

# **4+1 Co-terminal BS Chemistry and MAS Food Safety and Technology**

## **1) Program Overview**

The Institute for Food Safety and Health (IFSH) is an Institute evolved from and built on the success of the National Center for Food Safety and Technology (NCFST) which was established in 1988 under a cooperative research agreement among IIT, FDA and the food industry. IFSH brings together the food safety and technology expertise of academia, industry, and the FDA in the common goal of enhancing and improving the safety and nutrition of foods for U.S. consumers. IFSH is the only institute where industry can collaborate on projects with FDA scientists on food safety, nutrition, and technology research.

The graduate education program of IFSH offers Master of Science (MS) and Professional Masters (MAS) degrees, certificates, as well as non-degree courses in Food Safety and Technology, and Food Process Engineering disciplines. These education programs are in collaboration with IIT's Department of Chemical and Biological Engineering and Department of Biological and Chemical Sciences. The IFSH education program has a current enrolment of 131 graduate students.

## **2) Program Justification (a-c)**

The master's degree programs in Food Safety and Technology (FST) are designed to train students with backgrounds in food science, Biochemistry, chemistry, or related disciplines to be food safety experts for the private sector and for the federal and state public health agencies. Therefore, value-added curricula such as combined BS/MAS degrees are part of IIT's strategic plan, and we would like to offer the Co-terminal degree in BS in Chemistry and MAS in Food Safety and Technology to boost enrollment and attract ambitious and highly motivated students. This would also enable IIT to retain talented Chemistry undergraduates to continue into the MAS FST program in a combined 5 year program. We anticipate about 5 students to enroll.

Relationship and benefits of the proposed 4+1 Co-terminal BS Chemistry and MAS FST

- Synergies between BS and MAS program curricula
- Enhanced skills and food safety and food science related employment opportunities for IIT graduates
- Integration of BS and MAS courses in years 4 and 5 to reduce time pressure on MAS courses in the final year
- Students save time and cost in gaining two degrees BS and MAS
- Easier for students to obtain finance for a joint BS+MAS degree than for two separate degrees

## **3) Program Resources**

The teaching faculty for the MAS degree is drawn from IFSH/IIT faculty and IFSH/FDA scientists, and is augmented by IIT faculty from several departments, together with scientists and experts from the private sector. In addition to the formal course requirements, students may participate in food safety and technology research projects at IFSH under the supervision of IIT faculty and FDA scientists. The FDA presence provides a unique opportunity for students to understand the synergy of scientific philosophy and legal issues involved in the regulatory process governing the safety and wholesomeness of the food supply. Hence, teaching resources are already available. IFSH classes are taught at the main campus and facilities are readily available. The Food Microbiology Laboratory class is taught at the Moffett campus and the facility is readily available.

#### 4) Program Description:

a.) The document outlines a 9 credit hour reduction of the total requirement for a co-terminal BS Chemistry and MAS FST program when they are combined into a unified, 4+1 BS/MAS program. This is considered a 9 total credit hour reduction achieved by efficiencies gained in unifying the two programs into an integrated curriculum encompassing both degrees. Accordingly, this would only apply to students receiving both IIT degrees BS Chemistry and MAS FST contemporaneously in a co-terminal 5 year BS/MAS program. UG transfer students would not be accepted after Y3 (where IIT students are formally accepted) and students wishing only an IIT MAS degree for instance would not be eligible.

1. 32 Credit hours to complete the MAS FST program. Twelve of the credits will be completed in the undergraduate Chemistry program starting in Year 4.
2. Special Project is optional (1-6 credit hours variable)
3. Project report/review –discretion of the Professor overseeing students
4. Comprehensive Exam (No)
5. Required Specialization /Concentration (No)
6. Required Courses – please see the attachment.
7. Elective Courses – please see the attachment.

#### b) Admission Requirements

Students can be admitted directly during UG admissions, or by ‘transfer’ of regular BS Chemistry students in Year 3. Chemistry Admission Advisors will work with FST advisors near Yr 3 to confirm the student is a fit for the Co-Terminal. The availability of this streamlined process into a graduate degree might be an effective high school recruiting tool.

A GPA of 3.0 would be required at the end of Y3. Earlier, direct admits would be subject to transfer into a regular BS program after Y3 if they do not meet this criterion. The gatekeeper would be the Chemistry and FST graduate admission committees. After this time, normal degree GPA requirements apply.

#### c) Curriculum and timeline schedule

The program is identical with the regular BS programs in Y1, Y2 and Y3. Year 3 will be the year the GPA cutoff will apply. In Years 4 and 5 both graduate level classes and upper division UG classes are taken. The shared courses (9 credit hours) are also taken in Years 4 and 5. (Sample curriculum attached)

5) Courses shared between the undergraduate and graduate programs will be a maximum of 9 credit hours taken in Years 4 and 5 for the required courses:

#### a) Shared courses

FST 505 Food Microbiology (3 credit hours)

FST 506 Food Microbiology Laboratory (3 credit hours)

FST 524 Fundamentals of Food Science and Technology (3 credit hours)

*4+1 Co-terminal BS Chemistry and MAS FST – continued*

b) shared elective courses - none

c) Course substitutions may only be made in the event a course is not offered in a particular semester. FST Graduate Advisor will inform the student if a course substitution is necessary.

6) Since this is a Co-Terminal Degree, the elective credit rules are:

- i. 400 credit hour limit? Yes
- ii. 400 level limit (0-3 credit hours)
- iii. 500-600 level (29-32 credit hours)
- iv. 700 level credit hour use (0) We do not offer any 700 level courses

## **Combined BS Chemistry and MAS Food Safety and Technology 5 Year Program**

This combined program allows students to complete both a Bachelor Degree in Chemistry and a Master Degree in Food Safety and Technology in 5 years. The Professional Master Degree in Food Safety and Technology does not require a thesis. The MAS program is designed for students who are looking for careers in food science.

Students should declare and intent to pursue the programs as soon as possible before and after undergraduate enrollment to facilitate advising by both Chemistry and FST Advisors; but are formally admitted after their third year of studies and meeting with FST Advisors, at which time must have a GPA of 3.0 or above. In the fourth and fifth years, students take a combined undergraduate/graduate curriculum that meets both undergraduate and Master degree requirements.

---

## Combined BS Chemistry/ MAS in FST

Required courses:

Credit hours

---

<b>Chemistry requirements</b>	<b>48</b>
CHEM 100, 124, 125, 237, 239, 240, 247, 321, 343, 344, 415, 416, 434, 451, 485 (2)**	
<b>Chemistry electives**</b>	<b>6</b>
<b>FST Requirements</b>	<b>18</b>
FST 505, 506, 507, 521, 524, 541	
<b>Biology Requirements</b>	<b>3-4</b>
BIOL 401/403	
<b>Mathematics requirements</b>	<b>18</b>
MATH 151, 152, 251, 252	
<b>Physics requirements</b>	<b>8</b>
PHYS 123, 221	
<b>Computer Science requirements</b>	<b>2</b>
CS 105	
<b>Humanities and Social Science Requirements</b>	<b>21</b>
For general education requirements see page X	
<b>Interprofessional Projects</b>	<b>6</b>
<b>FST Electives: Choose from the following</b>	
FST 501, 504, 511, 522, 531, 593, 594	<b>14</b>
or other FST Advisor approved elective	
<b>Technical electives*</b>	<b>6</b>

---

**TOTAL**

**150-151**

\*One of the technical electives must be BIOL 107 or BIOL 115. This course must be taken before the student enrolls in BIOL 401.

\*\* For a B.S. in Chemistry with thesis, CHEM450, CHEM 487 and one credit of CHEM485 are taken.

## Curriculum

### BS Chemistry and MAS Food Safety and Technology

Semester 1	Credits	Semester 2	Credits
CHEM 100 Intro to the Profession	2	CHEM 125 Prin of Chemistry II w/Lab	4
CHEM 124 Princ of Chemistry I with Lab	4	MATH 152 Calculus II	5
CS 105 Intro to Computer Programming I	2	PHYS 123 General Physics I	4
MATH 151 Calculus I	5	Humanities or Socieal Sciences Elective	3
Humanities 100-level Elective	3		
Total Hours	16	Total Hours	16
Semester 3	Credits	Semester 4	Credits
CHEM 237 Organic Chemistry I	4	CHEM239 Organic Chemistry II	3
CHEM 247 Analytical Chemistry	3	CHEM240 Organic Chemistry Lab	2
MATH 251 Multivariate & Vector Calculus	4	MATH 252 Introduction to Differential Equations	4
PHYS 221 General Physics II	4	Technical Electives *	3
Humanities or Socieal Sciences Elective	3	Humanities or Socieal Sciences Elective (300 + )	3
Total Hours	18	Total Hours	15
Semester 5	Credits	Semester 6	Credits
CHEM343 Physical Chemistry I	3	CHEM 344 Physical Chemistry II	4
CHEM321 Instrumental Analysis	4	CHEM 434 Spectroscopic Methods	4
IPRO 497 Interprofessional Project I	3	CHEM485 Chemistry Colloquium	1
Technical Electives *	3	Chemistry Elective**	3
Humanities or Socieal Sciences Elective (300 + )	3	Humanities or Socieal Sciences Elective (300 + )	3
Total Hours	16	Total Hours	15
Semester 7		Semester 8	
CHEM 415 Inorganic Chemistry	3	Chemistry Elective**	3
BIOL 401/403 Introductory Biochemistry	3/4	FST 521 Food Process Engineering	3
CHEM 451 Modern Techniques in Chem Literature	3	CHEM 485 Chemistry Colloquium	1
FST 505 Food Microbiology	3	CHEM 416 Inorganic Chemistry Laboratory	3
FST 506 Food Microbiology Lab	3	FST 507 Food Analysis	3
Total Credits	15/16	Humanities or Socieal Sciences Elective (300 + )	3
		Total Credits	16
Semester 9		Semester 10	
IPRO 497 Interprofessional Project II	3	FST 501 Nutrition, Metabolism and Health	3
FST 524.Fundamentals of Food Science	3	FST 531 HACCP Planning and Implementation	3
FST 594 Special Project	2	FST 541 Principles of Food Packaging	3
FST Elective	3	FST Elective	3
Total Credits	11	Total Credits	12

Total credits of the program: 150-151

\*CHEM 416, 450, 485, and 487 are not required for students pursuing a Bachelor of Science in Chemistry with emphasis in Chemical Education.

\*\* Students taking CHEM 487 need only one semester of CHEM 485.