UNIVERSIDAD DE BURGOS

COURSE DESCRIPTIONS

DEGREE IN HEALTH ENGINEERING

- **1st YEAR**

  - **8213 Algebra**

MATRICES, DETERMINANTS AND SYSTEMS OF LINEAR EQUATIONS

Matrices, determinants and systems of linear equations

Matrices and determinants. Definitions and properties. Inverse matrix. Calculation of the inverse matrix through elementary operations by rows and the adjacent matrix. Rank of a matrix. Linear equation systems. Definitions and classification. Gauss and Gauss-Jordan method. Rouché-Frobenius theorem. Cramer's Rule.

VECTOR SPACES

Vector spaces

Vectorial space. Vector subspaces. Intersection and sum of subspaces. Linear combination. Generator system and base of a vector space. Dimension of a vector space. Coordinates of a vector with respect to a base. Base change. Scalar product. Euclidean vector space. Euclidean norm and distance. Angle between two vectors. Orthogonal subspace. Orthonormal systems and bases. Orthogonal projection of a vector onto a subspace. Orthogonal matrix. Base change between orthonormal bases.

LINEAR APPLICATIONS

Linear applications

Linear application. Definition, properties and examples. Core subspaces and image of a linear map. Equations and matrix associated with a linear application with regard to a base. Similar matrices. Similarity theorem.

DIAGONALIZATION

Diagonalization

Eigenvalues and eigenvectors of an endomorphism and a matrix. Characteristic equation and characteristic polynomial. Eigenspace of an eigenvalue. Algebraic and geometric multiplicities of an eigenvalue. Endomorphisms and diagonalizable matrices. Theorems on diagonalization. Endomorphisms and orthogonally diagonalizable matrices. Symmetric matrices. Orthogonal diagonalization.

ANALYTICAL GEOMETRY (CARTESIAN GEOMETRY)

Analytic geometry

Cross product and mixed product, respectively, of two and three vectors in space. Definitions, properties and applications. Geometric places: straight lines, planes, conic sections.

- **8214 Physics Applied to Health**

Kinematics

Particle kinematics.

Dynamic

Particle dynamics.

Fluids

Fluid mechanics.

Thermology

Heat and temperature.

Electromagnetism

Electric current.

Magnetic field.

Electromagnetic waves.

Optics

Optical phenomena.

Modern physics

Atomic and nuclear physics.

Electronics

Fundamentals of electronics.

- **8215 Bioethical, Deontological Code and Legal Basis of Health**

LEGAL ASPECTS

Topic 1

Basic Legal Notions.

Topic 2

Protection of computer programs.

Topic 3

Data protection.

Topic 4

Electronic commerce.

Topic 5

Computer crime.

HEALTH DEONTOLOGY

Topic 6

Fundamentals of Bioethics.

Topic 7

Ethics and Deontology of the Health Professions.

Topic 8

Principle of Autonomy. Patient Rights.

Topic 9

Principle of Justice. Ethics of Health Institutions.

Topic 10

Ethics of biomedical and biotechnological research.

Topic 11

Genetics. Ethical and legal frontiers of Biotechnology.

Topic 12

Risks / benefits and public perceptions of Biotechnology.

- **8216 Principles of Computing**

UNIT A: INTRODUCTION TO COMPUTING

1: Basic concepts

Information coding, computer architecture.

2: Introduction to operating systems

3: Introduction to computer networks and the Internet

4: Introduction to programming

5: History of computing

UNIT B: USE OF BASIC TOOLS

6: Spreadsheets

7: Word processors

8: Generation of presentations

9: Information Management

- **8217 Cellular and Genetic Biology**

UNIT I - INTRODUCTION

Topic 1: OBJECTIVES AND COMPETENCES

1. Objectives. 2. Contents of the subject matter. 3. Evaluation methods.

Topic 2: INTRODUCTION TO THE CELL

1. Organization of living beings. 2. Bioelements and biomolecules. 3. The cell as

A structural unit of living beings. 4. Types of cells.

UNIT II - INTERNAL ORGANIZATION OF THE CELL

Topic 3: CELLULAR MEMBRANES

1. Composition and structure of the membranes. 2. Transport through the membrane. 3. Cell surface and cell adhesion.

Topic 4: CELLULAR ORGANIZATION AND MOVEMENT

1. Microtubules. 2. Actin filaments. 3. Intermediate filaments. 4. Cell mobility.

Topic 5: INTRACELLULAR COMPARTMENTS AND TRANSPORTATION

1. Cellular organelles. 2. Vesicular transport. 3. Endocytic pathways. 4. Secretory pathways.

Topic 6: CELLULAR COMMUNICATION

1. Cell signaling mechanisms. 2. Receptors and signal transduction.

Topic 7: MITOCHONDRIAS AND PEROXISOMES

1. Structure and function of mitochondria and peroxisomes. 2. Mitochondrial pathologies.

Topic 8: THE NUCLEUS

1. Nuclear structure and function. 2. The nuclear envelope. 3. The nucleolus.

UNIT III - GENETICS

Topic 9: INTRODUCTION TO GENETICS

1. Concept and objectives of genetics. 2. Divisions of genetics. 3. Model of genetic organisms.

Topic 10: NUCLEIC ACIDS

1. Nucleic acids as transmitters of genetic information. 2. Structure and characteristics of DNA. 3. Structure and types of RNA. 3.1. Coding RNA. 3.2. Non-coding RNA.

Topic 11: STRUCTURAL ORGANIZATION OF DNA

1. Chromosomes and chromatin. 2. Genes and genomes. 2.1. Eukaryotic genome. 2.2. Organelle DNA. 2.3 Genome of prokaryotes and viruses. 3. Structure of genes.

Topic 12: CHROMOSOMES AND CELLULAR REPRODUCTION

1. The cell cycle. Generalities. 1.2. Cellular division. 2. Control of the cell cycle. 3.

Meiosis: a special type of cell division. 4. Proliferation and cell death.

Topic 13: CELLULAR BIOLOGY OF CANCER

1. Characteristics of cancer cells. 2. Introduction to the genetic bases of cancer.

Topic 14: MENDELIAN GENETICS

1. Fundamentals of Mendelian genetics. 2. Genotype and phenotype. 3. Chromosomal bases of genetic inheritance.

- **8218 Calculus**

CALCULUS

Numeric sets

Real and complex numbers.

Real functions of a real variable

Real functions of real variable, limits. Continuity and derivability. Graphical representation of functions.

Numerical and functional series

Sequences of real numbers, numerical series. Taylor development, power series.

Integration of functions

Indefinite integral. Definite integral, improper integrals.

Real functions of several real variables

Functions of several variables, limits. Continuity and derivability. Multiple integrals.

Numerical calculus

Introduction to numerical calculus.

Differential equations

Introduction to differential equations.

- **8219 Fundamentals of Electricity in Medicine**

UNIT 1: ELECTRICAL CIRCUITS

TOPIC 1: THEORY OF ELECTRICAL CIRCUITS

TOPIC 2: ALTERNATING CURRENT CIRCUITS

TOPIC 3: TRIPHASIC (THREE-PHASE) CIRCUITS

UNIT 2: ELECTRICAL MACHINES

TOPIC 4: GENERAL PRINCIPLES OF ELECTRICAL MACHINES

TOPIC 5: TRANSFORMERS

TOPIC 6: ASYNCHRONOUS OR INDUCTION MACHINES

TOPIC 7: SYNCHRONOUS MACHINES AND GENERATING SETS

TOPIC 8: DIRECT CURRENT AND SPECIAL MACHINES

UNIT 3: ELECTRICAL INSTALLATIONS

TOPIC 9: ELECTRICAL ENERGY SYSTEMS IN HOSPITAL FACILITIES

TOPIC 10: ELECTRICAL TECHNOLOGY APPLIED TO MEDICAL AND HOSPITAL EQUIPMENT

UNIT 4: LABORATORY PRACTICES

PRACTICE 1: NOTIONS OF ELECTROMETRY

PRACTICE 2: ELECTRICAL ELEMENTS

PRACTICE 3: CURRENT, VOLTAGE AND POWER MEASUREMENT

PRACTICE 4: TESTING LAWS AND THEOREMS

PRACTICE 5: ALTERNATING CURRENT CIRCUITS

PRACTICE 6: TRIPHASIC (THREE-PHASE) CIRCUITS

PRACTICE 7: TRANSFORMERS

PRACTICE 8: ASYNCHRONOUS OR INDUCTION MACHINES

PRACTICE 9: SYNCHRONOUS MACHINES AND GENERATING SETS

PRACTICE 10: MEDICAL AND HOSPITAL ELECTRICAL TECHNOLOGY

- **8220 Structure and Function of the Human Body I**

Unit 1. General Concepts of Physiology

Topic 1: Introduction to Physiology.

Topic 2: Interactions between cells and the extracellular environment.

Topic 3: Membrane potentials.

Topic 4: Homeostasis and control.

Unit 2. Nervous System

Topic 5: Organization of the nervous system.

Topic 6: Autonomic nervous system: sympathetic and parasympathetic.

Topic 7: Sensitive Physiology.

Unit 3. Circulatory System and Blood

Topic 8: Blood.

Topic 9: Coagulation.

Topic 10: Cardiovascular physiology.

Unit 4. The Immune System

Topic 11: The immune system.

Unit 5. The Respiratory System

Topic 12: Mechanics of respiration.

Topic 13: Gaseous exchange.

Unit 6. Renal System

Topic 16: The kidneys (I).

Unit 17: The kidneys (II).

Topic 18: Fluid and electrolyte balance.

- **8221 Programming**

A: INTRODUCTION TO PROGRAMMING.

Topic 1: What is Python?

What is Python? Environment installation (Anaconda, REPL, Jupyter, notebooks and running scripts). Basic expressions and types: lists, dictionaries and tuples.

Topic 2: Expressions and basic types.

Topic 3: Data collection I.

Lists and tuples.

B: STRUCTURED PROGRAMMING.

Topic 4: Flow control

Sequential. Conditionals. Loops.

Topic 5: Functions

Topic 6: Advanced Data Structures.

Sets and dictionaries.

Unit 7: Functions II.

Recursiveness. Functional programming.

Topic 8: Introduction to Object Orientation

C: INTRODUCTION TO DATA PROCESSING WITH PYTHON

Topic 9: Input / output operations with binary and text files.

Topic 10: Introduction to other libraries of scientific computing I

Topic 11: Introduction to data processing in table form I

Topic 12: Introduction to other libraries of scientific computing II

- **8222 Structural and Metabolic Biochemistry**

UNIT I: INTRODUCTION TO THE BIOCHEMISTRY COURSE

1. OBJECTIVES AND COMPETENCES

1. Objectives. 2. Contents: thematic units of the subject program. 3. Competences that the student must acquire. 4. Training activities and teaching methodology. 5. Evaluation methods. 6. Source of bibliographic information and internet resources.

2. INTRODUCTION TO BIOCHEMISTRY

1. Concept and objectives of Biochemistry. 2. Biomolecules: structure function relation. 3. Weak interactions in aqueous media and their importance in biological systems. 4. Mission of water in biological processes.

UNIT II. STRUCTURAL BIOCHEMISTRY: STRUCTURE AND FUNCTION OF BIOMOLECULES

3. GLUCCIDS

1. Concept and classification. 2. Monosaccharides. 3. Disaccharides. 4. Polysaccharides. 5. Glycoconjugates: proteoglycans, glycoproteins and glycolipids. 6. Molecular recognition and cellular communication: the sugar code and the role of lectins.

4. LIPIDS

1. Introduction. 2. Lipid storage. 3. Lipids in membranes. 4. Lipids as pigments, co-factors and signals.

5. PROTEINS: COMPOSITION AND STRUCTURE

1. Functions and biological importance of proteins. 2. Amino acids. 3. Peptide linkage and peptides. 4. Structure and conformation of proteins. 5. Protein folding. 6. Protein denaturation. 7. Bioinformatics: protein databases.

6. STRUCTURE AND FUNCTION OF FIBROUS PROTEINS

1. Concept and function of fibrous proteins. 2. Structure of keratins. 3. Structure of collagen. Collagen-related diseases. 4. Structure of elastin.

7. STRUCTURE AND FUNCTION OF GLOBULAR PROTEINS

1. Characteristics of globular proteins. 2. Structure and function of myoglobin. 3. Structure and function of hemoglobin. 4. Structure and function of immunoglobulins.

8. EXPERIMENTAL METHODS FOR THE STUDY OF PROTEINS

1. Protein purification: an essential step in understanding its function. 2. Separation of proteins by size, solubility, charge and affinity. 3. Separation of proteins by electrophoresis. 4. Ultracentrifugation. 5. Determination of the primary structure of proteins. 6. Determination of the protein structure by X-ray crystallography. 7. Localization and determination of proteins with antibodies.

9. ENZYMOLOGY I: BASIC CONCEPTS

1. Function and general characteristics of enzymes. 2. Mechanism of action of enzymes. 3. Cofactors and Coenzymes. 4. Experimental determination of the enzymatic activity.

10. ENZYMOLOGY II: ENZYME KINETICS

1. Enzyme kinetics: Michaelis-Menten equation. 2. Effect of pH and temperature. 3. Types of reversible and irreversible enzyme inhibition. 4. Allosteric enzymes.

- **2nd YEAR (effective in the academic year 2020/2021)**
  - **8223 Structure and Function of the Human Body II**

UNIT 7. DIGESTIVE SYSTEM

Topic 14

Digestive system (I).

Topic 15

Digestive system (II).

UNIT 8. THE MUSCULAR SYSTEM

Topic 19

Muscles and body movement control.

Topic 20

Exercise physiology.

UNIT 9. THE OSTEOARTICULAR SYSTEM

Topic 21

The osteoarticular system.

UNIT 10. ENDOCRINE SYSTEM

Topic 21

Introduction to the endocrine system.

Topic 22

Metabolic regulation.

Topic 23

Metabolism and energy balance.

Topic 24

Homeostatic control of blood glucose.

Topic 25

Regulation of the endocrine system (I).

Topic 26

Regulation of the endocrine system (II).

Topic 27

Regulation of the endocrine system (III).

Topic 28

Regulation of the endocrine system (IV).

Topic 29

Reproductive Physiology (I).

Topic 30

Reproductive Physiology (II).

UNIT 11: CENTRAL AND PERIPHERAL NERVOUS SYSTEM

Anatomy, Exploration, Complementary Tests and Pathology of the Central and Peripheral Nervous System.

- **8224 Molecular Genetics**

UNIT I: INTRODUCTION

TOPIC 1: INTRODUCTION TO THE SUBJECT.

Goals. Contents. Competencies. Training activities and teaching methodology. Evaluation methods. Bibliography and internet resources.

TOPIC 2: INTRODUCTION TO MOLECULAR GENETICS.

Objectives. Methods. Applications. Relationship with other sciences.

UNIT II-ORGANIZATION OF THE EUKARYOTIC GENOME

TOPIC 3. GENOME AND EUKARYOTIC GENES.

Organization of the genome. Organelle genomes. Gene concept. Structure and function of genes. Regulatory genes, pseudogenes, and gene families. Transposable genetic elements.

UNIT III-TRANSMISSION OF GENETIC INFORMATION

TOPIC 4: REPLICATION OF DNA.

Replication: general characteristics. Components of replication. Escherichia coli DNA replication as a model. Replication of eukaryotic DNA. Telomere synthesis.

TOPIC 5: RNA SYNTHESIS AND PROCESSING.

RNA classes. RNA polymerases. Promoters and transcription apparatus. Transcription in prokaryotes as a model: initiation, elongation and termination. Transcription in eukaryotes. Regulatory elements. Processing of eukaryotic pre-Mrna. RNA editing.

TOPIC 6: TRANSLATION.

Genetic code and genetic decoding. Ribosomes and tRNAs. Translation cycle: initiation, elongation and termination. Transcription-translation coupling.

TOPIC 7: DNA REPAIR.

DNA repair mechanisms: direct reversion and indirect repair systems. Diseases caused by deficiencies in repair.

TOPIC 8: MOLECULAR MECHANISM OF RECOMBINATION.

Role of recombination. Homologous recombination models. Other types of recombination. Assembly of immunoglobulin genes.

TOPIC 10: MECHANISMS OF GENETIC VARIATION.

Mutations: concepts and types. Gene and chromosomal mutations. Structural and numerical chromosomal alterations. Recombination as a source of variation. Other sources of variation.

UNIT IV-CONTROL OF GENETIC EXPRESSION: REGULATION MECHANISMS.

TOPIC 10: REGULATION OF GENE EXPRESSION IN BACTERIA.

Jacob e Monod operon model for the regulation of the lac genes of E. coli. Examples of operon control: lac and trp. RNA-mediated regulation.

TOPIC 11: REGULATION OF GENE EXPRESSION IN EUKARYIOTS.

Changes in the structure of chromatin. Control at different levels: transcription, RNA processing, splicing and alternative splicing, mRNA stability and at the level of translation.

TOPIC 12: EPIGENETICS.

Fundamental concepts. Epigenome. Main epigenetic mechanisms. Epigenetic control of cell differentiation. Epigenetics and human health.

TOPIC 13. TECHNIQUES FOR GENE EXPRESSION ANALYSIS.

DNA and RNA isolation. Electrophoresis, Hybridization, PCR, sequencing. Genomic and proteomic techniques.

UNIT V-REGULATION OF GENE EXPRESSION: HUMAN DISEASES. CANCER

TOPIC 14: INTRODUCTION TO GENETIC DISEASES.

Chromosomal inheritance. Mendelian patterns. Mutation and polymorphism. Multifactorial inheritance. Linkage analysis.

TOPIC 15: MOLECULAR PATHOLOGY.

Loss or gain of function mutations - Effects of gene dose. Relation between mutations and syndromes.

TOPIC 16. SOMATIC MUTATIONS AND CANCER.

Genes involved in cancer. Tumor suppressor genes. Tumor viruses. Somatic mutations in non-cancerous diseases.

TOPIC 17. GENETIC DIAGNOSIS.

Genetic testing in individuals and populations. Diagnostic, prenatal and neonatal genetic tests. Genetic predisposition tests.

TOPIC 18. MONITORING AND GENETIC TREATMENT.

Genetic techniques for studies of genetic diseases. Studies of gene expression, regulation and function in cells. Current advances: transgenic models and gene therapy.

- **8225 Biostatistics**

THEMATIC BLOCK 1

Basic concepts of epidemiology and demography. Types of research, design. Sampling methods. Data collection methods. Variables Measurement scales.

THEMATIC BLOCK 2

Descriptive and graphic analysis of quantitative data. Measures of central tendency. Measures of dispersion. Graphic representations.

THEMATIC BLOCK 3

Most common continuous random variables. Inferential analysis. Estimate. Hypothesis contrast. Analysis of Variance.

THEMATIC BLOCK 4

Contingency tables. Statistical parameters to evaluate diagnostic tests.

THEMATIC BLOCK 5

Linear regression. Inference on the regression parameters. Correlation. Multilinear regression. Introduction to logistic regression and survival analysis.

- **8226 Databases**

INTRODUCTION TO DATABASES

Definitions

What is a DBMS? What is a DB?

Data Models and Levels of Abstraction

Basic concepts of the relational model

Relation, tuple, attribute, domain, superkey, key.

FIRST STEPS WITH SQL

SQL language and script programming

Basic SQL commands and SQL data types

DDL Commands, DML Commands INSERT - VALUES, BASIC SELECT (WHERE and ORDER BY), DELETE, UPDATE, BULK INSERT, CREATE TABLE AS SELECT,

Views with SQL

Foreign Keys and Referential Integrity Restriction

RELATIONAL ALGEBRA AND ITS EQUIVALENT REPRESENTATION IN SQL

Introduction to relational algebraic operators

Set selection, projection, and operations.

Attribute renaming

Renaming in algebra and in SQL.

Cartesian product

Cartesian product in algebra and in SQL.

Theta-Join

Theta-join in algebra and in SQL.

Join Natural

Join Natural in algebra and in SQL.

External Join

External Join in algebra and in SQL.

The relational quotient

Relational quotient, decomposition into elementary operations, the quotient in SQL.

INTRODUCTION TO STANDARDIZATION

Problems of relational representations with information redundancy

Anomalies in registrations, eliminations and modifications, loss of information.

Normal forms

The First Normal Form, Functional Dependencies, Super Keys and Keys, Second, Third and Boyce-Codd Normal Forms.

Decomposition of a relationship schema

Lossless decompositions. Bernstein synthesis.

THE E/R MODEL AND ITS LOGICAL REPRESENTATION IN SQL

Basic concepts of the E/R model

Entities, Attributes, Binary Interrelations, Cardinalities.

SQL representation of binary relationships

1:1, 1:N and N:M. Reflective interrelations, dependencies by existence and identification.

Reflective or recursive interactions

Higher-degree interrelationships in the E/R model.

Justification. Chen cardinalities in ternaries. Cases N: M: P, N: M: 1, N: 1: 1 and 1: 1: 1. Representation in the diagram and passage to SQL tables. Ternaries as a way of modeling the time dimension in the E/R diagram.

Aggregations in the E/R model.

ISA interrelationships in the E/R model.

E/R representation. Types of ISA. Discriminators. Switching to tables as 1: 1 relations, switching to tables using a single table, switching to tables as independent tables. Advantages and disadvantages of each solution. SQL queries on schemas with ISAs.

THE SQL DML IN DEPTH

CASE Branch Constructs

Null value manipulation

Trivalued logic, external join revision, COALESCE function.

Logical tests

BETWEEN, LIKE, regular expressions, IN.

Aggregation functions

COUNT, SUM, AVG, MIN and MAX.

GROUP BY and HAVING.

The GROUP BY and HAVING clauses, external joins with groupings.

Uncorrelated subqueries

Clauses that accept subqueries (SELECT, FROM, WITH, WHERE, and HAVING). Subqueries in the FROM and nesting of aggregation functions. Subqueries in SELECT, WHERE, and HAVING that return one or zero rows vs. those that return more than one row. Nulls in the IN and ALL tests. Quotient using subqueries in HAVING.

Correlated subqueries

Syntactic elements of the correlated subqueries, their semantic interpretation. Case study: correlated subqueries in SELECT, WHERE and HAVING. The EXISTS test and correlated subqueries.

- **8227 Programming Methodology**

A. Modularity

Topic 1: Introduction to Object Oriented Programming.

B. Classes and Objects

Topic 2: The static structure: Class.

Topic 3: The dynamic structure: Object.

C. Heredity and Genericity

Topic 4: Inheritance.

Topic 5: Genericity.

D. Robustness

Topic 6: Defensive programming and exception handling.

Topic 7: Design by contract.

E. New techniques

8. New programming techniques and paradigms.

- **8228 Human Physiopathology**

Unit I: Introduction to Physiopathology

- Notions of health and illness.
- Health disorders, semiology.
- Physiopathology of pain, inflammation, and fever.
- Bases of Physiopathology.

Unit II: Physiopathology of the Nervous System

- Alterations of consciousness.
- Alterations in motor functions and coordination.
- Alterations in sensitivity.
- Alteration of brain functions.
- Main CNS pathologies.

Unit III: Physiopathology of the Circulatory System

- Alterations in arterial pressure.
- Vascular disorders.
- Cardiac disorders, shock.

Unit IV: Hematological Physiopathology

- Alterations in the white series.
- Alterations of the red series.
- Alterations in hemostasis.

Unit V: Physiopathology of the Immune System

- Alterations in the immune response.

Unit VI: Physiopathology of the respiratory system

- Respiratory insufficiency.
- Alterations in respiratory function.
- Vasculo-pulmonary pathologies.

Unit VII: Physiopathology of the digestive system

- Disorders of gastrointestinal function.
- Hepatobiliary and exocrine pancreas disorders.

Unit VIII: Renal Physiopathology and Acid-Base Balance

- Disorders of the urinary system.
- Disorders of the water and electrolyte balance.
- Disorders of the acid-base balance.

Unit IX: Physiopathology of the Muscular and Osteoarticular Systems

- Disorders of the muscles, bones and joints.

Unit X: P Physiopathology of the Endocrine System

- Pituitary and pineal gland disorders.
- Endocrine pancreatic disorders.
- Thyroid and parathyroid gland disorders.
- Disorders of the adrenal cortex.

Unit XI: Physiopathology of the Reproductive System

- Disorders of the gonads.

Unit XII

Physiopathology of the Nervous System II.

- **8229 Principles of Communications and Networks**

Introduction to communications and networks.

Data transmission.

Internet access.

The link layer and local networks.

The network level.

The level of transport.

The application level.

Next Generation Networks: Fiber Networks and Wireless Networks.

- **8230 Electronics**

Thematic unit 1. Introduction to Electronics. Applications.

Thematic unit 2. Electronic Devices.

Semiconductor diodes.

Transistors.

Applications.

Thematic unit 3. Analog Electronics.

Amplifiers.

Operational amplifiers.

Applications.

Thematic unit 4. Digital Electronics.

Combinational circuits.

Sequential circuits.

- **8231 Data Structures and Algorithms**

Algorithm analysis.

Linear structures.

Sets and tables.

Tree structures.

Graphs.

Algorithm design.

Computational Complexity.

- **8232 Clinical Software Engineering and Project Management**

Unit 1

Introduction to software engineering.

Unit 2

UML as a modeling language.

Unit 3

Iterative development and unified process.

Unit 4

Agile methodologies in project management.

- 3rd YEAR (To be implemented in the 2021/22 academic year)
- 4th YEAR (To be implemented in the 2022/23 academic year)
- Electives 4th Year (9 credits to be choosen)