

**Minimum Standards for Higher
Agricultural Education
(MSHAE)**

Biotechnology



**Education Division
Indian Council of Agricultural Research
PUSA, New Delhi 110 012**

PREFACE

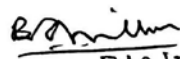
Education Division of the ICAR has taken a praiseworthy initiative to develop Minimum Standards of Higher Agricultural Education in 12 disciplines of agricultural education programmes operational in the country under the patronage of the ICAR. These standards, once in place, will help in the establishment of new college/programme to build up capability/capacity to award quality education in all spheres of agricultural sciences. Delineation of educational standards is pre-requisite for uniformity in streaming educational norms, enforcing academic discipline and quality output of graduates. The standards are required to enable the identification of sub-standard institutions/programmes.

On behalf of the committee, I thank the ICAR for having reposed faith in us in assigning the important academic task of formulating Minimum Standards of Higher Agricultural Education in terms of infrastructure, laboratories/field facilities, faculty, man-power and other support so as to firm up guidelines for establishing College of Biotechnology in Agricultural Universities/ICAR Institutes/Deemed Universities.

I express my sincere thanks to the members of the committee, namely Dr Anil Sirohi, Dean, College of Biotechnology, SVP Univ. of Agri. & Tech., Modipuram, Meerut; Dr AK Sankhla, Dean, College of Dairy & Food Science Technology, MPUAT, Udaipur; Dr HS Dhaliwal, Dean, College of Agriculture (COA), PAU, Ludhiana and Dr KL Khurana, Principal Scientist, Education Division, ICAR, New Delhi, for their highly valuable expert suggestions and input towards finalization of the standards. During the meeting of the committee held at PAU, Ludhiana, the interaction with Dr SS Gosal, Director of Research, PAU, Ludhiana and Dr DS Brar, Honorary Adjunct Professor, School of Agric. Biotechnology (SAB) were of immense value to the committee. Input from the other faculty members of PAU, namely Dr (Mrs) JK Sangha, Dean, College of Home Science, Dr RK Gumber, Additional Director of Research (Crop Improvement), Dr MIS Gill, Head, Deptt. of Fruit Science, Dr (Mrs) SK Banga, Head, Deptt of Plant Breeding and Genetics, Dr RIS Gill, Head Deptt of Forestry & Natural Resources, Dr PK Chhuneja, Chairman, Academic Affairs Committee (COA), Dr SS Kang, Secretary Board of Studies (COA), Dr (Mrs) Parveen Chhuneja, Geneticist (SAB), Dr BS Cheema, Associate Professor of Agricultural Education, Dr JS Sandhu, Biotechnologist (SAB), and Dr (Mrs) Yogesh Vikal, Geneticist (SAB) made the task of the committee in framing the Minimum Standards of Higher Agricultural Education in the field of Biotechnology much easy.

My special thanks are for Dr (Mrs) Parveen Chhuneja for collecting and consolidating the desired information and making the presentation through nicely prepared informative slides. The efforts of her team for ensuring quick incorporation of the desired modifications in the draft proposal based on the deliberations to bring out the final manuscript are appreciated. I am also thankful to Dr PK Chhuneja and the other scientists of his team from the PAU for arranging all the logistics for the smooth conduct of the meeting.

I wish that from the contemplated temples of quality education in Biotechnology, qualified human resource is generated that will work on alleviating food, health, energy and environment problems from the nation and humanity.


9/3/2012
(BS Dhillon)
Chairman
Expert Committee

INTRODUCTION

Biotechnology has enormous potential to provide solution to several challenges in the food, health care, energy and related sectors. The importance of this high technology sector will become evident as its products catalyse the transformation of Indian economy by offering solutions to the multitude of challenges that both India and the world will encounter in food, health care and fuel security. Furthering these three areas will enable the nation to realize rapid economic development and prosperity.

Biotechnology, in agriculture, is a powerful tool to keep pace with the ever burgeoning population for meeting the food and nutritional security and meeting the challenge of escalating biotic and abiotic stresses. Agricultural biotechnology is a collection of scientific techniques used to improve plants, animals and microorganisms. Based on the understanding of DNA, Indian Biotechnologists are trying to augment agricultural productivity and quality of the produce, and to develop climate resilient cultivars.

Biotechnology approaches offer novel strategies for producing suitable crop genotypes that are able to resist pathogens, pests, drought, high temperature, submergence and salinity stresses. It enables improvements through facilitating exchange of genetic material even across sexual barriers that is not possible with the conventional methods. Biotechnology is used for precision breeding using molecular marker technology, developing genetically modified crops, producing disease-free planting material, molecular diagnostics and developing vaccines for livestock and humans. Since 1995, farmers have been growing transgenic crops and currently 175 million ha area is under these crops across 27 countries. In India, 85 per cent of the cotton cultivation area is under Bt cultivars. Modern molecular biology and genomic techniques such as MAS (marker assisted selection) help in identifying desirable traits, thereby allowing agricultural scientists to develop varieties that have improved traits such as high yields and resistance to environmental stresses such as drought, pests and diseases.

In India, rice varieties like Pusa 1460 and RP Bio-226 (bacterial blight resistant), Punjab Basmati 3 (dwarf and bacterial blight resistant), Swarna Sub1A and IR 64 Sub1A (submergence tolerant) and maize hybrid QPM 9 (high quality protein maize) developed through MAS are under cultivation.

To meet increasing demand of Biotechnologists in research institutes and industry, qualified human resource is mandatory. Indian Council of Agricultural Research (ICAR) institutes and Agricultural Universities are to play important role for generating trained human resource through Biotechnology degrees at undergraduate and postgraduate levels. With increasing application of biotechnology in diverse areas such as crop improvement, livestock improvement, industrial microbiology, environmental sciences, etc. the specializations within biotechnology have taken their shape. With fast emerging technologies such as RNAi, targeted gene replacement using zinc-finger nucleases, chromosome engineering, marker assisted recurrent selection, genome wide selection, next generation sequencing technology and nanobiotechnology, the future seems bright with respect to the development of designer crops. Thus, there is need to establish colleges, which are adequately equipped in terms of faculty and laboratories, to promote comprehensive development in the field of biotechnology and the generation of specialized human resource towards wider application of biotechnology approaches for achieving faster development and economic growth leading to national prosperity. This would help in creating a road map for successful and sustainable application of biotechnology in food and agriculture. The initiative of the ICAR towards formulating the comprehensive minimum requirements and standards for establishing Colleges of Biotechnology in Agricultural Universities, ICAR institutes and Deemed Universities is most well-timed and highly praiseworthy. These standards as basic requirements would steer the establishment of new colleges in Biotechnology towards ensuring the delivery of high quality education and strengthening research capabilities in the subject.

Punjab Agricultural University, Ludhiana

Proceedings of the meeting of the ICAR's Expert Committee to work out the **Minimum Standards of Higher Agricultural Education (MSHAE)** in terms of infrastructure, laboratories/field facilities, faculty, man-power and other support so as to firm up guidelines for establishing College of Biotechnology in SAUs/ ICAR Institutes/Deemed Universities, held in the Committee Room of the Vice Chancellor, PAU, Ludhiana on March 8-9, 2014

Following committee members attended the meeting:

- | | | |
|----|---|------------------|
| 1. | Dr BS Dhillon, Vice Chancellor, PAU Ludhiana | Chairman |
| 2. | Dr Anil Sirohi, Dean, College of Biotechnology, SVP Univ. of Agri. & Tech., Modipuram, Meerut | Member |
| 3. | Dr AK Sankhla, Dean, College of Dairy & Food Science Technology, MPUAT, Udaipur | Member |
| 4. | Dr HS Dhaliwal, Dean, College of Agriculture, PAU, Ludhiana | Member |
| 5. | Dr KL Khurana, Principal Scientist, Education Division, ICAR, New Delhi | Member Secretary |

The following scientists also attended the meeting as Special Invitee:

1. Dr DS Brar, Honorary Adjunct Professor, School of Agricultural Biotechnology, PAU, Ludhiana
2. Dr SS Gosal, Director of Research, PAU, Ludhiana
3. Dr (Mrs) JK Sangha, Dean, College of Home Science, PAU, Ludhiana
4. Dr RK Gumber, Additional Director of Research (Crop Improvement), PAU, Ludhiana
5. Dr MIS Gill, Head, Deptt. of Fruit Science, PAU, Ludhiana
6. Dr (Mrs) SK Banga, Head, Deptt. of Plant Breeding and Genetics, PAU, Ludhiana
7. Dr RIS Gill, Head, Deptt. of Forestry and Natural Resources, PAU, Ludhiana
8. Dr PK Chhuneja, Chairman Academic Affairs Committee, COA, PAU, Ludhiana
9. Dr SS Kang, Secretary, Board of Studies, College of Agriculture, PAU, Ludhiana
10. Dr (Mrs) Parveen Chhuneja, Geneticist, School of Agricultural Biotechnology, PAU, Ludhiana
11. Dr BS Cheema, Assoc. Prof. of Agricultural Education, College of Agriculture, PAU, Ludhiana
12. Dr Yogesh Vikal, Geneticist, School of Agricultural Biotechnology, PAU, Ludhiana
13. Dr JS Sandhu, Biotechnologist, School of Agricultural Biotechnology, PAU, Ludhiana

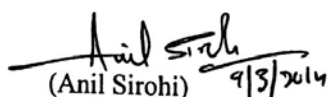
The chairman of the committee, Dr BS Dhillon, welcomed the committee members and acknowledged the ICAR for providing an opportunity to the PAU for hosting this important meeting.

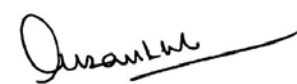
Dr HS Dhaliwal introduced the Heads of various Departments and other special invitees of College of Agriculture, PAU, Ludhiana to the committee. Dr BS Dhillon introduced the house regarding the background under which the committee was constituted by the ICAR. He also briefed about Biotechnology as a growing sector having enormous potential to provide solutions to several challenges in the food, health care, energy and related sectors. Biotechnological approaches offer novel strategies for producing suitable crop genotypes that are able to resist pathogens, pests, drought and other weather vagaries. ICAR institutes and Agricultural Universities can and need to play an important role to meet increasing demand of Biotechnologists.

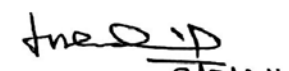
Dr KL Khurana, in his opening remarks elaborated on the initiative taken by ICAR for taking up this task to workout minimum standards and requirements for opening new institution offering undergraduate and postgraduate degrees in the discipline of Biotechnology. He mentioned the need of strengthening this discipline in Agricultural Universities and other ICAR institutes.

Dr (Mrs) Parveen Chhuneja made a power point presentation on proposed Minimum Standards of Higher Agricultural Education (MSHAE) in terms of infrastructure, laboratories/field facilities, faculty, man-power and other support so as to firm up guidelines for establishing College of Biotechnology in Agricultural Universities, ICAR Institutes and Deemed Universities. There were thorough deliberations on the presentation and based on the suggestions from the esteemed members of the committee and other colleagues the final draft has been prepared.

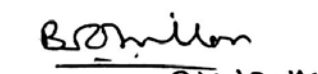
Dr Anil Sirohi suggested the institution of scholarships for Biotechnology at ICAR level for attracting the talent. Dr AK Sankhla, on behalf of the members of the committee, acknowledged PAU for providing the requisite assistance in hosting this committee meeting at its campus. He appreciated the concerted efforts of the Dr BS Dhillon, Dr HS Dhaliwal and Dr (Mrs) Parveen Chhuneja and the team for preparing and presenting the detailed draft. The final draft of the MSHAE for establishing College of Biotechnology is enclosed as Annexure-I.


(Anil Sirohi) 9/3/2014
Member


(AK Sankhla)
Member


(HS Dhaliwal) 9/3/2014
Member


(KL Khurana) 9/3/14
Member Secretary


(BS Dhillon) 9/3/2014
Chairman

Annexure-I

Minimum Standards for Establishing a College of Biotechnology in State Agricultural Universities/ICAR Institutes/Deemed Universities

1. Divisions/Section: Three Divisions and One Section

Division of Plant Biotechnology (PB)
Division of Animal Biotechnology (AB)
Division of Microbial and Environmental Biotechnology (MEB)
Bioinformatics Section

2. Undergraduate and Postgraduate Degrees Nomenclature

Undergraduate	B.Tech. Biotechnology
Postgraduate (Master's and Doctorate)	M.Tech. Plant Biotechnology
	M.Tech. Animal Biotechnology
	M.Tech. Microbial and Environmental Biotechnology
	M.Tech. Bioinformatics
	Ph.D. Plant Biotechnology
	Ph.D. Animal Biotechnology
	Ph.D. Microbial and Environmental Biotechnology

3. Eligibility Criteria

B.Tech. Biotechnology	Higher Secondary/10+2/Intermediate Subjects: PCM/PCMB/PCB/Inter (Agriculture) with at least 50% marks in aggregate (P, C, M and B are Physics, Chemistry, Mathematics and Biology, respectively)
M.Tech. Plant Biotechnology	B.Tech. or equivalent degree in Biotechnology/ B.Sc. Agriculture (Hons.)*/ B.Sc. Horticulture (Hons.)*/ B.Sc. Forestry (Hons.)* with at least 60% marks
M.Tech. Animal Biotechnology	B.Tech. or equivalent degree in Biotechnology /B.V.Sc.*/ B.Tech. Dairy Technology* with at least 60% marks
M.Tech. Microbial and Environmental Biotechnology	B.Tech. or equivalent degree in Biotechnology/B.Sc. Agriculture (Hons.)*/B.Sc. Horticulture (Hons.)*/ B.Sc. Forestry (Hons.)*/B.V.Sc.* with at least 60% marks

M.Tech. Bioinformatics	B.Tech. or equivalent degree in Biotechnology/Bioinformatics with at least 60% marks
Ph.D. Plant Biotechnology	M.Sc./M.Tech. in Plant Biotechnology/M.Sc. Agriculture having specialization in Plant Biotechnology with at least 60% marks
Ph.D. Animal Biotechnology	M.Sc./M.Tech. in Animal Biotechnology/M.V.Sc. having specialization in Animal Biotechnology with at least 60% marks
Ph.D. Microbial and Environmental Biotechnology	M.Sc./M.Tech. in Microbial Biotechnology/Environmental Biotechnology/Plant Biotechnology/Animal Biotechnology/M.V.Sc. having specialization in Biotechnology with at least 60% marks

*Note: B.Tech. is equivalent to B.Sc. 4 year programme; *Deficiency courses to be cleared*

4. Medium of Instruction: English

5. Minimum Intake

Degree	Discipline	Minimum Intake/Year
B.Tech.	Biotechnology with elective in 4 disciplines	50
M.Tech.	Plant Biotechnology	8
	Animal Biotechnology	8
	Microbial and Environmental Biotechnology	8
	Bioinformatics	8
Ph.D.	Plant Biotechnology	4
	Animal Biotechnology	4
	Microbial and Environmental Biotechnology	4
Total	Undergraduate	50
	Master's	32
	Doctorate	12

6. Land Requirements

Main building and hostels:	4 ha
Field area:	10 ha
Play grounds:	From common facility of the institute
Total:	14 ha

7. Manpower Requirements of Dean's Office

Manpower	Number
Dean	1
A. Establishment	
PA to Dean	1
Administrative Officer	1
Superintendent	1
Steno/Computer operator	4
Assistant	2
Operator (Audio Visual)	1
Attendants/Messengers	4
Clerk (LDC)	4
Electrician	1
Store Keeper	1
Driver	6
Security, Sanitation and Landscaping	To be outsourced
B. Central Research and Teaching Laboratories (Four Laboratories)	
Assistant Professor (Genomics)	1
Assistant Professor (Computer Engineering)	1
Computer Assistant	1
Laboratory Technicians	2
Laboratory Assistant	1
Laboratory Attendant	3
C. Library Staff	
Assistant Librarian	1
Library Assistant	1
Clerk	1
Shelf Assistant	2
D. Students Welfare	
To be provided by the Institute as the Central Facility	

E. Hostel Staff for two Hostels	
Wardens	1+1
Assistant Wardens	1+1
Clerk (LDC)	2
Attendants	8
Security, Sanitation and Landscaping	To be outsourced

8. Faculty Requirements for Divisions/Section

Division/Section	Faculty			Total
	Professor	Associate Professor	Assistant Professor	
Division of Plant Biotechnology	1	2	6	9
Division of Animal Biotechnology	1	2	6	9
Division of Microbial and Environmental Biotechnology	1	2	6	9
Bioinformatics Section	-	1	4	5
Total	3	7	22	32

Note: Services of the existing faculty will be utilised for teaching the supporting courses

9. Administrative and Supporting Staff for Divisions/Section

Division/Section	Steno/PA/Computer Operator	Assistant	Attendant/Messenger	Clerk	Laboratory Assistant/Attendant	Field Staff
Plant Biotechnology	2	1	2	1	6	3
Animal Biotechnology	2	1	2	1	6	3
Microbial and Environmental Biotechnology	2	1	2	1	6	3
Bioinformatics Section	5	1	2	1	1	-
Total	11	4	8	4	19	9

Note: Security services to be outsourced

10. Faculty Expertise

Division/Section	Faculty Expertise	
	Core	Associated
Plant Biotechnology	Plant Molecular Biology, Tissue culture and Genetic Transformation, Genetics, Microbiology, Plant Biochemistry	Plant Breeding, Plant Protection, Plant Physiology, Agronomy, Horticulture, Forestry
Animal Biotechnology	Cell Culture and Genetic Transformation, Molecular Biology, Animal Genetics, Animal Biochemistry, Animal Microbiology, Immunology	Animal Breeding, Animal Physiology, Live Stock Production and Management
Microbial and Environmental Biotechnology	Microbiology, Microbial Genetics, Microbial Engineering, Biochemistry	Plant Physiology, Water and Soil Sciences, Analytical Chemistry, Agrometeorology, Food Science and Technology
Bioinformatics Section	Bioinformatics, Information Technology	Plant and Animal Biotechnology, Statistics/ Biostatistics

11. Central/Division/Section Laboratories (as per requirements of the teaching and research work of the college)

Division/Section	Laboratory
Central Research and Teaching Laboratories	- DNA sequencing, SNP Genotyping and Proteomics Laboratory - High Performance Computing Facility - Cold Rooms: -20°C, 4°C - Liquid Nitrogen Plant - Computer Lab
Plant Biotechnology	- Plant Genomics Laboratory - Functional Genomics Laboratory - Genetic Transformation Laboratory - Molecular Breeding Laboratory - Proteomics and Metabolomics Laboratory
Animal Biotechnology	- Animal Genomics Laboratory - Functional Genomics Laboratory - Arthropod Molecular Biology Laboratory - Animal Cell culture Laboratory - Immunology Laboratory
Microbial and Environmental Biotechnology	- Microbial Genetics and Genomics Laboratory - Environmental and Soil Microbiotechnology Laboratory - Bioremediation Laboratory
Bioinformatics Section	- Sequence Analysis Laboratory - Computational Biology Laboratory

12. Floor Space Requirement

Central Facilities

S. No.	Details	Number of Rooms	Dimensions
1.	Dean office	1	20' x 24'
2.	PA room	1	20' x 12'
3.	Committee room with video conferencing facility	1	20' x 48'
4.	Administrative officer room	1	20' x 12'
5.	Admin. staff rooms	3	20' x 36' each
6.	Examination cell	1	20' x 12'
7.	Evaluation room	1	20' x 36'
8.	Faculty room	1	20' x 12' each
9.	Placement cell	1	20' x 48'
10.	Smart Lecture rooms	5	Seating capacity - 70
11.	Auditorium (optional)	1	Seating capacity - 300
12.	Library/Book bank	1	30' x 72'
13.	Examination hall (optional)	1	Seating capacity - 300
14.	Multipurpose room	1	20' x 36'
15.	Laboratories	4	30' x 48' each
16.	Hostels	2	UG and PG Boys, UG and PG Girls
17.	Generator shed	1	20' x 36'
18.	Liquid Nitrogen plant	1	20' x 24'
19.	Toxic chemical waste storage/disposal Unit	1	20' x 24'
20.	Canteen	1	20' x 12' (kitchen) & 20 x 36' (sitting)
21.	Toilets	-	2 sets for each floor
22.	Parking space	As per requirement (APR)	For college and hostels
23.	Vehicles: Office car Staff car/Jeep Bus Pick-up van	1 3 1 1	

Division/Section

S. No.	Detail	Number of rooms	Dimensions
1.	Office of Head of the Division	3 (one for every Division)	20' x 24' each
2.	Administrative Staff	4 (one for every Division)	20' x 36' each
3.	Faculty room	21 (as per faculty strength)	20' x 24' (3 rooms) 20' x 12' (18 rooms)
4.	Rooms for Research Scholars	4 (one for every Division)	20' x 24' each
5.	Committee room cum library	4 (one for every Division)	20' x 36' each
6.	Smart Lecture cum seminar room	4 (one for every Division)	Seating capacity - 50 each
7. Laboratories (no. of laboratories as per requirement and include UG and PG teaching laboratories)			
	Plant Biotechnology	5	20' x 60' (one) 20' x 36' (four)
	Animal Biotechnology	5	20' x 60' (one) 20' x 36' (four)
	Microbial and Environmental Biotechnology	4	20' x 60' (one) 20' x 36' (three)
	Bioinformatics Section	2	20' x 48' each
8.	Screen houses, glass houses, transgenic green house	APR	

13. Equipment Required

Central Teaching and Research Laboratories

S. No.	Name of the Equipment	Number
1	Sequencer - ABI 3730xl	1
2	Illumina Sequencing Platform	1
3	Cold room -20°C	1
4	Cold room 4°C	1
4	SNP Genotyping Platform	1
5	HPTLC	1
6	High Performance Computing Grid	1
7	Liquid Nitrogen Plant	1
8	Inductively Coupled Plasma (ICP-OES) Central laboratory	1
9	High Speed Centrifuge	4
10	Water Purification Unit	As per requirement

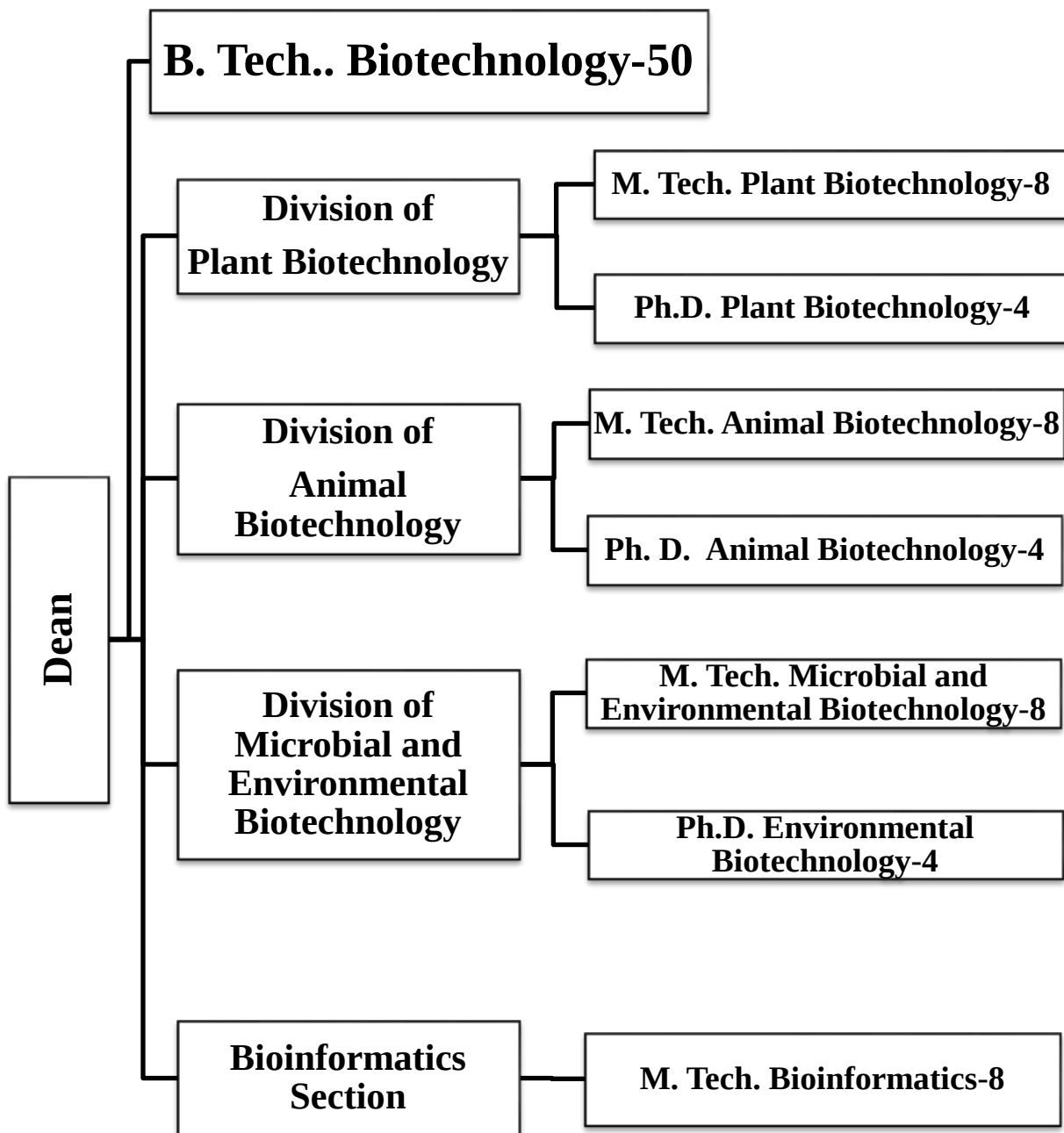
Equipment in the Divisional Laboratories (additional specialised equipment may be required depending on the mandate of the institute)

S. No.	Name of the Equipment	Number of units x Divisions	Total number	Divisions [#]
1	-20°C Freezer	2x3	6	PB, AB, MEB
2	-80°C Freezer	1x3	3	PB, AB, MEB
3	Autoclaves	2x3	6	PB, AB, MEB
4	Automated Capillary Electrophoresis System	1x3	3	PB, AB, MEB
5	Autopipetting System	1x2	2	PB, AB
6	Biolistic Particle Gun	1x1	1	PB, AB
7	Biophotometer	1x3	3	PB, AB, MEB
8	Biosafety Cabinet	4x3	12	PB, AB, MEB
9	Centrifuge	8x3	24	PB, AB, MEB
10	Cryo-cans	5x3	15	PB, AB, MEB

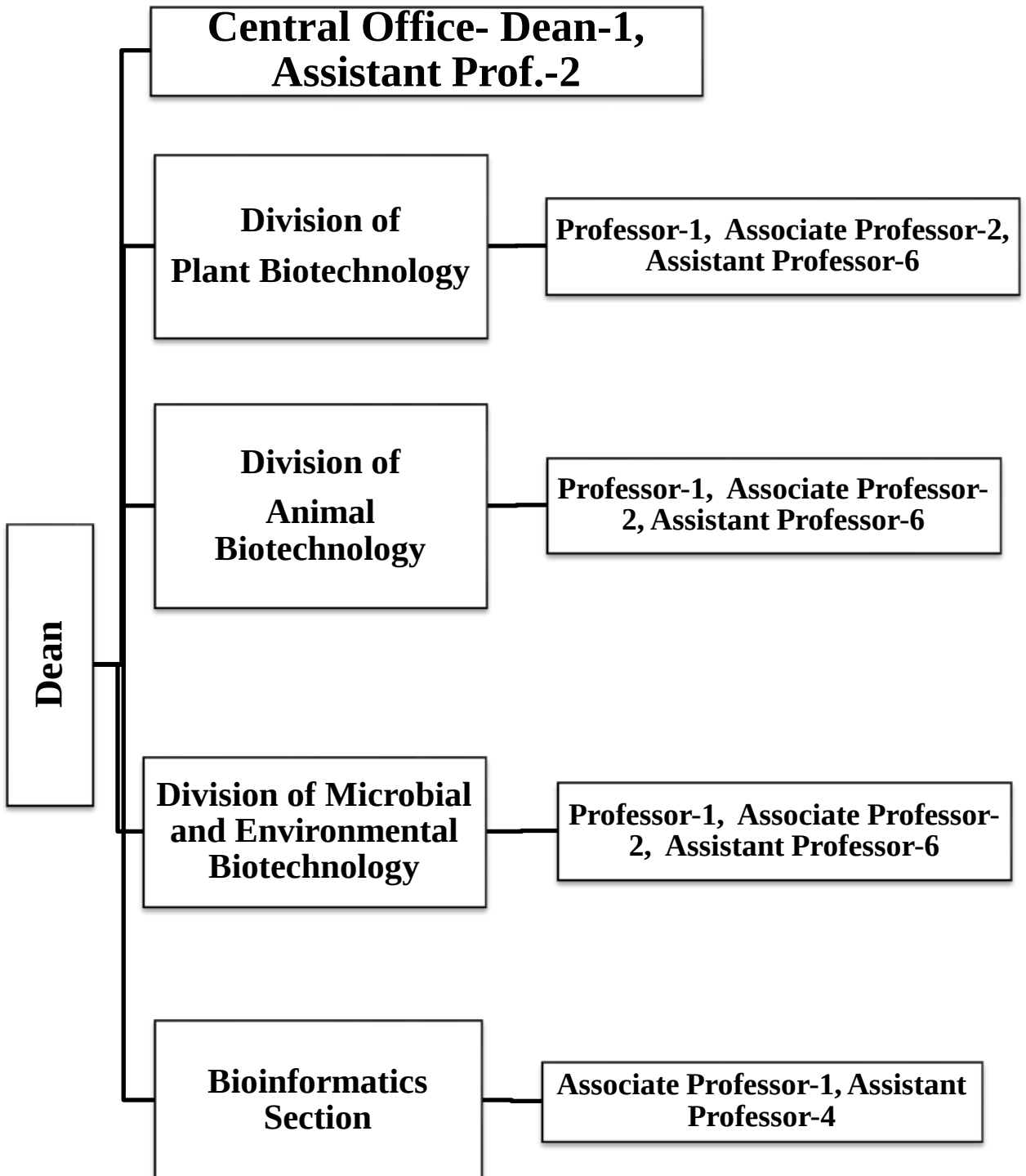
11	Dry Baths	APR	-	PB, AB, MEB
12	Electrophoresis Systems and Power Packs	10x3	30	PB, AB, MEB
13	Electroporator	1x3	3	PB, AB, MEB
14	Environmental Chamber	1x3	3	PB, MEB
15	Fermenter	2x1	2	MEB
16	Fluorescent Microscope	1x2	2	PB, AB
17	Gel Documentation System	2x3	6	PB, AB, MEB
18	Gel Dryers	1x3	3	PB, AB, MEB
19	Growth Rooms	2x1	2	PB
20	Hot Plates, Magnetic stirrers, Vortex etc.	APR	-	PB, AB, MEB
21	Hybridization Ovens	1x2	2	PB, AB
22	Ice Making Machines	1x3	3	PB, AB, MEB
23	Incubator Shakers	4x3	12	PB, AB, MEB
24	Incubator	APR	-	PB, AB, MEB
25	Laminar Flow	3x3	9	PB, AB, MEB
26	Lypholyser	1x3	3	PB, AB, MEB
27	Microcentrifuge	10x3	30	PB, AB, MEB
28	Microplate Washer	1x2	2	PB, AB
29	Microscope	1x3	3	PB, AB, MEB
30	Microscopes (for teaching)	10x2	20	PB, AB
31	Microplate Readers	1x2	2	PB, AB
32	Microwave Digestion Oven	1x1	1	MEB
33	Multiflow Dispenser	2x3	6	PB, AB, MEB
34	Nanodrop for DNA Quantification	1x3	3	PB, AB, MEB
35	Precision Ovens	APR	-	PB, AB, MEB
36	Plant Imager	1x2	2	PB, MEB
37	Plate Centrifuges	2x3	6	PB, AB, MEB
38	Real Time PCR	2x3	6	PB, AB, MEB
39	Refrigerator 4°C	4x3	12	PB, AB, MEB
40	Semi Dry Blotter	1x3	3	PB, AB, MEB
41	Shakers (Table Top)	3x3	9	PB, AB, MEB

42	Spectrophotometer	1x3	3	PB, AB, MEB
43	Thermocycler	10x3	30	PB, AB, MEB
44	Thermomixer	4x3	12	PB, AB, MEB
45	Tissue lyser	2x3	6	PB, AB, MEB
46	Ultracentrifuge	1x3	3	PB, AB, MEB
47	Ultrasound Sonicator	2x3	6	PB, AB, MEB
48	UV Transilluminator	2x3	6	PB, AB, MEB
49	UV Stratalinker	1x2	2	PB, AB
50	Vacuum Concentrator	1x3	3	PB, AB, MEB
51	Water Bath - Shaking	2x3	6	PB, AB, MEB
52	Computers	-	50	PB, AB, MEB
53	Computer for Bioinformatics Section	40	40	Bioinformatics
54	Major Softwares-CLC Genomics and other relevant softwares	APR	APR	Bioinformatics
55	Internet Facility	-	-	Central facility

College of Biotechnology: Overview



College of Biotechnology: Faculty



College of Biotechnology: Supporting Staff

