

Fundamentals of Biomedical Sciences (GMS6001) is a one-semester course consisting of lectures, discussion groups, grand rounds, and team-based learning activities. The course provides exposure to fundamentals of all of the disciplines represented by the seven advanced concentrations in the College of Medicine Interdisciplinary Program in Biomedical Science, and is designed to prepare students for study in any one of the advanced concentrations and at the same time provide training which is sufficiently broad to accommodate a diversity of careers in virtually any branch of modern biomedical science. While the lectures provide a survey of the material, the discussions provide a more intimate, in-depth examination of individual topics. Discussion groups consist of approximately ten students and one discussion leader. Most discussions focus on a research article and provide in-depth discussion of a discipline through a rigorous examination of this literature. To ensure uniformity among all of the discussion groups, a coordinator for each discussion will identify the appropriate literature and major points to be covered by all of the discussion groups. Grand rounds consists of a presentation by a basic scientist and/or a clinician covering a clinically important aspects of human disease related lecture or discussion material. Grand rounds are intended to enhance the significance of the other aspects of the course, and provide insight into the relevance of basic research into current problems in public health. Team-based learning (TBL) exercises are designed to evaluate scientific knowledge and develop skills in interpreting experimental data. Additional novel learning activities may appear on an experimental basis. Attendance at all lectures is expected but not mandatory. Attendance at other course activities is mandatory unless otherwise informed by the module director.

#### Content and Philosophy:

The curriculum for Fundamentals of Biomedical Sciences was developed in a collaborative effort by faculty representing the College of Medicine Advanced Concentrations. These disciplines provide a comprehensive perspective on biomedical research and human disease. The guiding philosophy in curriculum development was to integrate the fundamental knowledge of each of these disciplines in a logical succession so that each segment builds on previous sections and anticipates future sections. The result is a progression of material that might be described as "Molecules to Man".

The Fall semester deals with cellular and subcellular processes from biochemistry of macromolecules, molecular biology, cell biology, and genetics.

An essential practical goal of the curriculum is to provide students with the experience and knowledge necessary to read and interpret the primary research literature in any field of biomedical science. This goal is accomplished through the interplay between the lectures, grand rounds, and discussions. The lectures and grand rounds provide students with a current overview perspective and factual information concerning all aspects of biomedical science, while the discussions provide practical experience in the application of this knowledge through the study of relevant primary literature.

#### Organization:

The course is organized into five modules; biochemistry, molecular biology, genetics, signal transduction, and cell structure. Section leaders are responsible for the content and organization of the five segments of the course: Students are encouraged to take full advantage of the faculty. Students who have trouble understanding the material in a lecture or discussion should feel free to contact the lecturer, the section leader, or the course director.

#### Exams and Grading:

An exam will follow each of the five course modules. Individual section leaders have discretion over the

content and format of each exam. The various learning activities may be given different weights in determining the exam score for each module. Exams from previous years will be made available prior to each exam.

*Letter grades will not be awarded for individual sections during the Fall semester.* Exam scores from each of the five modules will have equal weight in determining the overall course grade. Cumulative percentage scores from each exam will be determined and letter grades assigned by the section leaders taking into consideration the final mean and distribution of all scores. While overall course grades are usually more generous, guaranteed cut-offs for final letter grades will be: A, >90; A-, 87-89; B+, 84-86; B, 80-83; B-, 77-79; C+, 74-76; C, 70-73; C-, 67-69; D, 60-66; E, <60.

#### Textbook and Lecture Material:

This website is the primary resource for information about the course. Students are responsible for examining this site regularly and thoroughly to keep up to date with course requirements and content.

Handouts for lecture will not be provided except under special circumstances. PowerPoints, and PDFs, and other course material are provided on e-Learning.

The required texts for the course are listed below. All will be available at the Health Science Center bookstore.

❑❑"Molecular Biology of the Cell" (6th Edition) by Alberts et al. Garland Science, 2015 ([book info](#)) W.H.

Freeman, 2011 ([book info](#))❑"Biochemistry" by Voet & Voet. ([book info](#)). )❑"An Introduction of Genetic

Analysis" (8<sup>th</sup> through 10<sup>th</sup> Edition) by Griffiths et al. may prove useful to students lacking a background in genetics but is not required.

#### Attendance and performance:

Attendance at all lectures is expected. Attendance at other course activities is mandatory unless otherwise informed by the module director. If for some reason a student is absent from a course activity, it is his/her responsibility to notify the section leader or course director. At any time during the semester, students who feel they are struggling to keep up with course material are encouraged to contact the section leader, course director, or graduate program coordinator.

#### Student Evaluations of Teaching:

GMS6001 faculty strongly encourage students to provide course evaluations. These student assessments are essential to continuous improvement of course material, activities, and teaching.

Information for Students with Disabilities: ❑Students with disabilities are encouraged to register with the Office for Student Services to determine the appropriate accommodations. Any student requesting special accommodations must be registered with the Dean of Students Office, P202 Peabody Hall, 392-1261 (TDD 392-3008), and have documentation on file in the office of Student Services in order to receive special accommodations such as examination accommodations. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation.

|  |                  |                           |             |    |  |                    |
|--|------------------|---------------------------|-------------|----|--|--------------------|
|  |                  |                           |             |    |  |                    |
| <b><u>Biochemistry &amp; Molecular Biology</u></b> |                  |                           |             |    |  |                    |
|  |                  |                           |             |    |  |                    |
| <b>Day</b>   |                  | <b>Time</b>               | <b>Room</b> |    | <b>Title</b>   | <b>Instructors</b> |
| <b>M</b>   | <b>8/22/2022</b> |                           |             |    | <b>Lab Rotation 1 begins Presentations 10/17-10/21</b> |                    |
| W  | 8/24/2022        | 8:30-9:30                 | C1-9        | L  | Introduction   | Resnick/Bungert    |
| Th   | 8/25/2022        | 8:30-9:20                 | C1-9        | L  | Methods and Experimental Design                        | Ball/Bungert       |
| Th   | 8/25/2022        | 9:30-10:25                | C1-9        |    | OPEN (no lecture)                                      |                    |
| F  | 8/26/2022        | 8:30-9:20                 | C1-9        | L  | ABL kinase & BCR-ABL                                   | L Bloom            |
| F  | 8/26/2022        | 9:30-10:25                | C1-9        | L  | Introduction to Chimera - Methods                      | L Bloom            |
|  |                  |                           |             |    |  |                    |
| M  | 8/29/2022        | 8:30-9:20                 | C1-9        | L  | Introduction to Amino Acids and Primary Structure      | L Bloom            |
| M  | 8/29/2022        | 9:30-10:25                | C1-9        |    | OPEN (no lecture)                                      |                    |
| T  | 8/30/2022        | 8:30-9:20                 | C1-9        | L  | Peptide Bonds and Secondary Structure                  | L Bloom            |
| T  | 8/30/2022        | 9:30-10:25                | C1-9        | L  | Tertiary and Quaternary Structure                      | L Bloom            |
| W  | 8/31/2022        | 8:30-9:20                 | C1-9        | L  | Protein Folding and Chaperones                         | L Bloom            |
| W  | 8/31/2022        | 9:30-10:25                | C1-9        | L  | Protein-Ligand Interactions                            | L Bloom            |
| Th   | 9/1/2022         | 8:30-9:20                 | C1-9        | L  | Methods and Experimental Design                        | Ball/Bungert/Bloom |
| Th   | 9/1/2022         | 9:30-10:25                | C1-9        | L  | Methods and Experimental Design                        | Ball/Bungert/Bloom |
| F  | 9/2/2022         | 8:30-9:20                 | C1-9        | L  | Protein-Ligand Interactions                            | L Bloom            |
| F  | 9/2/2022         | 9:30-10:25                | C1-9        | L  | Enzyme Catalysis & Mechanisms                          | L Bloom            |
|  |                  |                           |             |    |  |                    |
| <b>M</b>   | <b>9/5/2022</b>  | <b>HOLIDAY- LABOR DAY</b> |             |    |  |                    |
| T  | 9/6/2022         | 8:30-9:20                 | C1-9        | L  | Enzyme Catalysis & Mechanisms                          | L Bloom            |
| T  | 9/6/2022         | 9:30-10:25                | C1-9        | L  | Enzyme Kinetics & Inhibition                           | L Bloom            |
| W  | 9/7/2022         | 8:30-9:20                 | C1-9        | L  | Enzyme Kinetics & Inhibition                           | L Bloom            |
| W  | 9/7/2022         | 9:30-10:25                | C1-9        | GR | Introduction to CML                                    | Zeina Al-Mansour   |
| Th   | 9/8/2022         | 8:30-9:20                 | C1-9        | L  | Methods and Experimental Design                        | Ball/Bungert       |
| Th   | 9/8/2022         | 9:30-10:25                | C1-9        | L  | Methods and Experimental Design                        | Ball/Bungert       |
| F  | 9/9/2022         | 8:30-9:20                 | C1-9        | L  | Nucleic Acids Structure: DNA                           | Bungert            |
| F  | 9/9/2022         | 9:30-10:25                | C1-9        | L  | Nucleic Acids Structure: RNA                           | Bungert            |
|  |                  |                           |             |    |  |                    |
| M  | 9/12/2022        | 8:30-9:20                 | C1-9        | L  | Protein/DNA Interactions                               | Bungert            |
| M  | 9/12/2022        | 9:30-10:25                | C1-9        | L  | Gene and Promoter Structure                            | Bungert            |
| T  | 9/13/2022        | 8:30-9:20                 | C1-9        | L  | Molecular Modeling                                     | Ostrov             |
| T  | 9/13/2022        | 9:30-10:25                | C1-9        |    | OPEN (no lecture)                                      |                    |

|    |           |            |      |    |   |                  |
|----|-----------|------------|------|----|---|------------------|
| W  | 9/14/2022 | 8:30-9:20  | C1-9 | L  | Methods and Experimental Design             | Ball/Bungert     |
| W  | 9/14/2022 | 9:30-10:25 | C1-9 | L  | Methods and Experimental Design             | Ball/Bungert     |
| Th | 9/15/2022 | 8:30-9:20  | C1-9 | L  | Chromatin Structure 1                       | Guryanova        |
| Th | 9/15/2022 | 9:30-10:25 | C1-9 | L  | Chromatin Structure 2                       | Guryanova        |
| F  | 9/16/2022 | 8:30-9:20  | C1-9 |    | OPEN (no lecture)                           |                  |
| F  | 9/16/2022 | 9:35-10:25 | C1-9 |    | OPEN (no lecture)                           |                  |
|    |           |            |      |    |   |                  |
| M  | 9/19/2022 | 8:30-9:20  | C1-9 | L  | Phase Separation and Biological Condensates | Bungert          |
| M  | 9/19/2022 | 9:35-10:25 | C1-9 |    | OPEN (no lecture)                           |                  |
| T  | 9/20/2022 | 8:30-10:25 | TBA  | D1 | Chronic Myelogenous Leukemia (CML)          | Kevin Senior     |
| T  | 9/20/2022 | 8:30-10:25 | TBA  | D1 |   | Augustine Vinson |
| T  | 9/20/2022 | 8:30-10:25 | TBA  | D1 |   | Lauren Combs     |
| T  | 9/20/2022 | 8:30-10:25 | TBA  | D1 |   | Rodrigo Tomas    |
| W  | 9/21/2022 | 8:30-9:20  | C1-9 | GR | Structural Biology of Gene Therapy          | R. McKenna       |
| W  | 9/21/2022 | 9:35-10:25 | C1-9 |    | OPEN (no lecture)                           |                  |
| Th | 9/22/2022 | 8:30-9:20  | C1-9 |    | OPEN (no lecture)                           |                  |
| Th | 9/22/2022 | 9:30-10:25 | C1-9 |    | OPEN (no lecture)                           |                  |
| F  | 9/23/2022 | 8:30-10:25 | C1-9 |    | Review                                      |                  |
|    |           |            |      |    |   |                  |
| M  | 9/26/2022 | 8:30-11:30 | C1-9 |    | EXAM 1                                      |                  |
| T  | 9/27/2022 | 8:30-9:20  | C1-9 | L  | Transcription Prokaryotes                   | Bungert          |
| T  | 9/27/2022 | 9:30-10:25 | C1-9 | L  | Transcription Eukaryotes 1                  | Bungert          |
| W  | 9/28/2022 |            |      |    | HURRICANE IAN No Class                      |                  |
| Th | 9/29/2022 |            |      |    | HURRICANE IAN/ No Class                     |                  |
| Th | 9/29/2022 |            |      |    | HURRICANE IAN/ No Class                     |                  |
| F  | 9/30/2022 |            |      |    | HURRICANE IAN/ No Class                     |                  |
| F  | 9/30/2022 |            |      |    | HURRICANE IAN/ No Class                     |                  |
|    |           |            |      |    |   |                  |
| M  | 10/3/2022 | 8:30-9:20  | C1-9 | L  | Transcription Eukaryotes 2                  | Bungert          |
| M  | 10/3/2022 | 9:30-10:25 | C1-9 | L  | Transcription Eukaryotes 3                  | Bungert          |
| T  | 10/4/2022 | 8:30-9:20  | C1-9 | L  | RNA Processing 1                            | Mingyi Xie       |
| T  | 10/4/2022 | 9:35-10:25 | C1-9 | L  | RNA Processing 2                            | Mingyi Xie       |
| W  | 10/5/2022 | 8:30-9:20  | C1-9 | L  | Noncoding RNA                               | Bungert          |
| W  | 10/5/2022 | 9:35-10:25 | C1-9 | L  | Replication 1                               | Melike Caglayan  |
| Th | 10/6/2022 | 8:30-9:20  | C1-9 | L  | Replication 2                               | Melike Caglayan  |
| Th | 10/6/2022 | 8:30-9:20  | C1-9 | L  | Replication 3                               | Melike Caglayan  |

| F                      | 10/7/2022  | HOLIDAY- UF HOMECOMING |      |    |                                    |                  |
|------------------------|------------|------------------------|------|----|------------------------------------|------------------|
|                        |            |                        |      |    |                                    |                  |
| M                      | 10/10/2022 | 8:30-9:20              | C1-9 | L  | DNA Repair 1                       | Jianrong Lu      |
| M                      | 10/10/2022 | 9:35-10:25             | C1-9 | L  | DNA Repair 2                       | Jianrong Lu      |
| T                      | 10/11/2022 | 8:30-10:25             | TBA  | D2 | Chronic Myelogenous Leukemia (CML) | Kevin Senior     |
| T                      | 10/11/2022 | 8:30-10:25             | TBA  | D2 |                                    | Augustine Vinson |
| T                      | 10/11/2022 | 8:30-10:25             | TBA  | D2 |                                    | Lauren Combs     |
| T                      | 10/11/2022 | 8:30-10:25             | TBA  | D2 |                                    | Rodrigo Tomas    |
| W                      | 10/12/2022 | 8:30-9:20              | C1-9 | L  | Protein Synthesis 1                | Bungert          |
| W                      | 10/12/2022 | 9:35-10:25             | C1-9 | L  | Protein Synthesis 2                | Bungert          |
| Th                     | 10/13/2022 | 8:30-9:20              | C1-9 | GR | Cancer Epigenetics                 | Richard Bennett  |
| Th                     | 10/13/2022 | 9:35-10:25             | C1-9 |    | OPEN (no lecture)                  |                  |
| Fr                     | 10/14/2022 | 8:30-10:25             | C1-9 |    | Review                             |                  |
|                        |            |                        |      |    |                                    |                  |
| <u><b>Genetics</b></u> |            |                        |      |    |                                    |                  |
| M                      | 10/17/2022 | 8:30-11:30             | C1-9 |    | Exam 2                             |                  |

## Genetics

|           |                   |                   |             |    |  |                  |
|-----------|-------------------|-------------------|-------------|----|--|------------------|
| <b>M</b>  | <b>10/17/2022</b> | <b>8:30-11:30</b> | <b>C1-9</b> |    | <b>Exam 2</b>  |                  |
| T         | 10/18/2022        | 8:30-9:20         | C1-9        | L  | Chromosomes, Meiosis, Mendels's Laws                       | Resnick          |
| T         | 10/18/2022        | 9:35-10:25        | C1-9        | L  | Mendelian Inheritance, Recomb, Linkage                     | Resnick          |
| W         | 10/19/2022        | 8:30-9:20         | C1-9        | L  | Physical Maps  | Resnick          |
| W         | 10/19/2022        | 9:35-10:25        | C1-9        | L  | Cytogenetics, Human Mutation, and Cancer Genetics          | Resnick          |
| Th        | 10/20/2022        | 8:30-9:20         | C1-9        | L  | MicroRNA/CRISPR  | Brian Harfe      |
| Th        | 10/20/2022        | 9:35-10:25        | C1-9        |    | OPEN (no lecture)  |                  |
| F         | 10/21/2022        | 8:30-9:20         | C1-9        | L  | Analysis of Mutants  | Resnick          |
| F         | 10/21/2022        | 9:35-10:25        | C1-9        | L  | Population Genetics  | Resnick          |
| <b>F</b>  | <b>10/21/2022</b> |                   |             |    | <b>Rotation 1 ends</b>                                     |                  |
|           |                   |                   |             |    |  |                  |
| <b>M</b>  | <b>10/24/2022</b> |                   |             |    | <b>Rotation 2 begins- Presentations 12/12-12/16</b>        |                  |
| M         | 10/24/2022        | 8:30-9:20         | C1-9        | L  | Mouse I  | Resnick          |
| M         | 10/24/2022        | 9:35-10:25        | C1-9        | L  | Mouse II   | Resnick          |
| T         | 10/25/2022        | 8:30-10:25        | TBA         | D3 | Reversibility of acute B-cell leukemia induced by BCR-ABL1 | Kevin Senior     |
| T         | 10/25/2022        | 8:30-10:25        | TBA         | D3 |  | Augustine Vinson |
| T         | 10/25/2022        | 8:30-10:25        | TBA         | D3 |  | Lauren Combs     |
| T         | 10/25/2022        | 8:30-10:25        | TBA         | D3 |  | Rodrigo Tomas    |
| W         | 10/26/2022        | 8:30-9:20         | C1-9        | L  | Emerging techniques in genetics based analysis             | Resnick          |
| W         | 10/26/2022        | 9:35-10:25        | C1-9        | L  | NonMendelian Inheritance                                   | Resnick          |
| Th        | 10/27/2022        | 8:30-10:25        | TBA         | D4 | Correction of a pathogenic mutation in human embryos       | Kevin Senior     |
| Th        | 10/27/2022        | 8:30-10:25        | TBA         | D4 |  | Augustine Vinson |
| Th        | 10/27/2022        | 8:30-10:25        | TBA         | D4 |  | Lauren Combs     |
| Th        | 10/27/2022        | 8:30-10:25        | TBA         | D4 |  | Rodrigo Tomas    |
| Fr        | 10/28/2022        | 8:30-9:20         | C1-9        | L  | Genetic Imprinting   | Resnick          |
| <b>Fr</b> | <b>10/28/2022</b> | <b>9:30-10:25</b> | <b>C1-9</b> |    | <b>Review</b>  |                  |
|           |                   |                   |             |    |  |                  |
| <b>M</b>  | <b>10/31/2022</b> | <b>8:30-11:30</b> | <b>C1-9</b> |    | <b>Exam 3</b>  |                  |

### **Cellular Structure and Signaling**

|     |            |                       |         |     |   |
|-----|------------|-----------------------|---------|-----|---|
| T   | 11/1/2022  | 8:30-9:20             | C1-9    | L   | Plasma membrane   |
| T   | 11/1/2022  | 9:35-10:25            | C1-9    | L   | Introduction to Cell Signaling                                  |
| W   | 11/2/2022  | 8:30-9:20             | C1-9    | L   | Receptor Tyrosine Kinases/MAPK/AKT:PI3K I                       |
| W   | 11/2/2022  | 9:35-10:25            | C1-9    | L   | Receptor Tyrosine Kinases/MAPK/AKT:PI3K II                      |
| Th  | 11/3/2022  | 8:30-9:20             |         |     | OPEN  |
| Th  | 11/3/2022  | 9:35-10:25            |         |     | OPEN  |
| F   | 11/4/2022  | 8:30-9:20             | C1-9    | L   | GPCR/G-protein signaling I                                      |
| F   | 11/4/2022  | 9:30-10:25            | C1-9    | L   | GPCR/G-protein signaling II                                     |
|     |            |                       |         |     |   |
| M   | 11/7/2022  | 8:30-9:20             | C1-9    | L   | Cell Cycle I  |
| M   | 11/7/2022  | 9:35-10:25            | C1-9    | L   | Cell Cycle II   |
| T   | 11/8/2022  | 9:00-10:25            | R5-265  | TBL | CML: BCR-Abl Signaling  |
| W   | 11/9/2022  | 8:30-9:20             | C1-9    | L   | Cytoskeleton I  |
| W   | 11/9/2022  | 9:35-10:25            | C1-9    | L   | Cytoskeleton II   |
| Th  | 11/10/2022 | 8:30-9:20             |         |     | OPEN  |
| Th  | 11/10/2022 | 9:35-10:25            |         |     | OPEN  |
| F   | 11/11/2022 | HOLIDAY- VETERANS DAY |         |     |   |
|     |            |                       |         |     |   |
| M   | 11/14/2022 | 8:30-9:20             | C1-9    | L   | Cell Death I  |
| M   | 11/14/2022 | 9:30-10:25            | C1-9    | L   | Cell Death II   |
| T   | 11/15/2022 | 8:30-10:25            | CG67/68 | TBL | Cell: Life and Death  |
| W   | 11/16/2022 | 8:30-10:25            | C1-9    |     | Review for Exam 4   |
| Th  | 11/17/2022 | 8:30-9:20             |         |     | OPEN  |
| Th  | 11/17/2022 | 9:35-10:25            |         |     | OPEN  |
| F   | 11/18/2022 | 8:30-11:30            | C1-9    |     | EXAM 4  |
|     |            |                       |         |     |   |
| M   | 11/21/2022 | 8:30-9:20             | C1-9    | L   | Protein Sorting to RER I  |
| M   | 11/21/2022 | 9:30-10:25            | C1-9    | L   | Protein Sorting to RER II                                       |
| T   | 11/22/2022 | 8:30-10:25            | CG67/68 | TBL | Cell: Methodology   |
| W-F | 23-25      | HOLIDAY- THANKSGIVING |         |     |   |
|     |            |                       |         |     |   |
| M   | 11/28/2022 | 8:30-9:20             | C1-9    | L   | Vesicular Trafficking I   |
| M   | 11/28/2022 | 9:35-10:25            | C1-9    | L   | Vesicular Trafficking II  |
| T   | 11/29/2022 | 8:30-10:25            | CG67/68 | TBL | Cell: Protein Trafficking                                       |
| W   | 11/30/2022 | 8:30-9:20             | C1-9    | GR  | Alpha1-antitrypsin deficiency, a disease of the liver and lungs |

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| J Aris               |
| J Harrison           |
| B Law                |
| B Law                |
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| J Harrison           |
| J Harrison           |
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| S Narayan            |
| S Narayan            |
| B Law and J Harrison |
| S Holliday           |
| S Holliday           |
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| D Kopinke            |
| D Kopinke            |
| W Dunn and A Ishov   |
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| J Aris               |
| W Dunn and A Ishov   |
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| J Aris               |
| W Dunn               |
| W Dunn and A Ishov   |
| N Khoda              |