



PennState

Master of Biotechnology

*A Professional Science
Master's Degree Program*



**Student Handbook
2023-24**

Introduction

The Master of Biotechnology (MBIOT) at Penn State University is a Professional Science Master's (PSM) degree program offered by the Department of Biochemistry and Molecular Biology in collaboration with the Huck Institutes of the Life Sciences. It is a multidisciplinary program involving faculty members from different academic departments and colleges at Penn State University as well as ad hoc mentors from the academic faculty and from industry.

At the most basic level, the translation of science to benefit society is what Biotechnology is all about. The MBIOT curriculum is designed to give students broad knowledge and training in the scientific and practical aspects of biotechnology, launching them into careers that will benefit society. It involves innovative, hands-on, and multidisciplinary learning approaches to train students in the science and state-of-the-art technology driving modern biotechnology, its business and legal aspects, intellectual property and regulatory aspects, and the ethical and social issues that it brings about. In addition, the courses and the activities required of all students in this program integrate professional development emphasizing teamwork and communication skills, networking and other professional proficiencies transferrable in any workplace.

Graduates of this program are prepared for diverse careers as scientists, educators, leaders and managers, across industry, government, and academic biotechnology realms. Many facets of the biotechnology field including the social, ethical, legal and intellectual property issues are examined. This broad knowledge base enables graduates to fill niches where the ability to interface across organizational groups in the workplace are required; this can accelerate biotechnology careers for our graduates.

Degree Requirements

The MBIOT degree requires a minimum of 30 graduate credits¹, 18 credits of which must be from courses in the 500 level and higher. Students are required to take 17 credits from core courses, including 3 credits of the Capstone Research Course. Additional credits are from elective courses chosen from course offerings of various academic departments. Courses related to agricultural applications, medical applications, business, etc. may be selected depending on the student's area of interest. Please see Appendices A and B for a list of required core courses and an exemplar program of

¹ Only courses numbered 400 and above count as graduate credits.

study, respectively. MBIOT students must complete a minimum 27 credits between their first two semesters.²

Core Courses

The MBIOT core courses are intended to provide the groundwork for careers in biotechnology; comprehension of molecular biology mechanisms and laboratory techniques, the principals of bioprocessing, and research professionalism are emphasized.

BMB 400 Molecular Biology of the Gene

The molecular biology of procaryotic and eukaryotic genes and genetics. (2 credits).

MCIBS 593 Molecular Biology Laboratory

An intensive lecture/laboratory course on the principles and techniques in molecular biology research. (3 credits)

BIOTC 479 Methods in Biofermentation³

Bioprocessing principles and development; uses and operation of biofermentors, determination of biomass; problems of scale-up. (3 credits)

MCIBS 571 Current Issues in Biotechnology

Group projects and lecture series by academic and industry speakers dealing with the state-of-the-art scientific developments in biotechnology, and the business, regulatory, intellectual property, legal, social, ethical and professional aspects of biotechnology. (2 credits)

MCIBS 591 Ethics, Rigor, Reproducibility and Conduct of Research in the Life Sciences

An examination of integrity and misconduct in life sciences research. (2 credits)

MCIBS 590 Colloquium Seminar Series

A monthly colloquium that will present current life science topics of general interest. (2 credits)

MCIBS 594 Research Project in Biotechnology

Supervised individual projects either in industry, academic or government laboratory, culminating in a Capstone research report (3-5 credits)

² Students must have a minimum of 12 credits for full-time status during the first two semesters.

³ Alternatively, students may take BE 468 - Microbiological Engineering (3 credits).

Elective Courses

An extensive number of elective courses are available to MBIOT students, chosen from offerings in various academic departments based on student's interests and career objectives. A sample, non-restrictive list of elective courses previously taken by MBIOT students is found in Appendix D.

For detailed course descriptions and additional elective options, please see:

<https://bulletins.psu.edu>

For Fall 2023 schedule of courses offered, please see:

<https://public.lionpath.psu.edu>

A strongly recommended elective is 'Individual Studies' (MCIBS 596, or equivalent 596 course under another department code). This course listing allows students to gain additional research experience and technical skills in laboratories on campus while earning elective credits (1-3 credits). Students must first seek permission from the faculty member whose research is of interest to them and agree on a work schedule in the host faculty's laboratory; this process is often initiated prior to the student's arrival to campus. Students interested in learning the technologies in the core research facilities on campus may also register MCIBS 596 after consultation with the academic adviser and the core facility concerned.

Responsible Conduct of Research Training

All students in the MBIOT graduate program are required to complete the online Collaborative Institutional Training Initiative (CITI) Biomedical Science Responsible Conduct of Research (RCR). This online course will supplement in-class, discussion-based RCR training provided in MCIBS 591, Ethics. Rigor, Reproducibility and Conduct of Research in the Life Sciences, a required 2-credit course.

New students must complete the online CITI RCR course at the start of their first semester, via the following process:

- Register on the Penn State CITI website <http://citi.psu.edu/>.
- Select your campus (University Park), then select Pennsylvania State University Courses and register for the Biomedical Responsible Conduct of Research Course.
- Independently complete the course modules and pass the on-line quizzes.
- Submit a copy of the 'Completion Report' to the program administrative office (email to fqh5144@psu.edu).



Capstone Research Project

All MBIOT degree candidates are required to complete a capstone research project culminating in a research paper. The primary objective of the research project is to provide to students a meaningful, practical work experience in biotechnology. This project can incorporate any topic related to the student's specific area of interest in biotechnology, including but not limited to: scientific/technical research, business practices, intellectual property and legal practices, or social and ethical facets.

The research project is completed during a 6-month, full-time research position, during which students enroll in MCIBS 594 (3-5 credits, depending on research outcomes); registration to this course must be done in consultation with the student's academic adviser. During this time, student immersion in the dynamics and expectations of the real-world workplace is meant to enhance their preparation and qualification for entry-level employment. Students are expected to learn not only about their host institution or laboratory but also:

- the work expectations within the host organization,
- the techniques involved in the specific research project,
- the existing knowledge that underlies the research problem,
- the skills involved in gathering, analyzing, organizing, and presenting data, and
- how to communicate the research properly and effectively, in writing.

The capstone research is typically conducted off-campus, hosted by industry, academic, non-government, or government organizations as a cooperative education (co-op) or internship activity. Students are required to independently apply, interview, and negotiate their individual co-op positions, though on-campus resources are available for support. In practice, students start preparing their resume in their first semester and begin applying for co-op positions in late Fall and early Spring semesters.

Students may also elect to do their research project on campus if that best suits their career objectives. It is each student's responsibility to identify a host laboratory or unit working in his/her area of interest, before or soon after arrival to campus. Students must also discuss the expectations for the project and terms of support with hosting faculty.

The capstone research project culminates in a scholarly research paper, submitted at the end of the co-op⁴. Evaluation of the report will be the responsibility of the graduate faculty member in charge of MCIBS 594, in consultation with the research supervisor, and/or a member of the biotechnology graduate faculty who has interest and expertise

⁴ Any proprietary information involved in the work can be uncoupled from the written report or the oral presentation; notify the instructor in-charge in advance so that an alternative written assignment can be arranged, if necessary.

in the research project of the student. Regardless of whether the research is done on- or off-campus, the student must make it clear to the host laboratory/unit/employer that a written report will be required and will need to be completed at a specific date determined by the student's curriculum.

MBIOT Program Contacts

For questions about the Master of Biotechnology degree program, please contact:

Natasha Tirko, Ph.D.

Program Director, Academic Advisor
211 Life Sciences Building

tirko@psu.edu

814-863-5751

MBIOT Program Administration

Freya Heryla – Records Specialist
The Huck Institutes

101 Life Sciences Building

fqh5144@psu.edu

University Resources

MBIOT Program Websites

The Huck Institutes of the Life Sciences:

<https://www.huck.psu.edu/graduate-programs/master-of-biotechnology>

The Department of Biochemistry and Molecular Biology:

<https://science.psu.edu/bmb/graduate/masters-programs>

The Graduate School Bulletin:

<https://bulletins.psu.edu/graduate/programs/majors/biotechnology/>

Integrated Undergraduate-Graduate Program in Biotechnology:

<https://science.psu.edu/bmb/undergraduate/degree-programs/BIOTC-IUG>

The Graduate School

<https://gradschool.psu.edu>

The Penn State Graduate School website includes comprehensive resources for all graduate students, including: education resources, student life information, general degree requirements, alumni and diversity information. Please take careful note of the graduate student policies and academic integrity expectations -

<http://www.gradschool.psu.edu/current-students/student/>.

The Graduate School's New Student Orientation

<https://gradschool.psu.edu/graduate-student-life/new-graduate-student-orientation/>

The Graduate School's New Student Orientation will be delivered as a Canvas course for Fall 2023; it will go live in late July 2023 and will remain in a student's Canvas dashboard for the remainder of their time at the University. The Orientation Canvas course has a wealth of information about the University, tips on how to be successful as a graduate student, and information about the many resources available to graduate students from health insurance to student support offices.

Student Life Resources

<https://www.psu.edu/current-students>

General resources and up-to-date information on University policies, registration and financial resources, academic resources, student living, diversity and inclusion, health and wellness and services and support.

Penn State Global

<https://global.psu.edu/category/international-students>

Information and resources for prospective and current international students as well as international alumni.

Career Services

<http://www.studentaffairs.psu.edu/career/>

Information regarding career counseling, resume review, mock interviews, career fairs, on-campus recruiting events, etc.

nittanylionCAREERS

<https://nittanylioncareers.psu.edu>

Penn State's single-system recruiting platform for all students, alumni and employers.

Commencement

<https://www.commencement.psu.edu/>

Information and resources needed as you prepare for graduation.

Appendix A: MBIOT Program of Study

	Course Code	Course Title	400-level Credits	500-level Credits	Suggested Semester
Core/Required Courses	MCIBS 590	Life Sciences Colloquium		2	Fall**
	MCIBS 593	Molecular Biology Laboratory		3	Fall
	MCIBS 591	Ethics in the Life Sciences		2	Fall**
	BIOTC 479* or BE 468	Biofermentation/ Bioprocessing	3		Spring
	MCIBS 571	Current Issues in Biotechnology		2	Spring**
	BMB 400	Molecular Biology of the Gene	2		Spring**
	MCIBS 594	Research Project in Biotechnology		3	Year 2**
Elective Courses					
Total Credits (by course level)				(Must be at least 18)	
Total Credits			(Must be at least 30)		

* BIOTC 479 or BE 468 will meet the program requirement.

** This is the required time to enroll in this course.

Appendix B: Example MBIOT Course Plan

	Course Code	Course Title	400-level Credits	500-level Credits
Year 1 - Fall Semester	MCIBS 590	Life Sciences Colloquium		2
	MCIBS 593	Molecular Biology Laboratory		3
	MCIBS 591	Ethics in the Life Sciences		2
	Elective	Course Title	3	
	Elective	Course Title		2
	MCIBS 596	Independent Research		1
	Semester Total Credits		13	
Year 1 - Spring Semester	BMB 400	Molecular Biology of the Gene	2	
	BIOTC 479	Biofermentation	3	
	MCIBS 571	Current Issues in Biotechnology		2
	Elective	Course Title	2	
	Elective	Course Title		2
	MCIBS 596	Independent Research		3
	Semester Total Credits		14	
Summer Semester	MCIBS 594	Co-op Capstone Research		1
Year 2 - Fall Semester	MCIBS 594	Co-op Capstone Research		2
Co-op Total Credits			3	
Total Credits (by course level)			10	20
Total Credits			30	

Appendix C: MBIOT Student Course Proposal

	Course Code	Course Title	Section	400-level Credits	500-level Credits
<i>Year 1 - Fall Semester</i>	MCIBS 590	Life Sciences Colloquium			2
	MCIBS 591	Ethics in the Life Sciences			2
	<i>Semester Total Credits</i>				

<i>Year 1 - Spring Semester</i>	BMB 400	Molecular Biology of the Gene		2	
	MCIBS 571	Current Issues in Biotechnology			2
	<i>Semester Total Credits</i>				

<i>Summer Semester</i>	MCIBS 594	Co-op Capstone Research	601		1
<i>Year 2 - Fall Semester</i>	MCIBS 594	Co-op Capstone Research	601		2
<i>Co-op Total Credits</i>				3	

<i>Total Credits (by course level)</i>			
<i>Total Credits</i>		30	

Appendix D: Sample Elective Courses Taken by MBIOT Students

Course Abbreviation	Course Number	Course Title	Course Credits
AGBIO	520	Agricultural Biosecurity: Protecting a Key Infrastructure	3
AGRO	460	Transgenic Plants	3
ANSC	413	Transgenic Biology	3
BBH	451	Pharmacological Influences on Health	3
BBH	452	Women's Health Issues	3
BIOE	512	Cell and Molecular Bioengineering	3
BIOE	514	Quantitative Microscopy	3
BIOE	597K	Regenerative Medicine	3
BIOET	501	Perspectives and Methods in Bioethics	3
BIOL	428	Population Genetics	3
BIOL	439	Practical Bioinformatics	3
BIOL	467	Neurodiseases	3
BIOL	469	Neurobiology	3
BIOL	472	Mammalian Physiology	3
BIOL	497	Evolution of Infectious Diseases	3
BIOL	597F	Bioinformatics I	3
BMB	408	Instructional Practice	1
BIOTC	416	Microbial Biotechnology	2
BIOTC/HORT	459	Plant Tissue Culture and Biotechnology	3
BIOTC	460	Advances and Applications of Plant Biotechnology	3
BIOTC	489	Animal Cell Culture Methods	3
BMB	401	General Biochemistry	2
BMB	411	Survey of Biochemistry and Molecular Biology Literature	1
BMB	432	Advanced Immunology: Signaling the Immune System	3
BMB	433	Molecular Toxicology	3
BMB/VBSC	435	Viral Pathogenesis	2
BMB	460	Cell Growth and Differentiation	3
BMB	464	Molecular Medicine	3

BMB	474	Analytical Biochemistry	3
BMB/MICRB	480	Cancer Development and Progression	3
BMB	484	Functional Genomics	3
BMMB	502	Critical Analysis of Biochemical, Microbial, and Molecular Biology Scientific Literature	1
BMMB	503	Molecular and Cellular Genetics	4
BMMB	510	Current Literature in Molecular Biology	1
BMMB	542	Eukaryotic Cell Biology	3
BMMB/MCIBS	551	Genomics	3
BMMB/MCIBS	554	Bioinformatics I	3
BMMB	852	Applied Bioinformatics	2
BRS	597	Biomanufacturing Lab	1-9
CHE	449	Bioseparations	3
ENGR	405	Project Management for Professionals	3
ENGR	425	New Venture Creation	3
ENGR	426	Invention Commercialization	3
ENTR	504	Essentials of Business Planning	2
ENT	535	Statistical Techniques in Entomology	3
FDSC	407	Food Toxins	2
FDSC	408	Applied Food Microbiology	2
HORT/BIOTC	459	Plant Culture and Biotechnology	3
HPA	410	Public Health Principles	3
MCIBS	596	Individual Studies	1-3
MCIBS	592	Current Research Seminar	2
MICRB	408	Laboratory Instructional Practice	2
MICRB	410	Principles of Immunology	3
MICRB	412	Medical Microbiology	3
MICRB	415	General Virology	3
MICRB	422	Medical Microbiology Laboratory	2
MICRB	435	Medical Virology	2
MICRB	447	Molecular Immunology Laboratory	1
MGM/IST/ENGR	425	New Venture Creation: Introduction to Entrepreneurship	3
MGMT	426	Invention Commercialization	3
MGMT	427	Managing an Entrepreneurial Start-up Company	3
NEURO	520	Cellular and Molecular Neuroscience	3

NUTRN	520	Readings in Nutrition	0.5
PHSIO	571	Animal Physiology	3
PPEM	405	Microbes and Plants	3
SOILS	420	Remediation of Contaminated Soils	3
STAT	500	Applied Statistics	3
STAT	501	Regression Methods	3
STAT	506	Sampling Theory and Methods	3
STAT	555	Statistical Analysis of Genomics Data	3
STS	589	Ethics and Values in Science and Technology	3
VBSC	405	Laboratory Animal Science	3
VBSC	420	General Animal Pathology	3
VBSC	430	Principles of Toxicology	3
VBSC	520	Pathobiology	3
VBSC	534	Current Topics in Cancer Research	3
VBSC	596	Individual Studies	1-3

MBIOT Graduates (2021-22 Cohort)



**Saranya
Amirthalingam**

Co-op: Bhoehringer
Ingelheim (Viral Platform
Group), Ridgefield CT
Now: time off for family



**Krishna
Battula**

Co-op: BMS (Functional
Genomics), Cambridge
MA
Now: Merck, Boston MA



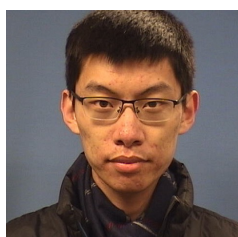
**Fay
Chios**

Co-op: GSK, Upper
Merion, PA
Now: GSK, Upper
Merion PA



**Christian
Pacifico**

Co-op: Merck, Boston MA
Now: AstraZeneca,
Discovery Hematology,
Boston MA



**Xueer Will
Han**

Co-op: CSL Behring
Facility, PSU
Now: PhD, University of
Illinois Urbana-
Champaign



**Stutee Santosh
Panse**

Co-op: Amgen, Thousand
Oaks, CA
Now: Amgen



**Nishitha
Kodali**

Co-op: Zoetis, Molecular
Biology, Kalamazoo MI
Now: Alnylam
Pharmaceuticals,
Cambridge MA



**Megha
Lakshminarayan**

Co-op: GSK, In vivo in vitro
Translation, Collegeville PA
Now: Dana-Farber
Cancer Institute, Fischer
Lab, Boston MA



**Aditi
Dixit**

Co-op: Boehringer Ingelheim
Animal Health, Athens GA
Now: Novartis (Antibody
Discovery), Cambridge MA



**Aidan
Matunis**

Co-op: Medina Lab, PSU
Now: PhD student,
University of Pittsburgh



**Soha Rajdatta
Patil**

Co-op: Sanofi, Waltham, MA
Now: New York Stem Cell
Foundation Research
Institute



**Meruyert
Yertemir**

Co-op: MTF Biologics,
Edison NJ
Now: Kazakhstan
Institute



**Kyle
Lee**

Co-op: Moderna,
Cambridge MA
Now: Moderna



**Aishwarya
Mahajan**

Co-op: GSK, Upper
Providence, PA
Now: Cleveland Clinic



**Sakshi Prakash
Tike**

Co-op: Syngenta, Durham
NC
Now: Syngenta

MBIOT 2nd-year Students (2022-23 Cohort)



*Master of Biotechnology
Program Member Profiles*



Maryam Al Najjar
2nd Year Student

Email	mha5451@psu.edu
LinkedIn	https://www.linkedin.com/in/maryam-al-najjar-a832a5258/
Hometown/Country	Iraq
Education	Medical Laboratory Technology, Al Furat Al Awsat Technical University
Exp. Grad. Year	Summer 2024
MBIOT Electives	Fall 2022: BIOL 455 (Stem Cell Biology and Therapy), BIOL 469 (Neurobiology), BIOTC 489 (Animal Cell Culture Methods), Spring 2023: BMMB 542 (Eukaryotic Cell Biology), MCIBS 596 (Individual Studies)
PSU Lab	Dr. Melissa Rolls; Dr. Lorraine Santy
Co-op Employer & Location	Planned for Spring 2024
Post-Grad. Plans	
Advice to 1 st Year Students	
Fun Fact	



*Master of Biotechnology
Program Member Profiles*



**Abhinayaa
Ananth Suryanarayana**
2nd Year Student

Email	ava6531@psu.edu
LinkedIn	https://www.linkedin.com/in/abhinayaananth/
Hometown/Country	Chennai, India
Education	B.Tech Biotechnology (PSG College of Technology) Master of Biotechnology (Penn State University)
Exp. Grad. Year	December 2023
MBIOT Electives	Fall 2022: BIOTC 489 (Animal Cell Culture Methods), NEURO 520 (Cellular and Molecular Neuroscience), MCIBS 596 (Independent Research) Spring 2023: VBSC 555 (Metabolomics), MCIBS 596 (Independent Research) Human Stem Cell Engineering Laboratory: Dr. Xiaojun Lance Lian
PSU Lab	Employing molecular cloning strategies to design a novel small molecule inducible plasmid vector to induce gene expression in human pluripotent stem cell lines with an aseptic mammalian cell culture technique.
Co-op Employer & Location	Moderna, Norwood, MA
Post-Grad. Plans	Looking forward to pursue a doctoral program in Molecular and Cellular Biology
Advice to 1 st Year Students	Choose coursework that are both interesting and easier to learn.
Fun Fact	I enjoy traveling to new places and meeting different people! A fun fact is I did a cross country trip from State College, PA to Hillsboro, OR and covered 6 national parks on the way!

MBIOT 2nd-year Students (2022-23 Cohort)



*Master of Biotechnology
Program Member Profiles*



Grace Buddle
2nd Year Student

Email	gkb5151@psu.edu
LinkedIn	https://www.linkedin.com/in/grace-buddle-74a9b01ab
Hometown/Country	North Wales, PA
Education	Bachelor's Degree: Biotechnology (Penn State University) Master's Degree: Biotechnology (Penn State University)
Exp. Grad. Year	Spring 2024
MBIOT Electives	BIOTC489, BIOTC479, BIOTC459, MICRB410
PSU Lab	Miyashiro Lab – Host Microbe Interactions The Miyashiro Lab studies the symbiosis formed between the Hawaiian bobtail squid, <i>Euprymna scolopes</i> , and the bioluminescent marine bacteria, <i>Vibrio fischeri</i> . My research is focused on the strain diversity and population evolution of <i>V. fischeri</i> in response to a selective pressure, then investigating the evolved populations to observe the impact of altered phenotypes on the ability of <i>V. fischeri</i> to colonize and establish symbiosis with the squid
Co-op Employer & Location	Merck; West Point, PA
Post-Grad. Plans	Full time job performing research in industry
Advice to 1 st Year Students	Start applying to co-ops early and apply to more than you think you need to! I started applying in September and would keep checking for new postings every few weeks, and I was able to receive an offer by December.
Fun Fact	I love hiking, cooking, and baking!



*Master of Biotechnology
Program Member Profiles*



Urvi Gadgil
2nd Year Student

Email	umg5013@psu.edu
LinkedIn	https://www.linkedin.com/in/urvi-gadgil-742595189/
Hometown/Country	Dubai, U.A.E
Education	Bachelor's degree: Biotechnology (The Pennsylvania State University) Master's degree: Biotechnology (The Pennsylvania State University)
Exp. Grad. Year	SPRING 2024
MBIOT Electives	BMB 480 (Cancer Dev & Progression)
PSU Lab	The Peters Lab: Dr. Jeffrey Peters (Undergraduate)
Co-op Employer & Location	Bristol Myers Squibb, Devens, MA
Post-Grad. Plans	Work full-time at a biopharma company
Advice to 1 st Year Students	<i>Don't be afraid to ask for help from anyone in our network if you need it.</i>
Fun Fact	I can do the chipmunk voice from Alvin and the Chipmunks :)

MBIOT 2nd-year Students (2022-23 Cohort)



*Master of Biotechnology
Program Member Profiles*



Naomi Kriner
2nd Year Student

Email	nsk13@psu.edu
LinkedIn	linkedin.com/in/naomi-kriner-biotech
Hometown/Country	Bradford, PA
Education	Bachelors: Biology (Lock Haven University)
Exp. Grad. Year	July 2024
MBIOT Electives	BIOT495: Plant Culture and Biotechnology BRS568: Applied Biomanufacturing Lab
PSU Lab	The Santy Lab (May 2023 – Dec 2023): Development and mobility of epithelial cells
Co-op Employer & Location	Will pursue a co-op for Spring 2024
Post-Grad. Plans	Biotechnology research and Project management
Advice to 1 st Year Students	<i>Natasha's Issues in Biotechnology course offers great insight into the business side of biotechnology and alternative careers. However, I'd advise you to be aware of the alternative careers so you can make an informed choice before scheduling your electives.</i>
Fun Fact	I have a 3-year-old corgi named Willow. We love to take walks in nature and go camping.



*Master of Biotechnology
Program Member Profiles*



Divya Nagarajan
2nd Year Student

Email	divya.n@psu.edu
LinkedIn	https://www.linkedin.com/in/nagarajan-divya/
Hometown/Country	India
Education	BS in Biomedical Engineering, Anna University
Exp. Grad. Year	December 2023
MBIOT Electives	Fall '22: Animal Cell Culture (BMB 489), Bioprocessing (BRS 568) Spring '23: Bioinformatics I (BMMB 554), Metabolomics (VBSC 555), Individual Studies (MCIBS 596)
PSU Lab	Santhosh Girirajan
Co-op Employer & Location	Seres Therapeutics, Cambridge, MA
Post-Grad. Plans	
Advice to 1 st Year Students	
Fun Fact	

MBIOT 2nd-year Students (2022-23 Cohort)



Master of Biotechnology
Program Member Profiles



Preeti Naik
2nd Year Student

Email	Pbn5109@psu.edu
LinkedIn	https://www.linkedin.com/in/preetinaik1/
Hometown/Country	Bangalore / India
Education	B.Tech In Biotechnology (PES University), Master's in Biotechnology (Penn State)
Exp. Grad. Year	December 2023
MBIOT Electives	Fall 22' : Animal cell Culture (BMB 489), Bioprocessing (BRS 568), Individual studies (MCIBS 596) Spring 23' : Medical microbiology (Micrb 412), Individual studies (MCIBS 596)
PSU Lab	Szpara Lab (virology), Dr. Moriah Szpara (Image analysis to quantify viral plaques) https://szparalab.psu.edu/people/preeti-naik/
Co-op Employer & Location	Biogen, Cambridge, MA
Post-Grad. Plans	Full Time Employment in a Biotechnology Company / PhD
Advice to 1 st Year Students	<i>It's going to be fast and frenetic, but you'll make it at the end, Do not worry too much! Don't forget to make memories and have fun alongside the vigorous academic courses that you'll go through. It'll be over before you know it :)</i>
Fun Fact	I love swimming, playing TT, hiking and cooking



Master of Biotechnology
Program Member Profiles



PV Hemanth Sai
2nd Year Student

Email	vzp5256@psu.edu
LinkedIn	linkedin.com/in/pv-hemanth-sai-040644180
Hometown/Country	Hyderabad, India
Education	Bachelor's Degree: Biotechnology (KL University) Master's Degree: Biotechnology (The Pennsylvania State University)
Exp. Grad. Year	December 2023
MBIOT Electives	Fall '22 : BMB 480 Cancer Dev & Progression, BRS 568 Applied Biomanufacturing Lab, NEURO 520 Cellular & Molecular Neuro Spring '23 : VBSC 555 Metabolomics, MCIBS 596 Individual Studies
PSU Lab	Dr. Andrew Zydny's Lab: Worked with RC and PES filter to determine the membrane fouling rate before and after protein purification. Conducted a literature review on the effects of different surfactants on membranes used in the product filtration procedures
Co-op Employer & Location	Johnson & Johnson family of companies, Malvern, PA
Post-Grad. Plans	To get a fulltime employment in a biotechnology company
Advice to 1 st Year Students	Start your search for a lab of your liking and get in contact with the professor early enough, even before starting your first semester and make sure you pursue it relentlessly. Getting into a lab and working there really helps. Focus on enjoying the subject and learning new things from the electives you choose, it helps.
Fun Fact	I cook when I feel low and watch FRIENDS while eat it.

MBIOT 2nd-year Students (2022-23 Cohort)



Master of Biotechnology
Program Member Profiles



Dixit Raiyani
2nd Year Student

Email	dgr5194@psu.edu
LinkedIn	https://www.linkedin.com/in/dixit-raiyani-50678a1a0/
Hometown/Country	Gujarat, India
Education	BS (Hons.) in Life Sciences (Ahmedabad University) MS in Biotechnology (The Pennsylvania State University)
Exp. Grad. Year	December 2023
MBIOT Electives	Fall'22 – Animal Cell Culture (BIOTC 489), Applied Biomanufacturing Lab (BRS 568). Spring'23 – Medical Microbiology (MICRB 412), Metabolomics (VBSC 555).
PSU Lab	Ali Demirci Lab (Bioengineering) Title: Design a fermentation process of L-glutamine by Corynebacteria glutamicum.
Co-op Employer & Location	GSK, Upper Merion, PA
Post-Grad. Plans	Full Time Employment in Biotechnology Company.
Advice to 1 st Year Students	You will find this curriculum going super fast, but you will be able to cope up with the pace. I suggest that you look for labs prior to coming; that will help you find your spot in a lab. Special suggestion: don't run behind the marks; grab opportunities to learn more and more. There are ample opportunities for on-campus jobs, so don't worry about that. Make more and more connections at the university and with the people you meet. State college is so beautiful, so have fun with your learning.
Fun Fact	I am passionate about cooking, and I love to try new dishes. I like swimming and painting. I love organizing and managing events.



Master of Biotechnology
Program Member Profiles



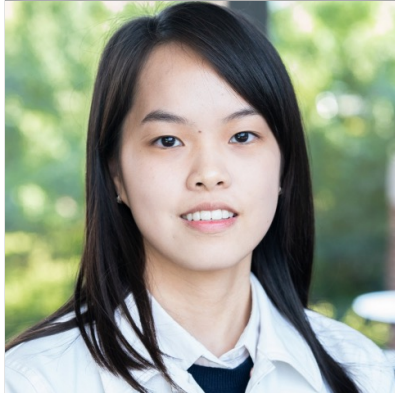
Brooke Stem
2nd Year Student

Email	bas6667@psu.edu
LinkedIn	https://www.linkedin.com/in/brooke-stem-a75b93158/
Hometown/Country	Central City, PA, USA
Education	Bachelor's: Saint Francis University, Molecular Biology Master's: Penn State University, Biotechnology
Exp. Grad. Year	December 2023
MBIOT Electives	Fall '22: PPEM 405 (Microbes & Plants); MCIBS 596 (Individual Studies); BIOTC 489 (Animal Cell Culture Methods) Spring '23: BIOL 559 (Darwin's Origin of Species); MCIBS 596 (Individual Studies)
PSU Lab	Dr. Melissa Rolls – Developmental Biology Using Drosophila melanogaster as a model to study microtubule polarity of dendrites; Utilizing EB1-GFP assay to visualize microtubule plus-end movement; Responsible for general fly husbandry and genetics, including separating virgins
Co-op Employer & Location	CSL Behring Fermentation Facility; PSU main campus
Post-Grad. Plans	Full-time employment in biotechnology company (not sure which yet!)
Advice to 1 st Year Students	<i>PPEM 405 was a harder class but you learned a lot as long as you're good at memorizing life cycles of diseases and whatnot (and I mean you have to illustrate trees, hyphae, etc). BIOTC 489 I took with Dr. K, she was easy, but the class could be frustrating in terms of writing lab reports. I learned many useful skills in this lab though, so highly recommend if you're looking to do any type of cell work. My favorite elective was my BIOL 559 since we discussed the Origin of Species book. On another note, BMB 400, Dr. Katsu Murakami was hard for me, I didn't get the hang of his tests until almost the last one. I felt his class to be quite difficult, so if there is a professor that teaches it besides him, I would take that. I was able to find a lab fairly quickly because I had Dr. Rolls for Colloquium. It's always easier to ask a professor to join their lab after you've created a relationship with them.</i>
Fun Fact	I'm a big animal person. I've rescued 3 leopard geckos and a middle-aged cat from unfit conditions. It's my own personal zoo!

MBIOT 2nd-year Students (2022-23 Cohort)



*Master of Biotechnology
Program Member Profiles*



Yu Syuan Wu
2nd Year Student

Email	yqw5680@psu.edu
LinkedIn	https://www.linkedin.com/in/yu-syuan-wu-282a0a1a2/
Hometown/Country	Taipei, Taiwan
Education	Bachelor's degree: Biomedical Sciences Master's degree: Biotechnology (Pennsylvania State University)
Exp. Grad. Year	December 2023
MBIOT Electives	Fall' 2022: MCIBS 596 Individual Studies, NEURO 520 Cellular & Molecular Neuro Spring' 2023: VBSC 405 Lab Animal Science, MCIBS 596 Individual Studies, VBSC 555 Metabolomics
PSU Lab	Microfluidic Lab – Dr. Paul Cremer (Chemistry department) Plant Pathology Lab – Dr. Sharifa Crandall
Co-op Employer & Location	BlueRock Therapeutic; Boston
Post-Grad. Plans	Full Time Employment in a Biotechnology Company
Advice to 1 st Year Students	<i>Networking is important!!</i>
Fun Fact	I love all kinds of sports and travelling! Have accidents every time travelling lol.

Master of Biotechnology Program Penn State University

Capstone Research Project (CRP) Information

Contents:

Information:

CRP – Overview	Page 2
CRP – Timeline	Page 3
CRP – Professionalism and Academic Integrity	Page 4
CRP Report – Requirements	Page 5
CRP Report Alternative – Review Paper Requirements	Page 7

Forms:

CRP Report Cover Page	Page 9
CRP Review Cover Page	Page 10
CRP Endorsement Page	Page 11

Capstone Research Project - Overview

The purpose of the Capstone Research Project is to provide students enrolled in the Master of Biotechnology (MBIOT) program an opportunity to complete an independent research project in a field directed towards their intended career path. The nature of the research projects can be as diverse as the field of biotechnology itself and the types of industry that serve as hosts for students' research work; the work may be completed in industry, government, nonprofit, or academic research during the co-op period.

The primary objective of the research project is to allow students a meaningful practical experience in work or research related to biotechnology, to enhance the student's preparation and qualifications for diverse employment opportunities. In the process, students are expected to learn not only the techniques involved in their specific research project, but also: the proper conduct of research within the context of the organization in which they are doing research; the existing knowledge that underlies the research problem; the skills involved in gathering, analyzing, organizing, and presenting data; and how to effectively communicate the research in writing and orally.

The research project must be conducted over a period equivalent to a minimum of 6 months of full-time work (defined as 40 hours/week); a research paper is required at the culmination of the project and will complete the capstone requirement for the degree.

The research findings* will be communicated in a written paper of publishable quality and will be reviewed with each student's Supervisor or Principal Investigator (PI) and the Program Director. The report evaluation and the student performance evaluation (by the Supervisor/PI) will determine the Capstone Research Project grade.

** Proprietary/Confidentiality Issues* - Students are expected to discuss with their Supervisor/PI very early on regarding the nature of the research as it relates to proprietary or confidentiality issues. In accordance with academic rules pertaining to student research:

- The research paper should not be subject to confidentiality agreements with the organization or industry that hosts the student's research project.
- In cases where confidential or proprietary information constitute part of the student's research work, references to such information must be uncoupled from the research paper or report.
- If a major portion of the student's work is proprietary, the student must obtain a certification from the research Supervisor/PI informing the Program Director of the proprietary nature of the student's research. An alternative paper or written assignment will then be arranged; this may be a comprehensive review on a topic related to the student's biotechnology interests and/or the Capstone Research if appropriate.

Capstone Research Project - Timeline

Prepare for your Capstone Research – Year 1 (Fall & Spring Semesters)

Students are encouraged to participate in on-campus research during their first year, in research most interesting to them. Research positions must be coordinated with faculty and students*; the Program Director does not arrange research opportunities. Depending on the arrangement, students may enroll in research credits (XXX 596) or receive financial compensation for their research efforts. In some cases, students will continue working in a campus lab for their full-time, 6-month research requirement to fulfill their capstone requirement. This option is available at the discretion of the lab PI. This might be most appropriate for students interested in continuing their careers in academia.

* It is helpful to initiate discussions with potential labs prior to arrival to campus.

Students interested in completing industry research experiences are responsible for applying and being offered 6-month co-op positions, to begin after completion of 2 semesters of coursework. Applications for Summer co-ops may begin *as early as Fall* prior to Summer start dates and continue throughout the spring semester.

Once your research position/co-op is determined, submit the 'Capstone Research Project Information' document to the Program Director.

Begin your Capstone Research – Summer Semester

During co-ops, students must request enrollment in MCIBS 594 Section 601 for a total of 3 credits**. Typically, 1 credit is taken in the Summer Semester, and 2 credits are taken in the Fall Semester.

** For international students: please contact the International Student and Scholar Advising (ISSA) office regarding minimum credit requirements and application for Curricular Practical Training (CPT) work authorization for employment.

Student Capstone Research will typically begin in May-June following their second semester. During the first month of the co-op, discuss with your Supervisor/PI the nature of the research as it relates to proprietary/confidentiality issues and submit the 'Capstone Research Project Plan' document to the Program Director. This will determine the format for your 'Capstone Research Project Report' (research or review paper).

Please submit the 'Capstone Research Project Update' document to the Program Director two (2) weeks prior to the end of the Summer Semester.

Complete your Capstone Research – Year 2 (Fall Semester)

Student Capstone Research will continue through the Fall Semester of their second year of the MBIOT program. Students must request enrollment in MCIBS 594 Section 601 for the remaining required credits. During this final semester, students will prepare draft sections of their 'Capstone Project Report' for submission deadlines as indicated on the MCIBS 594 Canvas course page. The final Report will be submitted as an electronic format PDF, due two weeks prior to the end of the semester.

Capstone Research Project – Professionalism and Academic Integrity

A message to the student, from the Program Director:

The purpose of the Capstone Research Project and Report is to help you become an experienced professional in biotechnology. The Report is an important milestone and should be a body of work of which you are proud, and that represents your dedication to your education and career.

During your Capstone Research, whether in industry or academia, the level of your personal investment in the process will determine the benefit you get from the experience. As you've been constantly advised by the MBIOT Advisory Board and other professionals: do more than the minimum expected work, take on additional responsibilities and challenges, seek out and learn new skills and techniques, etc. Taking shortcuts will devalue the experience.

Similarly, strong investment and commitment to your writing your Capstone Report will ensure you receive maximal benefit from the experience. Writing and science communication is a practiced skill, and taking shortcuts will rob you of the learning opportunity. The shortcuts I'm specifically referring to:

Plagiarism:

Plagiarism is an academic and professional offense that carries serious consequences. A helpful tool for review the challenges in American academic writing related to plagiarism can be found here: https://owl.purdue.edu/owl/avoiding_plagiarism/index.html.

Artificial Intelligence (AI) - generated material:

I acknowledge that AI-assisted work will be a component of many professional endeavors in the future. However, because the Capstone Research Report is an essential part of your training in science communication, any work written, developed, created or inspired by AI will be considered plagiarism and will not be tolerated. The content of your report must be your own in order for the experience to have value towards your career.

Should forms of plagiarism (direct plagiarism, paraphrasing without acknowledging sources, AI-assisted work, etc.) be detected in your Report, you will not receive passing marks. Please ask me if you have any questions or concerns as to whether your work has plagiarism issues.

In return for your significant investment into your Capstone Research and Report, I promise to give thoughtful feedback on your writing and scientific communication that will help you in your careers. I don't want to spend my time giving feedback on plagiarized or AI-generated work, so thank you in advance for your commitment to act with professionalism and integrity.

Capstone Research Project Report – Requirements

The Capstone Research Project Report is intended to summarize the research project and outcomes, in a professional manner. In some cases, the report will summarize original research being prepared for publication. The research paper must include the following in the order listed below:

1. Title Page
 - a. 'Capstone Research Project – Report Cover Page' (see page 9)
2. Endorsement Page
 - a. Signed by the student, research supervisor or PI, and/or authorized company representative
 - b. 'Capstone Research Project – Endorsement Page' (see page 10)
3. Abstract
 - a. Brief statement of the research problem, methodology, key results, and conclusion
 - b. Typically 100-200 words
4. Table of Contents
 - a. List the key sections/headings of the report, with page numbers
 - b. Include location and title of figures and tables
5. Introduction
 - a. State the purpose of the investigation, the problem being investigated, and the background information
 - b. Introduce your research question and general approach
6. Methods
 - a. Describe any procedures, materials/equipment used, methods of analysis
7. Results
 - a. Present the results; include tables, graphs, examples of data when appropriate
 - b. Graphs and tables must be sequentially numbered with appropriate legends
8. Discussion
 - a. Interpret your results and state their significance
 - b. Compare your results with what was expected and/or what is reported in the literature
9. Conclusion
 - a. Review the results and assess the success of your study
 - b. Propose future directions of the work
10. Acknowledgements
 - a. Optional addition to acknowledge contributors to the presented work
11. References
 - a. References must follow the AMA guidelines.

Additional formatting details and notes:

- The report must be written in clear, grammatically correct English following APA Style.
- Minimum 7000-word count, for Sections 3-9 above (not including figure legends or other sections)
- Single- or one-and-a-half spaced body text
- 1-inch margins on all sides
- Standard typeface (Arial, Calibri, Times New Roman, Helvetica) of 10-, 11- or 12-point size
- Include page numbers (bottom of the page)

- Follow proper use of *italics* (e.g. for Latin terms and scientific names), **bold letters**, underlines, unit abbreviations and spacing (48 h, 1 μ M, 25 $^{\circ}$ C, etc.), spacing between words, scientific abbreviations, etc.
- Follow proper APA Style citations of articles and other sources of information.
- Figures and Tables should appear immediately after the first mention of them in the paper, on the same page (if there is room) or on the following page.
- Figure/Table Legends must be complete; included information should be enough for a reader to understand the Figure/Legend without referencing the text.
- Figures should include statistical analysis (means, error bars, significant differences, etc.)

Evaluation:

- The MBIOT Program Director will be responsible for evaluation of the research paper. In some cases, a faculty member with interest and expertise in the Capstone Research may contribute to the evaluation.
- The Capstone Research Project Report will be evaluated as follows:
 - 25% - Inclusion of required elements and formatting; timeliness of submission
 - 55% - Body of research paper
 - 20% - Supervisor/PI's performance evaluation

Capstone Research Project Report Alternative**Review Paper – Requirements**

A review paper will be considered a legitimate alternative to the research paper only under conditions where a major part of the research work of the student is of proprietary nature. The student must confirm with the research host/supervisor at the start of the co-op whether the work he/she will be involved in is proprietary in nature and cannot be viewed by a third party outside of the company or organization. If so, the student and the supervisor must inform the Program Director in the 'Capstone Research Project Plan' document, submitted within one month of the co-op start date. The review topic and content outline will be included in this Project Plan for review by the Program Director

The review paper must be an exhaustive literature research on the topic and must not only cover the scientific information but also the relevance to biotechnology and the current and/or potential business, legal, social and ethical implications of its application. The review paper must include the following in the order listed below:

1. Title Page
 - a. 'Capstone Research Project – Review Cover Page' (see page 9)
2. Endorsement Page
 - a. Signed by the student, research supervisor or PI, and/or authorized company representative
 - b. 'Capstone Research Project – Endorsement Page' (see page 11)
3. Abstract
 - a. Brief statement of the review topic and motivation for topic selection
 - b. Typically 100-200 words
4. Table of Contents
 - a. List the key sections/headings of the review, with page numbers
 - b. Include location and title of figures and tables
5. Introduction
 - a. Describe the purpose of the review paper, the topic being covered, and the background information
6. Main text
 - a. Discuss the selected topic in an organized manner – headings and subheadings should be used to organize the discussion
 - b. Include tables, graphs, examples of data when appropriate
 - c. Graphs and tables must be sequentially numbered with appropriate legends
7. Conclusion/Outlook
 - a. Review the key points of your review
 - b. Provide a forward-looking summary for the field/topic
8. Acknowledgements
 - a. Optional addition to acknowledge contributors to the presented work
9. References
 - a. Within the reference list, highlight 3-5 key references for your review

Additional formatting details and notes:

- The report must be written in clear, grammatically correct English following APA Style.
- Minimum 7000-word count, for Sections 3-9 above (not including figure legends or other sections)
- Single- or one-and-a-half spaced body text

- 1-inch margins on all sides
- Standard typeface (Arial, Calibri, Times New Roman, Helvetica) of 10-, 11- or 12-point size
- Include page numbers (bottom of the page)
- Follow proper use of *italics* (e.g. for Latin terms and scientific names), **bold letters**, underlines, unit abbreviations and spacing (48 h, 1 μ M, 25 $^{\circ}$ C, etc.), spacing between words, scientific abbreviations, etc.
- Follow proper APA Style citations of articles and other sources of information.
- Figures and Tables should appear immediately after the first mention of them in the paper, on the same page (if there is room) or on the following page.
- Figure/Table Legends must be complete; included information should be enough for a reader to understand the Figure/Legend without referencing the text.
- Figures should include statistical analysis (means, error bars, significant differences, etc.)

Evaluation:

- The MBIOT Program Director will be responsible for evaluation of the research paper. In some cases, a faculty member with interest and expertise in the Capstone Research may contribute to the evaluation.
- The Capstone Research Project Report will be evaluated as follows:
 - 25% - Inclusion of required elements and formatting; timeliness of submission
 - 55% - Body of review paper
 - 20% - Supervisor/PI's performance evaluation

The Pennsylvania State University

[RESEARCH PROJECT TITLE]

Research Report

by

[STUDENT NAME]

Submitted in partial fulfillment of the requirements for the degree of

Master of Biotechnology

[Graduation Date (Month, Year)]

The Pennsylvania State University

[REVIEW TOPIC TITLE]

A Comprehensive Review

by

[STUDENT NAME]

Submitted in partial fulfillment of the requirements for the degree of

Master of Biotechnology

[Graduation Date (Month, Year)]

[RESEARCH/REVIEW PROJECT TITLE]

by

[STUDENT NAME]

By signing below, I acknowledge that:

- the work described in this report was carried out by **[STUDENT NAME]** at the **[RESEARCH INSTITUTE/COMPANY]**
- this report does not contain proprietary information

[SUPERVISOR NAME], [TITLE] - Supervisor/PI

Date

[SUPERVISOR NAME], [TITLE] (*if applicable*)

Date

[STUDENT NAME], Master in Biotechnology Student

Date