LU-FMS Rules & Regulations

LU-FMS Application and Admission Guidebook

1. General Regulations

- Students' admission to the Lebanese University – Faculty of Medical Sciences (LU-FMS) is defined by articles 13 and 14 of decree law number 1118 dated 12/10/1983.
- The undergraduate program of the LU-FMS is organized in 6 education years, ranging from the second to the seventh year included. Therefore, students who wish to pursue their medical education at the Lebanese University (LU) follow the first-year program of the LU Faculty of Sciences (as a preparatory year), then sit for a competitive entrance exam at the LU-FMS to be admitted in the 2nd year of the LU-FMS.
- Students from other medical schools may be eligible to apply for this competitive exam along with graduates of the LU- FS, based on submission of an application file and its prior approval by a "Student Admission Committee".
- The total number of students admitted yearly at the second education year of the LU-FMS is determined by a decision of the LU council upon a recommendation of the LU-FMS council. It is usually around 100 students. There is just one competitive entrance exam for the second education year, even if the number of successful applicants is below this target number.
- Transfer to the third or fourth medical education years from other national and international programs and institutions is based on submission of an application file and its prior approval by a "Student Admission Committee", then eligible students need to pass a special entrance exam as detailed in the "Students Transfer to Third and Fourth Year" section. Only one special entrance exam for each of these years is conducted every academic year.
- The maximum number of students who may transfer yearly to the third and fourth education years of the LU-FMS is also determined by a decision of the LU council upon a recommendation of the faculty council.
- Details about the exams organized to enroll students from the second year to the fourth year are listed in the decree law number 3503 dated 06/11/1986 and the amendment decree law number 4196 dated 07/10/1987.

2. Application and admission to the Second-Year

2.1.Application to the competitive entrance exam

Admission to the second education year is based on a competitive entrance exam. This exam is

- Open ipso facto to students of any branch of the Faculty of Sciences of the Lebanese University (LU-FS) who have successfully completed at least the first education year in the biology, chemistry, or biochemistry major with an overall grade equal or above 12/20.
- Open to students from other national or international officially recognized medical schools exclusively, under the following conditions:
    - The student must have successfully completed at least one year of medical studies (first education year in a medical school following the French education system or three years pre-med in a medical school following the American system)
    - The student must be admitted in the following education year in their university
    - The student must submit a complete application file (see below). This file must be deemed eligible by the "student Admission Committee" according to the "Eligibility Criteria" (see below) and approved by the dean.

- A student cannot apply to take the entrance exam of the 2nd education year more than twice.

2.2.Competitive entrance exam of the Second-Year

- The written Entrance Exam is based on multiple choice questions, and it is corrected electronically to ensure maximum objectivity.
- The materials for the entrance exam of the 2nd medical education year are as follows:

Exam Materials	Exam duration	Points	Questions
Biology	2 Hours	60 points - 15 for cytology - 12 for animal histology - 3 for plant histology - 9 for botany - 5 for plant reproduction - 10 for genetics - 6 for anatomy	120 MCQ - 30 for cytology - 24 for animal histology - 6 for plant histology - 18 for botany - 10 for plant reproduction - 20 for genetics - 12 for anatomy
Chemistry	1 Hour	40 points - 13 C1100 - 13 C1102 - 13 C1103	40 MCQ - 13 C1100 - 13 C1102 - 13 C1103 + 1 for 1 of them
Language	1 Hour	20 points 0.4/ MCQ	50 MCQ
Mathematics	1 Hour	20 points	30 MCQ - 20 for M1109 - 10 for S1100
Physics	1 Hour	40 points - 20 for P1104 - 20 for P1105	20 MCQ - 10 for P1104 - 10 for P1105

- Subjects/materials are selected from the 1st year program by specialty committees whose members are teachers of the different branches of the Faculty of Sciences. Questions are prepared on the day of the entrance exam to ensure confidentiality and in two languages, French and English, to accommodate students of both education languages.

2.3.Admission in the Second-Year

- Admission of students is based on the global exam grade ranking within the predefined number of students to be admitted to the second education year. A ranked waiting list is defined among students who pass the exam with a total grade above 12/20.
- If one of the parents of the applicant is an academic or administrative staff member of the Lebanese University, the student from the waiting list may be admitted as supernumerary to the LU-FMS, as detailed in the minutes of the University Council meeting, session 42 dated 10/22/1999.

3. Students Transfer to the Third and Fourth Years

3.1.Application to the Third and Fourth Years

Admission to the third and fourth education years is based on a special entrance exam. This exam is open to students from other national or international officially recognized medical schools exclusively, under the following conditions:

- The student must be admitted in the education year they are applying for in their institution of origin. More specifically
    - Admission to the third year is open to students who are admitted in the third education year in medical schools following the French system or in Med 2 in medical schools following the English system.
    - Admission to the fourth year is open to students who are admitted or have completed at least the fourth education year in medical schools following the French system or at least the Med 3 in medical schools following the English system.
- The student must submit a complete application file (see below). This file must be deemed eligible by the “student Admission Committee” according to the “Eligibility Criteria” (see below) and approved by the dean.

A student cannot apply to transfer to the faculty more than once, as detailed in the article 7 of decree law number 3505 dated 06/11/1986.

3.2. Special entrance exams of the Third and Fourth Years

- The written Special Entrance Exams are based on open questions and are corrected by the professors' members of the Student Admission Committee.
- The materials for the special entrance exams of the third and fourth medical educational years are published in decrees that are updated yearly. In decree number 1855, related to the academic year 2021-22, the list of materials is as follows:

Exam Materials of the 3rd year	**Exam Materials of the 4th year**
Organ Histology	Organ Histology
Biochemistry	Biochemistry
Virology	Virology
Bacteriology	Bacteriology
Physical Diagnosis (Semiology)	Physical Diagnosis (Semiology)
General Physiology	General Physiology
English- French Language	English- French Language
English Language	English Language

3.3.Admission to the Third and Fourth Years

- In order for an applicant from another medical school to be admitted in the third or fourth education year at the LU-FMS, he/she should pass the special entrance exam with a total grade above 12/20, and rank within the predefined number of transfer students who may be admitted in his/her target education year.

4. Student Admission Committees

- A "Student Admission Committee" for each of the second, third and fourth years is appointed by the dean of the LU-FMS every academic year. The committee members are professors of the LU-FMS and their names are announced in a decree law. The role of the Student Admission Committee is to carry out exam correction tasks, approving the final results and determining the successful candidates. Apart from these tasks, the committee plays a crucial role in the admission process, taking on various responsibilities. These include discussing and finalizing subjects for the entrance

examination and the admission guidebook. The committee also establishes policies and principles for question items and marking. It also addresses any other significant issues concerning the admission process.

- In case one or more members of the "Student Admission Committee" are absent with or without a legitimate excuse, the dean assigns whomever he/she deems appropriate to replace them.
- The number of transfer students admitted in each education year should not exceed ten percent (10%) of the number of students registered in that year as per the paragraph A of the Article 2 of the decree number 3279 dated 11/03/1993.

5. Transfer Application Files

Transfer applicants to the second, third or fourth medical education years from other medical schools should submit an application file including the following documents:

1. A letter of Intent highlighting the student's motivation, relevant experiences, and why they want to transfer to the LU-FMS.
2. A comprehensive resume or curriculum vitae (CV)
3. Official transcripts of records from their current university, demonstrating their academic performance and completion of prerequisite courses.
4. Detailed course descriptions or syllabi for the completed courses.
5. A proof of admission in the education year they are applying for in their institution of origin.
6. Three letters of recommendation, preferably from their professors (including one from the Dean/Chairman), who can attest to the student's abilities and suitability for the medical program.

6. Eligibility Criteria

Once applications are submitted by students from other medical schools to the second, third or fourth medical education years, the "Student Admission Committee" will review applicants' materials, assess their eligibility, and compare their academic backgrounds with the corresponding LU program requirements. The committee may consider available capacity in the program, and they evaluate factors such as:

6.1.Letter of Intent and CV:

The LU-FMS requests from transfer candidates to the second-, third- and fourth- medical education year to submit a comprehensive resume or curriculum vitae (CV), and a personal statement explaining their reasons

for transferring and their commitment to pursuing a medical career in order to evaluate their knowledge, motivation and suitability for the medical program.

6.2.Academic Performance

The LU-FMS requires a minimum of academic performance throughout candidate's previous academic studies as a prerequisite for transfer. More specifically:

- Completion of the required number of education years in candidate's current program and in an officially recognized medical school, as described above and as specified in the article 4 of the decree number 2379 dated 23/04/1992, taking into consideration the provisions of Article 47 of Law 67/75 dated 12/26/1967.
- Candidates' GPA and other grading systems should be satisfactory and meet the minimum required passing grade of 12/20.

6.3.Prerequisite Courses - Course Equivalency:

The LU-FMS has specific prerequisite courses that need to be completed for the student to be eligible for transfer. The Student Admission Committee will review and evaluate the candidate's previous coursework including Course Descriptions/Syllabi and the Transcript of Records to determine if it meets their program requirements. More specifically:

- To be eligible for admission in the Second-Year at the LU-FMS, students must have completed all the courses included in the first Medical Educational Year Syllabus of the Faculty of Sciences of the LU – (Preparatory Year) or their equivalent, as specified in the Article 4 of the decree number 2379 dated 23/04/1992.
- To be eligible for admission in the Third- or Fourth-Year at the LU-FMS, students must have completed all the courses included in Syllabi of the Second or Third Medical Educational Year of the LU-FMS respectively, or their equivalent, as specified in the Article 4 of the decree number 2379 dated 23/04/1992.

6.4.Letters of Recommendation:

The LU-FMS requests three letters of recommendation from professors (including one from the Chairman/Dean of the Faculty) who can provide insight into candidates' academic abilities, character, and potential for success in medical studies.

7. Final registration

Accepted Transfer candidates must also complete their registration within a week from the date of officially announcing their affiliation acceptance (on the bulletin board in the faculty and/or on its website) under penalty of losing their right to join. They will be replaced by other successful candidates according to their order in the waiting list.

Examinations

Article one:

1. The Faculty of Medical Sciences at the Lebanese University undergo written, practical preclinical and clinical exams.
2. Theoretical exams consist of one or more partial exams and a final exam.
3. Practical exams consist of an exam Practical, continuous assessment mark and written exam mark.
4. The preclinical and clinical subject exams consist of written, oral, and assessment mark exams.

First: Theoretical materials exams

The text of Article 2 of Resolution No. 1246 of May 26, 1988, was repealed and replaced. With the following text:

1. For each of the theoretical subjects taught in the College of Medical Sciences, partial exams and examinations are conducted final.
2. The number of these exams is determined according to the number of teaching hours prescribed for each subject as follows:

Type and number of exams	The number of teaching hours in the subject
Final exam only	30 hours or less
One partial exam and one final exam	31 hours and over

3. The partial exam includes the topics that were studied during the first half of the course teaching hours, and the final exam includes all the topics of this course.
4. Scores for theoretical exams are set on 100 (one hundred) and these scores are distributed in percentages Partial and final exams as follows:

Percentage of final exams	The percentage of partial exams
60% (sixty percent)	40% (forty percent)

5. The college can take exams Quick and unannounced, other than the partial and final exams. In each of the theoretical subjects, these exams are given 10% (ten percent). Deducted from the percentage of the final exam.

Percentage of final exams	The percentage of partial exams
50% (fifty percent)	50% (fifty percent)

Second: Practical material exams

1. Practical material marks are distributed on the practical exam, the continuous assessment and the written exam in varying percentages according to the subject.
2. The practical material mark is part of the material mark as a whole. Combine these tags with the marks of the theoretical course to form a general average for the course, which is approved when calculating the general average for the entire year.

Third: in pre-clinical and clinical exams

1. At the end of each training course, students undergo a partial exam consisting of a written exam, an oral exam, and an assessment mark. These students also undergo a final written exam at the end of the clinical training courses for each year.
2. The percentage of marks is distributed Clinical partial exams are as follows:
   a. The written exam is 65 % (sixty-five percent), the oral exam is 2 0% (twenty percent), and the continuous assessment mark 15 % (fifteen percent).
   b. covering Partial exams 65% (seventy-five percent) And final exams 3 5% (thirty-five percent).
3. In the eighth year, interns undergo a final exam consisting of:
   a. Clinical written exam 65 % of the total mark
   b. Oral exam 20% of the total mark
   c. An evaluation exam that includes 15 % of the total mark

Fourth: Exams for subjects of specialization years

1. At the end of the academic year, resident doctors in different years of specialization undergo a final exam consisting of:
   a. Written exam 55% of the total mark
   b. Exam Oral 20% of the total mark
   c. Evaluation mark 25% of the total mark
2. The following paragraphs shall be added to Article 2 of Resolution No. 1880 of April 12, 1995, for resident physicians sent by the College for training abroad, if they are unable to attend For exams at the end of the year, they have to take the exam in a special course designated by the college for all students Terms of reference.
3. If the traveling resident doctor fails, the training period he spent prior to the academic year in which he failed is counted are added.

On success, failure and absence

First: Success and failure

1. A student who obtains less than 12/20 as an average in all clinical subjects is considered to have failed Medicine, pharmacy, pre-clinical and dental subjects.
2. A student who obtains less than 12/20 as a general average in total is also considered to have failed final grades, or whose grades average is low Final for 8/20 in more than three Subjects, regardless of the general average of the total marks.
3. Subject to the provisions of Articles Seven and Eleven Resolution 1236 of 5/26/1988 is considered a successful year Undergraduate student who obtains an average of 12/20 and above in the total His final marks, and his final mark shall not be less than 8/20 in any subject study.
4. A student who obtains 12/20 or above in his total marks is considered supplement final scores are lower than the final scores 8/20 in three subjects the most.
5. At the beginning of the following academic year, the completing student shall take an exam in the subjects that are covered His mark in it decreased to 8/20.
6. A student who obtains an average of 8/20 or more in the completed exams is considered passed in accordance with the following account:
    i. The examination marks obtained in the previous year are included in the aforementioned account The total article if those marks are above 8/20.
    ii. The completion exam mark is included in the calculation for the remaining percentage after entering the marks mentioned .
7. A student who fails to pass the final exam will receive a zero.
8. A student who fails to take the partial exam will receive a zero, except that if he fails to Partial exam with a legitimate excuse approved by the College Council, the weight of the exam mark The aforementioned added to the weight of the final exam .

Second: Absence

1. Attending theory lessons is compulsory for all students and may be for reasons Absenteeism from these lessons is allowed by 20% (twenty percent) at most of general teaching hours .
2. Attending practical, pre-clinical, and clinical lessons is 100% (one hundred percent) mandatory, and absence from these lessons is not accepted.
3. A student who violates the text of paragraphs (a) and (b) of this article is considered to have failed, if his absence was illegal and for an excuse not approved by the College Council.
4. The student informs the college administration of the reasons for his absence in writing, within the 48 hours following the first day of absence.

Third: Within the limits of grades

The following grades are awarded to students who obtain a general average according to the following:

Average	Class
13-13.99	Acceptable
14-15.99	Good
16-17.99	Very good
Over 18	Excellent

Part Three: General Provisions

The duration of the exam for each theoretical subject is determined according to the following schedule:

The duration of the final exam at most	Partial exam duration	The number of hours of teaching the subject
2 hours	-	30 and under
three hours	hour	31 and over

The mark of each subject is weighted by the number of teaching hours according to the following table:

weighted sign	The number of hours	material type
1	10	Theoretical
1	20	Practical
1	20	Preclinical
1	40	Clinical

Affiliation and Promotion

First: Entrance match for the second academic year and some other academic years:

1. An entrance examination takes place after a preparatory year at the Faculty of Medical Sciences at the Lebanese University.
2. The College of Medical Sciences annually organizes an entry match for some academic years.
3. Students coming from outside the Lebanese University who have successfully completed their studies in an officially recognized higher education institution that prepares students to study general medicine are entitled to participate in this competition in the Faculty of Science at the Lebanese University, the curricula of previous years to those they want to enroll in in the faculty.
4. Students from outside the Lebanese University may be accepted in some of the academic years of the Faculty of Medical Sciences: the second, third and fourth years.
5. The entry exam stipulated in Article 2, Paragraph B of Decree No. 3279 dated 3/11/1993 consists of a written exam that includes competitions at the level of the curricula of the year preceding those in which the student wishes to enroll in the Faculty of Medical Sciences.
6. Examination materials for the sixth- and fourth-year exams for general medicine are determined by a decision issued annually by the Dean of the College of Medical Sciences.
7. Enrollment of students is accepted according to the sequence of their success degrees and within the limits of the number referred to in Article Six of this decision.
8. He shall be deemed successful in the match if he obtains an average of 12/20 or more from his total marks without any enrollment.
9. The candidate who accepted his affiliation to one of the methodological years in the College of Medical Sciences must complete his registration procedures within a week from the date of announcing his acceptance of his affiliation on the bulletin board in the college, under penalty of losing his right to affiliation and replacing him with other successful ones according to the aforementioned sequence rule.
10. The number of foreign students from outside the Lebanese University to be accepted in one of the academic years of the Faculty of Medical Sciences is determined by an additional

percentage that does not exceed ten percent of the number of students in the academic year to which the student wishes to enroll.

Second: The general entry exam system for higher specialization and sub-specialization in internal medicine, pediatrics and chest diseases of the College of Medical Sciences.

1. Students are admitted to the higher specialization as a result of a match organized for this purpose by this decision of the University Council based on the recommendation of the College Council.
2. Students are accepted according to the sequence of degrees of their success in the match without any other consideration and within the limits of the number referred to above.
3. He is deemed to have passed the match if he scores 12/20 or more from his score.
4. The value of college marks in the higher specialization match is calculated as follows:
    a. 50% for the linear match.
    b. 50% is based on the evaluation of the student's university file by the college (his grade average during his studies at the college from the second to the seventh year).
5. As for students from outside the college, only the written match is counted.
6. The number of those admitted from outside the Faculty of Medical Sciences at the Lebanese University should not exceed 10% (ten percent).
7. If a sufficient number of candidates do not succeed in the match, only the successful ones are satisfied.
8. Those who succeeded in the higher specialization match are considered accepted in the first year of specialization, and those who succeeded in the specialization match that branched out from internal medicine in the fourth year are specialization and neonatology, blood diseases and cancer in children in the fifth year, specialization and geriatrics in the fourth year, specialization and medical resuscitation in the sixth year, specialization after chest diseases And the fifth specialization after internal medicine.
9. After announcing the results of the higher specialization match, the successful doctors are distributed according to their desire and hierarchy of ranks in the match to the various specialties and positions specified in Article Two during a general meeting with the winners in the presence of the dean and members of the College Council. Candidates from

outside the college are accepted as part of a separate list after the completion of the distribution of positions among the students of the college.

10. The candidate whose affiliation has been accepted must complete his registration procedures within a week from the date of announcing his admission to affiliation on the bulletin board in the college, under penalty of losing his right to affiliation and replacing him with other successful ones according to the aforementioned sequence rule.
    a. Research areas
    b. Achievements and awards
11. For the specialization match sub-specialty of internal medicine and pediatrics, the value of the student's mark in the match is calculated as follows:
    a. 50% for the written exam
    b. 10% for the oral exam and interview
    c. 40% depends on the evaluation of the student's profile from the college (his grade average while studying in the college for internal medicine or pediatrics)
12. Candidates from outside the college are accepted after distributing positions to candidates from the college. Those who score 12/20 and above are considered successful in the match and the positions are distributed according to their success sequence.
13. The right to participate in this match is limited to doctors who have a pediatric degree.
14. A written examination shall be conducted for each specialization in the specializations specified in this exam.
15. The duration of the exam is three hours.
16. The Faculty Council decides on applications submitted by licensed physicians from outside the Lebanese University and announces the list of those accepted to participate in it, provided that they possess a certificate of success in the colloquium exam.
17. Candidates from inside or outside the college are not entitled to participate in the entry exam in all majors and branch disciplines more than twice.
18. A small committee emanating from the College Council supervises the development and printing of questions and the course of the match.

Rules and regulations of Clinical Rotations in the 5th Year of Medicine

LEBANESE UNIVERSITY

FACULTY OF MEDICAL SCIENCE

الجامعة اللبنانية

كلية العلوم الطبية

Rules and Regulations of Clinical Rotations in the 5th Year of Medicine

FUNCTION: DEPARTMENT		CATEGORY: ACADEMIC	
CODE: ACD-RR-EXT	TYPE: GUIDELINE	IMPLEMEMNTATION DATE: 01/03/2023	EDITION: 2

	Name of committee/Team title/ Department/ Division/ Section/ Unit	Person authorized to sign	Title	Date	Signature
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Verified by	Quality Steering Committee	Antoine Abou Rached	Professor, Gastrologist, head of the gastro-enterology division	01/03/2023	
		Mirna Chahine	Professor of Cardiovascular Physiology, Head of Basic Sciences Department, President of the Thesis Committee & President of the International Relations Clinical Program	01/03/2023	
		Mona Al Buaini	Professor, Gastrologist, head of the gastro-enterology division Clinical Assistant Professor, Head of the Quality Management department	01/03/2023	
		Nawfal Nawfal	MD, pediatrician and Neonatologist, program director of interns.	01/03/2023	
		Hussein Mcheimeche	Associate professor of general surgery, and advanced laparoscopic and bariatric surgery, Medical director at Al Zahraa UMC, President of the International Federation for the surgery of obesity (IFSO) - Lebanese Chapter, Residents	01/03/2023	

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FUNCTION: DEPARTMENT		CATEGORY: ACADEMIC	
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			Program Director at LU-FMS		
		Khadija Ismail	Instructor of Epidemiology, PhD candidate, Member of the Accreditation Committee	01/03/2023	
Approved by	The Dean	Mohamad Moussa	Professor, Urologist, Chairman of the Surgery Department, Dean of the Faculty of Medical Sciences, LU	01/03/2023	

Following the accreditation programs, rules and regulations were updated for both the clinical rotations in 5th, 6th and 7th years of medicine.

The aim of these rules is to set the extent of exposure and the minimum clinical experience for the 5th year medical students in their externship rotation program as an introduction to the internship years at their 6th and 7th years of medicine. This will give sufficient time to spend a reasonable part of the program in planned contact with patients in relevant clinical settings and will help in acquiring sufficient knowledge, and clinical and professional skills to assume appropriate responsibility after graduation.

Clinical training facilities includes 39 hospitals in total (for more detail refer to List of Contracted Hospitals by LU faculty of Medicine), 80% provide adequate mix of primary, secondary and tertiary care, sufficient patient wards and diagnostic departments, laboratories, ambulatory services (including primary care), clinics, primary health care settings, health care centers and other community health care settings as well as skills laboratories. Thus, allowing the clinical training for the students to be organized is by using an appropriate mix of clinical settings and rotations throughout all main disciplines. In this way, the medical school ensures to have access to educational expertise where required customized according to each hospital (for more detail refer the contract with the respective hospitals). The gained knowledge and experience will help in curriculum development and in development of teaching and assessment methods. Also help in staff development not only in educational evaluation, in research, in the discipline of medical education but also allow staff to pursue educational research interest.

The effective and efficient delivery of healthcare requires not only knowledge and technical skills, also communication and analytical skills, inter disciplinary case counseling, evidence and system based- care. A challenge is faced in teaching methods and standardization of the program for the medical students due to the spread to the different university hospital. This is

where the importance of the ILO's lies for each of the externship and internship clinical rotations. This shall ensure necessary resources for giving the students adequate clinical experience, including sufficient: number and categories of patients, clinical training facilities, supervision of their clinical practice and be able to evaluate, adapt and improve the facilities for clinical training to meet the needs of the population it serves.

During the clinical rotations, the students shall have access to web-based or other electronic media and will be able to use existing and exploit appropriate new information and communication technology for: independent learning, accessing information, managing patients, working in health care delivery systems, and optimize student access to relevant patient data and health care information systems. The medical school formulates and implements a policy which addresses effective and ethical use and evaluation of appropriate information and communication technology and ensures access to web-based or other electronic media. The patients seen by the medical students should cover at least 60% of the ILO's discussed for each clinical rotation. Patients may include validated simulation using standardized patients or other techniques, where appropriate, to complement, but not substitute clinical training.

All the physicians having a clinical contract with the Lebanese University must participate in the teaching of students. The distribution of the tasks of these contractors will be made by mutual agreement between the faculty and the coordinator of the hospital. It is obvious that interns and residents are obliged to actively participate in this teaching. The contracted hospitals offering a medical education program, residents who supervise or teach medical students and graduate students and postdoctoral fellows must be familiar with the educational objectives of the course and be prepared for their roles in teaching and assessment. Teaching and assessing medical students are discussed at resident orientation each year. The residents' role in teaching and assessing medical students is discussed by the program director during

annual new resident orientation (for more detail, refer to Local Coordinator Job Description). This helps faculty members develop and use a shared understanding of the goals.

For better outcome, the clinical program is assessed at the end of each rotation/clinical year. Different assessment principles, methods and practices are used that are clearly compatible with intended educational outcomes and instructional methods. This shall ensure that the intended educational outcomes are met by the students and promote student learning. It will also provide an appropriate balance of formative and summative assessment that will guide both learning and future decisions about academic progress. This will lead to adjustment in the number and nature of examinations of curricular elements to encourage both acquisition of the knowledge base and integrated learning, ensure timely, specific, constructive and fair feedback to students on basis of assessment results. These assessments will help in positive guiding effect on learning and the curriculum. They are performed continuously to measure growth until graduation.

Thus, after completing the clinical rotations in each of the internship and externship, students undergo assessment evaluating both their knowledge and acquired skills. The competencies that are commonly assessed include general knowledge about the procedure, informed consent, pre- procedure preparation, analgesia, technical ability, aseptic technique, post-procedure management, and counseling and communication.
Assessment methods used are of different types: Objective Structured Clinical examination (**OSCE**) that consists of multiple stations where each candidate is asked to perform a defined task such as taking a focused history or performing a focused clinical examination of a particular system. Mini-Clinical Evaluation Exercise (**Mini-CEX**) to assess six core competencies of residents (medical interviewing skills, physical examination skills, humanistic qualities/professionalism, clinical judgment, counseling skills, organization and efficiency). Direct Observation of Procedural Skills (**DOPS**) is a structured rating scale for assessing and providing feedback on practical procedures. Clinical Work Sampling is an in-

trainee evaluation method that addresses the issue of system and rater biases by collecting data on observed behavior at the same time of actual performance and by using multiple observers and occasions.

360-Degree Evaluation/Multisource Assessment consists of measurement tools completed by multiple individuals in a person's sphere of influence. Assessment by peers, other members of the clinical team, and patients can provide insight into trainees' work habits, capacity for teamwork, and interpersonal sensitivity.

The assessment checklist for both the internship and externship clinical rotations must be filled by the coordinator of each hospital himself, or under his direct supervision. Checklists are used to capture an observed behavior or action of a student. Generally rating is by a five point.

Externship Rules for 5th year:

I. General rules:

The program is focused mainly in Internal Medicine and minimal information on Surgery, pediatrics and gynecology. The program entails a pre-clinical practical rotation that aims to acquire the basic skills of good history taking and practicing physical exams on real patients in hospitals. It involves case presentations to address the needs of Adaptive Teaching that enhances active learning and motivational counseling. By pre-clinical, we mean the 5th year, taking into consideration that clinical workshops are those of the 6th and 7th years.

The student should acquire the following skills:

- Interrogation and complete examination of the patient.
- Writing a complete medical file.
- Case discussion and medical observation with Bedside Teaching Instructor.

- Exclusion of any surgical aid.
- The bedside teaching should be paired every day at a meeting of all the students with a doctor in order to read and discuss an observation about a case thoroughly, or expose a simple medical or surgical case which can help external students to fix their knowledge and take advantage of the monitor's remarks on how to write the observation or on the signs found and the accuracy of the practical gestures. It is excluded to turn these meetings into theoretical classes.
- Whenever possible attend case discussion, journal club and conference.

II. Duration and Clinical Rotations:

- The duration of the Teaching Cases Presentations during the year will be determined by each captain depending on the course given.
- The duration of the Pre-Clinical Practical Presentation is 6 weeks by the end of the year. For 8 hours a day (from 8 am until 2 pm) except Saturdays, Sundays and public holidays.
- Attendance is mandatory in both. To be absent, it is necessary to obtain the agreement of the local coordinator and if necessary, that of the general coordinator. Any unjustified absence will be sanctioned according to the laws of the Faculty of Medicine. (For additional details check 3 The Job Description of local and general coordinators).
- It is desirable and even imperative to have a monitor for each 4 to 5 students.
- The student must have a dress code that respects the patients, doctors and all medical and paramedical and human personnel.

At the end, the student must present:

- A filled Medical Externship Assessment Checklist from the Resident in charge and co-signed by the local coordinator on the student performance. This will tackle the

following aspects: Gather a History and Perform a Physical Examination, Medical Knowledge (basic and clinical science), Interpersonal and Communication Skills, Professionalism, and Dress code and committed personal trait.

- An oral examination that includes the complete examination, the writing of a medical observation and the discussion of the latter by a panel appointed by the faculty.
- A partial and final written exam with questions (of the UCQ, MCQ type) of semiology, pathology, medical or surgical on subjects of frequent and common diseases.
- In addition to the clinical externship at the hospital, training at the university for externs concerning the clinical approach of patients (interrogatory, clinical examination, key signs), additional assessment to be requested (biology, radiology) as well as the initiation to the interpretations of the results. This training will be done in collaboration with the various medical and surgical departments and will be divided into eight sessions of 2 hours each.

III. Assessment and Grading:

The following is a system by which to evaluate and grade student performance.

A. **Medical Externship Assessment Checklist depend upon** patient management problems, modified essay questions (MEQs) checklists, OSCE, student projects, Constructed Response Questions (CRQs), MCQs, Critical reading papers, rating scales, extended matching items, tutor reports, portfolios, short case assessment and long case assessment, log book, trainer's report, audit, simulated patient surgeries, video assessment, simulators, self-assessment, peer assessment and standardized patients. (Checklists, global rating, student logbook, portfolio, video, etc).

B. **Oral examination:** Oral exam consists of evaluating the student's ability and capacity to take a detailed history and to practice a full physical examination of a random case

chosen from the hospital and asked medical questions about it by a jury of attending physicians selected by the University's direction.

The questions can incorporate clinical scenarios as Short Answer Questions (SAQ). A similar format is also known as Modified Essay Question (MEQ) or Constructed Response Question (CRQ) from a format clinical scenario. Taking into consideration that this type of exams has poor content validity, higher inter-rater variability and inconsistency in marking.

C. **Knowledge/written examination.** There are two written exams a partial and a final exam. Written exams (MCQs, True/False, Essay, MEQs, modified CRQs) can be based on Key Feature Test (clinical scenario-based paper and pencil test).

D. **Grades** in the clinical rotation will be divided as follows:

The clinical rotation is ~ 600 Hr (every 40Hr = 1 coefficient) I.e., **15 credits**.

- **Final written exam: 35% of the general note of the clinical rotation**
- **65 % of the general note of the clinical rotation divided into:**
    - **Partial written exam: 65% of the general note**
    - **Oral exam: 20%**
    - **Medical Internship Assessment: 15%**

IV. References:

- Barbara Bates (latest edition), Physical Examination and History Taking.

V. Related documents/Records:

- Externship assessment checklist

VI. Quality References:

Diffusion:

Department/Division Section/Unit	**Title of the person receiving this copy/ His delegate**	**Reception date**	**Name & Signature**
Faculty Council	Dean's Assistant / **Grace Hawi**	01/03/2023	
Students	Delegates for the academic year 2022-2023:		
	For 5th year: **Mostafa Al Sahili**	01/03/2023	
	For 6th year: **Mahdi Ghandour**	01/03/2023	
	For 7th year: **Hussein Tarhini**	01/03/2023	
	For residents: **Hassan Ghrayeb**	01/03/2023	
	For residents: **Hussein Hamdar**	01/03/2023	
Lebanese Hospitals where students are rotating (affiliated and non-affiliated to LU)	Medical Coordinators:		
	Al Rassoul Al Azam Hospital: **Dr. Mahmoud Younis**	01/03/2023	
	Al-Zahraa Hospital University Medical Center: **Dr. Samer Dbouk**	01/03/2023	
	Bahman Hospital: **Dr. Assaad Mhanna**	01/03/2023	
	Lebanese Hospital Geitaoui: **Dr. Naji Abi Rashed**	01/03/2023	
	Rafik Hariri University Hospital: **Dr. Nawfal Nawfal**	01/03/2023	
	Sacre Coeur Hospital : **Dr. Pierre Abi Hanna**	01/03/2023	
	Sahel General Hospital: **Dr. Walid Alameh**	01/03/2023	

LEBANESE UNIVERSITY FACULTY OF MEDICAL SCIENCE		الجامعة اللبنانية كلية العلوم الطبية
Rules and Regulations of Clinical Rotations in the 5th Year of Medicine		
FUNCTION: DEPARTMENT	**CATEGORY: ACADEMIC**	
CODE: ACD-RR-EXT / **TYPE: GUIDELINE**	**IMPLEMEMNTATION DATE: 01/03/2023**	**EDITION: 2**

Next Revision Dates: 01/03/2026 …… …… ……

Modifications and revision history

Edition	Paragraph	Modification/Description of change	Reviewer	Implemented date
01			–	
02	All	Separation of externship and internship rules. Coded the document. Reviewed the content by the curriculum committee. Added implementation date to the document.	**Antoine Abou Rached, MD** **Mirna Chahine, PhD** **Mona Al Buaini, MD** **Nawfal Nawfal, MD** **Hussein Mcheimeche, MD** **Khadija Ismail, PhD candidate**	01/03/2023

Rules and Regulations of Clinical Rotations in the 6th and 7th Year of Medicine

LEBANESE UNIVERSITY FACULTY OF MEDICAL SCIENCE		الجامعة اللبنانية كلية العلوم الطبية
Rules and Regulations of Clinical Rotations in the 6th and 7th Year of Medicine		
FUNCTION: DEPARTMENT	**CATEGORY: ACADEMIC**	
CODE: ACD-RR-INT **TYPE: GUIDELINE**	**IMPLEMEMNTATION DATE: 01/03/2023**	**EDITION: 2**

	Name of committee/Team title/ Department/ Division/ Section/ Unit	Person authorized to sign	Title	Date	Signature
Prepared by	Quality representative	Nawfal Nawfal	MD, pediatrician and Neonatologist, program director of interns.	01/03/2023	
Verified by	Quality Steering Committee	Nawfal Nawfal	MD, pediatrician and Neonatologist, program director of interns.	01/03/2023	
		Antoine Abou Rached	Professor, Gastrologist, head of the gastro-enterology division	01/03/2023	
		Mirna Chahine	Professor of Cardiovascular Physiology, Head of Basic Sciences Department, President of the Thesis Committee & President of the International Relations Clinical Program	01/03/2023	
		Mona Al Buaini	Professor, Gastrologist, head of the gastro-enterology division Clinical Assistant Professor, Head of the Quality Management department	01/03/2023	
		Hussein Mcheimeche	Associate professor of general surgery, MHM, CMO at Al Zahraa UMC, President IFSO - Lebanese Chapter, Residents Program Director at LU-FMS	01/03/2023	

LEBANESE UNIVERSITY FACULTY OF MEDICAL SCIENCE		الجامعة اللبنانية كلية العلوم الطبية
Rules and Regulations of Clinical Rotations in the 6th and 7th Year of Medicine		
FUNCTION: DEPARTMENT	**CATEGORY: ACADEMIC**	
CODE: ACD-RR-INT **TYPE: GUIDELINE**	**IMPLEMEMNTATION DATE: 01/03/2023**	**EDITION: 2**

		Khadija Ismail	Instructor of Epidemiology, PhD candidate, Member of the Accreditation Committee	01/03/2023	
Approved by	**The Dean**	Mohamad Moussa	Professor, Urologist, Chairman of the Surgery Department, Dean of the Faculty of Medical Sciences, LU	01/03/2023	

Following the accreditation programs, rules and regulations were updated for both the clinical rotations in 5th, 6th and 7th years of medicine.

The aim of these rules is to set the extent of exposure and the minimum clinical experience for the 5th year medical students in their externship rotation program as an introduction to the internship years at their 6th and 7th years of medicine. This will give sufficient time to spend a reasonable part of the program in planned contact with patients in relevant clinical settings and will help in acquiring sufficient knowledge, and clinical and professional skills to assume appropriate responsibility after graduation.

Clinical training facilities includes 39 hospitals in total (for more detail refer to List of Contracted Hospitals by LU faculty of Medicine), 80% provide adequate mix of primary, secondary and tertiary care, sufficient patient wards and diagnostic departments, laboratories, ambulatory services (including primary care), clinics, primary health care settings, health care centers and other community health care settings as well as skills laboratories. Thus, allowing the clinical training for the students to be organized is by using an appropriate mix of clinical settings and rotations throughout all main disciplines. In this way, the medical school ensures to have access to educational expertise where required customized according to each hospital (for more detail refer the contract with the respective hospitals). The gained knowledge and experience will help in curriculum development and in development of teaching and assessment methods. Also help in staff development not only in educational evaluation, in research, in the discipline of medical education but also allow staff to pursue educational research interest.

The effective and efficient delivery of healthcare requires not only knowledge and technical skills, also communication and analytical skills, inter disciplinary case counseling, evidence and system based- care. A challenge is faced in teaching methods and standardization of the program for the medical students due to the spread to the different university hospital. This is

where the importance of the ILO's lies for each of the externship and internship clinical rotations. This shall ensure necessary resources for giving the students adequate clinical experience, including sufficient: number and categories of patients, clinical training facilities, supervision of their clinical practice and be able to evaluate, adapt and improve the facilities for clinical training to meet the needs of the population it serves.

During the clinical rotations, the students shall have access to web-based or other electronic media and will be able to use existing and exploit appropriate new information and communication technology for: independent learning, accessing information, managing patients, working in health care delivery systems, and optimize student access to relevant patient data and health care information systems. The medical school formulates and implements a policy which addresses effective and ethical use and evaluation of appropriate information and communication technology and ensures access to web-based or other electronic media. The patients seen by the medical students should cover at least 60% of the ILO's discussed for each clinical rotation. Patients may include validated simulation using standardized patients or other techniques, where appropriate, to complement, but not substitute clinical training.

All the physicians having a clinical contract with the Lebanese University must participate in the teaching of students. The distribution of the tasks of these contractors will be made by mutual agreement between the faculty and the coordinator of the hospital. It is obvious that interns and residents are obliged to actively participate in this teaching. The contracted hospitals offering a medical education program, residents who supervise or teach medical students and graduate students and postdoctoral fellows must be familiar with the educational objectives of the course and be prepared for their roles in teaching and assessment. Teaching and assessing medical students are discussed at resident orientation each year. The residents' role in teaching and assessing medical students is discussed by the program director during

annual new resident orientation (for more detail, refer to Local Coordinator Job Description). This helps faculty members develop and use a shared understanding of the goals.

For better outcome, the clinical program is assessed at the end of each rotation/clinical year. Different assessment principles, methods and practices are used that are clearly compatible with intended educational outcomes and instructional methods. This shall ensure that the intended educational outcomes are met by the students and promote student learning. It will also provide an appropriate balance of formative and summative assessment that will guide both learning and future decisions about academic progress. This will lead to adjustment in the number and nature of examinations of curricular elements to encourage both acquisition of the knowledge base and integrated learning, ensure timely, specific, constructive and fair feedback to students on basis of assessment results. These assessments will help in positive guiding effect on learning and the curriculum. They are performed continuously to measure growth until graduation.

Thus, after completing the clinical rotations in each of the internship and externship, students undergo assessment evaluating both their knowledge and acquired skills. The competencies that are commonly assessed include general knowledge about the procedure, informed consent, pre- procedure preparation, analgesia, technical ability, aseptic technique, post-procedure management, and counseling and communication.
Assessment methods used are of different types: Objective Structured Clinical examination (**OSCE**) that consists of multiple stations where each candidate is asked to perform a defined task such as taking a focused history or performing a focused clinical examination of a particular system. Mini-Clinical Evaluation Exercise (**Mini-CEX**) to assess six core competencies of residents (medical interviewing skills, physical examination skills, humanistic qualities/professionalism, clinical judgment, counseling skills, organization and efficiency). Direct Observation of Procedural Skills (**DOPS**) is a structured rating scale for assessing and providing feedback on practical procedures. Clinical Work Sampling is an in-

trainee evaluation method that addresses the issue of system and rater biases by collecting data on observed behavior at the same time of actual performance and by using multiple observers and occasions.

360-Degree Evaluation/Multisource Assessment consists of measurement tools completed by multiple individuals in a person's sphere of influence. Assessment by peers, other members of the clinical team, and patients can provide insight into trainees' work habits, capacity for teamwork, and interpersonal sensitivity.

The assessment checklist for both the internship and externship clinical rotations must be filled by the coordinator of each hospital himself, or under his direct supervision. Checklists are used to capture an observed behavior or action of a student. Generally rating is by a five point.

Internship Rules for 6th and 7th years:

The following guidelines are an updated version of the current rules at the Lebanese University based upon the recommendations of the ACGME. At the end of the internship rotation the students would have acquired clinical skills that include history taking, physical examination, communication skills, procedures and investigations, emergency practices, and prescription and treatment. In addition to encourage the students to participate in health promotion and preventive medicine. All of these clinical activities conducted by students will be under supervision for patient safety.

I. General Rules:

1. Have a clean and decent dress.
2. Respect patients, doctors and all medical or paramedical personnel.
3. Regular attendance at work:

In surgery from 7am to 4pm in the afternoon.

In medicine from 8 am to 4pm in the afternoon.

This presence must be checked on a daily routine by attendance machine.

4. Respect the laws of medical ethics, as well as the laws of the Faculty of Medical Sciences of L.U. and as well as the general regulations specific to each hospital institution where it is assigned.
5. In the departments, the intern must:
   • Examine and write the observation of the patient
   • Write a daily progress note and on call note if necessary.
   • Refer to the resident or the attending physician for any problem that may occur in the patient and must warn them for any medical treatment or surgery or prescription of tests or medications...
6. In emergencies, the internal must keep a close monitoring for the patient, contact the resident or the physician in charge as soon as possible. If the patient does not have a doctor, he must refer to the doctor on call and must not make any decision concerning the patient before referring to the resident or the doctor in charge.
7. The intern must cover night shifts not exceeding 7 (1 over 4) shifts per month.
   During the on-calls, the intern must stay in the hospital.
8. During the working day or during the on-calls, any absence (illness or other) must be justified and planned with the coordinator and the managers of the services and the direction in the hospitals.
9. The intern must attend the visits made to the beds of the patients by the treating doctors or the residents.
10. The intern must participate in the scientific activities of the hospital. Whenever possible, attend case discussion, journal club and conference at least one of each per week.

11. In the event of illness or other cause requiring an absence of more than 2 days, the management of the faculty and the general coordinator must be informed by written.
12. The duration of the maternity leave is one month, this leave is paid (including 2 weeks vacation).
13. During the 6th or 7th year, the intern is only entitled once to 4 weeks of elective internship in a university hospital service within the scope of the faculty programs or in a university hospital center outside the faculty of sciences LU medical provided.
    They obtain the agreement of the coordinator of the hospital as well as that of the general coordinator of the faculty, and this at least three months before. This internship is sanctioned by an evaluation which will be completed by the managers of the service. The intern who takes an elective internship, will no longer be entitled to two weeks of vacation during the rotation.
14. The intern is not entitled to an elective internship during the month of December or months of exams.
15. At the end of each rotation of hospital internship, the coordinator of each hospital must sign the internship log of the intern.
16. During clinical rotations, any violation of the law or any unjustified absence (of 1 day or more) will be sanctioned according to the laws of the Lebanese University and according to the gravity of the offense:
    - 16.1: Oral warning that will be mentioned in the student's file.
    - 16.2: Written warning that will be placed in the student's file.
    - 16.3: The internship of the academic year will not be validated.
    - 16.4: The intern will be removed from the Faculty of Medical Sciences of U.L.

II. Duration Clinical rotations:

Internship is divided as follows:

- 6th year: 48 weeks of internship + 4 weeks of vacation

- 7th year: 48 weeks of internship + 4 weeks of vacation

Each year is divided into 2 rotations each of 24 weeks, the intern is entitled to 2 weeks of vacation during each rotation. The distribution of rotation and the respective duration in each specialty per year should be respected in order to gain clearance and be able to graduate.

A. DISTRIBUTION OF INTERNSHIPS IN THE 6TH YEAR:

- 16 weeks: internal medicine and medical specialties (cardiology, pulmonary, gastroenterology ...)
- 12 weeks: general surgery and sub-specialty (orthopedics, urology ...)
- 8 weeks: gynecology obstetrics
- 8 weeks: emergency or outpatient
- 4 weeks: pediatrics
- 4 weeks off.

B. DISTRIBUTION OF INTERNSHIPS IN THE 7TH YEAR:

- 12 weeks: general surgery and subspecialty
- 8 weeks: pediatrics
- 8 weeks: intensive care unit and coronary
- 8 weeks: internal medicine and subspecialty
- 4 weeks: emergency
- 4 weeks: open elective at the hospital: radiology, emergency, anesthetic resuscitation, gynecology
- 4 weeks: gynecology and obstetrics
- 4 weeks off.

III. Assessment and Grading

Measuring progress in acquiring core knowledge and competencies may be a problem if the exams are designed to measure multiple integrated abilities, such as factual knowledge, problem solving, analysis and synthesis of information. Students may advance in one ability and not in another. Therefore, progress tests that are designed to measure growth from the onset of learning until graduation should measure discrete abilities. The following is a system by which to evaluate and grade student performance.

A. **Medical Internship Assessment**: The students will undergo at the end of each rotation an assessment based on the following major six points:

1. Patient Care Goal: Care providers, taking into account the total – physical, mental and social – needs of the patient, must ensure a full range of treatment that is appropriate, compassionate and effective.
2. Medical Knowledge Goal: Providers of care should master basic scientific and clinical knowledge of medical disorders and be able to apply this knowledge in the practice of medicine.
3. Practice Based Learning and Improvement Goal: In order to improve patient care practices, care providers should regularly stay acquainted about newer practice patterns and keep on being subjects of assimilation of scientific evidence and self-directed life-long learners.
4. Interpersonal and Communication Skills Goal: The care providers must be excellent communicators in order to persuade individuals, families and the communities in their charge to adopt healthy lifestyles and become partners in the health effort and to allow effective exchange of information.
5. Professionalism Goal: Care providers should stay demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse population.

6. Systems-Based Practice Goal: Different care providers should work in a complementary pattern, be aware of and responsive to the healthcare system in which they practice and use available resources from this healthcare system to optimize care of the patient.

The evaluations must be filled on the **Medical Internship Assessment Checklist** by the direct coordinator of each hospital himself, or under his direct supervision.

B. **Oral Exam**: in the internship rotation at the end of each year. This will be used to judge whether the medical student has acquired not only knowledge but also has developed technical skills, analytical and communication skills, interdisciplinary care, counseling, evidence- and system-based care to enable him/her the effective and efficient delivery of healthcare. The questions can incorporate clinical scenarios as Short Answer Questions (SAQ). A similar format is also known as Modified Essay Question (MEQ) or Constructed Response Question (CRQ) from a format clinical scenario. Taking into consideration that this type of exams has poor content validity, higher inter-rater variability and inconsistency in marking.

C. **Written exams**: There are two written exams a partial and a final exam. Written exams (MCQs, True/False, Essay, MEQs, modified CRQs) these can be based on Key Feature Test (clinical scenario-based paper and pencil test).

D. **Grades** of the 6th and 7th year medical students will be divided as follows:

- **Final written exam: 35% of the general grade**
- **Clinical rotations grade is 65% of the general grade divided into:**
  - **Medical Internship Assessment: 15%**
  - **Oral exam: 20%**
  - **Partial written exam: 65%**

IV. References:

- Written exams are based on:
- **USMLE Step1 and Step2** and their review books
- **National Medical series (NMS)**
- **Board Review Series (BRS)**
- For further medical knowledge enrichment includes but not all, the intern may read the following references:
- **Harrison's Principles of Internal Medicine (last edition)**
- **Nelson Textbook of Pediatrics (last edition)**
- **SCHWARTZ's Principles of Surgery (last edition)**
- **Williams Gynecology (last edition)**
-

V. Related documents/Records:

- Internship assessment checklist

VI. Quality References:

Diffusion:

Department/Division Section/Unit	Title of the person receiving this copy/ His delegate	Reception date	Name & Signature
Faculty Council	Dean's Assistant / **Grace Hawi**	01/03/2023	
Students	Delegates for the academic year 2022-2023:		
	For 6th year: **Mahdi Ghandour**	01/03/2023	
	For 7th year: **Hussein Tarhini**	01/03/2023	
	For residents: **Hassan Ghrayeb**	01/03/2023	
	For residents: **Hussein Hamdar**	01/03/2023	
Lebanese Hospitals where students are rotating (affiliated and non-affiliated to LU)	Medical Coordinators:		
	Al Rassoul Al Azam Hospital: **Dr. Mahmoud Younis**	01/03/2023	
	Al-Zahraa Hospital University Medical Center: **Dr. Samer Dbouk**	01/03/2023	
	Baabda Governmental Hospital: **Dr. Ziad Saadeh**	01/03/2023	
	Bahman Hospital: **Dr. Assaad Mhanna**	01/03/2023	
	Hammoud Hospital UMC **Dr. Ibrahim Omeiss / Dr. Khalil Jaber**	01/03/2023	
	Haykel Hospital **Dr Lise ABI RAFEH**	01/03/2023	
	Lebanese Hospital Geitaoui: **Dr. Naji Abi Rashed**	01/03/2023	
	Nabatieh Governmental Hospital **Mme Hiba El Hussein**	01/03/2023	
	New Mazloum Hospital **Mme Youmna Mawass**	01/03/2023	
	Rafik Hariri University Hospital: **Dr. Nawfal Nawfal**	01/03/2023	

	Sacre Coeur Hospital : **Dr. Pierre Abi Hanna**	01/03/2023	
	Sahel General Hospital: **Dr. Walid Alameh**	01/03/2023	
	Saint Charles Hospital **Dr. Amal Tohmeh**	01/03/2023	

Rules and Regulations of Clinical Rotations in the 6th and 7th Year of Medicine

FUNCTION: DEPARTMENT		CATEGORY: ACADEMIC	
CODE: ACD-RR-INT	TYPE: GUIDELINE	IMPLEMEMNTATION DATE: 01/03/2023	EDITION: 2

Next Revision Dates: 01/03/2026 ……. …… ……

Modifications and revision history

Edition	Paragraph	Modification/Description of change	Reviewer	Implemented date
01			–	
02	All	Separation of externship and internship rules. Coded the document. Reviewed the content by the curriculum committee. Added implementation date to the document.	**Nawfal Nawfal, MD** **Mirna Chahine, PhD** **Mona Al Buaini, MD** **Antoine Abou Rached, MD** **Hussein Mcheimeche, MD** **Khadija Ismail, PhD candidate**	01/03/2023

Disciplinary Rules at the Lebanese University

Disciplinary Rules at the Lebanese University

Article 58

Any student who violates his duties or performs an act that is inconsistent with dignity or with the integrity of the university atmosphere shall be subject to discipline. Disciplinary measures issued by the university are independent of judicial procedures.

Article 59

It is considered a disciplinary action:

- Penal offense related to university life.
- Violating security and order within the university, its faculties and institutes.
- Deliberately refraining from attending lessons, lectures, and university work that university regulations require attendance at.
- Assaulting members of the teaching staff or university employees.
- Rebellion against university regulations.
- Committing or attempting to cheat in an exam.

Article 60

Subject to disciplinary authority:

- Students registered in faculties and institutes affiliated to the university, as long as their registration is valid.
- Candidates from outside the university to advance to university ranks.

Article 61

Disciplinary penalties are:

- Alert.
- Reprimand.
- Dismissal from the university for a period ranging between a week and a month.
- Deprivation of the right to apply for university exams for one session or more.
- Expulsion from the university for a maximum period of three years.
- Final expulsion from the university.

Article 62

The bodies responsible for imposing sanctions are:

- The dean of the faculty or the director of the institute in the first three cases, provided that the dean or the director obtains the approval of the faculty or institute council in the matter of dismissal if it exceeds a week.
- The university president based on the decision of its council in all cases.

Article 63

Every forgery, cheating, or attempted fraud, when registering or during exams, exposes the perpetrator to cancellation of his exam.

If the student is caught cheating, he is immediately expelled from the exam hall and his exam is deemed invalid. In all other cases, the invalidation of the exam is issued by a decision of the faculty or institute council.

Article 64

The perpetrator of forgery or cheating, or the perpetrator of attempted fraud with whoever participates with him, shall be referred to the faculty or institute council, and the council may issue, along with the decision to nullify the exam, one of the penalties stipulated in Article 61 of this law.

Article 65

A student against whom a disciplinary decision has been issued by the dean, director, or faculty or institute council may appeal against it before the University Council within a period not exceeding two weeks from the date of notification of the decision in an administrative manner. As for the disciplinary decisions issued by the University Council, no review is accepted except in the cases of temporary expulsion and final expulsion.

Article 66

The university or some of its faculties or institutes can be closed if necessary to maintain security and order.

- The college or institute is closed for a period not exceeding three days by a decision of the university president based on the proposal of the dean or the director, provided that it is immediately presented to the Minister of Education and Higher Education.
- The university or one of its branches is closed for a period not exceeding two weeks by a decision of the Minister of Education and Higher Education based on the termination of the university council or by a decree taken by the Council of Ministers.
- The university or one of its branches shall be closed for a period exceeding two weeks by a decree taken by the Council of Ministers based on the proposal of the Minister of Education and Higher Education after consulting the University Council.

Lebanese University
Faculty of Sciences

Life and earth Sciences Department

Section -1-

Course Description
First year CSVT

Head of Department

Pr. Hussein Abou-Hamdan

Lebanese University
Faculty of Sciences I
Section –I-

Department of Life and Earth Sciences
Courses Syllabus

Code	Entitled	Semester	Credits	Number of hours
B 1100	**Cytology, Histology**	**S1**	**6**	**60**

CYTOLOGY (30 hours)

Objective:

This course allows the student to acquire the basic concepts and keywords needed to the understanding of the related courses in BS of Life and Earth Sciences (SVT).

Content:

The Chemical Components of a Cell; Procaryota, Eucaryota and Viruses; Plasma membrane structure; Wall of a plant cell; the Cell Nucleus; the Cytosol: Endoplasmic reticulum, Golgi apparatus, Peroxisomes; Energy Conversion: Mitochondria and Chloroplast; the Cell-Division Cycle.

GENERAL HISTOLOGY (30 hours)

Objective:

This course gives the student basic knowledge in animals and plants, prerequired for the understanding of subsequent courses of Anatomy, histology of organs and botany.

► **Animal Histology:** Introduction to histology; Epithelial tissue; Connective tissue; Muscle tissue; Nerve tissue.

► **Plant Histology:** Cell wall structure; Meristems; Parenchyma and Collenchyma; Sclerenchyma; Vascular Tissue: Xylem and Phloem.

Code	Entitled	Semester	Credits	Number of hours
B1101	**Botany and Plant Reproduction**	**S1**	**3**	**30**

The course of Organization of the Living World must allow the students to have a first contact with the Diversity and the Organization of Plant World. In a first approach, the different attempts of classification of the Living World are studied with an evolutionary approach. This will permit to students to well understand the principal objective of this course which is the acquisition of a basic knowledge about the evolution and the organization of the different kingdoms of the Plant World.

Afterwards, a detailed study of each kingdom must be done and with the following features: general characteristics, morphology, anatomy, metabolism, classification, evolution and adaptation as well as the asexual and sexual reproduction with the life cycles of the different groups in each kingdom.

Code	Entitled	Semester	Credits	Number of hours
B1102	**Genetics and Anatomy**	**S1**	**3**	**30**

GENETICS (18 HOURS)

Biochemical bases of heredity : DNA and transmission of the genetic information – Cellular division – Chromosomal and gene mutations – Basic principles of heredity : Mendel's principles of inheritance– Extensions of Mendelian genetics – Genetics and sexuality – Linkage and recombination – Human heredity and monogenic inheritance – Probability.

ANATOMY (12h)

This course provides an overview of the anatomy of different human body systems to acquire basic anatomical concepts to the understanding of basic physiological processes. It will enable students to acquire the outline of the human body architecture.

Definition and application field, terminology, anatomical position, different regions of the body and its cavities. Systematic Study. Skeleton system, Articular system, Muscular system, Nervous system, Senses organs, Integumentary system, Cardio-vascular system, Respiratory apparatus, Digestive apparatus, Urogenital apparatus.

Code	Entitled	Semester	Credits	Lecture	Problems session	Number of hours
C1100	**General chemistry**	**S1**	**6**	**30**	**30**	**60**

The general chemistry course is divided into 4 parts.

The first part describes the composition of the atom and the atomic structure (Rutherford model, photelectric effect, Planck theory, Bohr model, modern atomic model, description of the atomic orbitals (s, p, d and f), poly-electronic atoms in the quantum mecanics …).

The second part describes the chemical bonding, the molecular orbitals theory (Lewis structure, VSEPR, energy diagrams of molecular orbitals, …)

The thermochemistry is discussed in the third part of this course which includes the different types of transformations. The first and second principle of thermodynamics will be defined (work, heat, internal energy, entropy, free energy, …)

The last part is the kinetics. We study the rate of a chemical reaction (rate laws, partial and total orders, half-life time vs total order relationship, Arrhenius law, elementary process, complex process, intermediate, rate determining step, …)

Code	Entitled	Semester	Credits	Lecture	Problems session	Number of hours
M1109	**Analysis**	**S1**	**6**	**30**	**30**	**60**

Content :

Field of real numbers: operations and absolute value.
Functions of a real variable: limit, continuity of real valued functions of a real variable, derivative, mean value theorem, trigonometric functions and their inverses.
Logarithm and exponential functions: Hyperbolic sine and cosine functions and their inverses, power functions.
Taylor expansion: definition, operations, use of Taylor series to get the equation of tangent lines to curves, the equations of an asymptote to curves, the position of the curve relatively to the tangent and the asymptote, use of Taylor series to calculate limits.
Integral calculus: definition, integration by parts, integration by substitution, integration of rational and irrational, exponential and trigonometric functions.
Real valued functions of several real variables: double integral in Cartesian and polar coordinates, area calculation.
Differential equations of the first order: separable equations, homogeneous equations, and linear equations.

Code	Entitled	Semester	Credits	C	TS	Number of hours
P 1104	**Fluids, Mechanics & Thermodynamics**	**S1**	**6**	**30**	**30**	**60**

Content:

Kinematics: Dynamics: Types of forces, Newton's three laws of motion. Applications: motion on an inclined plane, free fall, satellites, central forces.

Rotation: Moment of a force, moment of inertia, angular momentum.

Energy: work of a constant force, work of the weight of a body, work of a frictional force and of the tension force in a spring. Theorem of kinetic energy.

Conservation laws: conservation and non-conservation of mechanical energy, conservation of linear momentum and angular momentum.

A solid in equilibrium: Conditions of equilibrium.

Hydrostatics: fundamental principle and hydrostatics. The buoyant force.

Fluid dynamics: Bernoulli's theorem.

First law of thermodynamics: Enthalpy, energetic treatment of thermal cyclic - processes. Concept of work.

Second law of thermodynamics: Performance of a heat engine, Carnot's theorem. Entropy.

Code	Entitled	Semester	Credits	Number of hours
B1103	**Ecology and Geology**	**S2**	**3**	**30**

ECOLOGY (18h)

General Basics
Terminology.Abiotic and biotic ecological factors of the environment, terrestrial and aquatic Biomes.

Dynamic of ecosystems
-Concept of ecosystems, energy and matter in the biosphere, energy flow in the ecosystems and their function regulation.
-Ecology of the communities, structure and development of the communities, of organisms, food chains, succession and biodiversity.

GEOLOGY (12 h)

Planet earth and univers (4h)
-Origin evolution of the Univers, formation de star systems, genesis of the solar system.
-Characteristics and evolution of the planet earth and differentiation of the terrestrial envelopes.

Dynamic of the envelopes (8h)
-Dimensions and structures of the superficial envelopes (ocean, atmosphere). Energy balance at the surface of the Earth, gas cycle with greenhouse effects, atmospheric and oceanic surface and deep circulations, cycle of chemical elements in the ocean current sedimentation.
-Acquisition of fundamental knowledge the cycle of endogenous and exogenous rocks, geodynamics of the lithosphere, horizontal and vertical mouvements, deformations process of the rocks.

Code	Entitled	Semester	Credits	lectures	Exercises	Number of hours
C 1102	**Introduction to organic chemistry**	**S2**	**6**	**35**	**25**	**60**

Electronic effects and reaction intermediate:
Electronegativity, polarity, polarizability, inductive effect, resonance effect, conjugated systems. Formation, stability and reaction intermediates (free radical, carbocation and carbanion). Electrophiles and nucleophiles.

Conformation and stereochemistry:
Perspective representation, Newman representation and Fisher projection. Cahn-Ingold-Prelog rule, stereochemistry (Enantiomer and diastereoisomers), chirality and optical activity.

Alkanes:
IUPAC Nomenclature (Alkane, cycloalkane, alkyle groups).
Reactions of alkanes: Radical halogenation.

Alkenes and Dienes:

Nomenclature. Alkenes reactions: Catalytic Hydrogenation, electrophilic addition of X_2, HX, H_2O, and X_2/H_2O (mechanism, stereochemistry, Markovnikov rule, carbocation rearrangements. Hydroboration-oxydation, epoxydation (mechanism of hydrolysis), dihydroxylation (*syn-anti*), ozonolyse, oxidation with $KMnO_4$ (conc), reactions with conjugated dienes. Addition 1,2 and 1,4 Diels Alder cycloaddition (stereochemistry of dienophile only).

Alkynes:

Nomenclature. Alkynes reactions: acidity of terminal alkyne, catalytic hydrogenation, reduction by metal and ammonia, addition of HX, of X_2, and of H_2O.

Alcohols and halogenated derivatives:

Nomenclature

Acidity and basicity of alcohols.

Nucleophilic Substitution reactions (S_N1 and S_N2), mechanism, stereochemistry, competition between the two reactions, solvent effect, nucleophilic effect, leaving groups, and rearrangements of carbocations.

Elimination reactions (E1 and E2), mechanism, stereochemistry, competition between the two reactions. Competitions between substitution and elimination, heat effect, Zaytsev rule.

Other methods of converting alcohols to halogenated derivatives.

Oxydations of alcohols.

Organometallics RMgX.

Arenes and Aromaticity :

Benzene, structure, bonds, Huckel rule

Benzene substituted derivatives and their nomenclatures.

Reactions of Benzene: Addition reactions: Catalytic hydrogenation. Electrophilic aromatic substitution reactions (EAS): Mechanism, Nitration, Sulfonation, Halogenation, Friedel-Crafts (alkylation and acylations), synthesis of alkylbenzens (acylation-reduction). Regioselective disubstition reaction of benzenes. Activating groups and deactivating groups. Oxidation of alylbenzenes.

Code	Entitled	Semester	Credits	Lecture	Problems session	Number of hours
C1103	**Chemistry of solutions**	**S2**	**6**	**35**	**25**	**60**

The objective of this course is to provide the student with the basic knowledge necessary for understanding chemical equilibrium.

At the end of this course, the student will have understood and assimilated:

1.The concept of chemical equilibrium in aqueous solution; the relationship between thermodynamic equilibrium constant and reaction progress;

2. The concept of acid, base, pH and its importance in the phenomena of life, the prediction of the pH of aqueous solutions in simple cases; the acid-base titration and calculation of the pH at any point of the titration;

3. Complexation reactions, titration by complexation; precipitation reactions in aqueous solution, the influence of pH and complexation on solubility;

4. The concept of oxidant, reducer, Nernst potential, the prediction of dominant reaction and the calculation of the equilibrium constant; the realization of an electrochemical cell and the description of its operation; the influence of complexation and precipitation on the oxidizing power of an oxidant; the redox titration.

Code	Entitled	Semester	Credits	C	Number of hours
P 1105	**Electricity, Electromagnetism and Optics**	**S2**	**6**	**30**	**30**

Content:

Electric field and field lines created. Electric flux and Gauss's law.

Electric potential: the electric dipole.

Electrical conductor: Induction and dielectric phenomenon.

Electric capacitor: Capacitance of a parallel-plate, spherical and cylindrical capacitors. Energy density in a capacitor.

Electrodynamics: Electric current. Ohm's Laws and Joule's law. Electric resistance, receivers and generators (Pouillet's Law) .Circuits and networks - Kirchhoff's Laws.

Magnetic induction: Biot-Savart's law (straight wire, coil and solenoid). Ampere's theorem.

Properties and effect of the magnetic field: Lorentz formula, and Laplace's law. Motion of a charged particle in a uniform magnetic field.

Propagation of light: Propagation velocity, refractive index and frequency.

Reflection and refraction: Dioptric systems: Optical instruments: The eye and its defects.

Code	Entitled	Semester	Credits	CM
S 1100	**Statistics**	**S2**	**3**	**30**

The main objective of this course is to complete the information already acquired in descriptive statistics and probability. It includes three chapters:

- **Descriptive univariate statistics**: we present the use of tables, graphics and parameters in the description of discrete and continuous variables. We also introduce the variable changing and the calculation of mean and variance in the case of pooling many samples with different means and variances
- **Descriptive bivariate statistics**: we present all the cases of 2 discrete variables, discrete-continuous and 2 continuous. We learn how to verify the independence of 2 variables, to determine the coefficient of correlation and the regression lines
- **Rules of counting and probability**: we present most of the formulas used in counting, we also introduce to the Newton's binom and Pascal's triangle. All the probabilities properties are presented and the chapter is culminated by introducing the Bayes' Formula

Code	Entitled	Semester	Credits	CM
B 1104	**Animal Reproduction and Embryology**	**S2**	**3**	**30**

ANIMAL REPRODUCTION (15h)

Objective:

This course presents the main aspects of the reproductive functions in animals from the formation of gametes to fertilization, ensuring therefore the sustainability and the continuity of species.

Content: Sexual Reproduction, Spermatogenesis, Oogenesis, Fertilization, Parthenogenesis.

ANIMAL EMBRYOLOGY (15h)

Objective:

This course enables students to acquire basic concepts on the different stages of embryonic development from the fertilized egg to the organogenesis.

Content:

Introduction. Experimental approaches in Developmental Biology.
Early Developmental Stages in Insects, Echinoderma, Amphibians, Birds and Mammals.
Cellular interactions (induction) during organ formation.

Code	Entitled	Semester	Credits	CM
M1110	**Algebra**	**S2**	**3**	**30**

Matrix: operations on matrix, row echelon form of a matrix, invertible matrix. Determinant of a matrix: properties, rank of a matrix. System of linear equations: Cramer's system, echelon form and system of linear equations. Vector spaces: subspace, system of generators, linearly independent vectors, basis of a vector space. Reduction of matrix: eigenvalues, eigenvectors, characteristic polynomial, diagonalization.

Faculté des Sciences

Section -1-

Département Science de la Vie et de la Terre

Syllabus

L.M.D

1ère année

Fiche de Cours

Code	Intitulé	Semestre	Crédits	CM
B 1101	**Botanique et Reproduction Végétale**	S1	3	30

Département : Sciences de la Vie et de la Terre

Le cours d'Organisation du Monde Végétal doit permettre aux étudiants de prendre un premier contact avec la Diversité et l 'Organisation du Monde Végétal. Dans une première approche, une introduction sur le début de la Vie sur Terre suivie par un aperçu historique résumant les différentes tentatives de classification du Monde Vivant. Ceci va permettre aux étudiants de mieux comprendre l'objectif principal de ce cours qui est l'acquisition des connaissances de base sur l'organisation du Monde Végétal.
Différentes notions sont à développer dans cette première partie :

- la systématique et la taxonomie
- la nomenclature des êtres vivants
- la notion d'espèce et de taxon
- les déférentes approches de la classification
- la classification moderne du Monde Vivant (3 domaines et 6 règnes)
- la classification traditionnelle et moderne des Plantes

Ensuite, et dans une seconde approche, une étude détaillée de chaque règne.

Pour le règne des Archaebactéries et celui des Eubactéries les notions suivantes sont à développer :

1. Caractéristiques générales des Procaryotes
1.1. Diversité cellulaire morphologique
1.1.1. Coques
1.1.2. Bacilles ou bâtonnets
1.2.3. Courbées
1.2. Diversité cellulaire structurale et éléments constitutifs
1.3. La diversité métabolique des Bactéries
2. La classification des Bactéries
2.1. Le règne d'Archaebactéries
    - les Bactéries méthanogènes
    - les Bactéries halophiles extrêmes
    - les Bactéries thermoacidophiles
2.2. Le règne d'Eubactéries
2.2.1. Le sous-règne des Cyanobactéries ou Algues Bleues
2.2.2. Autres groupes importants d'Eubactéries
3. Différents mode de reproduction des Bactéries
4. La Théorie endosymbiotique

Pour le règne des Protistes, seul le sous-règne des Algues est à traiter. Une étude détaillée de l'appareil végétatif, de la morphologie, de l'anatomie, des complexes pigmentaires, du métabolisme ainsi que de l'appareil reproducteur et des différents cycles de développement chez les différentes classes d'Algues est attendue. Quelques notions en fin de chapitre sur le sous-règne des Protistes fongiformes.

1. Sous-règne des Algues ou Phycobiontes
1.1 Anatomie
1.2. Morphologie
1.3. Classification
1.3.1. Les Pyrrhophytes ou Dinoflagellés

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1.3.2. Les Bacillariophytes ou Diatomées
1.3.3. Les Euglénophytes
1.3.4. Les Chrysophytes
1.3.5. Les Chlorophytes ou Algues Vertes
1.3.6. Les Phéophytes ou Algues Brunes
1.3.7. Les Rhodophytes ou Algues Rouges
2. Reproduction et cycles de développement des Algues
3. Sous-Règne des Protistes fongiformes

Le quatrième règne à étudier est celui des Mycètes. L'appareil végétatif, les métabolismes, l'appareil reproducteur et les différents cycles de développement et modes de reproduction sont à développer chez les différentes classes des Mycètes. Ceci sera suivi par l'étude des champignons symbiotiques et des Lichens.

1. Caractéristiques générales
2. Métabolisme des Mycètes
3. Classification
3.1. Les Ascomycètes
3.2. Les Zygomycètes
3.3. Les Basidiomycètes
3.4. Les Deutéromycètes
4. Les Champignons symbiotiques ou mycorhizes
5. Les Lichens
5.1. Caractéristiques générales
5.2. Classification

Le dernier règne à traiter est celui des Plantes. Une grande introduction sur les caractéristiques générale des Plantes, sur leur adaptation à la vie aérienne ainsi que sur leur cycle de vie général. Par la suite, l'organisation de l'appareil végétatif et l'appareil reproducteur ainsi que les modes de reproduction et les différents cycles de développement des sous-règnes, divisions et classes composant ce règne seront traités en détail en mettant l'accent sur les caractéristiques évolutives de ces plantes.
Le plan proposé de ce chapitre peut-être comme suit :

1. Caractéristiques générales
1.1. L'adaptation à la vie aérienne
1.2. Cycle de vie général
2. Classification
2.1. Sous-Règne des Plantes non Vasculaires : division de Bryophytes
2.1.1. Classification des Bryophytes
2.2. Sous-Règne des Plantes Vasculaires (Rhizophytes)
2.2.1. Division des Ptéridophytes
2.2.2. Division des Spermaphytes ou Plantes à graines
2.2.2.1. Sous-division des Gymnospermes
- les Cycophytes
- les Ginkgophytes
- les Coniférophytes
- les Gnétophytes
- les cycles de développent de chaque taxon
2.2.2.2. Sous-division des Chlamydospermes
- les Ephedra
- les Gnetum
- le Welwitschia
- les cycles de développent de chaque taxon
2.2.2.3. Sous-division des Angiospermes
- Organisation typique des Angiospermes
* racine

* tige
* feuille
* fleur
* fruit
* graine

- le cycle de développent chez les Angiospermes
- la classe des Monocotylédones
- la classe des Dicotylédones
- caractéristiques évolutives des Angiospermes
  * racine
  * tige
  * feuille
  * fleur
  * fruit
  * graine
- les adaptations évolutives des Angiospermes

N.B. : La partie concernant la reproduction végétale peut-être donnée comme un cours séparé de 10 heures. Elle englobe les modes de reproduction asexuée et sexuée ainsi que les cycles de développement de chaque règne.

Fiche de Cours

Code	Intitulé	Semestre	Crédits	Nb. d'heures
C 1100	**Chimie Générale**	S1	6	60

Département : Chimie - Biochimie

Chapitre I: Constituants de l'atome

- ✓ Théorie atomique de Dalton
- ✓ Constituants de l'atome: description des expériences principales (Thomson, Goldstein, Millikan Goutte d'huile) et leurs résultats. Les calculs ne sont pas demandés.
- ✓ Modèle de Rutherford
- ✓ Représentation de l'atome (X, A, Z, N)
- ✓ Isotopes et abondance relative

Chapitre II: structure de l'atome

- ✓ Lumière et radiation électromagnétique
- ✓ Principe de la lumière. Spectre atomique discontinu
- ✓ Effet photoélectrique: formule et calcul. L'expérience pour trouver la constante de Planck n'est pas demandée.
- ✓ Théorie de Planck
- ✓ Modèle de Bohr: calculs du rayon et de l'énergie d'orbite sont demandés. Utiliser les termes: E, r, Z, K_e, m_e
- ✓ Hydrogénoïdes: formules seulement sans preuves
- ✓ Formule de Balmer-Rydberg
- ✓ Faillibilité du Modèle de Bohr
- ✓ Théorie de Louis de Broglie: concept et formule
- ✓ Principe d'incertitude de Heisenberg: concept et formule
- ✓ Modèle atomique moderne: fonction d'onde et nombres quantiques. Noter que les dérivations de l'équation de Schrodinger ne sont pas demandées. L'étudiant doit savoir que les nombres quantiques décrivent la position d'un électron
- ✓ Notation de la probabilité de présence
- ✓ Description des orbitales atomique s, p d and f (comme points de probabilité de présence).
- ✓ Atomes poly-électronique en mécanique quantique: Configuration électronique des éléments, règle de Klechkowsky's, Exceptions à la règle, règle de remplissage de l'orbitale atomique, le principe d'exclusion de Pauli, règle de Hund, Effet écran: Approximation de Slater (tous les calculs pour tous les orbitales sont demandés, utiliser la règle générale)
- ✓ Description du tableau périodique
- ✓ Variation générales dans le tableau périodique (rayons atomique et ionique, énergie d'ionisation et affinité électronique)

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Chapitre IV: Liaisons chimiques

Théorie de liaison, types de liaisons, électronégativité, prévision du type de liaison selon la différence d'électronégativité (calcul de l'électronégativité n'est pas demandé).

- ✓ Symbole de Lewis, structure de Lewis, structures de résonance, charge formelle
- ✓ Géométrie des molécules RPECV (VSEPR)
- ✓ Distance et ordre de liaison, énergie de liaison, moment dipolaire

Chapitre V: Théorie des orbitale de liaisons

- ✓ Faillibilité de la théorie de Lewis, théorie de liaison, théorie des orbitales moléculaires, notation orbitale moléculaire liante, non- liante and anti- liante
- ✓ Diagramme énergétique des orbitales moléculaires pour: X_2, XY et HX. Noter que l'exception est quand l'un des éléments (X ou Y) est B, C, ou N.
- ✓ Concept d'Hybridation: sp, sp^2, sp^3, sp^3d, sp^3d^2.
- ✓ Type de liaison: σ et π. Dessiner les orbitales dans une molécule est demandé.
- ✓

Chapitre VI: Thermochimie

- ✓ Définitions: système, milieu extérieur, univers, transformation physique et chimique, types de transformations (rev, irrev...) et (isotherme, isobare, isochore), fonctions d'état, capacité calorifique, isolant et conducteur. Calcul de la chaleur pour une transformation physique sans changement d'état (dq = ncdt), endothermique et exothermique.
- ✓ Définition de travail et formule, enthalpie ΔH, énergie interne ΔE, fonction de la capacité calorifique à V constant ou P constante, relation ΔE et ΔH pour les transformations chimiques et physiques. Relation C_p et C_v pour un gas idéal, état standard (P= 1 bar seulement), méthodes de calcul de ΔH (Loi de Hess, enthalpie de formation, énergie de formation de liaison, cycle), relation entre ΔH et température, preuve de la loi de Kirchoff, énergie de résonance ou de stabilisation, énergie réticulaire.
- ✓ Définitions des processus spontanés et non-spontanés, entropie et calculs, Définitions de l'entropie ΔS de système, milieu extérieur et univers, condition de spontanéité par rapport à ΔS de l'univers, relation entre l' entropie et la température sans preuve, Energie libre de Gibbs, condition de spontanéité, différence entre ΔG et $\Delta G°$ et le sens de chaque terme, relation ΔG et $\Delta G°$, relation $\Delta G°$ et constante d' équilibre.

Remarques:

- L'énergie interne doit être notée ΔU et non ΔE.
- La calorimétrie n'est pas demandée.
- La définition de l'énergie de dissociation de liaison doit être donnée.

  Les relations dans l'état gazeux et le principe de Le Chatelier ont été étudiés en classes terminales. Faire une révision.

Chapitre VII: Cinétique chimique

- ✓ Différence de concept entre thermodynamique (spontanéité d'une réaction) et la cinétique (vitesse d'une réaction)

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- ✓ Révision générale: vitesse instantanée, vitesse moyenne, vitesse d'une réaction, relation entre elles selon la stoechiométrie, détermination graphique da la vitesse, facteurs qui influent la vitesse, demi-vie...
- ✓ Expression de la loi de vitesse et détermination de l'ordre partiel et total (0, 1 et 2 seulement)
- ✓ Loi de vitesse intégrée pour les réactions en phase gazeuse.
- ✓ Relation entre demi-vie (ou temps de demi-réaction) et ordre total
- ✓ Equation d'Arrhenius, calcul de l'énergie d'activation
- ✓ Relation entre constante de vitesse et température
- ✓ Catalyseur et mécanisme
- ✓ Processus élémentaire, processus complexe, intermédiaire réactionnel, étape déterminante de la vitesse
- ✓ Détermination de l'expression de la loi de vitesse d'une réaction globale à partir des étapes d'un mécanisme donné.

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Fiche de Cours

Code	Intitulé	Semestre	Crédits	CM	TD
C 1102	**Introduction à la chimie organique**	S2	6	35	25

Département : Chimie - Biochimie

Description détaillée du contenu :

1. Introduction
- Définition d'une molécule organique
- Liaisons : ioniques, covalentes simples, doubles et triples
- Hybridation : sp^3, sp^2, sp
- Formule structurale et formule brute; structure développée, semi-développée, condensée, zigzag
- Isomérie (de fonction, de position)

2. Effets Electroniques et les Intermédiaires Réactionnels
- Notions de cinétique chimique, contrôle cinétique et contrôle thermodynamique
- Electronégativité, polarité, polarisabilité
- Effet inductif, effet mésomère, système conjugué
- Acidité, basicité
- Mode de rupture des liaisons (homolytique, hétérolytique)
- Intermédiaires réactionnels (radicaux libres, les carbocations, les carbanions)
- Stabilité relative des radicaux libres, des carbocations, des carbanions
- Electrophiles et nucléophiles

3. Stéréochimie

a. Etude Conformationnelle des Alcanes et des Cycloalcanes
- Représentation perspective, cavalière, Newman)
- Conformations de l'éthane, du propane et du *n*-butane
- Conformations et stabilité des cycloalcanes (cyclopropane, cyclobutane, cyclopentane)
- Conformations du cyclohexane (chaise, bateau)
- Conformations des cyclohexanes monosubstitués, disubstitués (*cis-trans*), et trisubstitués

b. Stéréoisomérie de Configuration
- Règle de Cahn-Ingold-Prelog
- Isomérie géométrique (*cis-trans* et E-Z)
- Isomérie optique : molécules symétriques (achirale) et molécules dissymétriques (Chirale), activité optique, molécules à 1 et à 2 C*, configuration absolue (R-S), Projection de Fisher, énantiomères, mélange racémique, diastéréoisomères, mésoforme.

4. Les Alcanes
- Classification des hydrocarbures
- Origine des hydrocarbures (alcanes, alcènes, alcynes)
- Nomenclature selon IUPAC (alcanes, cycloalcanes, groupes alkyles)
- Etat naturel, combustion
- Propriétés physiques (forces d'attraction, point d'ébullition, solubilité)
- Réactions des alcanes : halogénation par substitution radicalaire (mécanisme, stéréochimie)

5. Les Alcènes et les Diènes
- Nomenclature (alcène, cyclo alcène, diène)
- Etat naturel, propriétés physiques et stabilité relative
- Réactions des alcènes :

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- Hydrogénation catalytique (stéréochimie ; chaleur d'hydrogénation)
- Addition électrophile de X_2, de HX, de H_2O, et de X_2/H_2O (mécanisme, stéréochimie, règle de Markovnikov, réarrangement des carbocations
- Addition radicalaire de HBr
- Hydroboration-oxydation (mécanisme, stéréochimie), époxydation (mécanisme de l'hydrolyse), dihydroxylation (*syn-anti*), ozonolyse, oxydation par $KMnO_4$ concentré

- Réactions des diènes conjugués :
  - Addition 1,2 et 1,4
  - Cycloaddition de Diels-Alder (stéréochimie du diénophile uniquement)

6. Les Alcynes

- Nomenclature (ynes, enyne, diyne)
- Etat naturel (règne végétale) et propriétés physiques
- Réactions des alcynes :
  - Acidité des alcynes terminaux
  - Hydrogénation catalytique
  - Réduction par métal ammoniac
  - Addition de HX, de X_2, et de H_2O

7. Les Alcools et Les Dérivés Halogénés

- Nomenclature ; Classification ; Liaisons ; Propriétés physiques
- Acidité et basicité
- Réactions de substitution nucléophile (S_N1, S_N2), mécanisme, stéréochimie, compétition entre les deux mécanismes, effet du solvant et du nucléophile et du groupe partant, réarrangement des carbocations ; Utilisation des esters sulfoniques (sulfonates) dans des réactions de substitution nucléophile
- Réactions d'élimination de (E1, E2), mécanisme, stéréochimie, compétition entre les deux mécanismes, compétition entre substitution et élimination, effet de la chaleur, règle de Zaytsev
- Autres méthodes pour convertir les alcools en dérivés halogénés
- Oxydations des alcools
- Les organomagnésiens RMgX

8. Les Arènes et Aromaticité

- Benzène : structure, liaisons, règle de Huckel, stabilité
- Les dérivés substitués du benzène et leur nomenclature
- Les hydrocarbures aromatiques polycycliques, les composés aromatiques hétérocycliques, et les ions aromatiques
- Réactions du benzène :
  - Réactions d'addition : Hydrogénation catalytique
  - Réactions de substitution électrophile : Mécanisme ; Nitration ; Sulfonation ; Halogénation ; Friedel-Crafts (alkylation et acylation) ; synthèses des alkylbenzènes (acylation-réduction) ; Synthèse régiosélective des benzènes disubstitués ; Effet des substituants : groupes activant et groupes désactivant
  - Réduction de Birch (benzène non substitué)
  - Oxydation des alkylbenzènes
  - Réactions d'addition des alkenylbenzènes, polyaddition

NB. La permutation des chapitres ou des thèmes est permise par respect pédagogique.

Références

1. Solomons, Graham, and Craig B. Fryhle ; *Organic Chemistry* ; 9th Edition ; John Wiley ; 2007 ; 1280 pp. ; 9780471684961.
2. Carey, Francis A. ; *Organic Chemistry with Learning By Modeling CD-ROM* ; 8th Edition ; McGraw Hill College ; 2011 ; 1229 pp. ; 9780073402611.

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3. Traité de chimie organique. Vollhardt et Schore - 2ème édition - De Boeck Université 1995.
4. Chimie Organique Avancée. Carey et Sundberg - 3ème édition - De Boeck 1996.
5. Clayden, Jonathan, Nick Greeves, Stuart Warren, and Peter Wothers ; *Organic Chemistry*; 1st Edition ; Oxford University Press ; 2000 ; 1536 pp. ; 9780198503460.

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Fiche de Cours

Code	Intitulé	Semestre	Crédits	CM	TD
C 1103	**Chimie des solutions**	S2	6	35	25

Département : Chimie - Biochimie

Description détaillée du contenu :

1- Introduction générale (2h)

Introduction à l'étude des équilibres en solution : couples Accepteur/Donneur, Force des accepteurs et des donneurs, Classement des couples. Réactions d'échange (Règle de gamma), Ampholytes ou amphotères, Solvatation et effet du solvant sur la force d'un acide, Systèmes réactionnels homogène et hétérogène, notions d'électrolytes forts et faibles. Réactions complète et limitée (quantitativité et coefficient de dissociation), Quotient réactionnel - loi d'action de masse, relation concentration et activité (sans entrer dans le calcul).

2- Les équilibres acido-basiques en solution aqueuse (18h)

Force d'un couple acide/base – pK_a et pK_b, Réaction entre deux couples acido-basiques, prévision du sens des réactions, ordre de grandeur du déplacement de l'équilibre ($Kr > 10^4$ cas spécial) Rôle particulier du solvant eau ,les couples acide-base de l'eau (echelle de pK_a), les couples dans d'autres solvants non aqueux ($pK_a > 14$ et $pK_a < 0$). (Toutes les études sont en solutions seulement). Domaines de prédominance d'un acide ou d'une base, courbe de comversion suivant le pH pour un acide (base) faible et fort(e). Calcul du pH (pour un acide) et pOH (pour une base) : à traiter tous les cas possibles, solution d'acide ou de base (fort ou faible), mélanges d'acides ou bases (faible ou fort), soltion polyacide, solution polybasique, solution saline, ampholyte, solution tampon, mélange de plusieurs systèmes acide-base, Domaines de prédominance et calcul des concentrations des espèces présentes. Dosage acido-basique (mono di et tri protiques), Courbe de titrage, Domaines de prédominance, allure de la courbe, domaines de prédominance, indicateur coloré, effet tampon.

3- Les équilibres de complexation en solution aqueuse (14h)

Définition d'un complexe, la force d'un couple ou la stabilité d'un complexe, notions de K_f et K_d; Echelle de logK - Stabilité comparée de différents complexes : un seul ion métallique et un seul ligand. Définition du pL - Calcul de pL : solution de donneur ML et d'accepteur M. Domaine de prédominance suivant l'échelle pL et pM (à montrer que le système de complexation ressemble au système acido-basique, ressemblance dans le calcul et les formules). Diagrammes de prédominance suivant pL et pM. Complexations successives (polycomplexes), notion de β. Prévision du sens des réactions de complexation. Calcul dans une solution contenant un ion métallique et deux ligands. Calcul dans une solution contenant deux ions métalliques et un ligand. Courbe de titrage par complexation (dosage de M par L et de ML par L'), forme de la courbe de complexation, domaines de prédominance, dosage, indicateur coloré ; Complexation par OH^- - Formation d'hydroxydes métalliques suivant pH (pH début de complexation, pH de complexation et pH de fin de complexation).

4- Les équilibres d'oxydoréduction en solution aqueuse (14h)

Etats d'oxydation - Degrés d'oxydation ; Equivalent redox; Le potentiel redox - Force des oxydants et des réducteurs - Prévisions du sens des réactions. Potentiel d'électrode : électrode ESH, électrode ECS, détermination expérimentale du potentiel standard. Calcul du potentiel redox E d'une solution : solutions d'un seul système redox, mélange de deux systèmes redox, solution d'ampholyte ; Domaines de prédominance ; Courbes de titrage: allure de la courbe, domaines de prédominance, dosage, indicateur coloré redox, effet tampon ; Pile et cellule galvanique : fonctionnement d'une pile, force électromotrice. Modifications des propriétés oxydoréductrices par effet chimique : réaction principale redox avec réactions secondaires acide/base: système redox dépendant du pH.

5- Equilibres solide-solution : précipitation et dissolution (12 h)

Mécanisme de dissolution d'un solide ionique ; Notions de solubilité : solubilité et produit de solubilité ; Conditions de précipitation. Précipitation et oxydoréduction ; Précipitation et complexation : calculs généraux ; Précipitation et acidité : influence de la basicité de l'agent précipitant X, influence de la formation d'hydroxydes métalliques (pH début de précipitation et de fin de précipitation), exemple d'effets combinés, effet de la complexation sur la solubilité.

Ouvrages de référence :

1- Equilibres chimiques en solution ; Marie-Odile Delcourt, Nicole Bois, Fouad Chouaib ; De Boeck Université 2001 ; ISBN : 2-8041-3481-4.

2- Chimie générale ; Donald A. McQuarrie, Athan B. Callogly, Peter A. Rock ; De Boeck Supérieur 2012, 3ème édition ; ISBN-10 : 2804171272.

3- Chimie analytique en solution - Cours et applications ; Jean-Louis Brisset, Ahmed Addou, Mustapha Draoui, David Moussa, Fatiha Abdelmalek ; Lavoisier 2005 ; ISBN : 2-7430-0780-X.

Course Description

Code	Title	Semester	Credits	C
M 1110	**Algebra**	S2	6	60

Department: Mathematics

CHAPTER I: Matrices.

1.1. Introduction: We give the definition of a field and as examples we give the fields $\mathbb{Q}$, $\mathbb{R}$ and $\mathbb{C}$. Definition of a matrix, entries, main entry, row matrix, column matrix, square matrix, diagonal matrix, diagonal entries, zero matrix and unit matrix, upper triangular matrix, lower triangular matrix and triangular matrix.

1.2. Operations on matrices: addition of matrices and multiplication of a matrix by a scalar and we state their properties without proof. We define the transpose of a matrix and we give its properties. Also we give the definition of an invertible matrix, and we state without proof the theorem which says that if $A,B \in M_n(K)$, then $AB=I_n \Leftrightarrow BA=I_n$.

CHAPTER II: Row echelon form of a matrix.

2.1. Row operations: Leading entry of a non-zero row (resp. column), definition of matrix in row echelon form, row operations and elementary row operations, computation of a row echelon form of a matrix, via examples.

2.2. Invertible matrix and row echelon form: We show that the ith row of AB is equal to the product of the ith row of A by B and that the jth column of AB is the product of A by the jth column of B. We prove that if a square matrix is invertible, then every row and every column is non-zero. We admit that if a $(n\times n)$ matrix A is invertible and B is obtained from A by a finite sequence of row operations, then B is invertible. Also we admit that A is invertible if and only if A can be changed to I_n by a finite sequence of elementary row operations, and then we give the method that allows to calculate the inverse of a matrix by carrying some appropriate row operations simultaneously on A and I_n.

CHAPTER III: Determinant.

3.1. Definition and properties: We define the determinant of a matrix by induction on n and we admit the following:

(i) $|AB| = |A|\,|B|$, $\forall A,B \in M_n(K)$.

(ii) $|A| = (-1)^{i+1} a_{i1} |A_{i1}| + \cdots + (-1)^{i+n} a_{in} |A_{in}|$, $\forall 1 \le i \le n$.

(iii) $|A| = (-1)^{1+j} a_{1j} |A_{1j}| + \cdots + (-1)^{n+j} a_{nj} |A_{nj}|$, $\forall 1 \le j \le n$.

Then we state without proofs the properties of determinants and we give examples. We admit that a square matrix is invertible if and only if its determinant is non-zero.

3.2. Rank of a matrix: Definition of a minor, order of a minor, definition of the rank of a matrix as the greatest order of non-zero minors of A. We state without proof that a square matrix of order n is invertible if and only its rank is n, then we admit that $\text{rank}(A)=\text{rank}({}^tA)$. Finally we admit without proof that the rank of A is equal to the number of non-zero rows of a row echelon form of A.

CHAPTER IV: System of linear equations.

4.1. Definition and solutions: Definition of linear equation with n variables $x_1,...,x_n$ over K and definition of a system of linear equations. Matrix of a system, matrix representation, definition of solution, principal determinant, principal equations and principal unknowns, characteristic determinants. We admit without proof that a system has solutions if and only if every characteristic determinant of system (I) is zero. As corollary we show that if rank(A)=number of rows of A, then the system has solutions in K.Also if the system has solutions we state without proof the formula giving these solutions, by using the principal determinant and the principal unknowns. We define Cramer's system and we show that it has a unique solution and we show that a system has a unique solution if and only if it is a Cramer's system. We prove the important result which states that if $A \in M_n(K)$ and if the system $AX = 0$, has a non-zero solution, then $|A| = 0$.

4.2. Echelon form and system of linear equations: Resolution of a system of linear equations by using the augmented matrix.

CHAPTER V: Vector spaces.

Let K be a field and E be non-empty set.

5.1. Definition and properties. We define an **action** (or **scalar multiplication**) of K on E to be every mapping of K×E to E. If f is an action of K on E, then the image by f of every element (a,x) of K×E is denoted ax. Definition of a vector space over K, examples: $M_{m,n}(K)$, the set $K^n = \{(a_1,...,a_n) ; a_1,...,a_n \in K\}$, where $(a_1,...,a_n)+(b_1,...,b_n) = (a_1+b_1,...,a_n+b_n)$ and $\alpha(a_1,...,a_n) = (\alpha a_1,...,\alpha a_n)$. We state the rules of calculations in a vector space.

5.2. Subspace. Definition, examples, intersection of two subspaces, definition of the sum of two subspaces, direct sum.

5.3. System of generators: Let $S=\{x_1,...,x_n\}$ be a subset of E. definition of linear combination of elements of S, the set L(S) of all the linear combinations of elements of S, the properties of L(S), namely:

(i) $S \subseteq L(S)$, (ii) L(S) is a subspace of E over K.

We give the definition of a system of generators and we state that if $x_1,...,x_n \in E$, then $x_1,...,x_n$ form a system of generators of E over K if and only if every element x of W can be written in the form $x=a_1x_1+\cdots+a_nx_n$, where $a_1,...,a_n \in K$.

CHAPTER VI: Basis of vector space.

6.1. Linear dependence: linearly dependent and linearly independent elements, examples.

6.2. Basis of a vector space. We shall say that $\{x_1,...,x_n\}$ is a basis of E over K if $x_1,...,x_n$ are linearly independent and form a system of generators of E, examples the canonical bases of $M_2(K)$, $M_{2,3}(K)$, K^2 and K^3. dimension of a vector space. We admit that if $\dim_K(E)=n$, with $n \neq 0$ and if $x_1,...,x_n$ are elements of E linearly independent over K, then $\{x_1,...,x_n\}$ is a basis of E.

CHAPTER VII: Reduction of matrices.

Characteristic polynomial of a matrix, similar matrices, eigenvectors and eigenvalues of a matrix, the space

$V_\lambda(A)$, diagonalization of a matrix.Computation of A^S when A is diagonalizable.

Fiche de Cours

Code	Intitulé	Semestre	Crédits	Nb. d'heures
S 1100	**Statistique**	S2	3	30

Département : Informatique & Statistiques

Contenu :

Partie I : Statistique descriptive

Définitions et vocabulaire statistique : population, individu, unité statistique, échantillon, sondage, recensement, caractère, variable statistique, variable qualitative nominale, variable qualitative ordinale, variable quantitative discrète, variable quantitative continue, valeur, modalité, observations, données, effectif, fréquence relative, fréquence cumulée, série statistique, tableau statistique...

Représentations graphiques : Diagramme en secteurs ou diagramme circulaire, diagramme en barres ou en tuyaux d'orgue, diagramme en bâtons, fonction de répartition, courbe cumulative, histogramme, polygone d'effectifs ou de fréquences simples et cumulées.

Statistique descriptive univariée ou unidimensionnelle : caractéristiques de tendance centrale (mode, médiane, quantiles, moyenne), caractéristiques de dispersion (étendue, variance, écart-type, coefficient de variation), caractéristiques de forme (coefficient d'asymétrie de Fisher (skewness), coefficient d'asymétrie de Yule, coefficient d'asymétrie de Pearson, paramètre d'aplatissement (kurtosis)), boîte à moustaches, propriétés d'agrégation des moyennes et des variances, propriété de changement de variable, comparaison de plusieurs écarts-type.

Statistique descriptive bidimensionnelle : série statistique bidimensionnelle, tableau à double entrée, tableau de contingence, nuage de points, distributions marginales, distributions conditionnelles, calcul de leurs caractéristiques, covariance, indépendance et corrélation, rapport de corrélation, coefficient de corrélation linéaire, droite d'ajustement des moindres carrés ou droite de régression.

Partie II : Dénombrement

Analyse combinatoire : Rappel sur la théorie des ensembles, permutation avec et sans répétition, arrangement avec et sans répétition, combinaison avec et sans répétition, coefficient et théorème de binôme, partitions.

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LEBANESE UNIVERSITY
Faculty of Sciences-Section I

COURSE SYLLABUS
(BIOL 1102: Human Anatomy)

COURSE COORDINATOR:

MAJID EL-MESTRAH, *PH.D., M.D.* (E-Mail: majid.mestrah@gmail.com)

COURSE DESCRIPTION

Human Gross Anatomy is the study of human body by macroscopic observations and investigations. The study of Human Anatomy embodies the acquisition of knowledge and understanding of structures at the following levels: cells, tissues, organs, and systems.

BIOL 1102 (Human Anatomy) examines the basic concepts of structure (and function) of the human body. The course begins with an introduction to the human body and an overview of anatomical terminologies. Subsequent chapters pertaining to the various systems of the human body (skeletal, muscular, cardiovascular, nervous, respiratory, digestive, urinary and reproductive body systems) will be surveyed and discussed using illustrated diagrams and figures, models and other lab materials.

This course will be taught systemically in the form of lectures and labs. The lectures will provide information relevant to the students' understanding of the contents of the suggested reference textbook. No lecture series, however, can adequately cover the text material, and thus the students will learn the required depth of each topic by reading the lecture material and the text prior to attending each of the lectures and the laboratory sessions.

COURSE OUTCOMES

By the end of this course, it is anticipated that students are able to:

- Understand the basic anatomy of the human body.
- Grasp the fundamental knowledge of the physiology of the human body.
- Gain insights into the correlations between structure and function of the human body
- Acquire a firm foundation for use in current health sciences curricula and practice

SUGGESTED TEXTBOOK

Principles of Human Anatomy, 14th Edition (2009), Gerard J. Tortora and Mark T. Nielsen. Wiley, USA, (www.wiley.com).

N.B. For lectures and lab purposes, **ANY** Human Gross Anatomy Atlas or Textbook would be useful for study purposes but is not required.

COURSE OUTLINE BY TOPIC

Topic	Chapter Assignment	# Sessions
1	**Organization of the Human Body** • Definitions of Anatomy and Physiology • Selected branches of anatomy and physiology • Levels of organization and body systems • Anatomical terms (Anatomical position, Prone and Supine positions) • Anatomical names of body regions (common names and their corresponding anatomical terms) • Directional terms • Planes and sections • Body Cavities (including pleura, pericardium, and peritoneum)	1
2	**The Skeletal System** • Functions of bone and the skeletal system • Types of bones (with examples for each type) • Basic structure of a typical long bone (Thoracic vertebra) • Divisions of the skeletal system (Axial and Appendicular skeleton) (including the names and number of bones associated with each division) • Skull (Cranial and facial bones) • Unique features of the skull (sutures, paranasal sinuses, fontanels) • Hyoid Bone • Vertebral Column (regions, normal curves, vertebrae) • Comparison of structural features of cervical, thoracic, & lumbar vertebrae • Thorax (Sternum and Ribs) • Pectoral (shoulder) girdle (clavicle and scapula) • Upper limb (humerus, ulna and radius, carpals, metacarpals, and phalanges) • Pelvic (hip) girdle (female pelvis) • Lower limb (femur, patella, tibia and fibula, tarsals, metatarsals, and phalanges) • Herniated disc, Abnormal curves of vertebral column, Spina bifida	2
3	**The Joints** • Structural classification of joints (fibrous, cartilaginous, synovial) • Functional classification of joint (synarthrosis, amphiarthrosis, diarthrosis) • Types of Fibrous joints (suture, syndesmosis, gomphosis, interosseous membrane) • Types of Cartilaginous joints (synchondrosis, symphysis) • Structure of a typical synovial joint • Types of movements at synovial joints (gliding, angular, rotational, and special movements) • Types of synovial joints (Planar, Hinge, Pivot, Condyloid, Saddle, Ball and socket)	1
	• Details of a synovial joint: The knee joint	

4	**Central Nervous System: Brain & Spinal Cord** • Overview of the nervous system • Histology of nervous tissue (Neurons and Neuroglia) • Organization of the nervous system (CNS, PNS and ENS) • Spinal cord structure (Gross anatomy, internal structure in cross section) • Spinal nerves (Coverings and distribution) • Brain Organization (major parts and protective coverings, cerebrospinal fluid) • Sites of CSF production (ventricles) and circulation of CSF • Anatomy of Brain parts (Diencephalon, brain stem, cerebellum, and cerebrum) • Anatomy of Cerebrum and its functional organization (fissures, lobes)	1
5	**Special Senses** • Overview of sensations (somatic senses and special senses) (Briefly) • Olfaction: Sense of smell (anatomy with brief explanation of its physiology) • Gustation: Sense of taste (Anatomy of tongue with brief description of physiology of taste) • Vision: (Anatomy of eye, lacrimal apparatus, layers of eyeball, with brief explanation of the physiology of vision) • Hearing (Anatomy of ear, with brief explanation of the physiology of hearing)	1
6	**The Cardiovascular System: The Heart** • Brief description of blood vessels • Structural organization of the heart (Location, coverings, wall, chambers, valves, coronary arteries) • Anatomy of the heart (External anatomy: anterior and posterior, internal anatomy) • Conduction System of the heart (components of conduction system) • Pulmonary and systemic circulation	1
7	**The Respiratory System** • Overview and functions of the Respiratory system • Anatomy of the Respiratory System (Nose, Pharynx, Larynx, Trachea, Bronchi and bronchioles, bronchial tree) • Surface anatomy of the Lungs (Lobes/fissures/lobules) • Anatomy of larynx: anterior and posterior • Structural components of alveolus • Brief explanation of the mechanism of pulmonary ventilation (inhalation & exhalation)	1
8	**The Digestive System** • Overview and functions of the digestive system • Layers of the GI tract • Structure of Mouth (salivary glands) • Anatomy of typical tooth • Stomach (both anatomy and histology) (cells of gastric mucosa and their	

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	secretions) • Biliary tree (of liver, gallbladder, and duodenum) • Small intestine (both anatomy and histology) • Large intestine (both anatomy and histology) • Brief explanation of the physiology of digestion	
9	**The Urinary System** • Overview and functions of the urinary system • Organs of the urinary system • Structure of the kidneys (external and internal anatomy) • Structure of the Nephron • Brief explanation of the functions of nephron • Transportation, Storage, and Elimination of urine (Ureters, Urinary bladder, and Urethra)	1

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Course Syllabus Details

Code	Title	Semester	Credits	CM
B 1105	**Zoology, Animal Reproduction and Embryology**	S2	6	60

Department: Life and Earth Sciences

ZOOLOGY (24 hours)

ANIMAL REPRODUCTION (18 hours)

Aim

The primary focus of this unit is to examine the biological aspects of animal reproduction, with emphasis on human reproduction, from germinal cells formation and gametogenesis to fertilization, thus ensuring the survival and continuity of species.

Objectives

Upon completion of this unit, students should be able to:

- Recognize the two main types of reproduction in living things, the sexual and asexual.
- Realize that asexual reproduction involves distinct modalities.
- Understand the genetic aspects of meiosis and the main cellular events of gametogenesis in both male and female.
- Determine the peculiarities of spermatogenesis and oogenesis in terms of time course and gametes obtained.
- Understand the process of fertilization: the sequence of events leading to the formation of the diploid egg cell from the fusion of two haploid genomes of maternal and paternal origins (using mammals as model).
- Understand that parthenogenesis is a common natural mode of reproduction widespread and perfectly effective in many invertebrates.

Content

Sexual reproduction: Introduction and generalities; Meiosis: mechanism, consequences, utility, differences between meiosis and mitosis; sex differentiation: genetic, gonadal and secondary sexual characteristics

The molecules involved in gametogenesis and fertilization and their receptors: GnRH, gonadotropins, sex steroids, general principles of hormonal action, cellular and molecular mechanisms of hormonal action, membrane

receptors, intracellular receptors, membrane signal transduction, second messengers, activation of transcription and translation

Gametogenesis: Comparison between spermatogenesis and oogenesis; Characteristics of gametes (eggs, spermatozoa); Cells involved in gametogenesis (Germ cells, Leydig cells, Sertoli cells); Steps of gametogenesis: proliferation, growth, meiosis, genetic shuffling, maturation; Apoptosis of germ cells.

Spermatogenesis: *Male genital apparatus*: Structural and functional organization of the adult testis; Secretions of the male genital tract: straight tubules, rete testis, efferent tubules, epididymis, vas deferens, urethra, glands of the male genital tract (Prostate gland, Seminal vesicles, Cowper's glands); Evolution of the seminal epithelium; Histology of the male genital tract: spermatogonia, dark spermatogonia Ad, pale spermatogonia Ap, spermatocytes, spermatids, spermatozoa; Detachment of spermatozoa; Acquisition of fertilizing ability; Epididymal maturation; Capacitation; Factors affecting spermatogenesis; Abnormalities of spermatogenesis; Transcription of the male genome during spermatogenesis; Leydig cells; Sertoli cells; Blood-testis barrier, Cellular interactions in the testis. *Hormonal control:* Testis/hypothalamo-pituitary axis; Role of GnRH, LH, FSH and Testosterone; Role of Sertoli factors in normal spermatogenesis; Interactions of Leydig cells, germ cells and peritubular cells with Sertoli cells.

Oogenesis and Folliculogenesis: *Female genital apparatus: macroscopic and microscopic anatomy*
Uterine tubes; Uterus; Vagina; Structural and functional organization of the ovary; Ovarian follicles: primordial follicle, primary follicle, secondary follicle, dominant follicle, antral follicle, Pre-ovulatory mature follicle or Graafian follicle; Maturation of the oocyte and ovulation; Corpus luteum; Corpus albicans

Ovarian cycle: Preparatory steps for the embryo, fetus and child development; Folliculogenesis; Kinetics of follicular growth; Regulation of the number of ovulating follicles; Recruitment, selection and dominance; Ovulation: weakening of ovarian walls, further maturation, release of the cumulus-oocyte complex; Role of maturation factors: MPF and OMI; Cyclic luteal function; Morphological and physiological characteristics of the corpus luteum; Regulatory mechanisms of luteolysis; **Cycle of the genital tract** (endometrium, myometrium, cervix and vagina); **Hormonal control of oogenesis:** Hypothalamo-pituitary axis; Role of GnRH, LH, and FSH; Control of folliculogenesis; Oocyte maturation, Control of ovulation; Control of luteal phase

Fertilization: Definition and generalities; *Mechanism of fertilization*: reciprocal recognition of gametes, primary fixation of spermatozoa to the zona pellucida, acrosomal reaction, secondary fixation, crossing the zona pellucida, fusion of gametes membranes. *Phenomena triggered by the fusion of gametes:* cortical reaction, physical modifications, ionic fluxes, release of intracellular Ca^{2+}, block of polyspermia, metabolic activity of the egg cell

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Amphimixis and Karyogamy: formation of male and female pronuclei, replication of DNA, migration of pronuclei, fusion of pronuclei or amphimixis; **Metabolic changes in the egg cell:** synthesis of rRNAs and mRNAs in the oocyte during oogenesis, DNA synthesis and activation of mitosis after fertilization, mechanisms of activation of protein synthesis after unblocking the maternal mRNAs, use of reserve macromolecules

Parthenogenesis: Definition; Thelytoky; Arrhenotoky; Experimental parthenogenesis; Examples

EMBRYOLOGY (18 hours)

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Fiche de cours

Code	Intitulé	Semestre	Crédits	CM
B 1100	**Biologie Cellulaire : Cytologie, Histologie**	S1	6	60

Département : Sciences de la Vie et de la Terre

CYTOLOGIE (30 heures)

But : transmettre aux étudiants de première année les connaissances de base sur les cellules vivantes, notamment :
- Les constituants chimiques de la matière vivante,
- La structure des cellules procaryotes, eucaryotes et des virus et les différences entre eux,
- La structure détaillée des organites et des éléments cellulaires des eucaryotes, tout en mentionnant les grandes lignes de leurs fonctions.

Objectifs : ce cours permet à l'étudiant d'acquérir les notions de base et les mots clefs nécessaires pour comprendre les cours relatifs aux spécialités SVT et Biochimie.

Contenu :

Constituants chimiques de la cellule (5 heures) :
- substances inorganiques : eau et sels minéraux. brève description, rôles, propriétés, polarité, liaison hydrogène, liaison ionique
- substances organiques :
  - Protéines : les acides aminés (propriétés, formule générale, les 4 familles), polypeptide, liaison peptidique, polarité N-C, pont di-sulfures, liaisons faibles; diversité fonctionnelle, les 4 niveaux de structures (définition, liaisons stabilisantes et exemples), structure 3D (globulaire, fibreuse), domaine fonctionnel, dénaturation.
  - Glucides : rôles (structural, énergétique, identité, antigènes des groupe sanguins). Classification : aldoses, cétoses, monosaccharides, disaccharides, liaison osidique, trioses, tetroses, pentose (ribose et désoxyribose), hexose (glucose), formes cycliques (pyranose, furanose) et stéréo-isomères alpha et beta, derivés de sucres simples (osamines, acides uroniques, etc..), polysaccharides (homo et hétéro avec des exemples : cellulose, amidon, glycogène, chitine, GAGs, pectine, hemicellulose).
  - Lipides : rôles (structural, énergétique, identité/signalisation). Acides gras (longueur, saturation, saponification, estérification, interaction hydrophobe), phospholipides (glycérol et sphingosine), glycolipides (glycérol et sphingosine), triglycérides, cérides, stéroïdes (vitamine, hormone), terpènes,
  - Acides nucléiques : nucléotides (nucléosides, nomenclature, abréviations, liaison phosphodiester et polarité, liaison N-glycosidique, liaison 5' ester), propriétés générales, structures et différences ADN/ARN, double hélice, complémentarité des bases, antiparallélisme, ARN (classes, rôles, structure).

Procaryotes, eucaryotes, et virus (2.5 heures) :
- Procaryotes : définition, classification, structure générale des bactéries et de cyanobactéries (paroi, peptidoglycanes, Gram+/-, capsule, flagelle, pili, plasmide, nucléoïde, endospore). Autotrophie, hétérotrophie
- Eucaryotes : définition, classifications, structure générale, différence entre cellules eucaryotes animales et végétales.
- Virus : définition, structure générale et propriétés, classification, reproduction (phase lytique et lysogène)

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- Prions : définition.

Périphérie cellulaire (4 heures) :
Membrane plasmique :
- modèle de la mosaïque fluide [structure (aspect au ME, composition chimique et organisation moléculaire des lipides, protéines et des glucides membranaires) et propriétés (fluidité, asymétrie, définition du transport cytotique (actif et passif) et du transport vésiculaire).
- Différenciations morpho-fonctionnelles (structure et rôles des jonctions, molécules d'adhésion). Structure des microvillosités, cils, flagelles, stéréocils, replis basaux.

Paroi de la cellule végétale
Structure (primaire, secondaire), composition chimique, fonctions et lieux de synthèse.

Le noyau (2.5 heures) : Présentation globale de l'organisation (structure et rôle). Enveloppe nucléaire, pore nucléaire, nucléoplasme, ADN, chromosomes, caryotypes, chromatine (description brève de la condensation, histones, euchromatine/ hétérochromatine).
Nucléole (structure, rôle, définition de l'organisateur nucléolaire).
Structure des gènes d'eucaryotes et procaryotes (promoteur, exons, introns, région UTR de l'ARNm). Les acteurs et les principes de la réplication et de la transcription. Maturation des ARNm.

Cytosol (6 heures) :
- **ribosomes et traduction :** ribosome (structure, différences entre procaryotes/eucaryotes, assemblage dans le nucléole). Code génétique, définition du codon, codon initiateur, UTR de l'ARNm, anticodon, ARNt, ARNt-aminoacyl synthétases, brièvement les protéines accessoires (facteurs d'initiation, d'élongation et de terminaison).
- **Cytosquelette :** Filaments (fins, intermédiaires et épais) : structure et idée brève sur la polymérisation et les rôles. Microtubules (structure, polarité, polymérisation, rôles). Centriole et corpuscule basal (structure, rôles). Flagelles et cils (structure, fonctions), Cytosquelette des cellules végétales.
- **Glycolyse** (définition, bilan global).

Système endomembranaire (4 heures) : structures du réticulum endoplasmique et variabilité intercellulaire. Enumération de ses rôles avec un exemple de chaque (synthèse des lipides, détoxification, stockage du Ca, glycosylation et maturation des glycoprotéines attachement des ribosomes. Description générale de la structure et des fonctions du complexe de Golgi (glycosylation et prolifération des membranes, sécrétion, mouvement vésiculaire globale), des lysosomes (origine, contenu et rôle), de la vacuole (plante) et de ses rôles en comparaison aux lysosomes.

Mitochondrie et chloroplaste (4 heures) :
Mitochondrie : Description structurale détaillée des mitochondries (forme et nombre et ultrastructure) avec les grandes lignes de ses fonctions (oxydation des substances organiques, respiration cellulaire, définition du cycle de Krebs, de la bêta oxydation, coenzymes, ATP synthétase).

Plastes : Généralités sur les plastes et description structurale détaillée du chloroplaste (forme et nombre et infrastructure) avec une idée brève de ses fonctions (différents pigments, chaîne photosynthétique, ATP synthéase, réduction du CO2, définition des réactions dépendante/non dépendantes de la lumière).

Peroxysomes (0.5 heure) : description structurale et enzymatique (catalase, peroxidase, aa oxydase, urate oxydase, oxydation de certains acides gras). Grande lignes des fonctions. Glyoxysomes.

Cycle cellulaire (1.5 heure) : présentation du cycle cellulaire avec une brève idée sur son contrôle (cycline et cdk). Détails des événements de la mitose/interphase. Cytodiérèse des cellules animales et végétales et implication du cytosquelette dans les deux cas.

HISTOLOGIE GENERALE (30 heures).

But : donner à l'étudiant les connaissances des tissus fondamentaux animaux et végétaux nécessaires à la compréhension des cours ultérieurs d'anatomie, d'histologie des organes et de Botanique.

Objectifs : A la fin de ce cours, l'étudiant doit être capable de :
- distinguer les différents types de tissus animaux et végétaux
- reconnaître ces différents tissus sur des préparations microscopiques ou microphotographiques.

► Histologie animale (24 heures) :

1. Introduction à l'histologie

2. Tissus épithéliaux :
   - de revêtement : caractéristiques des cellules épithéliales. Propriétés et classification des tissus épithéliaux de revêtement.

   - glandulaires : caractéristiques des cellules glandulaires et des cellules sécrétrices. Histogénèse des glandes. Classification des épithéliums glandulaires. Glandes exocrines : caractéristiques de la cellule glandulaire exocrine (séreuse, muqueuse) ; classification selon plusieurs critères (anatomiques, morphologiques, fonctionnelles,...). Glandes endocrines : caractéristiques et classification selon plusieurs critères. Glandes amphicrines.

3. Tissus Conjonctifs de soutien et spécialisés
   - Tissu conjonctif de soutien (non spécialisé) : comparaison avec le tissu épithélial, classification (lâche, dense).

   - Tissu adipeux : structure et éléments (cellules, MEC), rôles.

   - Tissus conjonctifs spécialisés :
     - Tissu Cartilagineux : spécificité par rapport aux autres tissus conjonctifs. Structure et éléments (cellules, MEC, périchondre), classification (hyalin, élastique, fibreux), nutrition, croissance endogène et exogène.
     - Tissu Osseux : spécificité de ce tissu par rapport aux autres tissus conjonctifs. Structure et éléments (cellules, MEC) et classification (Os compact, Os spongieux). Organisation macroscopique et microscopique, périoste et endoste, résorption osseuse. Ossification primaire et secondaire, croissance en longueur et en épaisseur de l'os.
   - Tissu Sanguin : spécificité, structure (éléments figurés et plasma). Hématopoïèse.

4. Tissus musculaires (lisse, strié squelettique, strié cardiaque) : structure, organisation, hétérogénéité.

5. Tissu nerveux :

- Le système nerveux central : cellule nerveuse (structure, propriétés, classification), structure des synapses, différents types de cellules gliales, substance blanche, substance grise.
- Le système nerveux périphérique : nerfs périphériques : fibres nerveuses myélinisées et amyéliniques, cellule de Schwann ; organisation de fibres nerveuses en nerfs périphériques, les ganglions nerveux.
- La myéline.

► **Histologie végétale (6 heures) :**

- Rappel sur la structure de la paroi cellulaire : paroi primaire et secondaire.
- Méristèmes : primaire et secondaire : structure, organisation et emplacement.
- Parenchymes : structure, organisation et classification.
- Tissus Protecteurs : épiderme, périderme, et liège : structure, organisation et différenciation.
- Tissus Conducteurs : xylème et phloème : structure, organisation et différenciation.
- Tissus de Soutien : collenchyme et sclérenchyme : structure, organisation et emplacement.
- Tissus Sécréteurs : différents types et sécrétion.

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Fiche de Cours

Code	Intitulé	Semestre	Crédits	CM
B 1102	**Génétique et Anatomie**	S1	3	30

Département : Sciences de la Vie et de la Terre

GENETIQUE (18 HEURES)

I. Bases biochimiques de l'hérédité

1. ADN : Support de l'information génétique
    a. Observation de Griffith
    b. Principe transformant de l'ADN (Avery, MacLeod, Mc Carty)
2. Composants et structure de l'ADN
3. Réplication de l'ADN
4. Transmission de l'information génétique
    a. Transcription
        i. Etapes, promoteur, terminateur
        ii. Epissage chez les eucaryotes (exon/intron) (sans spliceosome et snRNP), ARNm polycistronique chez les procaryotes + définition du cistron
        iii. Brin codant/non codant, sens/antisens, transcrit /non transcrit
    b. Traduction
        i. ARNt (anticodon, liaison covalente avec l'a.a.), ribosome, code génétique (ORF)
        ii. Etapes

II. Les chromosomes

1. Chromosomes métaphasiques
    a. Types de chromosomes métaphasiques
    b. Chromosomes métaphasiques humains + groupes (détails des groupes seulement pour le concours)
2. Organisation moléculaire des fibres chromatiniennes
    a. ADN et histones
    b. Nucléosome
    c. Chromatine
    d. Structure de la chromatine : euchromatine, hétérochromatine constitutive/facultative
    e. De l'ADN aux chromosomes
3. Caryotype
    a. Technique détaillée
        i. Taille des chromosomes
        ii. Position du centromère
        iii. Marquage en bandes (seulement G) + application pour la localisation de gènes

III. Division cellulaire

1. Cycle cellulaire
    a. Mitose (aspect quantitatif : nombre d'ADN, de chromosomes, de chromatides)
2. Méiose (aspect quantitatif : nombre d'ADN, de chromosomes, de chromatides)
    a. Méiose I
        i. Crossing-Over en Prophase I
        ii. Recombinaison génétique
    b. Méiose II

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3. Formation des Gamètes
    a. Spermatogenèse
    b. Ovogenèse
    c. Nombre effectif (pratique) et nombre théorique (possible).

IV.Mutations chromosomiques et géniques

Mutations chromosomiques

1. Aberrations chromosomiques du nombre : génomiques/ numériques
    a. Euploïdie
        i. Triploïdie
        ii. Tétraploïdie
    b. Aneuploïdie
        i. Polysomie (trisomie complète/libre ou transloquée, trisomie double, tétrasomie, pentasomie) + Ex : 13, 18, 21
        ii. Monosomie, nullisomie
        ii. Aneuploïdies des chromosomes sexuels: XXY, X0, XXX, XYY
        iv. Corpuscule de Barr
2. Aberrations chromosomiques de structure : structurelles (préciser pour chaque cas si l'aberration est équilibrée/non équilibrée)
    a. Délétion
    b. Duplication
    c. Inversion
    d. Isochromosome
    e. Chromosome dicentrique
    f. Chromosome en anneau (stable ou perdu)
    g. Translocation
        i. Translocation Robertsonienne
        ii. Translocation réciproque

Mutations géniques

1. Types of mutations
    - Substitution (transition, transversion), addition, délétion
    - Silencieuse, Mi-sens (faux-sens), non-sens, frameshift
2. Maladies Moléculaires
    Anémie falciforme ou Drépanocytose
3. Maladies Métaboliques
    Albisnisme
4. Causes des mutations : mutations spontanées, mutations induites ou provoquées (+ fréquence)
5. Effets des mutations : mutation somatique, mutation germinale

V. Principes des bases de l'hérédité

1. Principes de Mendel
    a. Plante de petits pois
    b. Traits observés
2. Définitions génétiques de Mendel : phénotype, génotype, dominant, récessif, co-dominant, homozygote, hétérozygote, hybride, eugénisme
3. Lois de Mendel
    a. Croisement monohybride
    b. Rétro-croisement / testcross
    c. Croisement dihybride
    d. Croisement polyhybride

VI.Extensions de la génétique mendelienne

1. Dominance incomplète

a. Dominance intermédiaire
    i. Croisement monohybride
    ii. Croisement dihybride
b. Codominance

2. Allèles multiples pour un locus
   - Exemple de dominance : pelage chez les lapins ou les canards
   - Exemple de dominance et codominance : couleurs des yeux chez la drosophile
   a. Système sanguin ABO: trois allèles différents
   b. Phénotype Bombay
   c. Groupe rhésus : D, d, C, c E, e (sans le tableau de Fisher Race)
   d. Détermination des groupes sanguins avec les sérums tests
   e. Complexe Majeur d'Histocompatibilité (Classe I : A, B, C ; Classe II : DR)
3. Allèle Létal : dominant et récessif
   - Allèle sublétal, pénétrance, expressivité
4. Allèle affectant des aspects multiples du phénotype : pléiotropie
   - Syndrome de Marfan / Drépanocytose
5. Allèles de différents loci interagissant pour produire un phénotype : polymérie
   a. Interaction de gènes (interaction simple)
   b. Epistasie (exemples à l'appui)
      - Epistasie récessive
      - Epistasie dominante
      - Epistasie récessive double
      - Epistasie dominante double
      - Epistasie dominante et récessive (suppression dominante)
      - Epistasie dominante- récessive (double interaction)
      - Autres types
6. Hérédité Polygénique (notion d'additivité). Ex : couleur de la peau ou la taille chez l'Homme

VII. Génétique et sexualité

1. Détermination du sexe
   - Pseudo-autosomes, gènes holandriques
2. Hérédité liée à l'X
3. Traits influencés par le sexe
4. Traits limités au sexe
5. Hémizygotie
6. Différents modes pour la détermination du sexe (lygaeus, abraxas, protenor)

VIII. Linkage et recombinaison

1. Recombinaison par crossing-over
   - Linkage complet, incomplet
   a. Expérience de Morgan
2. Distance Génétique entre deux loci et Fréquence de Recombinaison
   a. Fréquence de recombinaison
   - Linkage en *cis*, en *trans*
   b. Ordre de trois loci et distances relatives
3. Distance Génétique entre trois loci et Fréquence de recombinaison

IX. Génétique humaine

1. Symboles dans un pedigree

ANATOMIE (12 heures)

Chapitre 1 – Introduction

1.1- Définition et champs d'applications
1.2- terminologie
1.3- position anatomique, plans, axes, ...
1.4- différentes régions des différentes portes du corps
1.5- les cavités du corps (introduction des membranes)

Chapitre 2 – le système squelettique.

2.1- Définition, Généralités et Organogenèse
2.2- Fonctions du système osseux
2.3- Les principales régions du squelette :
   a. squelette axial : os de la tête (os du crane et os de la face fontanelle), os hyoïde, colonne vertébrale (nb des vertèbres, Atlas et axis, le diffèrent type de vertèbres, sacrum et coccyx), cage thoracique (clavicule et scapula)
   b. squelette appendiculaire : ceintures scapulaire et pelvienne
   c. anomalie de la colonne vertébrale (scoliose,...., spina bifuda)

Chapitre 3 – le système articulaire

3.1- Classification des articulations :
   a. articulations fibreuses : syndesmose, suture, gomphose
   b. articulations cartilagineuses : synchondrose, symphyse
   c. articulations synoviales : L'articulation sphéroïde
      1. L'articulation ellipsoïde
      2. L'articulation en selle
      3. La ginglyme ou L'articulation à charnière
      4. L'articulation trochoïde
      5. L'articulation plane

Chapitre 4 – le système musculaire

4.1- Observation des muscles superficiels (abdomen : superficiel et profond)
4.2- Les muscles et leur action: La face (vue latérale et vue frontale)

Chapitre 5 – le système nerveux. Innervation. Fonction de relation

5.1- Introduction, Classification et organisation du SN
5.2- Le système nerveux central:
   a. Encéphale :
      1. Cerveau : configuration externe (lobe), télencéphale, diencéphale, LCR
      2. Tronc cérébral : mésencéphale, pont de varole, bulbe rachidien
      3. cervelet
   b. Moelle spinale :nombre de nerfs, ganglions, plexus, méninges
5.3- Le système nerveux périphérique
   a. classification
   b. Nerfs crâniens (12 paires, nom, nb, M ou S et fonction)
   c. Nerfs spinaux
   d. Le système nerveux sympathique (autonome ou végétatif)
      1. SNV Orthosympathique
      2. SNV parasympathique

Chapitre 6 – les organes du sens. Sensoriel, Fonction de relation

6.1- Organe de Vision : l'œil (système lacrymale, vue latérale et vue frontale), anatomie de l'œil, corps ciliaire (régulation de l'intensité luminaire), voie visuelle
6.2- Organe Stato-acoustique : l'oreille externe, moyenne et interne

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6.3- Organe de l'olfaction : bulbes olfactifs du nez et voies olfactives
6.4- Organe du gout : calicules gustatives de la langue et voie gustative

Chapitre 7 – le système tégumentaire. Sensoriel, Fonction de relation

7.1- Peau: Structure, vascularisation, innervation (dermatoglyphes, dermatomes)
7.2- Les phanères: cheveux, poils et ongles

Chapitre 8 – le système cardio-vasculaire. Fonction de nutrition

8.1- La pompe cardiaque: Le cœur
a. généralité et localisation
b. tuniques du cœur
c. anatomie : externe, interne, circulation coronaire et maladies

Chapitre 9- Appareil respiratoire

a. introduction
b. Le pharynx
c. Le larynx
d. Trachées et bronches (carène)
e. Les poumons (hile)

Chapitre 10 -l'appareil digestif

10.1- Introduction
10.2- Caractéristiques générales du système digestif
10.3- le tractus gastro-intestinal (GI)
a. La bouche et les organes associés : langue, dents, glandes salivaires
b. le pharynx
c. l' oesophage
d. l'estomac
e. l'intestin grêle (villosité, muqueuse)
f. le gros intestin
10.4- les organes annexes
a. Le pancréas
b. Le foie
c. La vésicule biliaire et voies biliaires
10.5- la digestion chimique dans l'intestin grêle

Chapitre 11-Appareil urogénital

11.1- Introduction
11.2- Appareil urinaire
a. Les reins (néphrons)
b. Les uretères
c. La vessie et l'urètre

Fiche de Cours

Code	Intitulé	Semestre	Crédits	CM
B 1103	**Ecologie et Géologie**	S2	3	30

Département : Sciences de la Vie et de la Terre

Objectifs:

1- *Ecologie*: Etudier l'énergie et la matière dans la biosphère, concept d'écosystème - flux d'énergie dans les écosystèmes et régulation de leur fonctionnement, la distribution globale et les caractéristiques de différents types de biomes, initier les étudiants à l'étude des différents écosystèmes.

2- *Géologie*: Exposer les théories les plus avancées concernant la naissance et l'évolution de l'Univers actuel, étudier les structures et la dynamique des enveloppes superficielles (océan, atmosphère), acquérir des connaissances fondamentales sur la géodynamique de la lithosphère par la description des formes et des reliefs de la Terre (en terme de sismicité, volcanisme).

ECOLOGIE (18 heures)

Notions générales

1.1. Terminologie

1.2. Facteurs écologiques abiotiques et biotiques de l'environnement, biomes terrestres et aquatiques

Dynamique des écosystèmes

1.3. Concept d'écosystème, énergie et matière dans la biosphère, flux d'énergie dans les écosystèmes et régulation de leur fonctionnement

1.4. Ecologie des communautés, structure et développement des communautés d'organismes, réseaux trophiques, succession et biodiversité

GEOLOGIE (12 heures)

La terre dans l'univers (4h)

2-1. Naissance et évolution de l'Univers, formation de systèmes stellaires, genèse du système solaire

2-2. Caractéristiques des planètes, évolution de la planète Terre et différentiation des enveloppes terrestres

Dynamiques des enveloppes (8h)

2-3. Dimensions et structures des enveloppes superficielles (océan, atmosphère), bilan énergétique à la surface de la Terre, cycle des gaz à effets de serre, circulations atmosphériques et océaniques de surface et profonde, cycle des éléments chimiques dans l'océan, sédimentation actuelle.

2-4. Acquisition des connaissances fondamentales sur le cycle des roches endogènes et exogènes (depuis les processus d'érosion jusqu'au magmatisme), géodynamique de la lithosphère par la description des formes et des reliefs de la Terre (en terme de sismicité et volcanisme), les mouvements horizontaux et verticaux et présentation des principaux contextes géodynamiques (tectonique des plaques et structure de la Terre), processus de déformations des roches en lien avec les différents contextes géodynamiques.

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Fiche de Cours

Code	Intitulé	Semestre	Crédits	Nb. d'heures
M 1109	**Analyse**	S1	6	60

Département : Mathématiques

Contenu:

- Corps des réels IR : ordre, inégalités, valeur absolue, partie entière, intervalles, voisinage d'un réel.

- Suites numériques : limites, opérations sur les limites, suites monotones, suites récurrentes.

- Fonctions réelles d'une variable réelle : définition, parité, monotonie, fonctions bornées, limite, limite à droite et limite à gauche, opérations sur les limites, formes indéterminées. Fonctions usuelles.

- Continuité des fonctions réelles d'une variable réelle : définition de la continuité en un point et sur un intervalle, continuité à droite et continuité à gauche, prolongement par continuité, opérations algébriques pour la continuité .Théorèmes fondamentaux (énoncé). Fonctions réciproques, exemples, fonctions réciproques des fonctions circulaires.

- Dérivées : définition, interprétation géométrique, dérivée à droite et dérivée à gauche, dérivabilité et continuité, opérations sur les dérivées; rappel, dérivées des fonctions réciproques, exemples, dérivées des fonctions usuelles. Théorème de Rolle et Théorème des accroissements finis (énoncés), applications.

- Développements limités: définition, développements limités usuels, opérations sur les développements limités, applications.

- Calcul intégral (avec exemples d'application en biologie) : primitives, calculs de primitives: changement de variables, intégration par parties, primitives usuelles, calcul des primitives des fonctions rationnelles de diverses formes et des fonctions avec radical. Intégrales définies : propriétés, théorème fondamental du calcul intégral (énoncé), règles d'intégration.

- Fonctions réelles de plusieurs variables réelles (définition et exemples en biologie). Fonctions réelles de deux variables réelles : définition, domaine, dérivées partielles, différentielle, gradient, extremums (techniques de calcul), intégrale double; calcul en coordonnées polaires et cartésiennes.

- Equations différentielles de premier ordre avec applications.

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Course Description

Code	Title	Semester	Credits	C	TS
P 1104	**Fluids, Mechanics & Thermodynamics**	S1	6	24	36

Offering Department: Physics

Offered to: 1st year Univ. students majoring in: Chemistry, Biochemistry and Biology

Prerequisite: Knowledge of derivatives and integration.

Purpose: This course is designed to familiarize the student with the fundamental principles of mechanics, and the concepts of fluids and thermodynamics. It also helps train students on scientific reasoning.

Educational Objectives:
At the end of this course, students must be able to:

1. Specify the characteristics of the motion of a point mass.
2. Apply Newton's laws.
3. Apply and verify the conservation laws of energy, and of linear momentum in collisions.
4. Describe the state of equilibrium of a solid.
5. Apply the fundamental principle of hydrostatics.
6. Distinguish a real fluid from an ideal fluid.
7. Study the cyclic transformations of a thermodynamical system.
8. Compare the performance of a heat engine to that of a Carnot's engine.

Contents:

Kinematics: position vector, velocity vector and acceleration vector of a point mass. Study is restricted to Cartesian and polar coordinates.

Dynamics: Types of forces, Newton's three laws of motion. Applications: motion on an inclined plane, free fall, satellites, central forces.

Rotation: Moment of a force, moment of inertia, angular momentum.

Energy: work of a constant force, work of the weight of a body, work of a frictional force and of the tension force in a spring. Theorem of kinetic energy.

Conservation laws: conservation and non-conservation of mechanical energy, conservation of linear momentum and angular momentum.

A solid in equilibrium: Conditions of equilibrium.

Hydrostatics: fundamental principle and hydrostatics. The buoyant force.

Fluid dynamics: Bernoulli's theorem.

First law of thermodynamics: Enthalpy, energetic treatment of thermal cyclic - processes. Concept of work.

Second law of thermodynamics: Performance of a heat engine, Carnot's theorem. Entropy.

Assessment:

1. 60 minutes partial exam (30% of course grade)
2. 120 minutes final exam (70% of course grade).

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Course Description

Code	Title	Semester	Credits	C	TS
P 1105	**Electricity, Electromagnetism and Optics**	S2	6	24	36

Offering Department: Physics

Offered to: First year students majoring in Biology, Chemistry and Biochemistry

Purpose: This course is designed to familiarize the student with electrostatics, electromagnetism and optics.

Educational Objectives:
At the end of this course, students shall be able to:
1. Determine the electric field and the electric potential created by a distribution of electric charges and apply Gauss's theorem in the case of a plane, cylindrical and spherical distribution.
2. Determine the characteristics of a conductor at equilibrium and study the discontinuity of the electric field at its surface.
3. Determine the capacitance of a capacitor, calculate the equivalent capacitance of a combination of capacitors.
4. Apply Kirchhoff's laws to electric circuits.
5. Apply Biot-Savart's law and Ampere's law.
6. Identify the characteristics of motion of a charged particle in electric and magnetic fields. Apply Laplace's law.
7. Apply the laws of refraction and reflection and study the condition of total internal reflection.
8. Determine the characteristics of the image of an object given by a plane and a spherical diopter, a thick lens and a spherical thin lens.
9. Identify the defects of the eye and determine the necessary corrective lens.

Contents:

Electric field: Electric field and field lines created by a distribution of electric charges. Electric flux and Gauss's law.

Electric potential: Relationship between electric potential and electric field. the electric dipole.

Electrical conductor: fundamental properties of an electrical conductor at equilibrium. Induction and dielectric phenomenon.

Electric capacitor: Capacitance of a parallel-plate, spherical and cylindrical capacitors. Energy density in a capacitor.

Electrodynamics: Electric current. Ohm's Laws and Joule's law. Electric resistance, receivers and generators (Pouillet's Law) .Circuits and networks - Kirchhoff's Laws.

Magnetic induction: Biot-Savart's law (straight wire, coil and solenoid). Ampere's theorem.

Properties and effect of the magnetic field: Lorentz formula, and Laplace's law. Motion of a charged particle in a uniform magnetic field.

Propagation of light: Propagation velocity, refractive index and frequency.

Reflection and refraction: Descartes-Snell's laws of refraction and reflection of light. Dispersion. Applications: parallel plates.

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Dioptric systems: spherical diopter, plane diopter, thin lenses.

Optical instruments: The eye and its defects.

Assessment:

1. 60 minutes partial exam (30% of course grade)
2. 120 minutes final exam (70% of course grade).