

**SCHOOL OF PHARMACY**  
**Medical College of Virginia**  
**VIRGINIA COMMONWEALTH UNIVERSITY**

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**MEDC 691 Special Topics – Glycochemistry and Glycobiology**  
**Credits 1.0, Spring 2013**

**FACULTY OFFICES & CONTACT INFORMATION**

Dr. Umesh Desai (Suite 212, Room 223 of Biotech Park I, 800 E. Leigh Street, Richmond, VA 23219; Ph. 8-7328, [urdesai@vcu.edu](mailto:urdesai@vcu.edu)) is the coordinator of the course. Other experts from outside VCU may be invited, e.g., Dr. Kuberan Balagurunathan of University of Utah, Dr. Krishna Rajarathnam of University of Texas, Dr. David Gailani of Vanderbilt University, Dr. Agnes Azimzadeh of University of Maryland and others.

**COURSE DESCRIPTION**

This course will present fundamental and applied principles of glycochemistry and glycobiology to students of the PharmD and MS/PhD programs. The glycochemistry module (~4 lectures) will integrate the chemical properties of carbohydrates. Emphasis will be placed on structure of carbohydrates including monosaccharides, disaccharides and polysaccharides and techniques used in their characterization. The glycobiology module will highlight the functional role of glycans with special emphasis on their modulation of physiological responses. Students will learn about the increasing role of glycans in biology and opportunities to develop pharmaceutically relevant entities.

**OBJECTIVES**

The goal of this course is to expose the student to the widening field of glycobiology. Having completed this course, a student should be able to:

1. Recognize and name common carbohydrates.
2. Predict the conformational properties of common carbohydrate/glycan structures.
3. Describe a simple protocol for the structural characterization of carbohydrates.
4. Predict the probable functional role of a glycan.
5. Describe carbohydrate – protein interaction phenomenon.
6. Describe the role of carbohydrates/glycans in modulating a biological response.
7. Compare and contrast pharmaceutical opportunities available with regard to glycans.

**REQUIRED TEXTS AND RESOURCES**

Lecture material is drawn from the primary literature. A useful book is "Essentials of Glycobiology, 2<sup>nd</sup> Edition (Ajit Varki (Ed), Cold Spring Harbor Laboratory Press 2009)".

**STRUCTURE**

The module will be presented using a one lecture hour per week format.

**ANTICIPATED METHODS OF COURSE DELIVERY**

Each didactic class consists primarily of a formal lecture presentation by an instructor. The instructor encourages questions from students and will often initiate brief discussions by asking questions of the students. Active student participation of this type is expected and encouraged. Students will be given the opportunity near the end of the semester to evaluate this course and the instructor. The evaluations will be reviewed by the Departmental Chairman and the course coordinator.

**EVALUATION AND GRADING**

A mid-term and a final exam will be given. If any exam is missed and an excused absence is recorded in the Dean's Office, the instructor may:

- a) give a written make-up test, or
- b) give an oral test, or
- c) calculate a grade based upon the examination taken.

Students should arrive on time for quizzes and examinations. Extra time WILL NOT be given at the end of a testing event to compensate for time lost due to tardiness. A student wishing to have an examination re-graded must do so within one week following the return of the examination. The entire examination will be re-graded. The course grade will be based on the following:

1	Mid-term	50%
1	Final Exam	50%
<b>Total</b>		<b>100%</b>

Performance levels for grades are not firmly established, however, they will not exceed the following:

67 and above	<b>Pass</b>
Less than 67	<b>Fail</b>

Students will come to exams/quizzes with only the items they need to complete. They should leave all other personal belongings in their locker, otherwise all book bags, electronic items (i.e., cell phones, PDAs, calculators, and IPODs) will be placed by the student on the floor in the designated area of the classroom. Failure to comply with this policy will result in an exam grade of zero.

## **POLICIES**

The Attendance Regulations of the School of Pharmacy apply fully, and will be enforced. Absence can only be excused by the Dean or his representative. Unexcused absence exceeding one per semester hour will result in the reduction of the earned grade by one level. Further reductions at the same rate will be made for succeeding blocks of unexcused absences. An unexcused absence from a test or the final will result in the assignment of a grade of zero for the missed activity, except in those instances when the Dean has specifically exempted the student from any penalty.

### **Statement on Americans with Disabilities Act**

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 require Virginia Commonwealth University to provide an 'academic adjustment' and/or a 'reasonable accommodation' to any qualified individual with a physical or mental disability who self-identifies as having such. Students should contact the Disability Support Services office on the MCV Campus (828-9782) for appropriate academic adjustments or accommodations.

### **Student Conduct in Instructional Settings Policy**

VCU Rules and Procedures state that students are entitled to receive instruction free from interference. Therefore, in classrooms, laboratories, and other learning areas, students are expected to conduct themselves in an orderly, cooperative and respectful manner.

- Exhibit professional behavior at all times (see "Standards for Professionalism in Instructional Settings" at [www.pharmacy.vcu.edu](http://www.pharmacy.vcu.edu))
- Adhere to the School's attendance policy and dress code
- Prepare in advance for all assignments
- Understand that professors' lecture outlines, slide presentations, audio/video media and examinations are protected as copyrighted materials and require permission for duplication
- Submit constructive comments on course and instructor evaluations

Students are encouraged to discuss behavior that is disruptive to learning directly with the person or people and/or the faculty member. If a faculty member believes that a student's behavior is disrupting the class and interfering with instruction, the faculty member can direct the student to leave the class for the remainder of the class period. Disruptive behavior on the part of the student may result in the completion of a Professionalism Concern Form.

### **VCU Honor System**

Virginia Commonwealth University recognizes that honesty, truth, and integrity are values central to its mission as an institution of higher education. The Honor System is built on the idea that a person's honor is his/her most cherished attribute. A foundation of honor is essential to a community devoted to learning. Within this community, respect and harmony must coexist. The Honor System is the policy of VCU that defines the highest standards of conduct in academic affairs.

The Honor System in its entirety can be reviewed on the Web [here](#) or it can be found in the 2010-11 VCU Insider at [www.students.vcu.edu/insider.html](http://www.students.vcu.edu/insider.html).

The Honor System must be upheld and enforced by each member of the Virginia Commonwealth University community. The fundamental attributes of our community are honor and integrity. We are privileged to operate with this Honor System.

## **Copyright Statement**

All the lectures, handouts, exams, assignments, and any other materials presented in this course are protected by federal copyright law; the copyrights are owned by the respective faculty lecturers and others. These materials are for your personal use and you may not copy, take photos, video or audio record, transmit, profit by, or make any other use of these materials without expressed written authorization of the faculty member in question. You do not have permission to record these lectures and resell the tapes to your classmates or any other party or broadcast any materials (e.g., World Wide Web) without the expressed written permission of the faculty member in question. You do not have permission to copy your notes and sell them to your classmates or any other party for a profit. Please see the course coordinator if there are any questions about this course policy.

## **VCU Statement on Safety**

What to know and do to be prepared for emergencies at VCU:

- Sign up to receive VCU text messaging alerts (<http://www.vcu.edu/alert/notify>). Keep your information up-to-date.
- Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms.
- Listen for and follow instructions from VCU or other designated authorities.
- Know where to go for additional emergency information (<http://www.vcu.edu/alert>).
- Know the emergency phone number for the VCU Police (828-1234). Report suspicious activities and objects.

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**Wed 3 – 4 PM?**

<u>Date</u>	<u>Lecture #</u>	<u>Instructor</u>	<u>TOPIC</u>
	1	URD	What is Glycobiology and Why Study it?
	2	URD	Glycan Diversity
	3	URD	Classes of Glycans
	4	URD	N-Glycans – Structure and Function
	5	URD	O-Glycans and Cancer
	6	KB	Mass Spectrometry in Structural Characterization of Glycans
	7	KB	Regulation of Heparan Sulfate Biosynthesis
		URD	Mid-term (10 pt /lecture; lectures 1→7; Weightage 50%)
	8	URD	Heparin and Coagulation
	9	URD	Heparan Sulfate and Growth Factor Function Regulation
	10	URD	Chondroitin Sulfate / Hyaluronan and Cartilage Degradation
	11	KR	Interaction of Proteins with Glycans
	12	KB	Glycosaminoglycans and Chemokines
	13	URD	Sialic Acids, Sialidases and Pharmacologically Active Agents
	14	URD	Role of Glycans in Bacterial Infections
	15	URD	Role of Glycans in Viral Infections
Dec Finals Week			Final Exam (10 pt /lecture; lectures 8→15; Weightage 50%)