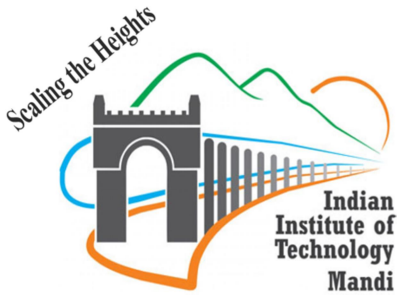
Master of Technology in Biotechnology



Programme Level	Post Graduate
Year of Commencement	2016
Minimum Duration	2 Years (4 Semesters)
Maximum Duration	3 Years (6 Semesters)
Senate Meeting Reference	9.3/18.5

Motivation and Preamble

The Biosciences and Biotechnologies (BioX) at IIT Mandi is motivated by the needs in the field of human healthcare, food/agriculture, and environment sustainability in terms of development of new technologies for better disease diagnosis and management, identification and development of rare medicinally important molecules from various sources, and to clean and protect environment. Being present in the Himalayas, it aims to utilize the diverse resources easily available in the region to fulfil the above-mentioned goals. Motivated by the goals, IIT Mandi is committed to intensify academic teaching, research and development in several areas of BioX. M. Tech in Biotechnology programme is mainly initiated with the goal to train the next generation of students with cutting edge knowledge and skills suitable towards biotechnological research and Bio-industry needs such as biomedical/biopharma etc.

The curriculum of M.Tech in Biotechnology programme at IIT Mandi is directed towards fundamental and practical understanding of the core biotechnology areas along with specialized fields in “Systems Biology” and “Medical and Nano-biotechnology”. In addition, elective courses from other disciplines provide interdisciplinary exposure to the students. The core-subjects, specialized theme areas of BioX, electives from other schools, hands on laboratory training along with the Thesis project component to be undertaken in-house/ other R&D institutes/ industries will enrich students with right skills required in the current Job market both in academia and industries, on completion of the program.

Outline of M.Tech. Curriculum

Foundation course: Advanced cell Biology (BY510)

[Credit: 3]

Biotechnology Core: Cell physiology in Health and Disease (BY511), Quantitative and Computational Biology (BY512), Cellular Bioprocess Technology (BY513), Analytical Biotechniques (BY514), Molecular Biotechnology (BY515)

[Credit: 3+3+3+3+3]

Core Lab Courses: Cell Biology and Physiology (BY520P)
Computational Biology and Cellular Bioprocess Technology (BY521P)
Analytical and Molecular Biotechnology (BY522P)

[Credit: 1+1+1]

Elective Courses:

[Total: 9 – 10 Credits]

Specialization Electives:

Systems Biology Basket:

Introduction to Omics and Systems Analysis (BY516)
Metabolic Systems Biology (BY504)
Proteomics (BY517)
Metagenomics, and Next Generation Sequencing Technologies (BY613)
Systems Biology Specialization Lab (BY523P)

Medical and Nano-biotechnology Basket:

Cellular Fuel and cellular communication (BY503)
Disease Biology (BY518)
Nano-Biotechnology (BY505)
Protein Science in Therapeutics (BY519)
Medical and Nanobiotechnology Specialization Lab (BY524P)

Other Electives: Any other elective courses being offered in BioX or related area by the school.

Project: Post Graduate Project-1 (BY 698P)
Post Graduate Project-2 (BY 699P)

Dissertation project thesis work can be undertaken in any industry or academic institute. However, the student should have a guide from IIT Mandi and the student should undergo the evaluation process as laid down in the ordinances.

[Credit: 16+17]

Outside discipline electives: (Mandatory)

[Total: 6 Credits]

Other Mandatory Courses:

Seminar (BY525)
Research Methodology (RM600)
IPR and Biosafety (BY526)

[Credit: 1+1+0]

Total 72 credits

Credit Structure: A student, to be awarded M.Tech. degree, must need to earn 70 -72 credits.

Program Specialization: The program offers an option to the student to obtain a specialization in the area of "Systems Biology" or "Medical and Nano-biotechnology". Towards this the student needs to mandatorily credit at least three electives from the specialization basket and the respective specialization lab. If specialization is to be done then the dissertation project should preferably be from the similar area.

Although obtaining a specialization is not mandatory and the program offers the flexibility to the students to opt for any of the specialization electives or other electives as per their choice from among those offered in BioX or related areas by the school.

Degree structure **Total credit requirement: 70-72 credits**

		Credits
a)	Foundation and core courses	18
b)	Specialization elective baskets from BioX	9
c)	Core laboratory	3
d)	Advanced Specialization laboratory	1
e)	Research Methodology, IPR and seminars	2
f)	Free Electives from other disciplines	6
g)	Thesis	33

M.Tech Biotechnology course structure outline (Total credits required 70-72)

Semester 1	Credits L-T-P-C	Semester 2	Credits L-T-P-C
Foundation: Advanced Cell Biology (BY510)	3-0-0-3	**Core 4:** Analytical Biotechniques (BY514)	3-0-0-3
Core 1: Cell Physiology in health and disease (BY511)	3-0-0-3	**Core 5:** Molecular Biotechnology (BY515)	3-0-0-3
Core 2: Quantitative and Computational Biology (BY512)	3-0-0-3	**Specialization electives*** from BioX Systems Biology theme: S1, S2, S3, and S4 (9 credits) **or** Medical and Nano-biotechnology theme: M1, M2, M3 and M4 (9 credits, Any 3 courses with nano-biotechnology as compulsory) **or** Any 3 courses from among S1, S2, S3, S4, M1, M2, M3 and M4 **or** **Other electives:** Offered by the school in BioX or related areas.	Total: 9 credits
Core 3: Cellular Bioprocess Technology (BY513)	3-0-0-3		
Free elective 1: from other disciplines **Free elective 2**: from other disciplines	Total: 6 credits		
		Mandatory: Research Methodology (RM600)	1-0-0-1
		Mandatory: IPR and Biosafety (BY526)	1-0-0-0
Core Lab 1 – Cell Biology and Physiology (BY520P)	0-0-2-1	**Core Lab 3**- Analytical and Molecular Biotechnology (BY522P)	0-0-2-1
Core Lab 2 - Computational Biology and Cellular Bioprocess Technology (BY521P)	0-0-2-1	***Specialization Lab** – Systems Biology (BY523P)(ML1) or Medical and Nano-biotechnology (BY524P)(ML2)	0-0-2-1
Total credits Sem 1	**20**	**Total credits Sem 2**	**18**

Semester 3	L-T-P-C	Semester 4	L-T-P-C
Seminar (BY525)	0-0-0-1		
Post Graduate Project-1 (BY 698P)	0-0-32-16	Post Graduate Project-2 (BY 699P)	0-0-34-17
Total credits Sem 3	**17**	**Total credits Sem 4**	**17**

 # Thesis work in sem 3 and 4 can be undertaken in any industry or academic institute. However, the student should have a guide from IIT Mandi and the student should undergo the evaluation process as laid down in the ordinances.

*** Specialization electives from BioX (Either of the two specialized themes can be opted by each student (9 credits + 1 specialization lab (ML1/ML2) credit compulsory) in semester 2).**

If specialization is to be done then the dissertation can preferably be from the similar area. Although obtaining a specialization is not mandatory and the program offers the flexibility to the students to opt for any of the specialization electives or other electives as per their choice from among those offered in BioX or related areas by the school.

Theme 1: Systems Biology* (Any 3 courses + lab)		
Course		Credits (L-T-P-C)
Special elective S1	Introduction to omics and Systems Analysis (BY516)	3-0-0-3
Special elective S2	Metabolic Systems Biology (BY504)	3-0-0-3
Special elective S3	Proteomics (BY517)	3-0-0-3
Special elective S4	Metagenomics, and Next Generation Sequencing Technologies (BY613)	3-0-0-3
Specialisation Lab ML1	Systems Biology (BY523P)	0-0-2-1

Theme 2: Medical and Nano-biotechnology* (Any 3 courses + lab, nanobiotechnology is compulsory)		
Course		Credits (L-T-P-C)
Special elective M1	Cellular Fuel and Cellular Communication (BY503)	3-0-0-3
Special elective M2	Disease Biology (BY518)	3-0-0-3
Special elective M3	Nano-Biotechnology (BY505)	3-0-0-3
Special elective M4	Protein Sciences in therapeutics (BY519)	3-0-0-3
Specialisation Lab ML2	Medical and Nanobiotechnology (BY524P)	0-0-2-1