

FAU COLLEGE OF MEDICINE

Syllabus :

1. **Course title :** Fundamentals of Biomedical Science 1

Course number: BMS 6002

Number of credit hours: Credit Hours: 8

Lecture Hours: up to 8 hrs/week in BC-126, unless otherwise specified.

Small-group Hours: up to 6 hrs/week for PBL, location as assigned

Other activity Hours: up to 4 hrs/week in laboratory-based sessions

2. **Course prerequisites:**

Accepted for matriculation in the FAU College of Medicine.

3. **Course logistics:**

a. term: fall 2011

b. not an online course

c. Biomedical Science Building room BC-126, anatomy lab, small group PBL rooms.

4. **Instructor information:**

Course Director: Zhongwei Li, Ph.D.
Associate Professor of Biomedical Science
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Course support: Ms Mavis Brown
Curriculum Coordinator
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Please note: Any official student communication from the director or curriculum coordinator will be sent via e-mail to students at their FAU e-mail addresses. *If students would like to meet with the course director, they must call or e-mail the course director to schedule an appointment.*

5. **TA contact information:**

N/A

6. **Course description:**

The FBS 1 course is the first in the series of three fundamentals of basic science courses. It provides an introduction to molecular biology and genetics, biochemistry, cell biology, development and histology, anatomy, and pharmacology. The course will be taught in 8 weeks, and consist of lectures,

problem based learning sessions, small group discussions, and laboratory activities.

7. Course objectives/student learning outcomes:

After completing this course the student will:

- Understand how the single- and double-stranded forms of DNA and RNA are maintained by stabilizing forces and supercoiling.
- Understand how nucleic sequencing, restriction analysis, PCR amplification and hybridization techniques can be used to map DNA and RNA, detect nucleic mutations and analyze the copy numbers and expression levels of genes.
- Know the enzymes, mechanisms and cellular processes that govern DNA replication in prokaryotes and eukaryotes.
- Understand how genetic recombination, DNA replication, DNA repair processes, chromosomal segregation, insertion sequences and transposons can lead to DNA mutations.
- Understand those processes by which nucleic acid degradation and chromatin inactivation can regulate expression of specific genes.
- Know the basic structural features of genes and how genes are organized in chromosomes.
- Know the basic features of chromosomes including the centromere, the telomere and the names and features of the chromosomal arms.
- Understand the mechanisms that govern genetic exchange processes including genetic transformation, transduction and bacterial conjugation.
- Understand the principals of genetic linkage and how these principles can be applied to assigning phenotypes to specific loci.
- Understand the basic structures and mechanistic features of plasmids and bacteriophages.
- Describe mechanisms and enzymatic reactions of RNA synthesis, processing and degradation
- Relate the structure of tRNA and ribosome to their function in protein synthesis
- Analyze the structure of mRNA and the process the genetic code is translated into peptide sequence
- Explain how gene expression is regulated at the level of RNA metabolism and describe the following specific terms and processes: cis-regulatory elements, transcription factors, enhancers, promoters, silencers, represents, splicing
- Explain how gene expression is regulated during protein synthesis
- List some of the major types of post-translational modification of proteins and their roles in protein structure, stability, activity and regulation.
- Relate the mechanism through which proteins are targeted for degradation within the cell and in the circulation and how this is regulated.
- Explain the spontaneous process through which a polypeptide chain folds to its active native structure and the interactions that stabilize that structure.
- Discuss the mechanisms through which enzymes enhance the rates of chemical reactions and how the rates are affected by the concentrations of substrate and enzyme.
- Relate how different types of inhibitors, posttranslational modifications, and the interactions with regulatory proteins and non-substrate molecules can modulate the activities of enzymes.
- Summarize and compare the major metabolic pathways for energy production from carbohydrates, fatty acids, and amino acids
- Summarize and compare the major metabolic pathways for synthesis of carbohydrates, fatty acids, and amino acids

- Analyze the regulatory mechanisms for coordination of catabolic and anabolic pathways
- Explain the thermodynamic laws governing metabolic reactions and the role of ATP in energy transfer
- Describe the metabolic differences among different organs and tissues.
- Explain the metabolic imbalances that can result from diabetes, starvation, and inherited defects of metabolism
- Structure and function of cell components (e.g., endoplasmic reticulum, Golgi complex, mitochondria, lysosome, peroxidase, endosome, centriole, microtubule, ribosome, polysome, plasma membrane, cytosol, cilia, nucleus, cytoskeleton,)
- Signal transduction (including basic principles, receptors and channels, second messengers, signal transduction pathways)
- Cell-cell and cell-matrix adhesion
- Cell motility
- Intracellular sorting (e.g., trafficking, endocytosis)
- Cellular homeostasis (e.g., turnover, pH maintenance, proteasome, ions, soluble proteins)
- Cell cycle (e.g., mitosis, meiosis, structure of spindle apparatus, cell cycle regulation)
- Structure and function of basic tissue components (including epithelial cells, connective tissue cells, muscle cells, nerve cells, and extracellular matrix)
- Intracellular accumulations (e.g., pigments, fats, proteins, carbohydrates, minerals, inclusions, vacuoles)
- Embryogenesis: programmed gene expression, tissue differentiation and morphogenesis, homeotic genes, and developmental regulation of gene expression
- Congenital abnormalities: principles, patterns of anomalies, dysmorphogenesis
- Macroscopic structure of the thoracic wall, mediastinum, lungs and heart.
- Define and differentiate the terms Pharmacokinetics and Pharmacodynamics
- Identify the types of chemical bonds involved in drug-receptor interaction
- Describe the quantitative relationship between drug dose, concentration and effect
- Recognize the different components of pharmacokinetics: absorption, distribution, metabolism, and excretion, and identify the factors that influence these components
- Define the terms EC_{50} , ED_{50} and TD_{50} , and calculate the therapeutic index of a drug
- Recognize the types of agonists and antagonists and explain their actions
- Explain the parameters that affect dose scheduling for chronically administered drugs
- Identify individual factors that alter pharmacokinetics and pharmacodynamics (e.g., age, gender, disease, tolerance, compliance, body weight, metabolic proficiency, pharmacogenetics)
- Calculate the volume of distribution for different drugs and explain its significance
- Recognize the differences between zero order and first order elimination
- Predict the time that will take to get to a stable drug serum level, as well as, to get rid of an effective drug concentration
- Describe the major type of drug metabolism in the liver
- Review the general principles of autonomic pharmacology (ANS)

8. Course evaluation method:

Examination Policy:

Exam Composition: All examination questions will be multiple-choice. Clinical vignettes will be used for many questions, and images will be incorporated as appropriate. Approximately 1-2 questions per lecture hour, 1-2 questions per PBL case hour and 1-2 questions per laboratory hour will be used.

Exams will be delivered electronically via student laptops. Laboratory Practical Exams will be pen and paper exams.

During the exams, students are required to follow the examination protocol presented by the proctors. No specific questions regarding an exam item will be answered during any exam.

Examination Scoring: Scoring will be based solely on the answers recorded by the student on their laptop computer. Miskeying of answers will not be considered in grading a student's examination. Accuracy is the sole responsibility of the student.

Grades will be available via Blackboard in a timely fashion.

Viewing the Examination: All exams will be secure. Students can access a copy of the exam for review in the Office of Medical Education, Room BC-136

Grading Policy:

The course grade is made up of three components (exams, Anatomy exams & quizzes, and PBL). An unsatisfactory grade for any of the three components will result in an unsatisfactory grade for the course

Component 1

Exam 1	20 points
Exam 2	20 points
Exam 3	40 points

Component 2

Anatomy Exams & Quizzes 20 points

Component 3

PBL facilitators will provide narrative evaluation which will contain notations as to whether the student's academic and professional performance is on the level of "honors" (H), "high satisfactory" (HS) "satisfactory" (S), "marginally satisfactory" (MS), and "unsatisfactory" U. This will be based on the student's performance the following areas:

- Use of student's own knowledge base
- Knowledge acquisition/active learning
- Critical thinking/reasoning/problem-solving
- Teamwork/group communication and assessment

When a student obtains a "MS" or "U" on any examination, a letter is sent to the student asking them to contact the course director for assistance. The letter is copied to the student's file.

9. Course grading scale:

The grading scale for the course is as follows:

(H) Honors	= or >93% and (H) in PBL
(HS) High Satisfactory	85% - 92.99% (H) or (S) in PBL
(S) Satisfactory	= or >75% and (S) or (H) in PBL
(MS) Marginal Satisfactory	= or >75% and (MS) in PBL
	70%-74.99% and (H), (S) or (MS) in PBL
(U) Unsatisfactory	= or >70% and (U) in PBL
	<70% and (H), (S), (MS), or (U) in PBL

10. Policy on makeup tests, etc.

Exam Administration: All examinations will be administered in the Biomedical Sciences building on the dates and times documented in the examination schedule. A student must sit for all examinations as scheduled. A student must obtain permission for an excused absence from the course director and notify the Senior Associate Dean for Student Affairs prior to the time for sitting for a scheduled examination. In the event of a personal emergency, the course director and the Senior Associate Dean for Student Affairs must be notified of the absence as soon as possible. Missed examinations will be rescheduled at the discretion of the course director, at a time that does not interfere with other course work. Unexcused absences will result in a grade of zero (0) for the missed examination.

All absences from examinations should be documented by a PIR from the course director and will be communicated to the Office of Student Affairs. A record of excused and unexcused absences from examinations will be maintained by the Office of Student Affairs. A pattern of recurrent absences from examinations, whether excused or unexcused, will be reviewed by the MSPPSC and may result in a recommendation up to and including dismissal from the FAU Medical Education Program. (See Student Rights and Responsibilities Handbook)

11. Special course requirements:

Attendance Policy:

The FAU faculty and administration agree that student attendance and participation in all scheduled learning sessions are important to students' academic and professional progress and ultimate success as physicians.

Attendance at the Monday/Wednesday/Friday small-group sessions and wrap-up is mandatory.

For an absence to be excused, a request must be made to the Course Director. Only a Course Director can excuse an absence. No missed work associated with a specific session can be made up without loss of credit for satisfactory completion unless an excused absence has been granted.

An excused absence from a small-group PBL session will be made up by the assignment of an additional learning issue to the student. An unexcused absence will result in the assignment of an

additional learning objective for each absence, and documentation of absences in the narrative evaluation.

Attendance at the Tuesday morning anatomy sessions is expected for all scheduled activities. Students are expected to be on time: in that each session will start with a short written quiz, being on time is defined as being ready to start at the assigned time so as to not be pressured to finish the web-based quiz within its assigned time.

Repeated unexcused absences from required curricular activities may result in disciplinary action, up to and including dismissal from the FAU Medical Education Program.

12. Classroom etiquette policy:

Students should be considerate of each other by switching his/her cell phone to vibrate during all teaching activities.

If a telephone call is of an emergency nature and must be answered during class, the student should excuse him/herself from the lecture hall before conversing.

Laptop computer use should be limited to viewing and recording lecture notes rather than checking e-mail, playing or viewing other distracting websites. Students may be asked by faculty to turn off laptops during any session where group participation is required (such as PBL and wrap-up sessions).

13. Disability policy statement:

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) –in Boca Raton, SU 133 (561-297-3880)—and follow all OSD procedures.

14. Honor code policy:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility.

The FAU Honor Code requires a faculty member, student, or staff member to notify an instructor when there is reason to believe an academic irregularity is occurring in a course. The instructor must pursue any reasonable allegation, taking action where appropriate. The following constitute academic irregularities:

1. The use of notes, books or assistance from or to other students while taking an examination or working on other assignments, unless specifically authorized by the instructor, are defined as acts of cheating.
2. The presentation of words or ideas from any other source as one's own is an act defined as

plagiarism.

3. Other activities that interfere with the educational mission of the University.

For full details of the FAU Honor Code, see University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Honor_Code.pdf.

In addition to the FAU Honor Code, the FAU College of Medicine has adopted specific academic, professional and behavioral standards governing medical student conduct which the FAU COM faculty and administration believe are essential components of medical education and the development of medical students. The FAU COM academic, professional and behavioral standards are included in the COM Student Handbook.

15. Required texts/readings:

The following are textbooks that students are expected to purchase for use in the Fundamentals of Biomedical Science sequence. All the textbooks listed below will be available at the FAU Bookstore at the beginning of the academic year.

For FBS 1, the emphasis will be on the following:

Title	Author(s)	Publisher
Genetics in Medicine 7 th Edition	Thompson and Thompson	Saunders
Biochemistry: Lippincott's Illustrated Reviews 4 th Edition	Champe, Harvey and Ferrier	Lippincott, Williams and Wilkins
Langman's Medical Embryology 11 th Edition	Sadler	Lippincott, Williams and Wilkins
Histology: a Text and Atlas 6 th Edition	Ross and Pawlina	Lippincott, Williams and Wilkins
Essential Clinical Anatomy 4 th Edition	Moore, Agur & Dalley	Lippincott, Williams and Wilkins
Frank Netter Anatomy Atlas 4 th Edition	Netter	Elsevier

In FBS 2 and FBS 3, the additional texts are:

Title	Author(s)	Publisher
Medical Physiology 1 st Edition	Boron and Boulpaep	Elsevier
The Immune System 3 rd Edition	Parham	Garland Science
Medical Microbiology 5 th Edition	Murray, Rosenthal, Kobayashi & Pfaller	Elsevier
Robbins and Cotran's Pathologic Basis of Disease 7 th Edition	Kumar, Cotran, Robbins	Saunders

Edition		
Basic and Clinical Pharmacology 10 th Edition	Katzung	McGraw-Hill

16. Instruments and lab coats:

For the gross anatomy laboratory activity, students are required to dress appropriately in scrubs and lab coat with three-quarter length sleeve (preferred). Safety glasses are needed for splash protection while dissecting,

These supplies can be found at the FAU bookstore.

17. Supplementary resources:

Web Resources:

(These resources and others may be accessed via the “*Handouts and Links*” of the student e-Dossier on Blackboard)

Integrated Medical Curriculum <http://imc.meded.com/>

The site provides materials related to the gross anatomy component of the FBS sequence. A username and password will be given to each student.

Medline Dictionary, an online dictionary provided by the US National Library of Medicine and the National Institutes of Health, is a potentially useful resource during the PBL small group sessions.

The Visible Embryo <http://www.visembryo.com>

A visual guide through fetal development from fertilization through pregnancy to birth.

18. Web-based postings:

Students are encouraged to carry their laptop with them as much as possible in order to access resources, patient log and other resources.

Please refrain from checking personal e-mails during teaching periods. Please put your cell phone or pager on “vibrate” to minimize disruption.

Please be punctual as a courtesy to your colleagues and faculty.

Session handouts	Yes	Session Objectives	Yes	Quizzes	Delivered via laptop
Required Activities	Yes	Grades	Yes	Exams	Delivered via laptop (except practicals)

19. Course topical outline:

Content outline:

Please refer to Blackboard for up-to-date information and session-related objectives and handouts.

Session Topic
Introduction to FBS
Introduction to Histology
Introduction to Anatomy
Anatomy of ANS
Gross Anatomy Laboratory
Somatic and Autonomic Nervous Systems
Early Development Part I
Introduction and Flow of Information
Nucleic Acid Structure
Early Development Part II
Body Cavities
Back and Spinal Cord
Anatomy Case Correlations
Gross Anatomy Laboratory
Skeletal Muscular System Development
Eukaryotic Sequence Organization and Genomic Structure
DNA Replication
ANS Problems
DNA Mutation, Damage, Repair and Genetic Recombination
RNA Synthesis, Processing and Turnover
Shoulder and Axilla
Anatomy Case Correlations
Gross Anatomy Laboratory
Protein Synthesis
Control of Gene Expression
Introduction to Protein Structure and Function
Enzymology
Arm and Forearm
Anatomy Case Correlations
Gross Anatomy Laboratory
Introduction to Cell Membrane, Organelles and the Cytoskeleton
Signal Transduction
Recombinant DNA Technology I
Overview of Cell Cycle
Overview of Metabolic Pathways I
Introduction to Pharmacodynamics and Pharmacokinetics
Hands and Joints of Upper Limbs
Anatomy Case Correlations

Gross Anatomy Laboratory
Pharmacokinetics I
Overview of Metabolic Pathways II
Overview of Nitrogen Metabolism
Pharmacokinetics II
Overview of Metabolic Pathways III
Chest Wall and Lungs
Anatomy Case Correlations
Gross Anatomy Laboratory
Overview of Lipid Metabolism I
Cardiovascular Embryology I
Cardiovascular Embryology II
Pharmacokinetics and Pharmacodynamics Problems
Integration of Metabolism
Heart, Great Vessels and Mediastinum
Anatomy Case Correlations
Gross Anatomy Laboratory
Liver, Gallbladder and Pancreas

20. Study habits:

A major contribution to your learning is active engagement, which includes participation in the learning of other students and interaction with the instructors. Students are expected to be proactive and to access the Blackboard system to review items associated to individual sessions.

Learning in the field of medicine is a life-long endeavor that is not only necessary, but can and should be fun. One of the most important factors for learning is curiosity and sometimes, the best way to keep this curiosity stimulated is through our interaction with colleagues and peers. When learning in small groups, we have a chance to try to explain topics to each other, brainstorm solutions together, give each other constructive feedback, and support and validate each other. We encourage balancing studying alone with learning in small groups. It is important to develop a study routine to avoid “putting things off” and “cramming” and to minimize the stress we may add to our lives in that way.

21. Independent study time:

Independent Study Time allocated within the day time schedule is provided for students, on average about 9 hours per week.

Students are expected to use this time to further their learning. The time should be used for independent study or with peers. It is an opportunity to seek out faculty to interact with them outside the formal teaching setting. Since the PBL small-group format requires that students research learning objectives, the time may be used to prepare for the subsequent sessions. Finally, the time may be used to work on assignments, problem-solving cases, off-campus visits or other tasks that are required by the courses.

Occasionally, some Independent Study Time sessions may be used for curriculum-related activities (e.g. standardized examinations): notice will be given as early as possible for these occasions.

22. Pledge of respect for the gross anatomy component:

In recognition of the gift of human remains to the Anatomical Board of the State of Florida for use in our medical teaching, students are asked to sign the Pledge of Respect found in **Appendix 1** of this syllabus.

Please complete, detach and bring to 1st lab session on September 1, 2011. You will receive a bone box to help in your studies and they are available for checkout from Ms. Sandy Albrecht, RM. 335.

23. Dress code for gross anatomy sessions:

Students should protect their clothing by wearing a lab coat and/or scrubs. No open-toed footwear will be allowed.

24. Comments about the gross anatomy component:

The Tuesday morning activity in gross anatomy is divided into three parts.

First, the lectures in gross anatomy are meant to introduce concepts and relate the content to clinical problems. These sessions also have interactive discussions about content from related topics.

During the second hour, a number of clinical correlative problems, or minicases, will be reviewed with the students. These minicases are made available on Blackboard the preceding week and are meant to enhance the student's ability to relate gross anatomy concepts to both imaging modalities (CT, MR, etc.) and patient clinical scenarios. It is the responsibility of each student to use their texts, web-based resources, etc. to answer the questions addressed in these problems. A list of anatomy small groups (4 students per group) and a schedule of rotating tasks which include dissection, image and osteology, will be posted. Each week two students will dissect, and the remaining students will either review the image or osteology checklists. At some time before the quiz on Tuesday mornings, the group should convene and the dissectors for that week should demonstrate their preparation of the cadaveric learning material to the other members of their group. During this meeting, those members responsible for the images checklist (and in some instances those responsible for the osteology checklist) should also review that anatomical information with the group. Each member should work to insure that the others in their small group have learned the material found on the checklists.

Following the case review session, two students from each group will go to the gross lab. The laboratory component of this course is a self-directed dissection experience. A dissection guide, checklist, streaming video and atlas resources will be provided to the dissectors. The dissection laboratory will be open to students 24/7; anatomy faculty will be present in the lab from 1 to 3pm on Thursday afternoons.

Faculty will be available to assist you as needed during times other than Tuesday mornings.

Before the first session, all students are required to have completed the online courses in Blood-borne pathogens and formaldehyde use. Each one takes about 15-20 minutes to complete. These

courses are available at this web site, also available via the link in the “Handouts and links” section of your Blackboard e-Dossier.

25. Course and faculty evaluation:

FAU highly values the process of formal program evaluation and feedback. FAU students are required to complete all course evaluations and program evaluation surveys which are the Students Perception of Teaching (SPOT).

Grades and transcripts may be held for failure to submit required surveys. Evaluations should be constructive, to help improve individual faculty’s teaching, and the content and format of the courses.

Moreover, the timely completion of evaluations at the level of undergraduate medical education assists students in developing the administrative and organizational skills required throughout their academic and professional career. We appreciate your completing evaluations to help continue with improvement of the learning experiences and environment for all students.

26. Faculty (in alphabetical order):

Lecturers:

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Appendix

**Policies and Procedures Applicable to Florida Atlantic University Students
and Residents/Fellows**

Once a donated human anatomical specimen is made accessible to a faculty member of the Florida Atlantic University, the responsibility for the security and proper storage of the human anatomical specimen is that of the faculty member and the faculty member's program. Consonant with this responsibility, every student and resident having access to human anatomical specimens under the supervision of the faculty member will be required to sign the following pledge prior to having access to a donated human anatomical specimen provided by the Anatomical Board:

Pledge of Respect for the Sanctity of Donated Human Anatomical Specimens

I, the undersigned FAU student, resident, or fellow, recognize that the bequest of human remains to the Anatomical Board of the State of Florida represents a direct and important contribution to medical teaching and research. Such donations allow health professional faculty and students the opportunity to closely examine, evaluate, and understand the detailed structure of the human body. Further, the caring and thoughtfulness of such bequests provides physicians and research scientists with the opportunity to gain knowledge that may prolong, improve, or save someone's life. Without such bequests, medical science and health care would suffer devastating setbacks.

In recognition of the generosity of such bequests, I understand that the policy of the Anatomical Board of the State of Florida is to treat donated human anatomical specimens with the utmost respect and gratitude at all times, and I pledge to comply with this policy. I further pledge that the donated human anatomical specimens to which I have access will remain on the property of the Anatomical Board at all times, in specific storage space or teaching/research rooms approved for such use by the Anatomical Board, unless a signed authorization for transfer elsewhere has been executed by the Executive Director of the Anatomical Board of the State of Florida or his/her authorized designee. I further pledge to comply with all applicable requirements for timely return of human anatomical specimens to the Anatomical Board of the State of Florida.

Signature

Date

Typed or printed name

Title or Academic Class: Fundamentals of Biomedical Science I

Department/College: FAU College of Medicine