamics with computational examples and

problems. Some basic programming skills and familiarity with MATLAB are

expected.

IT417: Embedded Systems

Prerequisite: Micro Controllers

Embedded systems software design – either in assembly language or a highlevel

language or both – for typical embedded systems applications using

modern tools and approaches for development and debugging – Digital

interfacing using both parallel and asynchronous/synchronous serial techniques

incorporating typical on-chip modules as such as general purpose I/O – timers –

and serial communication modules (i.e. – UART – SPI – I2C – CAN – etc.) –

analog interfacing using analog-to-digital convertors connected to common

sensor elements and digital-to-analog converters connected to typical actuator

elements – Mobile and wireless embedded systems using both short-range

(Bluetooth – 802.15.4) and long-range (cellular – Ethernet) in various

interconnection architectures

IT418: Selected Topics in Embedded Systems and Robotics

Prerequisites: Micro Controllers

This course aims at introducing students to novel topics in embedded systems

and robotics that need to be identified in a responsive manner as technology

evolve and develop.

IT424: Wireless and Mobile Networks

Prerequisite: Advanced Computer Networks

Antennas: types – Radiation patterns – Antenna gain – Propagation models –

Line of sight transmission – Impairments – Fading in wireless environment –

Satellites: orbits types – Geostationary satellites – LEO satellites – MEO

satellites – Footprint – Capacity allocation: FDMA – TDMA – CDMA –

Cellular networks: definition – architecture – frequency reuse – Call forwarding

– Handoff – power control – Main architecture – Last generation architecture –

Ad-hoc networks: definition – problems – MAC protocol – routing – energy

management – Wireless sensor networks: definition – applications – routing –

energy consumption – aggregation techniques.

IT425: Cloud Computing Networks

Prerequisite: Advanced Computer Networks

Introduction to cloud computing – Cloud computing reference model – Physical

Layer (Compute/Storage – FC SAN – IPSAN – FcoE) – Virtual layer (VLAN –

VSAN – Tunneling Protocols) – Characteristics of cloud networking –

Deployment models – Network virtualization techniques used in data centers –

Data center evolution – Routing inside a Data center.

IT426: Internet Programming and Protocols

Prerequisite: Advanced Computer Networks

The principal structure of the internet and its most important protocols –

including TCP – IP – in addition to application layer protocols (DHCP – DNS –

HTTP – SMTP – POP – IMAP ) – basics of socket and thread programming.

IT427: Optical Networks

Prerequisite: Advanced Computer Networks

Optical Multiplexing (WDM – SONET – SDH) – Optical Transmission System

– Optical Devices/Components – Optical Circuit/Packet/Burst Switching –

Optical Switch Architectures and technologies – Passive Optical Networks –

Free-Space Optical Networks – Optical Data Centers – Optical Sensors –

Optical Networks Measurements – Optical Networks Emerging Technologies.

IT428: Wireless Sensor Networks

Prerequisite: Wireless and Mobile networks

Sensor node architecture – Introduction to applications – Network architecture –

Key aspects of the communication protocol stack – Physical layer – MAC –

IEEE 802.15.4 – Routing – RPL – Distributed detection – Distributed

estimation – localization and positioning – Time synchronization – Sensor

operation system – TinyOS – WSN control.

IT429: Selected Topics in Computer Networks

Prerequisites: Advanced Computer Networks

This course aims at introducing students to novel topics in computer networks

that need to be identified in a responsive manner as technology evolve and

develop.

IT433: Cyber Security

Prerequisite: Information and Computer Networks Security

Network attacks and defenses – operating system holes – web security – e-mail

– Botnet – malware – social engineering attacks – Privacy – and digital rights

management.

IT445: Advanced Image Processing

Prerequisite: Image Processing

Image Pyramids – Subband Coding – Haar Transform – Multiresolution Theory

– Wavelet Transform – Fast Wavelet Transform – Wavelet Packets –

Applications of Wavelet Transform/Packets in Image Processing and Examples

– Image Formation – Color Systems – Pseudo Color Image Processing – Full

Color Image Processing – Object and Region Representation Methods – Object

and Region Description Methods – Image Alias – Fuzzy Image Processing –

Integral Image and Real Time Image Classification – Thresholding – Image

Watermarking Theories and Techniques.

IT446: Virtual Reality

Prerequisite: Image Processing

Computer Graphics

3D geometric modeling and transformation – Free form deformation – Particle

systems – Physical simulation – Human factors – VR hardware – VR software

– VR applications.

IT447: Speech Processing

Prerequisite: Digital Signal Processing

Introduction to Speech Processing and Related Technologies – Fundamentals of

DSP (Revision): z-Transform – Fourier Transform – Digital Filters – Sampling

Theorem – Fundamentals of Speech Science: Speech Production Mechanism –

Sound Units – Acoustic Theory – Digital Modeling – Speech Analysis: timedomain

analysis – frequency-domain analysis – Linear Prediction Analysis –

Speech Recognition: Feature Extraction – Template Matching – Statistical

Modeling – Design of Recognition Systems.

IT448: Selected Topics in Multimedia

Prerequisites: Pattern Recognition

This course aims at introducing students to novel topics in multimedia that need

to be identified in a responsive manner as technology evolve and develop.

IT453: Advanced Pattern Recognition

Prerequisite: Pattern Recognition

Decision Tree classifier – Convolutional Neural Network (CNN) – Recurrent

Neural Network (RNN) – Long Short Term Memory LSTM network Support

Vector Machines (SVM). Kernel Functions. SVM with Kernels. Multi-classifier

Approaches. Technical Training Issues (Data Size – Over fitting – Data

Augmentation – Stopping criteria) technical implementation issues.

IT454: Human Language Technology

Prerequisite: Pattern Recognition

Natural text parsing – semantic understanding – text generation – dialogue

systems management – name entity recognition – word sense disambiguation –

carefreeness resolution – sentiment analysis – machine translation – phonetics –

speech synthesis – speech recognition – handwriting recognition.

IT462: Advanced Computer Graphics

Prerequisite: Computer Graphics

Visible surface detection algorithms – Reflection and illumination models –

Rendering algorithms for 3-D objects – Parametric representation of 3-D objects

– Shadows algorithms – 2-D texture mapping – 3-D texture mapping – Ray

tracing – Volume rendering – Anti-Aliasing – Introduction to fractals – 3-D

computer animation – Color Space in Computer Graphics.

IT463: Computer Animation

Prerequisite: Computer Graphics

3D Modeling – Rendering Techniques – Key framing – Interpolations –

Hierarchical animation – Camera animation – Light animation – Special effects

– Digital animation techniques – Recording and production planning.

IT471: Ubiquitous Computing

Prerequisite: Advanced Computer Networks

Structured Programming

Software infrastructure for pervasive computing – sensors and sensor networks

that can capture and disseminate context information – context-aware

applications – embedding computing into everyday objects – user interfaces for

ubiquitous computing – security and privacy to protect access to user context

information – application migration – spontaneous interaction – social

computing.

IT472: Concurrency and Parallel Computing

Prerequisite: Computer Architecture

Structured Programming

Paradigms of concurrency and parallel computing and distinguish between

them. Parallel architectures including multi-core – considerations of cache

coherence – Parallel programming models – Methodologies – Parallel

algorithms – Limitations of parallelism – Parallel programming performance.

IT473: Intelligent and Quantum Computing

Prerequisite: Computer Architecture

Data Structures

Physics of information processing – Quantum logic – Quantum algorithms

including Shor's factoring algorithm and Grover's search algorithm – Quantum

error correction – Quantum communication – and cryptography.

IT495: Selected Topics in Information Technology-1

Prerequisites: Passing 60 Credit Hours

This course aims at introducing students to novel topics in information

technology that need to be identified in a responsive manner as technology

evolve and develop.

IT496: Selected Topics in Information Technology – 2

Prerequisites: Passing 60 Credit Hours

This course aims at introducing students to novel topics in information

technology that need to be identified in a responsive manner as technology

evolve and develop.

**Project (6) credit hours - 3**

**6) Compulsory hours divided as follows**

IT498: Graduation Project

Prerequisite: Passing 85 Credit Hours

This course will continue for two semesters. In the first semester; a group of

students will select one of the projects proposed by the department and analyze

the underlying problem. In the second semester; the design and implementation

of the project will be conducted.

**Information Systems Department**

**1 Applied Sciences (39) credit hours - 3**

**39) Compulsory credit hours divided as follows:**

IS312: Database Management Systems

Prerequisite: Introduction to Database Systems

Object Oriented Programming

Transaction Management – Concurrency Control – Database Recovery – Query

Processing – Query Optimization – Database Security – Different Architectures

of DBMSs – Advanced SQL – Stored Procedures and Triggers.

IS313: Data Warehousing

Prerequisite: Introduction to Database Systems

Introduction to data warehouses – Data warehouses and decision support

systems – data warehouses characteristics and architecture – data warehouse

tools – Design issues – Dimensional models and data cubes – Data warehouse

models: star schema and snowflake schema – Data warehouses in real world:

Sales – Inventory – Education – Health – Transportation – and others –

Querying data warehouses using MDX.

IS321: File Management and Processing

Prerequisite: Data Structures

Basic Files Operations – Types of storage devices and their architecture –

Computing access time – Simple Index – Consequential Processing – Multi-

Level Indexing – B-Trees – B\* Trees – Indexed Sequential Access – B+Trees –

Hashing – Advanced indexing mechanisms

IS322: Information Retrieval

Prerequisite: Introduction to Database Systems

Probability and Statistics-2

Boolean and vector-Space Retrieval Models – Basic tokenizing, Text

Indexing, Text similarity – Performance evaluation of Information Retrieval Systems – Web Search, Automated Text Categorization, Text Clustering – Text

classification, and Recommender Systems.

IS332: Analysis and Design of Information Systems

Prerequisite: Introduction to Database Systems

Introduction to Systems analysis and design – Systems development lifecycle –

Requirements Engineering – Object-oriented Systems analysis – Use cases –

Domain Classes – Behavioral modelling – Architectural design – Detailed

design – User and System interfaces – Extending requirements model into

design models – Design-specific Models – Design Principles – Deploying the

system – Agile Methodologies: Unified Process – Extreme Programming –

SCRUM – Traditional System development approach – Data Flow Diagrams –

Process Descriptions – Data descriptions/dictionary.

IS333: Web-based Information Systems Development

Prerequisite: Web Technology

Architecture – I2EE – Sessions – Security – Data connectivity – MVC –

Advanced JavaScript – AJAX – JQuery – Framework for JS: Angular JS –

Framework for Java: Spring – Hibernate – JSF.

IS341: Business Process Management

Prerequisite: Analysis and Design of Information Systems

Introduction to BPM – Business Process Lifecycle – Process Modeling

Techniques – Business Process Model and Notation – Petri nets – Correctness

of Business Process Models – Simulation of Business Process Models – Process

Instantiation Semantics – BPEL – Mapping from BPMN to BPEL.

CS352: Advanced Software Engineering

(Prerequisite(s) and Description are in Computer science courses part)

CS361: Artificial Intelligence

(Prerequisite(s) and Description are in Computer science courses part)

IS414: Managing and Modeling Big Data

Prerequisite: Database Management Systems

Introduction to big data and its characteristics – Big data sources and

applications – Data science and big data analytics – Introduction to

virtualization and cloud computing – Data analytics life cycle – Hadoop

ecosystem (Hive – PIG – Spark – etc.) – Map-Reduce paradigm – R-language

for querying and analyzing big data – NoSQL vs relational databases –

Machine learning techniques for big data analytics – Graph databases for

representing big data and social networks – Introduction to recommendation

systems and other applications.

IS422: Data Mining

Prerequisite: Information Retrieval

Introduction and Basic Concepts – Data Exploration – Summary statistics –

Graphic Displays of Data Summaries – Measuring Data Similarity and

Dissimilarity – Data Preprocessing – Mining Frequent Patterns – Associations

and Correlations – Pattern Evaluation – Clustering – Classification and

Prediction.

IS434: Service-Oriented Architecture

Prerequisite: Web-based Information Systems Development

Evolution of client server computing in the context of the World Wide Web –

Design and develop a functioning distributed application: various standards and

specifications that support service orientation – XML – API’s – DBMS APIs

– XML databases and XQuery – Directory Services – Application Servers and

Registries – Security and configuration issues for enterprise systems – Design

issues for n-tier distributed systems

CS462: Machine Learning

(Prerequisite(s) and Description are in Computer science courses part)

**Elective courses are determined based on the student’s desire and are divided as follows: - 3**

**12) Hours chosen by the student from the following elective courses affiliated with the department. )**

**6) Hours chosen by the student either from the following elective courses affiliated with the department, or from)**

**Compulsory or elective courses belonging to another department.**

IS331 Fundamentals of Information Systems

Prerequisite: Introduction to Database Systems

Introduction to Information Systems – components of IS – types of IS – IS

development life cycle – IS methodologies – quality of IS – project management

concepts – the technical aspects of project management that are directly related

to practice.

IS415: Cloud Database

Prerequisite: Database Management Systems

Cloud storage: Blobs – NoSQL (Tables) and Relational (SQL Database) –

CDNs – Cloud Databases – CAP Theorem – NoSQL Database System –

Database-as-a-Service – Virtualized Database Servers – Data Partitioning –

Concurrency Management – Replication Management – Scalable Data

Management in the Cloud – Dynamic provisioning – Map-Reduce queries – –

Hadoop Distributed File system (HDFS) – Data Locality for Hadoop in the

Cloud.

IS416: Distributed Database

Prerequisite: Database Management Systems

DBMS Internal – Parallel Architectures for DBMSs – Data Placement Strategies

– Parallel Algorithms – Parallel DBMS Implementation Techniques –

Distributed DBMS Architectures – Distributed Database Design – Distributed

Query Processing – Multi database Systems Peer-to-Peer Systems – Transaction

Management in distributed databases – approaches to concurrency control in

Distributed database – deadlock and recovery in Distributed database.

IS417: Selected Topics in Databases

Prerequisite: Database Management Systems

This course aims at introducing students to novel topics in Databases that need

to be identified in a responsive manner as technology evolve and develop.

IS423: Business Process Mining

Prerequisite: Business process Management

Review over business process management – Event logs – Process Mining:

Discovery – Conformance – Enhancement – Discovery Approaches – Conformance Checking Approaches – Enhancement Approaches – Log-based

Performance Analysis – Tools: ProM/Disco.

IS424: Selected Topics in Data Engineering

Prerequisite: Database Management Systems

This course aims at introducing students to novel topics in Data Engineering

that need to be identified in a responsive manner as technology evolve and

develop.

IS435: Usability Engineering

Prerequisite: Web Technology

Introduction to Human-Computer Interaction – Interaction styles and human

psychology – Design methods – techniques and guidelines – Interface quality

and evaluation – User-centered design and task analysis – Interactive systems

and interface design examples – Emerging technologies and changes on design

– Interface design and implementation – Interface evaluation approaches –

Mobile design – limitations and evaluation.

IS436: Enterprise Mobile Applications Development

Prerequisite: Web Technology

Mobile technologies and standards: basics concepts, layout, multiple activities

and Intents, activity lifecycle, state and preferences – Software development

frameworks and tools – Applicable programming language extensions and

constraints – Limitations – strengths and opportunities of development for

mobile devices – Market development for mobile applications – Current

applications (local and international) – analysis of successes and failures –

Analysis and design techniques for mobile systems – Mobile data management:

local databases and remote databases, Location-based services – data Security –

Integration with Enterprise Applications

IS437: Information Systems Development Methodologies

Prerequisite: Analysis and Design of Information Systems

Information System development methodologies – tools and techniques –

different models of SDLC – Process Methodologies – Object-Oriented

Methodologies – Rapid Application Development life-cycles such as iterative – spiral and agile – Framework Methodologies – Organization methodologies –

and people methodologies.

IS438: Management Information Systems

Prerequisite: Analysis and Design of Information Systems

How IT is used in organizations for the improvement of quality and

productivity. The concrete and profound managerial framework in IT

management. Cases drawn from major corporations and small businesses to

illustrate how Information Technology innovations that can solve organizational

problems and challenges. A variety of cases which highlight problems many

corporations encounter, as well as international cases, written by prominent

international figures in the field, to illustrate how IT can be adapted to conform

to other cultures. State-of-the-art advances in Management Information

Systems.

IS439: Selected Topics in Advanced Information Systems

Prerequisite: Analysis and Design of Information Systems

This course aims at introducing students to novel topics in advanced

information systems that need to be identified in a responsive manner as

technology evolve and develop.

IS442: Geographical Information Systems

Prerequisite: Database Management Systems

Introduction to the concepts and principles of Geographic Information systems

(GIS) identifying and evaluating the Geographic Information systems,

distinction between the geographic and non-geographic environments.

Introduction to (GIS) programming tools and devices. Advanced state of the art

(GIS) programming tools and devices.

IS443: Information Systems Quality Assurance

Prerequisite: Analysis and Design of Information Systems

IS-QA concepts - Standards and Techniques in QA-IS - SW development and

PM - Best practices in IS development life cycle.

IS444: Information Systems Security and Risk Management

Prerequisite: Analysis and Design of Information Systems

Information Security Management concepts - Information risk management and

compliance - Risk assessment and analysis methodologies - Information

Security Program Development and Management - Information Security

Incident Management.

IS445: Information Systems Audit and Control

Prerequisite: Analysis and Design of Information Systems

Tasks of IS auditor during the process of auditing IS - Management of IS audit

function - IS audit and assurance standards and guidelines - IS controls -

Performing an IS audit - Control Self -assessment - Tasks of IS auditor during

the Governance and Management of IT - Corporate Governance - IS strategy -

Maturity of and process improvement models - IT investment and allocation

practices - Policies and procedures - Risk management - IT management

practices - Auditing IT governance structure - Business Continuity Plans -

Auditing Business Continuity.

IS446: Enterprise Information Systems

Prerequisite: Web-based Information Systems Development

The role that Enterprise Resource Planning Systems (ERPs) play in an

organization and the challenging task of managing the Information Systems (IS)

function – How ERP systems use relational databases – the role of an ERP in

carrying out business processes in a company – an entire business process chain

in different business cycle areas (Accounting – Sales – Procurement – Inventory

Management…) – the advantages and challenges of ERP solutions and how to

analyze operational data.

IS447: Information Systems Project Management

Prerequisite: Analysis and Design of Information Systems

The world of project management – The manager – the organization – and the

team – Project activity and risk planning – Scheduling the project – Allocating

resources to the project – Monitoring and controlling the project – Evaluating

and terminating the project.

IS448 E-Business

Prerequisite: Analysis and Design of Information Systems

Introduction to the fundamental principles of e‐Business and e‐ Commerce and

the underlying used technologies with emphasis on Internet Technologies: webbased

tools – e-commerce software – security issues – e-payment systems – web

auctions – legal – ethical – international – and tax issues – application of tools

and services to the development of small scale e‐Commerce applications.

IS449: Selected Topics in Information Systems Engineering

Prerequisite: Web-based Information Systems Development

This course aims at introducing students to novel topics in Information Systems

Engineering that need to be identified in a responsive manner as technology

evolve and develop.

IS495: Selected Topics in Information Systems-1

Prerequisite: Analysis and Design of Information Systems

This course aims at introducing students to novel topics in information systems

that need to be identified in a responsive manner as technology evolve and

develop.

IS496: Selected Topics in Information Systems-2

Prerequisite: Analysis and Design of Information Systems

This course aims at introducing students to novel topics in information systems

that need to be identified in a responsive manner as technology evolve and

develop.

**Project (6) credit hours - 3**

**6) Compulsory hours divided as follows:**

IS498: Graduation Project

Prerequisite: Passing 85 Credit Hours

This course will continue for two semesters. In the first semester; a group of

students will select one of the projects proposed by the department and analyze

the underlying problem. In the second semester; the design and implementation

of the project will be conducted.

**Operations Research and Decision Support Department**

**1 Applied Sciences (39) credit hours - 3**

**39) Compulsory credit hours divided as follows:**

DS312: Decision Support and Future Studies Methodologies

Prerequisites: Introduction to Operations Research and Decision Support

Concepts and techniques to construct and implement an effective computerbased

decision support systems (DSS) – including problem solving – decisionmaking

process – types of DSS (Data/Model/ Knowledge DSS) – model

building and its languages – model selection/integration/execution – types of

computer based information systems – system development life cycle – systems

analysis and integrated computer-based DSS design methodologies – real life

case studies of integrated DSS – foundations of futures studies – future studies

methodologies, such as; Scenario approach, environmental scanning, and

futures wheel – strategic foresight – software tools and integrated DSS software

packages will be stressed used throughout the course.

DS313: Computational Intelligence

Prerequisites: Linear and Integer Programming

Probability and Statistics-2

main components of the field of computational intelligence (CI) such as

evolutionary and fuzzy computation – emphasis will be made on the application

of CI techniques to real life optimization problems – related heuristic techniques

such as Ant Algorithms, Genetic Algorithms, Tabu search, Simulated Annealing

are covered – the advantages and limitations as well as the guidelines for

selecting the most efficient approach for various types of problems –

implementation of CI techniques for various problems will be stressed

throughout the course.

DS321: Linear and Integer Programming

Prerequisites: Introduction to Operations Research and Decision Support

Math-2

Formulation of problems into linear and integer programs – the graphical

solution approach – the simplex method – two-phase method – dual simplex

algorithm – revised simplex – duality in linear programming – sensitivity

analysis, post-optimal analysis – parametric linear programming –

decomposition technique – interior-point method – integer programming algorithms – economic interpretation of solutions – real life applications such as

the traveling salesman, transportation and assignment problems –real life case

studies and state of art solver software will be used throughout the course.

DS322: Non-linear Programming

Prerequisites: Linear and Integer Programming

Definitions and properties of convex functions and sets – optimality conditions

of unconstrained and constrained nonlinear programming problems – line search

methods without using derivatives – line search methods using derivatives –

multidimensional search methods without using derivatives – multidimensional

search methods using derivatives – penalty and barrier functions methods – and

methods of feasible directions – real life case studies and state of art solver

software will be used throughout the course.

DS323: Dynamic Programming and Stochastic Modeling

Prerequisites: Linear and Integer Programming

Dynamic programming – stochastic models – queuing theory – multistage

decision-making – recursive equations – forward and backward recursion – state

variables in dynamic programming –Markov chains and analysis – Markov

decision process –random walk – Poisson process – truncated Poisson process –

pure birth process – pure death process and birth and death process – queuing

systems covering single and multi-stage queuing models – queuing network

models – real life case studies and state of art solver software will be used

throughout the course.

DS331: System Modeling and Simulation

Prerequisites: Object-Oriented Programming

Fundamentals of simulation as a modeling technique – emphasis is on the value

of simulation as an experimental tool to support problem solving and decision

making – concepts of building a complete simulation study through stochastic

discrete event simulation procedures (event, activity, and process based models)

– Input data analysis – different time advance mechanisms – validation and

verification – output data analysis – using output to support decision making are

studied through a number of mathematical, industrial and business applications

– statistical methods in simulation experiments – implementing different

simulation models using computer programming is stressed throughout the

course –introduction to software tools for simulation is given – concepts of

random number generation and sampling are discussed and used. DS341: Learning From Data

Prerequisites: Probability and Statistics-2

Theoretical and practical aspects related to building data driven models – linear

models for regression and classification – kernel machines – neural networks –

emphasis will be placed on practical computational complexity and

programming aspects of such models – exposition will be made of the problem

of over fitting – the bias-variance dilemma – model regularization – and model

validation.

DS352: Production and Operations Management

Prerequisites: Decision Support and Future Studies Methodologies

Introduction to a variety of areas in operations and supply chain management –

various operations management decision including service and product design,

quality management, process and capacity, facility location, layout design,

scheduling, and inventory management – real life case studies and state of art

software will be used throughout the course.

CS361: Artificial Intelligence

(Prerequisite(s) and Description are in Computer science courses part)

DS414 - Game Theory

Prerequisites: Probability and Statistics-2

Linear and Integer Programming

Strategy games – rationality – dominance relations – bargaining theory – noncooperative

games – cooperative games – games with incomplete information –

repeated games and evolutionary stable strategies – case studies will be used to

illustrate the application of game theory to real world problems along with

implementing game-theoretic settings.

DS415: Decision Theory

Prerequisites: Probability and Statistics-2

Linear and Integer Programming

Basic concepts of decision making under certainty, risk and uncertainty –

decision tables – decision trees – sequential decision-making – opportunity loss

– one-time decisions – expected value of information – conditional probability –

decision analysis – multiple comparison and multiple ranking methods are

explained –approaches to the management of risk and concepts as such as

uncertainty and variability, Quantifying uncertainty, Probability assessment methods and risk attitudes – real life case studies and state of art software will

be used throughout the course.

DS424: Multi-objective Programming

Prerequisites: Non Linear Programming

Concepts of multi-objective programming – vector optimization problems

techniques – utility theory – goal programming methods – interactive multiobjective

methods and evolutionary algorithms for multi-objective

programming – real life case studies and state of art solver software will be used

throughout the course.

DS425: Network Modeling and Optimization

Prerequisites: Dynamic Programming and Stochastic Modeling

Introduction to network problems in operations research, computer science,

electrical engineering and systems engineering – concepts of graph theory,

network representations, network transformations, shortest paths algorithms,

maximum flows algorithms, minimum cost flows algorithms, generalized

network and combinatorial-based network models – real life case studies and

algorithms implementation will be stressed throughout the course.

**Elective courses are determined based on the student’s desire and are divided as follows: - 3**

**12) Hours chosen by the student from the following elective courses affiliated with the department. )**

**6) Hours chosen by the student either from the following elective courses affiliated with the department, or from)**

**Compulsory or elective courses belonging to another department**.

DS342: Data Analytics

Prerequisites: Probability and Statistics-2

Design, build, verify, and test predictive data models to make data-driven

decisions – concepts, methods, and applications of pattern discovery in data

mining – concepts of cluster analysis – clustering methodologies, algorithms,

and applications – partitioning methods, hierarchical methods, and densitybased

methods – steps of data preparation, analysis, learning and modeling, and

identifying the predictive/descriptive model that produces the best results DS343: Probabilistic Reasoning

Prerequisites: Probability and Statistics-2

Bayesian data analysis – inference and networks – a disciplined approach to

hypothesis formulation and test and to cultivate and appreciation of reasoning

and decision making under uncertainty.

DS344: Forecasting and Predictive Analytics

Prerequisites: Learning From Data

The effective application of popular data analytics tools – practical approaches

to data cleaning, parsing, and extraction for various sources – solving predictive

analytics problems using models such as multiple linear regression, logistic

regression, auto-regressive integrated moving average (ARIMA), decision trees,

and neural networks – time-series analysis – forecasting process: goal

definition, data visualization, modeling, performance, evaluation, and model

deployment – interpretation of results.

DS416: Strategic Decision Making

Prerequisites: Linear and Integer Programming

Key concepts, principles, and tools of strategic management – overview of the

strategic decision making process – formulating business vision and mission –

external assessment – internal assessment – strategies analysis and choice – real

life case studies, applications and use of state of art software packages are

stressed throughout the course.

DS432: System Dynamics Modeling

Prerequisites: System Modeling and Simulation

Introduction to systems thinking and the system dynamics approach to policy

analysis –applications to business management and public policy – causal-loop

and "stock and flow" models of business growth, technology adoption,

marketing, and various other domains – use of role-based simulation games to

explain key principles of systems – use of simulation software to model and

solve problems – case studies in dynamic policy analysis.

DS433: Agent-Based Modeling and Complex Systems

Prerequisites: System Modeling and Simulation

Concepts of agent-based modeling (ABM) and complex systems –agents, their

internal structure, their interactions, simulation environment –model validation

– complex adaptive systems; feedback loops, externalities, nonlinearity, chaos theory, self-organization theory, emergent properties resilient and robustness,

schemata and cellular automata – real life case studies, applications and ABM

implementations are stressed throughout the course.

DS453: Crisis Management

Prerequisites: Decision Support and Future Studies Methodologies

concepts and fundamentals of crisis management – identifying, preventing, and

controlling crisis situations – identifying potential risks or situations that may

precipitate a crisis – developing, assessing and determining consequences of

contingency plans – real life case studies, applications and use of state of art

software packages are stressed throughout the course.

DS454: Service Management

Prerequisites: Decision Support and Future Studies Methodologies

A complete and comprehensive picture of the management of service industries

–understanding of the nature and importance of the service sector in the

international economy – effective decision making in the management of a

service organization –design and management of systems for services –

contextualization of the service sector and its role in the economy – service

portfolio management – service marketing – service quality – service systems

capacity management.

DS455: Managerial Economics and Financial Analysis

Prerequisites: Decision Support and Future Studies Methodologies

Formulating, estimating, and evaluating the expected economic outcomes of

alternatives designed to accomplish a defined purpose – mathematical

techniques simplify the economic evaluation of alternatives – determining the

economic feasibility of projects; alternatives, especially the time value of

money, interest rates, depreciation, replacement, economic life, present value,

rate of return, and payback period – financing – supply and demand – private

and social cost estimations – secondary and intangible benefits and costs –

benefit-cost models – economic risk analysis – economic optimization.

DS456: Project Management

Prerequisites: Introduction to Operations Research and Decision Support

Introduction to the context and addresses the principles and the basic techniques

of project management – various project management techniques related to

project definition, project scheduling, managing projects under resource

limitation, and managing project risks –integrated planning, scheduling, and control systems for planning the scope of a project – real life case studies and

state of art software will be used throughout the course.

DS495: Selected Topics in Operations Research and Decision Support – 1

Prerequisites: Passing 60 Credit Hours

This course aims at introducing students to novel topics in decision support that

need to be identified in a responsive manner as technology evolve and develop.

DS496: Selected Topics in Operations Research and Decision Support – 2

Prerequisites: Passing 60 Credit Hours

This course aims at introducing students to novel topics in decision support that

need to be identified in a responsive manner as technology evolve and develop.

**Project (6) credit hours - 3**

**6) Compulsory hours divided as follows:**

DS498: Graduation Project

Prerequisite: Passing 85 Credit Hours

This course will continue for two semesters. In the first semester; a group of

students will select one of the projects proposed by the department and analyze

the underlying problem. In the second semester; the design and implementation

of the project will be conducted.

TR301: Field Training

Prerequisite: Passing 60 Credit Hours

Particular emphasis is placed on the importance of practical experience and all

teaching involves industry standard hardware, software, methods and

techniques. Students asked to complete training on chosen area of specialization

to be familiar with the industry.

**Appendix 2: Suggested Study Plan**

**First Level**

|  |  |
| --- | --- |
| First Semester | Credit Hours |
| Technical Report Writing *(INS 111)* | 2 |
| Ethics and Professionalism *(INS 112)* | 2 |
| Discrete Structures *(MATH 112)* | 2 |
| Mathematics-1 *(MATH 111)* | 3 |
| Electronics *(CMT 111)* | 3 |
| Fundamentals of Computer Science *(CS 111)* | 3 |
| Total | 15 Hours |

|  |  |
| --- | --- |
| Second Semester | Credit Hours |
| General Elective (1) | 2 |
| General Elective (2) | 2 |
| Creative Thinking and Communication Skills *(INS 113)* | 3 |
| Mathematics-2 *(MATH 113)* | 3 |
| Structured Programming *(CS 112)* | 3 |
| |  | | --- | |  |  |  | | --- | | Probability and Statistics-1 *(STAT 121)* | | 3 |
| Total | 16 Hours |

**Second Level:**

|  |  |
| --- | --- |
| Third Semester | Credit Hours |
| Data Structures *(CS 214)* | 3 |
| Introduction to Database Systems *(OR 211)* | 3 |
| Introduction to Software Engineering *(CS 251)* | 3 |
| Object-Oriented Programming *(CS 213)* | 3 |
| Logical Design *(CMT 212)* | 3 |
| Computer Networks Technology *(CMT 221)* | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Fourth Semester | Credit Hours |
| Mathematics-3 *(MATH 214)* | 3 |
| Introduction to Operations Research and Decision Support *(DS 211)* | 3 |
| Probability and Statistics-2 *(STAT 222)* | 3 |
| Web Technologies *(OR 231)* | 3 |
| General Elective (2) | 2 |
| Total | 14 Hours |

**Department of Information Technology**

**Third Level**

|  |  |
| --- | --- |
| Fifth Semester | Credit Hours |
| Operating Systems *(CS 341)* | 3 |
| Algorithm Analysis and Design *(CS 321)* | 3 |
| Signals and Systems *(CMT 341)* | 3 |
| Computer Networks - Advanced *(CMT 322)* | 3 |
| Data Transmission *(CMT 331)* | 3 |
| Computer Architecture *(CMT 313)* | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Sixth Semester | Credit Hours |
| Digital Signal Processing *(CMT 342)* | 3 |
| Pattern Recognition *(CMT 352)* | 3 |
| Microcontrollers *(CMT 313)* | 3 |
| Information Theory and Data Compression *(CMT 351)* | 3 |
| |  | | --- | |  |  |  | | --- | | Computer Graphics Systems *(CMT 371)* | | 3 |
| Total | 15 Hours |

**Summer Semester**

|  |  |
| --- | --- |
| Course | Credit Hours |
| Summer Training *(TR 301)* | 3 |

**Fourth Level**

|  |  |
| --- | --- |
| Seventh Semester | Credit Hours |
| Image Processing *(CMT 443)* | 3 |
| Communication Technology *(CMT 432)* | 3 |
| Specialization Elective (1) | 3 |
| Specialization Elective (2) | 3 |
| Specialization Elective (3) | 3 |
| Graduation Project - Part 1 *(CMT 498)* | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Eighth Semester | Credit Hours |
| Multimedia Data Mining *(CMT 444)* | 3 |
| Computer and Information Network Security *(CMT 423)* | 3 |
| |  | | --- | |  |  |  | | --- | | Specialization Elective (4) | | 3 |
| Specialization Elective (5) | 3 |
| Specialization Elective (6) | 3 |
| |  | | --- | |  |  |  | | --- | | Graduation Project - Part 2 *(CMT 498)* | | 3 |
| Total | 18 Hours |

**Department of Information Systems**

**Third Level**

|  |  |
| --- | --- |
| Fifth Semester | Credit Hours |
| Operating Systems *(CS 341)* | 3 |
| Algorithm Analysis and Design *(CS 321)* | 3 |
| |  | | --- | |  |  |  | | --- | | Web-Based Information Systems Development *(IS 312)* | | 3 |
| Advanced Software Engineering *(CS 352)* | 3 |
| File Management and Processing *(IS 321)* | 3 |
| |  | | --- | |  |  |  | | --- | | Information Systems Analysis and Design *(IS 332)* | | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Sixth Semester | Credit Hours |
| Business Process Management *(IS 341)* | 3 |
| |  | | --- | |  |  |  | | --- | | Artificial Intelligence *(CS 361)* | | 3 |
| |  | | --- | |  |  |  | | --- | | Database Management Systems *(IS 333)* | | 3 |
| Information Retrieval *(IS 322)* | 3 |
| Data Warehousing *(IS 313)* | 3 |
| Total | 15 Hours |

**Summer Semester**

|  |  |
| --- | --- |
| Course | Credit Hours |
| Summer Training *(TR 301)* | 3 |

**Fourth Level:**

|  |  |
| --- | --- |
| Seventh Semester | Credit Hours |
| Machine Learning *(CS 462)* | 3 |
| Service-Oriented Architectures *(IS 437)* | 3 |
| |  | | --- | |  |  |  | | --- | | Specialization Elective (1) | | 3 |
| Specialization Elective (2) | 3 |
| Specialization Elective (3) | 3 |
| |  | | --- | |  |  |  | | --- | | Graduation Project - Part 1 *(IS 498)* | | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Eighth Semester | Credit Hours |
| Data Mining *(IS 422)* | 3 |
| Big Data Management and Modeling *(IS 414)* | 3 |
| |  | | --- | |  |  |  | | --- | | Specialization Elective (4) | | 3 |
| Specialization Elective (5) | 3 |
| Specialization Elective (6) | 3 |
| |  | | --- | |  |  |  | | --- | | Graduation Project - Part 2 *(IS 498)* | | 3 |
| Total | 18 Hours |

**Department of Operations Research and Decision Support**

**Third Level**

|  |  |
| --- | --- |
| Fifth Semester | Credit Hours |
| Operating Systems *(CS 341)* | 3 |
| Algorithm Analysis and Design *(CS 321)* | 3 |
| |  | | --- | |  |  |  | | --- | | Dynamic Programming and Stochastic Modeling *(DS 321)* | | 3 |
| Decision Support Methodologies and Future Studies *(DS 312)* | 3 |
| Learning from Data *(DS 341)* | 3 |
| |  | | --- | |  |  |  | | --- | | System Modeling and Simulation *(DS 331)* | | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Sixth Semester | Credit Hours |
| Nonlinear Programming *(DS 322)* | 3 |
| |  | | --- | |  |  |  | | --- | | Production and Operations Management *(DS 351* | | 3 |
| |  | | --- | |  |  |  |  |  | | --- | --- | --- | | |  | | --- | |  |  |  | | --- | | Linear and Integer Programming *(DS 323)* | | | 3 |
| Computational Intelligence *(DS 313)* | 3 |
| |  | | --- | |  |  |  | | --- | | Artificial Intelligence *(CS 361)* | | 3 |
| Total | 15 Hours |

**Summer Semester**

|  |  |
| --- | --- |
| Course | Credit Hours |
| Summer Training *(TR 301)* | 3 |

|  |  |
| --- | --- |
| Seventh Semester | Credit Hours |
| Multi-Objective Programming *(DS 424)* | 3 |
| Network Modeling and Optimization *(DS 425)* | 3 |
| |  | | --- | |  |  |  | | --- | | Specialization Elective (1) | | 3 |
| Specialization Elective (2) | 3 |
| Specialization Elective (3) | 3 |
| |  | | --- | |  |  |  | | --- | | Graduation Project - Part 1 *(DS 498)* | | 3 |
| Total | 18 Hours |

|  |  |
| --- | --- |
| Eighth Semester | Credit Hours |
| Game Theory *(DS 414)* | 3 |
| Decision Theory *(DS 415)* | 3 |
| |  | | --- | |  |  |  | | --- | | Specialization Elective (4) | | 3 |
| Specialization Elective (5) | 3 |
| Specialization Elective (6) | 3 |
| |  | | --- | |  |  |  | | --- | | Graduation Project - Part 2 *(DS 498)* | | 3 |
| Total | 18 Hours |