

MBB revision 2016

Curriculum revision was approved by Biology unanimously 8th September 2016.

Rationale

The main problems with MBB as it stands are:

- The degree is very inflexible making hard to administer, and also difficult for the students to meet all requirements.
- MBB is a modest enrollment degree program (7 majors currently). This becomes a problem when specific courses are required for this major but no others, and can result in unsustainably low enrollment in those courses. Currently this is the situation for one such required class, PHYS410
- MBB was developed as a premed degree when Biology, Chemistry and Physics were combined together as the BCPS department. Several Biology faculty taught this class at that time; but since the split into individual departments, Physics has taken over scheduling and teaching PHYS410. This has complicated the low enrollment situation, as this class is rarely if ever taken by PHYS majors.
- This degree is attractive as a marquee degree. Historically a high proportion of life science focused CAMRAS applicants have applied to this program. If we can make it more viable it could be a modest growth area – especially in terms of student quality. But many students do not know what it is; and others are disappointed at the lack of biophysics content and transfer to other technical degrees (ENG, mostly BME; or BCHM)

Proposal

The proposal is to revise the degree to both create more flexibility and to increase the biophysics content that attracted the students in the first place. These changes are credit hour neutral. Additionally, MBB currently has only ONE biophysics class, even though biophysics is a focus of the major and presumably what attracted the student in the first place, and no electives where student could take other such classes.

To address this we propose adding significant flexibility to the degree, by removing some core required classes: PCHEM 2, modern PHYS, organic chemistry 2 lab, physiology, micro lab (courses whose inclusion was originally motivated by the MBB major being conceived of as a premed degree) while retaining them as possibilities for either “technical” or “biophysics” electives. We also expanded the number of electives from 0 to 5, and classify them into 2 categories:

1. **MBB electives** – these are courses selected as containing significant biophysics related content. Significantly, we have no biophysics specific courses in Biology. We propose to augment the existing list of available courses with two new Biophysics courses that could be implemented when resources permit and demand justifies. Since this would be only part of a group of electives, they would not need to be offered on any specific timetable, providing flexibility not only to the student, but also in administration. (9 credit hours)
2. **Technical electives:** to remain credit hour neutral, and to achieve parity with other degrees offered by the Biology department in elective content, there are another 2 technical electives (any 300 or 400 BIO, CHEM or PHYS course, or approved alternative) (6 credit hours)

By creating this flexibility we make it easier to schedule these low enrollment classes (perhaps on a every 2 year schedule) and make the degree easier to complete, especially for transferees, while providing more biophysics content to help grow the major.

Biology contribution to these electives

As the host department, it is incumbent upon Biology to contribute to these electives. Currently we do offer some biophysics content piecemeal in 500 level courses (504, 555, and 512) but do not have any UG offerings. To address this, we propose two new courses to increase the biophysics content that can be delivered by the Biology Department. Since these are all upper division electives:

- We have several years to get this going, as resources permit,
- They could be developed on a 2 year rotation, which will allow us to remain teaching slot neutral or even reduce load compared to the current situation, by alternating them with some other elective or lab.
- Since they are part of a panel of electives there is no specific need to offer any one of them in any semester at all, making this very flexible administratively

Course descriptions

BIO4xx lab “Protein and Molecular Techniques”

This lab will provide basic familiarity with the conceptual framework and practical operation of techniques in common use for the characterization of biologically relevant molecules, especially molecules and techniques of industrial or medical importance. This includes spectroscopic techniques such as NMR, CD, X-ray diffraction and scattering, fluorescence, surface plasmon techniques; measurement of molecular properties such as stability, aggregation and association and binding; and chromatographic techniques to isolate and purify such molecules.

BIO4xx “Biophysical Concepts and Techniques”

The course will provide an overview of thermodynamic and statistical mechanical properties of biological molecules, as well the theory and concepts of biophysical techniques used in the investigation of biological molecules and tissues. These will typically include spectroscopic techniques such as UV/Vis absorption and fluorescence including lifetime-resolved and FRET, Circular Dichroism, X-ray diffraction and scattering, NMR, super-resolution microscopy, and the conceptual basis of computational modeling techniques.

UGSC actions

Since this is credit-hour neutral, this revision qualifies a “minor change” and is presented as informational only.

This does not impact any classes required by any other majors.

Curriculum

The current and proposed [revised MBB](#) curricula are shown, as well as the basic biology BS and the other specialized degree offered by Biology department, biochemistry (BCHM)

BIOlogy	CH	126			BCHM		MBB	now		MBB	proposed			
Biology	CH	126			CH	128		CH	129		CH	129		
	100	2			100	2		100	2		100	2		
	107	3			107	3		107	3		107	3		
	109	1			109	1		109	1		109	1		
	115	3			115	3		115	3		115	3		
	117	1			117	1		117	1		117	1		
	210	3			210	3		210	3		210	3		
	214	3			214	3		214	3		214	3		
	225	2			225	2		225	2		225	2		
	401	3			401	3		401	3		401	3		
	402	3			402	3		402	3		402	3		
	430	3			430	3		430	3		430	3		
	445	3			445	3		445	3		445	3		
	404,446,431,491}	3			404	3	{404,446,431,491}	3		4xx	3	4xx	biophys lab	
	404,446,431,491}	3	{446,431,491}		404	3	{404,446,431,491}	3		4xx	3			
	451	2			451	2		451	2		451	2		
	495	1			495	1		495	1		495	1		
	495	1			495	1		495	1		495	1		
	E1	3			E1	3		E1	3		E1	3		
	E2	3			E2	3		E2	3		E2	3		
	E3	3			E3	3		E3	3		E3	3		
	E4	3			E4	3		E4	3		E4	3		
Chemistry	124	4			124	4		124	4		124	4		
	125	4			125	4		125	4		125	4		
	237	4			237	4		237	4		237	4		
	239	3			239	3		239	3		239	3		
					240	2								
	247	3			247	3		247	3		247	3		
					343	3		343	3		343	3		or chem505
					344	4								
					485	1								
								{chem phys}-495			1			
Physics	123	4			123	4		123	4		123	4		
	221	4			221	4		221	4		221	4		
	224	3						223	4		223	4		
								348	3					
								410	3					
Mathematics	151	5			151	5		151	5		151	5		
	152	5			152	5		152	5		152	5		
					251	4		251	4		251	4		
								252	4					
	425	3			425	3		425	3		425	3		
CS	105	2			105	2		104	2		104	2		
Humanities	1xx	3			1xx	3		1xx	3		1xx	3		
	3xx	3			3xx	3		3xx	3		3xx	3		
	3yy	3			3yy	3		3yy	3		3yy	3		
Soc. Science	1xx	3			1xx	3		1xx	3		1xx	3		
	1yy	3			1yy	3		1yy	3		1yy	3		
	3yy	3			3yy	3		3yy	3		3yy	3		
Hum/SocSci	1xx	3			1xx	3		1xx	3		1xx	3		
IPRO	497	3			497	3		497	3		497	3		
	497	3			497	3		497	3		497	3		
Free Elective	1	3												

N.B.: E1 and E2 “Technical Elective”; B1, B2, B3 “MBB elective”