

## Proposed Changes to Graduate Programs in Chemical Engineering

- A new **MAS degree in biological engineering** is added to the graduate degree offerings. This Masters program will be offered with assistance from the biomedical engineering program and BCPS. ChE and BME could alternate teaching some electives. Details of the program components are presented in the *attached table*. Joint course offerings can be co-listed between ChEE and BME for some courses such as ChE 584/BME 525. This degree requires a total of 30 credits distributed as 9 credits for the core requirement, 7 credits for the biology requirement, 2 credits for the professional requirement and 12 credits for electives. A number of new elective courses in biological engineering will be developed as proposed in the attached table. The electives are intended to reflect the strength of the department and IIT in areas of biomaterials, biosensors, tissue engineering, bionanotechnology, bioactive membranes, biochemical engineering, bioenvironmental engineering, pharmaceutical engineering and food process engineering.

- *Admission requirements.* Applicants to the proposed MAS in biological engineering should have a background similar to our current ChE UG curriculum plus the equivalent of a basic biology course (BIOL 107 General Biology Lectures, BIOL 115 Human Biology or ChE 311/412 Foundations of Biological Sciences for Engineers). This will ensure they have the required background to take the advanced biology courses suggested in the program of study. BIOL 504 requires one course in Physical Chemistry, one in Organic Chemistry and one in biology (BIOL 107 and 115). BIOL 515 requires BIOL 504 as a prerequisite. Students would take BIOL 504 first. With the exception of the biology requirement (BIOL 107 or 115) all ChE UG students take 2 courses in Organic Chemistry and one in Physical Chemistry. Students without the adequate preparation in biology may be admitted, but will be required to take ChE 412 "Foundations of Biological Sciences for Engineers" as a remedial course.

- **The MAS degree in Chemical Engineering** is **modified** in order to align it with the new proposed MAS degree in biological engineering. Details are as follows:
  - i. Four core courses are still required, but ChE 501 and 503 are replaced by the two new core courses ChE XXX: "Intermediate Transport Phenomena" and "Intermediate Thermodynamics".
  - ii. Interested students are allowed to substitute ChE 577: "Bioprocess Engineering" (see bioengineering MAS) for ChE 525: "Chemical Reaction Engineering".
  - iii. A professional requirement is added (see bioengineering MAS) which constitutes of 2 credits in "Intellectual Property Management and Entrepreneurship".
  - iv. The total credit requirement is 30 credits, with 16 credits allowed for elective courses.

## Masters of Biological Engineering

- Degree awarded from Department of Chemical and Environmental Engineering
- 30 credits total
- Joint courses offered by BME.
- Same admission criteria as MAS in CHE Degree plus the requirement of one basic biology course BIOL 107, 115 or ChE 311/412 as a remedial course.

	Course	
<b>Core courses</b> (9 credits)	ChE 5XX: Intermediate Transport Phenomena ChE 5XX: Intermediate Thermodynamics ChE 577: Bioprocess Engineering	
<b>Biology requirement</b> (7 credits)	BIOL 504 Biochemistry Lectures  BIOL 515 Molecular Biology (after completing BIOL 504)	
<b>Electives</b> (12 credits)	ChE 580: Biomaterials BME 570: Engineering Biocompatible Materials ChE 584 Tissue Engineering/BME 525: Concepts of Tissue Engineering ChE 5XX: Bionanotechnology and Interfacial Phenomena ChE 573: Bioseparations ChE 5XX: Metabolic Engineering ChE 583: Pharmaceutical Engineering ChE 585: Drug Delivery ChE 5XX: Biosensors ChE 5XX: Process Analytical Technology EnvE 513: Biotechnological Processes in Environmental Engineering ChE 533: Statistical Analysis of Systems BME 533: Biostatistics ChE 597: Research Project FPE 5XX: any 500 level course Other approved electives from ChE, CHEM, BME, BIOL	
<b>Professional requirement</b> (2 credits)	Intellectual Property Management and Entrepreneurship	

- Currently, the following courses are offered on a regular basis by ChE full time faculty: ChE 580, ChE 584 (also offered as BME 525 by the Biomedical engineering department on an alternating basis), ENVE 513. Four core FPE courses are offered every year for the Food Process Engineering Program. ChE XXX: Bionanotechnology and Interfacial Phenomena has been prepared by a full time faculty in ChE and will be offered in Spring 2007. ChE 583 and 585 courses have been prepared by a part time instructor and will continue being offered on a regular basis. BME 533 is offered every year.