EE 5345 – Introduction to Bio-Nanotechnology
Fall 2011
Syllabus

Name: Dr. SAMIR IQBAL
Office Number: NanoFab, Room Number 217
Tel Number/Email: 817.272.0228 / SMIQBAL@uta.edu
Office Hours: TBD

Time of Class: Tuesdays and Thursdays 9:30 am - 10:50 am
Place of meeting: 208 Woolf Hall

Course GTA: TBD
Course GTA O/Hs: TBD

Description of Course Content:

The goal of this course is to provide an introduction to the area of bio-nanotechnology. The basics of nanotechnology are covered, especially as applicable to biological and biomedical sensing, therapy and diagnostics. The theory, fabrication, techniques and uses of nano-scale devices and objects like nanopores, nanowires, carbon nanotechnology, etc. are covered as well as basic biological molecules and the need for their detection are discussed. Solid-state materials, devices and systems, top-down MEMS fabrication and bottom-up biochemistry, state of the art in BioMEMS and bio-nanotechnology are covered with particular emphasis on

(i) Introduction to solid-state fabrication at micro and nano-scale
(ii) Synthesis of 1-D, 2-D, 3-D nanostructures
(iii) Specialized fabrication processes (DUV, e-beam lithography, etc)
(iv) Basics of biological molecules (Proteins, DNA, cellular/nuclear)
(v) Electronic properties of biomaterials
(vi) Surface functionalization techniques
(vii) Nano-bio interface issues
(viii) Molecular recognition and specificity.

Required Textbooks and Course Materials: "Bionanotechnology" is at the cross-roads of a number of important engineering and scientific fields. No textbook is classified as "Required", rather recommended textbooks are placed on reserve in the library. Lecture notes, class handouts, some e-books and reading list will be followed for the course. The students will be expected to read assigned material before the lecture. A typical lecture will involve both review of methods, and a discussion of the underlying principles. We will also invite guest speakers that have expertise in bio-nano & related areas.

Recommended Books:

1. Nanodevices for the Life Sciences
   Editor: Challa S.S.R. Kumar, ISBN: 978-3-527-31384-6, John Wiley & Sons, Inc.
2. BioMEMS and Biomedical Nanotechnology
   Volume IV: Biomolecular Sensing, Processing and Analysis
   Editor-in-chief: Mauro Ferrari, ISBN: 978-0-387-25566-8, Springer, 2007, 407 pp.
3. Single-Molecule Techniques: A Laboratory Manual
   Editors: Paul R. Selvin, and Taekjip Ha, ISBN 978-087969775-4, CSHL Press, 2008, 507 pp.

Pre-requisites: For senior standing undergraduates or graduate students.

Descriptions of Major Assignments and Examinations with Due Dates: The course requires several homework assignments, one individual "Key Paper Review" presentation, a group research proposal and two exams. Blackboard (www.uta.edu/blackboard) will be used for assignment/project submission.

Assignments: Occasionally but no more than once per week, a homework assignment related to the current course material will be assigned. The full credit will be given for a reasonable attempt at the assignment (representing an hour or more of effort). Top 2 of each assignment solutions will receive 20% bonus points, and these solutions will be posted for inspiration to others (author name can be omitted, if requested).

Key Paper Review: Each student is required to do a literature search on a specific topic in Bio-nano. The goal is to identify the key paper(s) that launched a particular topic of research. A key paper could be the first paper (go back to the 19th century if you have to), or it could be a paper that finally explained a perplexing phenomenon. Topics can be discussed with instructor/GTA. Some example topics will be provided. The topic will be proposed with a **nomination report** and instructor will approve it. The "nomination" of the paper will be **less than one page**. Identify the shortcomings and explain the state of the art. More details will be provided in class.

Each student will **choose the deadline** for the formal nomination report. The earlier it is turned in, more points can be gained. If a "KPR Nomination Report" is submitted before the end of September, a maximum of 20 points will be given. If it is turned in by the middle of October, it will receive a maximum of 15 points. If it is submitted by the end of October it will net a maximum of 10 points. The report will be disseminated to the whole class. An earlier submission of report will maximize the utility of the report to the rest of the class. Each student will be asked to say a few words about the Key Paper in class.

Group Research Proposal: Towards the goals of developing a more interactive classroom environment and practicing analytical thinking and communication skills, a formal Group Research Proposal (report and presentation) will be developed in teams. The goal is to learn the process by which researchers, practicing engineers, and technology advisors, acquire, distill, process and present technically sound ideas based on alternative technological approaches to solve a problem. The aim is to turn data into information (meaningful data), and information into intelligence (actionable information). In the proposals we will not be competing for a multi-million dollar grant, rather we will apply this sort of approach to gauge our understanding and polish the critical thinking. The analysis would cover the state of the art and the synopsis of impeding problems/limitations. The major part of the proposal should present a technically sound solution backed with theory, data or simulation.

For this component of the course, the class will be divided into groups with each team comprising 2 to 3 students. Attempt will be made to form teams with balanced and complementary training and experience. Each group will develop and submit the proposal report (**minimum 3 pages in length**) by **October 20, 2011**. Each team member is responsible to contribute equally. On the day of the presentation, the group will make 20-30 minute oral presentations. Following the presentations, everyone will

be invited (and expected) to participate in discussion. Each individual's performance, and the performance of the team will be gauged using a standardized rubric. The total score of this course component will be broken down as follows:

- Report submitted by the deadline: 10% of course grade. All members of the group will receive the same score.
- Individual participation during presentation/discussions: 10% of course grade. Instructor/GTA will assess this portion of the grade on the basis of the quality and quantity of participation. Clarification questions will be asked. The presenter should be prepared to back up statements with references. Comments that clarify the issues or offer new ways to look at the problem will be considered particularly valuable.
- Peer Assessment: 5% of course grade. At the conclusion of the presentation, each student in the class will be required to rate each presenter. A 1-5 scale will be used, with "3" representing "average" effort, "1" would be a "slacker," and "5" would be reserved for exceptional effort. Only instructor/GTA will see the peer assessments. The average value of the class peer assessments will be used to determine the score on this component.

Exams: These will focus more on principles than methods. Dates of exams are:

Mid-term Exam:	Oct 6, 2008, 9:30 am - 10:50 am, WH208
Final Exam:	Dec 15 2011, 8 - 10:30 am, Room TBD

Grading Policy:

Assignments	15%
Key Paper Review	20%
Group Research Proposal	25%
Midterm Exam	20%
Final Exam	20%

Reference and Citation Policy: Include a bibliography of the research papers that you read in arriving at your Key Paper. Wikipedia and/or other websites can not be used as a reference in any of the assignments of this course. Proper referencing should be done using IEEE styling format given at following web address:

http://www.ieee.org/documents/ieeecitationref.pdf

It is not permitted to present and reporduce someone else's published words (and work) in a way that the source is not clearly referenced. No written, spoken, recorded text/speech from someone else can be used "verbatim" unless double quotes are used and proper citation and appropriate credit is noted. Website sources are generally not allowed in this course, but if it is unavoidable, same policy of citation holds for internet sources.

Attendance Policy: The course content will evolve around class-discussions and lecture notes. It would be imperative to attend the class to grasp the concepts and follow the material.

Make-up Exam/Assignment Policy: If a student can not meet an assignment deadline or appear for an exam or presentation, give the instructor/GTA an advance notice. Email the instructor, call a friend to email the instructor or meet the instructor before any anticipated conflict of schedule. No credit will be given for the missed assignment unless such absence/delay/failure-to-deliver occurs due to a documented emergency. You may be asked to furnish further evidence to confirm the nature of emergency.

Drop policy: The UTA drop policy will be adhered to. For a time table see links at
http://www.uta.edu/universitycollege/current/academic-planning/need-to-know-policies/schedule-changes.php

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled *Americans with Disabilities Act (ADA)*, pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, the instructor is required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

Academic integrity: It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. Each student is required to carefully read and sign the form titled “STATEMENT ON ETHICS, PROFESSIONALISM, AND CONDUCT FOR ENGINEERING STUDENTS”. If a student needs a soft copy of this statement, send an email to the instructor.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents’ Rules and Regulations, Series 50101, Section 2.2)

For the first occurrence of plagiarism by a student, a zero grade will be given on the exam, report, assignment, or project, as the case may be. Second occurrence of plagiarism by the same student (individual or in a team) will result in automatic reduction of one grade letter in the final grade. The Office of Student Judicial Affairs will be informed in writing if second or more cases of plagiarism are found for any student.

Plagiarism has many shapes, but can be explained in a few examples under the scope of this course. It may be presenting someone else’s published words (and work) in a way that these words (and works) do not clearly show the source. Any text from someone else’s work can not be used “verbatim” unless in double quotes and followed by a citation (or appropriate credit). Website sources like Wikipedia are generally not

allowed in this course but same policy of citation holds for internet sources also. If in doubt, ask the instructor/GTA.

Student support services available: The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

Library resources: Ms. Sylvia George-Williams is the Science and Engineering Librarian. She can help students get hold of reserve books, and can guide students in finding the literature or library materials that might be needed for assignments. She is available to assist students individually or as a group. She maintains subject guides and works with Library Liaisons to acquire new materials. She also maintains reference materials. She has her office in the UTA Science and Engineering Library, in room NH-B03D, and can be reached at 817-272-7519, and sylvia@uta.edu. Remember "Not everything can be found with Google or Yahoo!".

E-Culture policy: The University of Texas at Arlington has adopted the University email address as an official means of communication with students. Through the use of email, UT-Arlington is able to provide students with relevant and timely information, designed to facilitate student success. In particular, important information concerning registration, financial aid, payment of bills, and graduation may be sent to students through email.

All students are assigned an email account and information about activating and using it is available at www.uta.edu/email. New students (first semester at UTA) are able to activate their email account 24 hours after registering for courses. There is no additional charge to students for using this account, and it remains active as long as a student is enrolled at UT-Arlington. Students are responsible for checking their email regularly.

Instructor/GTA will send important course-related information to students' UTA e-mail addresses ONLY. An email sent to instructor/GTA should come from a UTA email account. Our junk mail filter does not like hotmail, yahoo, gmail and a long list of other words in email addresses. Any email sent from non-UTA accounts may never reach Instructor/GTA. Each student will be responsible for any misplaced or mis-directed email that is sent from non-UTA email address.

Submission of assignments, reports and presentations is strongly encouraged via blackboard (required in some cases). Upload the material before the deadline. Use standard software like Microsoft Office, Microsoft PowerPoint, Adobe Acrobat, etc. to prepare your answers. A PDF file is preferred than a word file.

Grade grievance policy: If you have any grievance regarding a grade, consult with Instructor/GTA. Information about the UTA grievance policy is given at http://www.uta.edu/gradcatalog/general_info#grievances