

1. Evaluative Report of School of Biotechnology

The School of Biotechnology is part of the Faculty of Applied Sciences and Biotechnology, which also has a School of Bioengineering and Food Technology; both schools being interdependent for Academic and Research programs.

Since 2012, the School has been ranked 2nd among the private biotechnology institutions of India by BioSpectrum survey. The University was also acknowledged for its excellent research in Biotechnology Sciences by CCI & Gujarat Technological University. The School has well qualified and learned faculty members encompassing Post-Docs from various institutions in USA and Europe. The School provides an outcome driven curriculum and innovative teaching and learning methods including online learning system (e-Univ). As a value addition to the education, SPRINT program has been adopted for skill and personality development of the students. The curricula are designed and revised in consultation with industry to meet the growing demand of R&D industry and Institutes.

Aligned with the University research thrust areas, the School focuses on harnessing Himalayan biodiversity. The key areas of research include conservation of Himalayan biodiversity, drug discovery, microbial diversity, agricultural research, etiology of human diseases, and diagnostics. Within a short span of five years, 20 students have completed their Ph.Ds. The School has generated research grants more than rupees four crores from DST, LSRB, DBT and ICMR. More than 70 research papers have been published in the journals of national and international repute with the highest impact factor of 15 and average h-index of 4. The School has filed seven patents in translational research of international importance. Moreover, the School has established a repository of micro and macro flora from the Western Himalayas with a vision to preserve and utilize their potential in the future.

1. Name of the Department/School: School of Biotechnology

2. Year of establishment: 2009

3. Is the Department/School part of a Faculty of the University?

Yes, School of Biotechnology is part of Faculty of Applied Sciences and Biotechnology.

4. Names of Programs offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc. D.Litt., etc.):

School of Biotechnology offers Biotechnology and Microbiology programs from undergraduate to Ph.D. level. All programs offered have research as a key

component in the curriculum. The courses offered by School of Biotechnology are listed below.

- B.Sc. (Hons) Biotechnology
- B.Sc. (Hons) Microbiology
- M.Sc. Biotechnology
- M.Sc. Microbiology
- M.Sc. Biochemistry
- B.Tech.-M.Tech. Dual Degree in Biotechnology
- B.Tech.-MBA Dual Degree in Biotechnology
- M.Tech. Biotechnology
- M.Phil. Biotechnology
- M.Phil. Microbiology
- Ph.D. Biotechnology
- Ph.D. Microbiology

5. Interdisciplinary Programs and departments involved:

The School of Biotechnology offers joint programs with other Schools of the University. The list of programs is given below:

Table BT01: List of Programs offered in School of Biotechnology in collaboration with other Schools

S.No	Programs	School
1	B.Sc. (Biotechnology)	School of Chemistry School of Biological and Environmental Sciences
2	B.Sc. (Microbiology)	School of Chemistry School of Biological and Environmental Sciences
3	M.Sc.(Biotechnology)	School of Biological and Environmental Sciences
4	M.Sc. (Microbiology)	School of Biological and Environmental Sciences
5	M.Phil./Ph.D. (Biotechnology)	School of Pharmaceutical Sciences School of Business Management & Liberal Arts School of Electrical and Computer Engineering
6	M.Phil./Ph.D. (Microbiology)	School of Pharmaceutical Sciences School of Business Management and Liberal Arts School of Electrical and Computer Engineering
7	B.Tech.-MBA Dual Degree (Biotechnology)	School of Business Management & Liberal Arts

6. Courses in collaboration with other universities, industries, foreign institutes, etc. : NIL

At present there are no such programs offered by the School of Biotechnology. However, the School intends to enhance collaboration with other Universities, Industries and Foreign institutions for the development of joint courses.

7. Details of Programs discontinued, if any, with reasons:

M.Sc. (Biochemistry) program was discontinued from 2014-15, because the number of students joining the program were less than five. This was done in accordance with the directions of H.P. Private Educational Institutions Regulatory Commission (HP-PERC).

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Semester system followed till June 2015. As per the UGC guidelines, Choice Based Credit System (CBCS) has been adopted from 2015-2016.

9. Participation of the department in the courses offered by other departments:

The School of Biotechnology follows an interdisciplinary approach and actively participates in faculty exchange and delivery of course curriculum across the faculties. School of Biotechnology has strong linkages with School of Bioengineering and Food Technology (SBFT), so faculty members of Biotechnology are actively involved in the courses offered by SBFT. Following is the list of courses taken by the members of the School of Biotechnology:

Table BT02: Participation of School of Biotechnology in courses offered by other Schools

S.No.	Course	Program	Name of the School
1.	Biochemistry	B. Pharmacy	School of Pharmaceutical Sciences
2.	Industrial Biotechnology	MBA (specialization in Biotechnology)	School of Management Sciences and Liberal Arts
3.	Research Methodology and Instrumentation; Advances in Genetic Engineering; Enzymology	B.Sc., M.Phil., Ph.D.	School of Biological and Environmental Sciences
4.	Immunology, Protein Engineering, Instrumentation, Genetic Engineering, Molecular Biology, Enzymology, Stem Cells and Health Care, Major project, Minor Project etc.	B.Tech. (Biotechnology/ Food Technology)	School of Bioengineering and Food Technology

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

Following is the list of teaching faculty in the School of Biotechnology

Table BT03: Number of teaching posts in the School of Biotechnology

Teaching Post	Sanctioned	Filled	Actual (including CAS & MOS)
Professors	3	3	
Associate Professors	4	3	
Assistant Professors	8	5	
Others	-	-	

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Details of teaching faculty in the School of Biotechnology and list of faculty members from other Schools that are teaching courses in School of Biotechnology have been given below:

Table BT04: List of faculty members of School of Biotechnology

Name	Qualification	Designation	Specialization	Years of experience	Ph.D/M.Phil students guided for the last 4 yrs*
Prof. D.R. Sharma	Ph.D.	Prof. of Eminence	Plant Biotechnology	40	5/8
Prof. P.C. Sharma	Ph.D.	Professor	Microbial Biotechnology, Pathogenic viruses	30	5/ 5
Dr Anuradha Sourirajan	Ph.D.	Professor	Cell Cycle and Cancer Biology, Stress Control	11	3/2
Dr Kamal Dev	Ph.D.	Associate Professor	Translational Control, Extremophiles Enzymology	11	4/5
Dr Umar Farooq	Ph.D.	Associate Professor	Parasitology, immunology	12	5/10
Dr Saurabh Kulshrestha	Ph.D.	Associate Professor	Molecular Plant Microbe Interaction	9	3/4
Dr Reena Vohra Saini	Ph.D.	Assistant Professor	Animal Biotechnology, Cancer Biology	6	Nil
Dr Astha Tripathi	Ph.D.	Assistant Professor	Mycoremediation and Mycology	4	Nil/11
Dr.Savita Jandaik	Ph.D.	Assistant Professor	Mycology	10	1/ 2
Dr Sheetal Mehta	Ph.D.	Assistant Professor	Microbiology	4	Nil
Mr Ashwani Kumar	Ph.D. viva awaited	Assistant Professor	Microbiology	1	Nil

*Number includes candidates whose thesis have been submitted

Table BT05: List of faculty members of other Schools involved in teaching in the School of Biotechnology

S. No	Name
1	Ms. Poonam Nanda, Associate Professor, School of Electrical and Computer Science Engineering
2	Dr. Rakesh Shukla, Assistant Professor, School of Business Management and Liberal Arts
3	Dr. Gaurav Sharma, Assistant Professor, School of Chemistry
4	Dr. Amit Kumar, Assistant Professor, School of Chemistry

12. List of Senior Visiting Fellows, adjunct faculty, emeritus professors

The School utilizes the expertise of senior and renowned people in their respective fields by conducting special lectures and discussions with students and faculty members. Following is the list of renowned scientists and academicians inducted in the School as Professor of Eminence and Adjunct Faculty:

Table BT06: List of Professor of Eminence and Adjunct Faculty in School of Biotechnology

S.No	Name	Affiliation
1	Prof. R. C. Mahajan, Professor of Eminence	Ex Professor, PGIMER, Chandigarh Ex President INSA.
2	Dr Manoj Kashyap, Adjunct Professor	Moore's Cancer Center, University of California, USA.

13. Percentage of classes taken by temporary faculty – Program-wise information: Nil

14. Program-wise Student Teacher Ratio

Table BT07: List of current student teacher ratio in the School of Biotechnology

Under Graduate Programs	Student Teacher Ratio
B.Sc.	22.6:1
M.Sc.	9.2:1
M.Tech.	9.6:1

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Table BT08: List of academic and support staff in the School of Biotechnology

Staff	Sanctioned	Filled	Actual
Number of Technical staff	1	Nil	Nil
Number of Lab Attendants	8	8	8
Number of administrative staff	1	1	1

16. Research thrust areas as recognized by major funding agencies

Research philosophy of the School of Biotechnology focuses on developing products of industrial and societal relevance through systematic exploration of Himalayan Biodiversity. School of Biotechnology also strives to provide solutions to problems of local (Himalayan) relevance in the areas of Agriculture, Health, Food and Environment. The same has been endorsed by various funding agencies of Govt. of India. Following are the list of specific areas in which funding has been received by the School:

Drug discovery

- Targeting cell cycle kinases and modulating immune response for Cancer Therapy.
- Identification of bioactive molecules (antimicrobial, anticancer, immunomodulators) from medicinal plants and mushrooms of Western Himalayas.

Microbial biodiversity

- Genomics, proteomics, and enzyme mining from extremophilic (thermophiles, psychrophiles, and halophiles) microorganisms of Himachal Pradesh.

Agricultural research

- Host pathogen interaction
- Generation of mycovirus based biocontrol strategy for the control of fungal pathogens.
- Molecular tools for engineering desiccation and salinity tolerance in crop plants.

Conservation of himalayan biodiversity

- Conservation, characterization and micro-propagation of economically important and endangered medicinal plant species of Western Himalayas.

Etiology of human diseases

- Molecular epidemiology of common diseases, like malaria, Leishmaniasis, Typhoid etc

Diagnostics

- Molecular mechanism, genetic relatedness, and diagnostics of various pathogens i.e. bacteria, viruses, fungi and parasites infecting humans and animals.
- Development of diagnostics and nano peptide based vaccines for Malaria

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

The School of Biotechnology is actively engaged in predefined thrust areas of research of the University. Within a short span of 5 years, most of the faculty members have their own externally funded research projects. In addition, a number of research projects have been granted to students to pursue Ph.D.

a) National

Number of faculty members with ongoing projects: 06

Name of faculty members: Dr. Umar Farooq, Dr. Anuradha Sourirajan, Dr. Saurabh Kulshrestha, Dr. Astha Tripathi, Dr. Reena Vohra Saini, Dr Savita Jandaik

b) International funding agencies: Nil

c) List of research projects sanctioned and grants received

Table BT9: List of research projects sanctioned and grants received by the faculty members in School of Biotechnology:

Year	PIs	Name of the Project	Name of Funding Agency	Total Grant Received (in lakhs)
2009-2012	Dr. Savita Jandaik	Studies on genetic variability in <i>Ganoderma lucidum</i> to study elite strain for commercial purposes	DST	14.0
2011-15	Dr. Anuradha Sourirajan	Identification of substrates for <i>S. cerevisiae</i> Polo- like kinase (PLK), Cdc5 during meiotic cell division.	DBT	45.47
2012-15	Dr. Umar Farooq	Prevalence and Characterization of <i>Echinococcus granulosus</i> strains isolated in Himachal Pradesh	ICMR	35.0

Year	PIs	Name of the Project	Name of Funding Agency	Total Grant Received (in lakhs)
2012-15	Dr. Anuradha Sourirajan Co-PI: Dr. Kamal Dev	Identification and Characterization of Medicinal Plants of North-West Himalayas with Synergistic Effects on Traditional Antibiotics to Control Clinical Bacterial Infections.	SERB/DST	22.7
2012-15	Dr. Saurabh Kulshrestha	Identification of genes involved in pathogenesis of <i>Rosellinia necatrix</i> causing white root rot on apple	DST	23.0
2014-17	Dr. Saurabh Kulshrestha	Identification and characterization of hypovirulence factors from <i>Rosellinia nectarix</i> causing white root rot in apple.	DBT	28.7
2014-17	Dr. Astha Tripathi (PI), Dr Saurabh Kulshrestha (Co-PI)	Isolation and identification of bioactive compounds from wild mushrooms for new drug discovery	DBT	16.0
Approved	Dr. Umar Farooq	Role of Th17 and Treg Cells in Pathogenicity and immunity of <i>P. falciparum</i> infection	ICMR	80.0
Approved	Dr. Reena Saini (PI) & Dr. Neeraj Mahindroo (CO-PI)	Evaluation of withanolide lactones as immunomodulators to induce granulysin expression in immune cells conferring cytotoxicity towards cancerous cells	DBT	25.0
Approved	Dr Astha Tripathi	Cultivation of wild edible mushrooms with functional properties of performance enhance	LSRB	20.0
			TOTAL	309.87

Table BT10: List of Student projects sanctioned by various funding agencies

Year	PIs	Name of the Project	Name of Funding Agency	Grant Received
2010-2015	Ms. Varsha Rani under the supervision of Dr Kamal Dev	Characterization of betagalactosidase from thermophilic bacteria.	DST(INSPIRE)	17.0 Lakhs
2010-2015	Mr. Jitender Kumar under the supervision of Dr D. R. Sharma	In vitro culture standardization of <i>Podophyllum hexandrum</i> for production of Podophyllotoxin.	UGC –RGNF	17.0 Lakhs
2011-2016	Ms. Nazam Khan under the supervision of Dr Umar Farooq	Identification and characterization of promiscuous peptides from vaccine candidate antigen of <i>P. falciparum</i> by using <i>In silico</i> approach.	UGC –MANF	17.0 Lakhs
2014-2018	Ms. Tanvi Gupta under the supervision of Dr Saurabh Kulshrestha	Identification and characterization of mycoviruses capable of inducing hypovirulence in isolates of <i>Sclerotinia sclerotiorum</i>	DST(INSPIRE)	17.0 Lakhs
2014-2018	Ms. Neha under the supervision of Dr Umar Farooq	Role of Th-17 and Tregulatory cells in pathogenesis and immunity in <i>Salmonella typhi</i> infection	DST(INSPIRE)	17.0 Lakhs
2012-2016	Ms. Poonam Kumar under the supervision of Dr Savita Jandaik	Isolation characterization, immobilization and application of an alkaliphilic thermotolerant protease	UGC –RGNF	17.0
2013-2017	Ms. Bharti under the supervision of Dr P.C. Sharma	Phenotypic and genotypic characterizations of Extended spectrum beta lactamase (ESBL) producing MDR isolates of pseudomonas aeruginosa from clinical case in Himachal Pradesh	UGC –RGNF	17.0
			TOTAL	119.0 Lakhs

Total Grant Received: Rs 428.87 lakhs

18. Inter-institutional collaborative projects and associated grants received

Shoolini University facilitates inter-institutional collaborations at national and international level for research. The School is able to obtain one research project having multi institutional national collaboration. A number of other collaborations are being pursued for funding.

a) National collaboration: 1

Table BT11: Details of Inter institutional research project

S. No.	Project Title	Funding Agency	PI	Co-PI	Grant amount
1	Role of Th-17 and Tregulatory cells in pathogenesis and immunity in <i>Plasmodium falciparum</i> infection	ICMR	1. Dr. Umar Farooq, M.Sc., Ph.D, Associate Professor, Microbiology, Shoolini University, Solan, HP 2. Dr. R. Sehgal, M.D., Professor, Deptt. Of Parasitology, PGIMER, Chandigarh 3. Dr. J. Mahanta, MD, Director Regional Medical Research Centre (ICMR) Dibrugarh, Assam.	1. Dr. R.C. Mahajan, MD. Emeritus Professor, Dept. of Parasitology, PGIMER, Chandigarh 2. Dr. P. K. Mohapatra, M.D. Deputy Director/Scientist F Regional Medical Research Centre (ICMR) Dibrugarh, Assam.	80.0 Lakh

b) International collaboration Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

The School of Biotechnology has applied for DST-FIST grant for Rs. 3 crores

20. Research facility / centre with

State recognition: Nil

National recognition: Nil

Microbial repository of North-western Himalayas (Proposed)

International recognition: Research Center in Biomics in collaboration with Sierra Biolife, Australia

21. Special research laboratories sponsored by / created by industry or corporate bodies: Nil

22. Publications:

Research being a focal theme of School of Biotechnology, School has published in the journals of national and international repute.

Number of papers published in peer reviewed journals (national / international): 72

Monographs: Nil

Chapters in books: Nil

Edited Books: Nil

Books with ISBN with details of publishers: Nil

Number listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete, Dare Database - International Social Sciences Directory, EBSCO host, etc.): 35

Citation Index – range /average: 0-15/1

SNIP:

SJR:

Impact Factor – range average: 0- 15 /11

h-index: 4

Detail List of Publications:

1. Ali R, Chauhan V, Farooq S, Khan A and Farooq U. *In-Vitro* Analysis of Antibacterial Activity of *Ocimum sanctum* against Pathogenic Bacteria and Quantification of Ursolic Acid and Oleanolic Acid. *International Journal of Pharmaceutical Science Review and Research* 2014, 25(2): 13-17.

2. Bains A and Tripathi A. Antibacterial activity of wild mushrooms against pathogenic bacteria. *Journal of Pharmacology* (Under revision)
3. Batta B, Katoch A, Bhatia VK, Patil S and Sharma PC. Screening of leaf extracts of *Azadirachta indica* (Neem), *Aegle marmelos* (Bael) and *Trigonella foenumgraecum* (Methi) for their inhibitory activity on the strains of *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Candida* species. *International Journal of Pharmaceutical Sciences Review and Research* 2013, 19(2): 42-46.
4. Bharti, Minhas N, Patil S, Kumar A and Sharma PC Novel preparations of culture media from plant materials for cultivation of *Candida albicans*. *International Journal of Pharmaceutical Sciences Review and Research* 2013, 20(1): 128-133
5. Chaudhary R and Tripathi A. Molecular profiling and bioactive properties of six wild mushrooms collected from Himachal Pradesh. *Journal of Applied Microbiology*. (Under Revision)
6. Chaudhary R. and Tripathi A. (2015) Isolation and identification of bioactive compounds by *Irpex lacteus*. *Journal of Pharmaceutical Research Science* (Accepted).
7. Chauhan R and Sharma PC Phenotypic detection of Metallo-Bactamase(MBL) producers among multidrug resistant(MDR)strains of *P. aeruginosa* in Himachal Pradesh. *Indian Journal of Basic and Applied Medical Research* 2015, 3(1):303-313
8. Chauhan S, Farooq U, Singh V and Kumar A. Determination of prevalence and antibacterial activity of ESBL (extended spectrum beta-lactamases) producing *Klebsiella* Species isolated from raw milk of doon valley in India. *International Journal of Pharma and Bio Sciences* 2013, 4(1): 417 – 423.
9. Clayberger C, Finn MW, Wang T, Saini RV, Wilson C, Barr VA, Sabatino M, Castiello L, Stroncek D and Krensky AM. 15 kDa granulysin causes differentiation of monocytes to dendritic cells but lacks cytotoxic activity. *Journal of Immunology* 2012, 188:61196126.
10. De Muyt A, Jessop L, Kolar E, Sourirajan A, Chen J, Dayani Y, and Lichten M. BLM helicase ortholog Sgs1 is a central regulator of meiotic recombination intermediate metabolism. *Molecular Cell* 2012, 46: 43-53.
11. Dev K, Qui H, Dong J, Zhang F, Barthlme D and Hinnebusch AG. The β /Gcd7 Subunit of Eukaryotic Translation Initiation Factor 2B

- (eIF2B), a Guanine Nucleotide Exchange Factor, Is Crucial for Binding eIF2 *In Vivo*. ***Molecular and Cellular Biology*** 2010, 30 (21), 5218-5233. *Spotlight article in the same issue: Double Duty for an Essential Subunit of Eukaryotic Translation Initiation Factor 2B.*
12. Farooq U, Dubey ML, Shrivastwa SK and Mahajan RC. Genetic polymorphism of *Plasmodium falciparum*: Differentiation of parasite isolates of high and low virulence by RAPD. ***Indian Journal of Medical Research*** 2012, 136: 292-295.
 13. Gupta S, Sharma P, Dev K, Srivastava M, and Sourirajan A. A diverse group of halophilic bacteria exist in Lunsu, a natural salt water body of Himachal Pradesh, India. ***SpringerPlus*** 2015, (accepted)
 14. Jandaik S, Kumar V and Thakur P. *Vermiwash: Plant growth enhancer and antifungal agent*. ***International Journal of Extensive Research*** 2015, 2:38-41.
 15. Jandaik S, Sharma M, Jitender, and Singh S. Antimicrobial activity of bacteriocin produced by lactic acid bacteria isolated from milk products. ***Journal of Pure and Applied Microbiology*** 2012, 7(1): 603-608.
 16. Jandaik S, Singh R and Sharma M. Comparative growth characteristics and yield attributes of Lingzhi or Reishi Medicinal Mushroom, *Ganoderma lucidum* (Higher basidiomycetes) on different substrates in India. ***International Journal of Medicinal Mushroom*** 2013, 15(5): 497-503
 17. Joshi H, Gururaja MP and Singh S. *Memecylon umbellatum*: A Review. ***Journal of Pharmacy Research*** 2011, 11(2): 54-58
 18. Kapoor S, Sharma DR and Sharma S. Supervising commodious exposed therapeutic plant *Inula Racemosa* by *in vitro* callus induction. ***Indian Journal of Scholarly Research*** 2013, 2(4): 49
 19. Katoch A, Batta B, Kumar A and Sharma PC. Screening of *Murraya koenigii* (Curry) and *Camellia sinensis* (Tea) leaves for antimicrobial activity against strains of *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Candida* species and their phytochemical analysis. ***International Journal of Pharmaceutical Sciences and Research*** 2013, 4(2): 862-868
 20. Kaur N, Farooq U, Rana T, and Singh S. Multidrug resistance in *P aeruginosa* : In vitro efficacy of current chemotherapy against clinical isolates from Northarn India. ***International Journal of Biology, Pharmacy and Allied Sciences*** 2015, (In Press)
 21. Kaushal S, Gupta A and Saini RV. Immunomodulatory activity of

- in vitro* propagated tissues of *Gentiana kurroo* Royle. ***International Journal of Biology, Pharmacy and Allied Sciences* 2015**, (Accepted).
22. Kaushal S, Sidana A, and Dev K. In vitro plant production through apical meristem culture of *Gentiana kurroo* Royle. ***Journal of Medicinal Plants Studies* 2014**, 3(1): 04-09
 23. Khan N, Kumar A, Sharma V, Khan A and Farooq U. Ghaggar River: Impact of polluting agents. ***International Journal of Pharmaceutical Sciences Review and Research* 2014**, 24(2): 171175.
 24. Khatri I, Kaur S, Devi U, Kumar N, Sharma D, Subramanian S and Saini AK. Draft Genome Sequence of Plant Growth-Promoting Rhizobacterium *Pantoea* sp. Strain AS-PWVM4. ***Genome Announcement* 2013**, 1. pii: e00947-13. doi: 10.1128/genome.A.00947-13.
 25. Kulshrestha S and Sharma M. *Colletotrichum gloeosporioides*: An anthracnose causing pathogen of fruits and vegetables. ***Biosciences, Biotechnology Research Asia* 2015**, (Accepted).
 26. Kulshrestha S, Hallan V, Sharma A, Seth CA, Chauhan A and Zaidi AA. Molecular characterization and intermolecular interaction of coat protein of *Prunus necrotic ringspot virus*-implications for virus assembly. ***Indian Journal of Virology* 2013**, 24(2): 235-241.
 27. Kulshrestha S, Seth CA, Sharma M, Sharma A, Mahajan R and Chauhan A. Biology and control of *Rosellinia necatrix* causing white root rot disease: A review. ***Journal of Pure and Applied Microbiology* 2014**, 8(3): 1803-1814.
 28. Kulshrestha S, Sharma A and Seth CA. Molecular biology of *Tomato spotted wilt virus* – an update. ***Journal of Applied Horticulture* 2013**, 15(2): 71-80.
 29. Kumar A, Dev K, and Sourirajan A. Screening of medicinal and aromatic plants of Himachal Pradesh for antiproliferative activities against budding yeast *Saccharomyces cerevisiae*. ***International Journal of Pharma and Bio Sciences* 2015**, 6(3): (B) 280 – 288.
 30. Kumar A and Sharma PC. In vitro studies on selective virulence traits of fluconazole resistant candid species of *Candida* isolated from clinical cases. ***International Journal of Biological and Pharmaceutical Research* 2013**, 4(10): 685-696.
 31. Kumar A, Kumar A, Sharma K, Patil S, Chauhan V, Pratush A and Sharma PC. Smear and Culture examination of clinical sample from suspected patient for *Mycobacterium tuberculosis*. ***International***

- Journal of Pharmaceutical Sciences Review and Research* 2012, 2:83-85.
32. Kumar A, Sharma PC, Kumar A and Negi V. A Study on phenotypic traits of *Candida* species isolated from blood stream infections and their in vitro susceptibility to fluconazole. *Al-Ameen Journal of Medical Sciences Research* 2014, 7(1):83-91
 33. Kumar A, Singh S and Kumar D. Evaluation of antimicrobial potential of cadmium sulphide nanoparticles against bacterial pathogens. *International Journal of Pharmaceutical Sciences Review and Research* 2014, 24(2):202-206.
 34. Kumar J, Dev K and Kumar A. Quantification of Podophyllotoxin From *Podophyllum hexandrum* Using HPLC-UVDAD. *Journal of Tree Sciences* 2014, 33 (2): 33-37.
 35. Kumar T, Sourirajan S and Dev K. Isolation and characterization of psychrotolerant *Serratia quinivorans* secreting β -galactosidase. *Universal Journal of Microbiology Research* 2015, 3(1): 1-9.
 36. Kumari P, Jandaik S and Batta S. A thermotolerant protease from *Bacillus* sp- isolation, characterization, optimization and purification. *Journal of Pure and Applied Microbiology* 2014, 8(5): 3667-3674
 37. Mehta P, Walia A, Chauhan A, Kulshrestha S and Shirkot CK. Phosphate solubilization and plant growth promoting potential by stress tolerant *Bacillus* sp. isolated from rhizosphere of apple orchards in trans Himalayan region of Himachal Pradesh. *Annals of Applied Biology* 2013, 163: 430-443.
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 40. Mehta S, Jandaik S and Gupta D Effect of cost-effective substrates on growth cycle and yield of Lingzhi or Reishi medicinal mushroom, *Ganoderma lucidum* (Higher Basidiomycetes) from North western Himalaya (India). *International Journal of Medicinal Mushrooms* 2014, 16(6): 585–591
 41. Neha, Chauhan S, Sharma Y, Tagore S, Alam A and Farooq U. Screening of medicinal plants for antityphoidal activity against

- multidrug resistance *Salmonella typhi*. **Universities' Journal of Phytochemistry and Ayurvedic Heights** 2014, 2 (17):68-72.
42. Pant N, Sharma PC, Jatana M, Singh S, Patil S and Kumar A. A novel modification of culture media for cultivation of *Cryptococcus neoformans* by using extracts of different plants from Solan area of Himachal Pradesh (India). **Elixir Bio Tech.** 2012, 45:7876- 7880
 43. Pathania K, Singh S and Joshi H. Synergistic activity of plants with standard antibiotics against MDR strains. **World Journal of Science and Technology** 2013, 3(2): 26-29
 44. Patil S, Kumar D and Sharma PC. Emergence of methicillin resistant *Staphylococcus aureus* strains (MRSA) and Multidrug resistant (MDR) strains in Himachal Pradesh. **International Journal of Pharmaceutical Sciences Review and Research** 2013, 23(1): 1-15.
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 46. Rana T, Singh S, Kaur N, Pathania K and Farooq U. A review on efflux pump inhibitors of medically important bacteria from plant sources. **International Journal of Pharmaceutical Sciences Review and Research** 2014, 26(2):101-111.
 47. Saini AK, Chauhan PK, Singh V and Sharma P. Phytochemical, antioxidant & in vitro antibacterial activity of aqueous & ethanolic fruit extracts of *Kigelia Africana*. **Indian Journal of Pharmaceutical and Biological Research** 2013, 1(2):46-52
 48. Saini RV, Wilson C, Finn MW, Wang T, Krensky AM and Clayberger C. Granulysin delivered by cytotoxic cells damages endoplasmic reticulum and activates caspase-7 in target cells. **Journal of Immunology** 2011, 186:3497-3504.
 49. Sankhyan N, Sharma A, Seth CA, Chauhan A and Kulshrestha S. Determination and comparison of Vitamin C content from *Moringa oleifera* by different methods. **International Journal of Agriculture Science and Research** 2013, 3(2): 67-70.
 50. Sharma A and Kulshrestha S. First report of *Amaranthus* sp. as a natural host of Capsicum chlorosis virus in India. **VirusDisease** 2014, 25(3): 412-413.
 51. Sharma A, Khan MA and Farooq U. Screening of Different Varieties of *Mangifera indica* for antimicrobial activity. **Universities' Journal of Phytochemistry and Ayurvedic Heights** 2014, 1 (16); 12-19.

52. Sharma B, Verma R, Dev K and Thakur R. Molecular characterization of Manikaran hot spring microbial community by 16S rRNA and RAPD analysis. *Biotechnology An Indian Journal*. 2012, 6: 254-266
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cellulans CKMX1 isolated from mushroom compost. *World Journal of Microbiology and Biotechnology* 2014, 30(10): 25972608.

23. Details of patents and income generated

The faculty members of the School have been able to file patents from the translational research outputs as per details below:

Table BT012: List of patents filed by the faculty members of School of Biotechnology

S. No	Title of the patent	Faculty Name	Patent filing no
1	Compound for enhancing activity of antibiotic compositions and overcoming drug resistance.	Umar Farooq, Tanuja Rana, Navroop Kaur	1229/DEL/2015
2	Novel peptide sequence for developing diagnostic agents for malaria detection.	Umar Farooq, Nazam Khan, Shakti Pal Singh Chauhan	1228/DEL/2015
3	Novel peptide sequences for developing anti-malaria vaccines and therapeutic compounds.	Umar Farooq, Nazam Khan, Shakti Pal Singh Chauhan	1465/DEL/2015
4	Terpenoids from <i>Colebrookea oppositifolia</i> as activity enhancers of antibiotic compositions and extraction method thereof.	Kamal Dev, Anuradha Sourirajan, Vipasha Sharma	1326/DEL/2015
5	Compounds for enhancing activity of antibiotic compositions against drug sensitive and drug resistant bacteria.	Kamal Dev and Kazal Pathania	1429/DEL/2015
6	Phytocompounds from <i>Vitex nigundo</i> for enhancing antibiotic activity and overcoming drug resistance.	Kamal Dev, Anuradha Sourirajan, Sonika Gupta	1464/DEL/2015
7	A novel microbe producing extracellular β -galactosidase and method of enzyme production thereof	Kamal Dev, Tarun Kumar	1895/ DEL/2015

24. Areas of consultancy and income generated:

School of Biotechnology encourages faculty members to conduct consultancy services in the areas of their expertise. Following are the details of consultancy services provided:

Table BT013: Consultancy provided in the areas of Biotechnology

S.No.	Faculty	Consultancy Topic	Institute/Organization
1	Dr Saurabh Kulshrestha	Polymerase Chain Reaction and its application	State Council of Educational Research and Training, Solan
2	Dr Saurabh Kulshrestha	Human Genome Project and applications	State Council of Educational Research and Training, Solan

25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

- Dr Saurabh Kulshrestha selected under DBT CREST award scheme to visit USA.

26. Faculty serving in

a) National committees:

Prof. D. R. Sharma, member Research advisory Committee to ICAR Institutes

b) International committees:

Prof. D. R. Sharma, member Indo-US Management Team

Prof. D. R. Sharma, UNESCO & FAO fellow in USA & Morocco,

c) Editorial Boards

Table BT014: List of faculty members serving in editorial boards of Journals and Societies

S.No.	Name of Faculty	Position	Journal/Society
1	Prof P. C. Sharma	Editor	Indian Journal of Veterinarians
2	Prof. P. C. Sharma	Editorial consultant	Indian journal of Veterinary Research
3	Dr Kamal Dev	Member	Universal Journal of Microbiology research and Academic Journals
4	Dr Umar Farooq	Member	Journal of Pharmaceutical Sciences and Allied Research
5	Dr Umar Farooq	Member of Advisory Committee	Universities Journal of Phytochemistry and Ayurvedic Heights

d) any other (please specify)

Three faculty members have served as reviewers for manuscripts of journals indexed in Scopus

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs). Table BT015: List of recharging strategies for member of School of Biotechnology

S.No	Academic Staff Development Programs		No. of Faculty Members
1	Refresher courses	---	---
2	HRD Programs	---	---
3	Orientation Programs	---	---
4	Staff training conducted by the University	1. eUniv Workshops by Mr Kamal Kant, Assistant Professor, MBA Shoolini University, 2013 & 2014 2. Faculty Development Program conducted by Faculty of Management Sciences, Shoolini University 3. Sensitization Program in collaboration with Ennoble IP 4. Train the Trainer workshop on IPR organized in collaboration with Corporate IP consultants	8 5 5 5
5	Staff training conducted by other Colleges/ University	---	---
6	Summer / winter Schools, workshops, etc.	Workshop on Advances in Electron Microscopy and Allied Fields (NWAEMA-2011) held in Shoolini University, September 2011	4
7	Any other (please Specify)	Conferences : national and International	9
		Thesis & Paper Writing, 16 th April, 2015 by Prof. Klaus von Gadow, University of Germany	9
		“Innovation, Innovative Minds Impacting Change”, 6 th April, 2015 by Dr. P.S. Ahuja, former Director General, CSIR	10
		“Latest Trends and Scientific Innovations”, 20 th March, 2015 by Dr. Niranjani Bilgi	8
		Research Writing, 2013 by Ms Andrea Wright, Brown University, USA	8

28. Student projects

All the programs offered in the School of Biotechnology have mandatory research projects as part of curriculum. Most of the students undergo in house research projects and some of the students pursue research project in other reputed research institutes/Industries.

•percentage of students doing in house projects including inter-departmental projects: 88%

•percentage of students doing projects in collaboration with other universities / industry / institute: 12%

Table BT016: List of total numbers of research projects executed by student of School of Biotechnology

No. of Programs with Students Project/research as mandatory course	Number of projects Executed (completing by June)
M.Sc. Biotechnology	87
M.Sc. Microbiology	51
M.Sc. Biochemistry	03
M.Phil. Biotechnology	19
M.Phil. Microbiology	38
M.Tech Biotechnology	27
B.Tech.-M. Tech Dual Degree in Biotechnology	14
Ph.D. Biotechnology	10
Ph.D. Microbiology	11
B.Sc. Biotechnology	-
B.Sc. Microbiology	-
B.Tech.-MBA Dual Degree in Biotechnology	-

29. Awards / recognitions received at the national and international level by

Faculty and students of School of Biotechnology have been recognized by various funding agencies in terms of research grants sanctioned and awards conferred.

Faculty members:

- Prof. D. R. Sharma: UNESCO & FAO fellow in USA & Morocco
- Dr Anuradha Sourirajan, DBT-BIOCARE for women scientists, 2011
- Dr Astha Tripathi, DBT-BIOCARE for women scientists, 2013

- Dr Saurabh Kulshrestha was awarded with DBT-CREST award for year 2012.

Doctoral/ postdoctoral students:

- Ms. Varsha Rani conferred INSPIRE research fellowship in 2010
- Ms. Nazam Khan conferred Maulana Azad National Fellowship in 2011
- Mr. Jitender Kumar conferred Rajiv Gandhi National Fellowship in 2011
- Ms. Poonam conferred Rajiv Gandhi National Fellowship in 2011
- Ms. Bharti conferred Rajiv Gandhi National Fellowship in 2012
- Ms. Tanvi Gupta conferred INSPIRE research fellowship in 2014
- Ms. Neha Chauhan conferred INSPIRE research fellowship in 2014

Students:

1. Shivali Pathania received Best Poster award, for the paper entitled “Sources and Mineral Constituents on Solid State fermentation of Brewer’s spent grains for Citric acid production”. In: Indo Italian workshop on Food Technology and Cold Chain Management. November, 26-27, Amity University, Noida, (New Dehli NCR) Campus, India”
2. Nitika Thakur, received first prize in oral session titled “Technological intervention through different systems of cultivation presented at National Conference on Recent Developments in Science and Technology (ISRS); 2014 Oct 10-12; Department of Biotechnology, HPU Shimla, Himachal Pradesh.
3. First Prize on Research paper, entitled “Neha, Shakti Chauhan, Yashu Sharma, Shilpi Tagore, Alam A and U Farooq, Screening of medicinal plants for antityphoidal activity against multidrug resistance *Salmonella typhi*”, 2014
4. Himika Gupta received Dr. Anji Reddy Award (2011) by Physiological Society of India Annual Conference, NRI Medical College and General Hospital, AP.
5. Ali R, Farooq S, Farooq U received Best Poster Award in "National Seminar On Bio-Degradation and Bioremediation -A Novel Remedy for pollution Abatement" Saturday,18th February 2012.

30. Seminars/ Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Following is the list of Seminars/ Conferences/Workshops jointly organized by the faculty members of School of Biotechnology and School of Bioengineering and food Technology:

Table BT017: List of Seminars/Conferences/Workshops organized by the School of Biotechnology

Source of Funding	Details	Outstanding Participants
DBT, Govt of India	Training cum seminar on Molecular Biology techniques for college lecturers (November 10-19, 2011): Rs. 50000.00	-Prof. S.K. Sharma, Vice Chancellor, HPKV, Palampur. -Prof. H.S. Dhaliwal, Department of Biotechnology, IIT Roorkee -College teachers and research scholars
Shoolini University	Fascination of Plants Day” in collaboration with European Plant Science Organization (EPSO) for creating awareness amongst the people about the environment and its value for the human society (18 may 2012 & 17 may 2013).	Prof. K.R. Dhiman, Vice Chancellor, UHF, Nauni
MOA, Govt of India	Awareness Program for farmers on Protection of Plant Varieties and Farmers Rights, sponsored by PPV&FRA, Ministry of Agriculture (February 19, 2013): Rs. 80000.00.	-Prof. K. Kumar, UHF, Nauni -Prof. R.K. Kohli -Farmers
Shoolini University	Sensitization Program in collaboration with Ennoble IP to provide awareness about IPR and encourage creativity among the faculty and students (July 30, 2014; August 13, 2014).	Teachers and students
Shoolini University	Train the Trainer workshop on IPR organized in collaboration with Corporate IP consultants, Mohali (April 8, 2015).	-Dr. Parikshit Bansal, Corporate IP consultants -Teachers and students

31. Code of ethics for research followed by the department’s

- ICMR code of ethics has been followed for research in Biotechnology and Microbiology.
- Joint Research and Development Committee (JRDC) and Institutional Ethical Committee (IEC) ensure that the research ethics of ICMR is followed.

32. Student profile Program-wise:

Table BT18: Program-wise profile of students in the School of Biotechnology

Courses	Year	Name of the Program (refer to question no. 4)	Applications received	Selected		Pass percentage		
				Male	Female	Male	Female	
B.Sc	2014-15	Biotechnology	55	10	28	NA	NA	
	2014-15	Microbiology	34	9	21	NA	NA	
M.Sc	2009-10	Biotechnology	40	3	2	100	100	
	2010-11		75	41	29	100	100	
	2011-12		50	21	21	88	100	
	2012-13		25	4	16	100	100	
	2013-14		26	3	9	100	100	
	2014-15		16	7	5	100	100	
	2009-10	Microbiology	40	4	0	100	100	
	2010-11		45	12	24	100	100	
	2011-12		30	11	14	88	100	
	2012-13		25	5	17	100	100	
	2013-14		10	3	6	100	100	
	2014-15		18	8	4	100	100	
	2012-13 2013-14	Biochemistry	1	0	1	100	100	
			3	0	2	100	100	
M.Tech	2010-12	Biotechnology	14	4	7	100	100	
	2011-13		10	2	6	100	100	
	2012-14		6	1	4	100	100	
	2013-15		6	0	3	100	100	
	2014-16		17	7	8	NA	NA	
B.Tech- M.Tech	2009-14	Dual Degree	8	5	3	100	100	
	2010-15	Biotechnology	6	3	3	100	100	
	2011-16		4	2	2	NA	NA	
	2012-17		8	5	3	NA	NA	
B.Tech- MBA	2009-10	Dual Degree Biotechnology	1	1	0	100	NA	
M.Phil	2010-11	Biotechnology	12	12	1	9	100	100
	2011-12		10	8	1	7	100	100
	2012-13		5		2	6	NA	83
	2013-14				1	2	NA	100
	2014-15				1	3	NA	NA
	2010-11	Microbiology	18		7	10	100	100
	2011-12		16		2	11	100	100
	2012-13		6		0	4	NA	100
	2013-14		10		1	7	NA	85
	2014-15		5		0	3	NA	NA

Courses	Year	Name of the Program (refer to question no. 4)	Applications received	Selected		Pass percentage	
				Male	Female	Male	Female
PhD	2009-10	Biotechnology	11	4	3	100	100
	2010-11		24	3	10	66	70
	2011-12		14	2	9	NA	11
	2012-13		22	6	12	NA	NA
	2013-14		17	1	9	NA	NA
	2014-15		15	2	3	NA	NA
	2009-10	Microbiology	12	2	4	100	100
	2010-11		14	5	4	60	75
	2011-12		13	4	6	NA	38
	2012-13		10	2	8	NA	NA
	2013-14		19	2	8	NA	NA
	2014-15		10	0	4	NA	NA

NA*: ongoing students

33. Diversity of students

Table BT19: Program-wise diversity of students in the School of Biotechnology

Name of the Program (refer to question no. 4)	% of Students from the Same University	% of students from other universities within the State	% of students From Universities outside the State	% of Students from other countries
M.Sc Biotechnology	Nil	65	35	Nil
M.Sc Microbiology	Nil	67	33	Nil
M.Sc Biochemistry	Nil	50	50	Nil
M.Tech. Biotechnology	23	Nil	77	Nil
B.Tech.-M.Tech. Dual Degree Biotechnology	100	Nil	Nil	Nil
B.Tech.-MBA Dual Degree Biotechnology	100	Nil	Nil	Nil
M.Phil Biotechnology	25	50	25	Nil
M.Phil Microbiology	Nil	67	33	Nil
PhD Biotechnology	20	50	30	Nil
PhD Microbiology	25	50	25	Nil

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

Table BT20: List of students the School of Biotechnology who have qualified national level examinations

S.No	Name of the fellowship	No. of students qualified
1	CSIR-UGC NET	05 (Kirti, Dinesh Kumar, Pradeep Kumar, Manoj Kumar, Rupjyoti Kalita)
2	ARS-NET	01 (Dinesh Kumar,)
3	DST-INSPIRE	03 (Varsha Rani, Neha Chauhan, Tanvi Gupta)
4	GATE	4 (Amit Kumar, Kirti, Varun Chauhan, Divyanshi Sharma)
5	UGC-Rajiv Gandhi Fellowship	03 (Jitender Kumar, Poonam Kumari, Bharti)
6	UGC-Maulana Azad Fellowship	01 (Nazam Khan)

35. Student progression within Shoolini University

Table BT21: Details of student progression in the School of Biotechnology

Student progression	Percentage against enrolled
UG to PG	10%
PG to M.Phil.	5%
PG to Ph.D.	5%
Ph.D. to Post-Doctoral	NA
Employed	
Campus selection	23%
Other than Campus recruitment	76%
Entrepreneurs	1%

36. Diversity of staff

Table BT22: Diversity of faculty members in the School of Biotechnology

Percentage of faculty who are graduates	Ph.D.
of the same University	10%
from other universities within the State	20%
from universities from other States	60%
from universities from other Countries	10%

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period: 2 (listed below)

Table BT23: List of faculty members awarded Ph.D. in the last 5 years

Name of Faculty Member	Year of Award of Ph.D. degree
Sheetal Mehta	2014
Astha Tripathi	2010

38. Present details of departmental infrastructural facilities with regard to

a) Library

Yogananda library of Shoolini University is fully digitized and houses text books, reference books, journals, magazines and newspapers both in hard bound and as e-resource sufficient for academic and research requirements of the students. All the e-resources are available to the faculty and students through Learning Management System (LMS) and Knowledge Management System (KMS). Yogananda library has subscription to a number of learning packages from EBSCO which includes more than a lakh e-books and ~9000 research journals etc.

In addition to central library each school has its own virtual library which is linked to the central library with a minimum physical books and journals. All the study material available in the central library can be easily used through school libraries. School library also contains thesis, dissertations, project reports etc

Following is the study material related to Biotechnology/Microbiology available through school library :

- o Total Books available: 5990 + more than 1 lakh e-books
- o Reference Books available: 480
- o Journals: 17 + 9000 e-journals (combined science, technology and management)

b) Internet facilities for staff and students

LAN (1000 Mbps of local network connected via fiber and cat 6) on desktops and Wi-Fi throughout Faculty/Campus

c) Total number of class rooms: 3 dedicated class rooms. In addition, University prepares a centralized time table and assigns the classrooms as per the need.

d) Class rooms with ICT facility: 2 class rooms with ICT facility and one movable projector.

e) Students' laboratories: six as mentioned below:

Table BT24: List of laboratories available in the School of Biotechnology for student practical

Laboratory	Description
UG1 Biotechnology	Biotechnology Undergraduate Lab is well equipped with facility to conduct practical at B.Sc. Biotechnology Level. The Lab contains Laminar Air Flow, Autoclave, -20 degree freezer, Ovens, Incubators, Shaker etc.
UG1 Microbiology	Microbiology Undergraduate Lab is well equipped with facility to conduct practical at B.Sc. Microbiology Level. The Lab contains Laminar Air Flow, Autoclave, Microscopes, Water Purification system etc.
PG1 Biotech	Biotechnology Postgraduate lab is well equipped with facility to conduct practical at M.Sc. Biotechnology Level. The laboratory consists of Laminar Air Flow, Autoclave, distillation unit etc.
PG1 Micro	Microbiology Postgraduate Lab is well equipped with facility to conduct practical at M.Sc. Microbiology Level. The Lab contains Laminar Air Flow, Autoclave, Microscopes, Water Purification system etc.
CIL	Instrumentation lab caters the need of all students (Both UG, PG and research) for the use of sophisticated instruments required for their work. This lab contains -80 degree freezer, Gel documentation system, Refrigerated Shakers, Refrigerated Centrifuge, PCR Machines, Ovens, Incubators, Microscope Water bath shaker etc.
Bioinfo Lab	Bioinformatics Lab is well equipped with computers with internet connections sufficient to conduct routine bioinformatics practicals at UG and PG level.

f) Research laboratories: 09

Table BT26: List of laboratories available in the School of Biotechnology for student projects and externally funded research projects

Laboratory	Description
ResI Biotech	Biotechnology Research Lab is involved in the production and optimization of conditions for enzymes that find wide applications in different fields including agriculture, medicine, pharmaceutical and food industry. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains Refrigerated Incubator Shaker, -20 degree freezer, Microscope, Soxhlet apparatus etc.
ResIMicro	Microbiology Research Lab engaged in characterization of human and animal (bacterial and fungal) pathogens. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains Biosafety hood, ELISA reader, BOD incubator, Shaker, Microscope etc.
Mycology Lab	Mycology Lab engaged in research on wild Macro Fungi for isolation of bioactive molecules to be used for medicinal and food purpose. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains PCR Machine, BOD incubator etc.
MPMI LAB	Molecular plant microbe interaction lab engaged in research on various aspects of Plant Microbe Interactions. It supports the research work of UG, PG and Ph.D. students. The Lab contains Type I Water Purification system, Refrigerated Incubator Shaker, UV-VIS Spectrophotometer, Plant Growth Chamber, PCR machine etc.
YBL	Yeast biology lab engaged in research in the areas of yeast cell cycle, yeast translation, phytomedicine, industrial enzymes and biology of extremophilic microbes. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains Fastprep, Refrigerated Incubator Shaker, Waterbath shaker, Rotaevaporator, Ice Machine, Gyrotwister etc.
LGR LAB	Laboratory of gene regulation engaged in research on various aspects of Gene regulation. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains Refrigerated Incubator Shaker, Refrigerated Centrifuge, PCR Machine, Electroporator, etc.
MIPL	Molecular immuno-parasitology research lab engaged on various aspects of Immunopathology of Malaria, Leishmaniasis, genetic polymorphism of <i>E. granulosus</i> , drug discover for leishmaniasis and vaccine development for Malaria. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains Laminar Air Flow, Fluorescent ELISA reader, Gel documentation system, BOD incubator, etc.
ABL	Animal Biotechnology lab engaged in research on effects of immunomodulators extracted from various plants on human immune cells thereby understanding the interaction of these immune cells with cancerous cells. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains -20 degree freezer, Biosafety hood, Cell culture facility etc.
PTCL	Plant Tissue culture lab engaged in micropropagation of economically important endangered medicinal plants. The laboratory supports research projects UG, PG and Ph.D. students. The Lab contains laminar air flow, environmentally controlled plant growth facility etc.

39. List of doctoral, post-doctoral students and Research Associates

a) from the host institution/University: 17 % PhD

Table BT27: Batch wise list of Ph.D. Microbiology and Ph.D. Biotechnology students

S. No.	Registration No.	Name of the student	Status
1.	12MCD05	Pooja Patial	Ongoing
2.	12MCD08	Arti Bains	Ongoing
3.	12MCD09	Mohini Dhiman	Ongoing
4.	12MCD10	Nidhi Bhatt	Ongoing
5.	12MCD11	Bharti	Ongoing
6.	12MCD12	Naveen Minhas	Ongoing
7.	13MCD01	Neha Chauhan	Ongoing
8.	13MCD02	Neha Thakur	Ongoing
9.	13MCD07	Sukrit Sagar	Ongoing
10.	14MCD04	Kajal Kumari	Ongoing
11.	12BTD21	Sukhvir Kaur	Ongoing
12.	13BTD06	Rakesh Kumar	Ongoing
13.	13BTD07	Tanvi Gupta	Ongoing
14.	13BTD08	Amandeep Thakur	Ongoing
15.	14BTD02	Divyanshi Sharma	Ongoing
16.	14BTD04	Gaurav Thakur	Ongoing

b) from other institutions/universities: 83% PhD

Table BT28: Batch wise list of Ph.D Microbiology and Ph.D. Biotechnology students

S. No.	Registration No.	Student Name	Status
COMPLETED/SUBMITTED			
17.	MC-09-D-02	Amit Kumar	Completed
18.	MC-09-D-03	Devender Kumar Sharma	Completed
19.	MC-09-D-04	Kazal Pathania	Completed
20.	MC-09-D-09	Sheetal Mehta	Completed
21.	MC-09-D-10	Sushila Devi Negi	Completed
22.	MC-09-D-11	Harjeet Kaur	Completed
23.	MC-10-D-01	Aradhana Dohroo	Completed
24.	MC-10-D-02	Patil Sandeep Shripati	Completed
25.	MC-10-D-03	Ruchi Chauhan	Completed
26.	MC-10-D-04	Shakti Pal	Submitted
27.	MC-10-D-06	Vikesh K Bhatia	Completed
28.	MC-10(II)-D-08	Usha Devi	Completed
29.	MC-11-D-03	Nazam Khan	Submitted

S. No.	Registration No.	Student Name	Status
30.	MC-11-D-07	Tanuja Rana	Submitted
31.	MC-11-D-08	Navroop Kaur	Submitted
32.	BT-09-D-02	Anil Kumar	Submitted
33.	BT-09-D-03	Anshul Sharma	Completed
34.	BT-09-D-04	Chandrika Attri	Completed
35.	BT-09-D-08	Vipasha Sharma	Completed
36.	BT-09-D-10	Tarun Kumar	Completed
37.	BT-10-D-01	Anil Kumar	Submitted
38.	BT-10-D-02	Jitender Kumar	Completed
39.	BT-10-D-04	Meenakshi Sharma	Completed
40.	BT-10-D-06	Parul Sharma	Submitted
41.	BT-10-D-10	Sonika Gupta	Completed
42.	BT-10-D-11	Sujata Chauhan	Submitted
43.	BT-10(II)-D-05	Monika	Completed
44.	BT-10(II)-D-13	Himika Gupta	Completed
45.	BT-11-D-13	Shivani Kaushal	Submitted
ONGOING			
46.	BT-10-D-09	Shweta Chauhan	Ongoing
47.	BT-10-D-07	Prachi Gupta	Ongoing
48.	BT-09-D-07	Varsha Rani	Ongoing
49.	BT-09-D-01	Abhishek Sharma	Ongoing
50.	13MCD08	Kavita Bhaita	Ongoing
51.	13MCD09	Anju Bala	Ongoing
52.	13MCD10	Manjeet Singh	Ongoing
53.	14MCD01	Shweta	Ongoing
54.	14MCD02	Neha Thakur	Ongoing
55.	14MCD03	Monika Verma	Ongoing
56.	MC-11-D-04	Poonam Kumari	Ongoing
57.	MC-11-D-05	Pradeep Kumar	Ongoing
58.	MC-11-D-06	Rohina Chaudhary	Ongoing
59.	MC-10-D-05	Varun Chauhan	Ongoing
60.	MC-10(II)-D-02	Kiran Mahant	Ongoing
61.	MC-10(II)-D-03	Lalit Kumar	Ongoing
62.	MC-11-D-01	Arushdeep Sidana	Ongoing
63.	MC-11-D-02	Devender Singh	Ongoing
64.	BT-10-D-08	Rampa Thakur	Ongoing
65.	MC-11-D-12	Ashwani Kumar	Ongoing
66.	MC-11-D-13	Neha Sharma	Ongoing
67.	12MCD01	Rakesh Kumar	Ongoing
68.	12MCD02	Poonam Dhillon	Ongoing
69.	12MCD03	Nitika Thakur	Ongoing
70.	12MCD07	Mridula Gupta	Ongoing

S. No.	Registration No.	Student Name	Status
71.	BT-10-D-12	Raquib Ali	Ongoing
72.	BT-10(II)-D-01	Aparna Aggarwal	Ongoing
73.	13MCD03	Anterpreet Kaur Chahal	Ongoing
74.	13MCD04	Jyoti Mehta	Ongoing
75.	13MCD05	Urmila	Ongoing
76.	13MCD06	Priyanka Chauhan	Ongoing
77.	BT-11-D-03	Divya Vishanbra	Ongoing
78.	BT-11-D-04	Karan Surya	Ongoing
79.	BT-11-D-05	Mohit Sharma	Ongoing
80.	BT-11-D-06	Neha Bhardwaj	Ongoing
81.	BT-11-D-07	Prabhjot Kaur	Ongoing
82.	BT-11-D-08	Preety Dogra	Ongoing
83.	BT-11-D-09	Renu Parmar	Ongoing
84.	BT-11-D-10	Sapna Thakur	Ongoing
85.	BT-11-D-02	Ankita Deshta	Ongoing
86.	BT-11-D-14	Ansu Kumari	Ongoing
87.	12BTD01	Aditi Gupta	Ongoing
88.	12BTD02	Akshita Sharma	Ongoing
89.	12BTD03	Ankur Kaushal	Ongoing
90.	12BTD04	Kanchan Heer	Ongoing
91.	12BTD05	Mamta Sharma	Ongoing
92.	12BTD06	Manoj Kumar	Ongoing
93.	12BTD07	Nitin Sharma	Ongoing
94.	12BTD08	Poonam	Ongoing
95.	12BTD09	Rajni Vaid	Ongoing
96.	12BTD11	Shikha Guleria	Ongoing
97.	12BTD12	Shikha Kumari Rangra	Ongoing
98.	12BTD13	Shiney Hangloo	Ongoing
99.	12BTD14	Sunny Bindra	Ongoing
100.	12BTD15	Vikas Kumar	Ongoing
101.	12BTD17	Shagun Gupta	Ongoing
102.	12BTD18	Rupak Nagraik	Ongoing
103.	12BTD20	Deepika Rana	Ongoing
104.	13BTD01	Sonam Sharma	Ongoing
105.	13BTD02	Shivani Vaidya	Ongoing
106.	13BTD04	Manju Kashyap	Ongoing
107.	13BTD05	Jyoti	Ongoing
108.	13BTD09	Janmeet Kour Bali	Ongoing
109.	13BTD13	Indu Hira	Ongoing
110.	14BTD01	Reena Kumari	Ongoing
111.	14BTD03	Ashu Mohammad	Ongoing
112.	14BTD05	Abhishek Bharwaj	Ongoing

c) **post-doctoral and Research Associate: Nil**

40. Number of post graduate students getting financial assistance from the University: 16

Table BT29: Details of post graduate students getting financial assistance from Shoolini University

S. No	Name of student	Program
1	Isha Sharma	M.Sc (Biochemistry)
2	Neha	M.Sc (Biotechnology)
3	Sanea Saher	M.Sc (Biotechnology)
4	Ruchi Sharma	M.Sc (Microbiology)
5	Chandini Dhiman	M.Sc (Microbiology)
6	Depti	M.Phil (Microbiology)
7	Anupriya	M.Phil (Microbiology)
8	Tanvi Gupta	Ph.D. (Biotechnology)
9	Neha	Ph.D. (Microbiology)
10	Kajal Kumari	Ph.D. (Microbiology)
11	Sapna Devi	M.Tech (Biotechnology)
12	Karan Jaswal	M.Tech (Biotechnology)
13	Shiny Bala	M.Tech (Biotechnology)
14	Jaspreet Kaur	M.Tech (Biotechnology)
15	Vivek Verma	M.Tech (Biotechnology)
16	Sachin Kumar	M.Tech (Biotechnology)

41. Was any need assessment exercise undertaken before the development of new Program(s)? If so, highlight the methodology.

Yes, assessment exercise is undertaken by the academic committee (includes Dean of the faculty, Head of the School and all the faculty members) of the School to start any new programs.

After assessing the demand of skilled professionals of the biotech industry and research in India, proposal for starting new program is formulated and presented before the board of studies of the School (it includes two external experts from academia and industry in addition to the members of the academic committee). Once it is approved, the proposal is sent to the Academic Council of the University. The Academic council takes the decision based on the current trends in the field and its necessity.

42. Does the department obtain feedback from

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

As the curriculum is outcome driven, the School obtains regular feedback from faculty members regarding curriculum as well as teaching-learning-evaluation. Feedbacks are discussed in the Board of Studies of the School and necessary changes, if required are incorporated after obtaining consent from the academic council. For example, students are accepted from all life sciences back ground (including Biotechnology and Microbiology) for postgraduate programs. After getting feedback from the faculty, credit courses specific for CSIR-UGC NET/GATE examinations were included as a part of course curriculum.

b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Feedback on staff, curriculum and teaching-learning-evaluation is taken from students every semester on a pre-designed proforma. All the suggestions of students are considered for further development. The feedbacks are further discussed in the Board of Studies and the faculty members are advised to adopt the teaching pedagogy as per student feedback.

c. alumni and employers on the Programs offered and how does the department utilize the feedback?

Alumni feedbacks are collected during the “Alumni Meet” and “Convocations” and adopted for the new courses, improvement of the course curriculum. School utilizes the feedback from employers to revise the course curriculum to make it industry centric.

43. List the distinguished alumni of the department (maximum 10)

The School of Biotechnology was established in 2009 and only 4 batches of post graduation programs have passed out. Most of the students choose to pursue research (M.Phil./Ph.D.) as a career, and few students intend to take up jobs. The list of alumni working in reputed companies and pursuing research at reputed institutes is given below:

Table BT30: Details of distinguished alumni of School of Biotechnology

S. No	Name of the student	Institutes/Industry
1	Mr. Manoj Kumar (M.Sc. Biotechnology)	JRF (CSIR NET), PGIMER Chandigarh
2	Dr Tarun Kumar (Ph.D. Biotechnology)	IP executive, Corporate IP consultants, Mohali
3	Ms. Heena Sharma (M.Sc. Microbiology)	Pharmacovigilance Scientist, Quantum Solutions Chandigarh
4	Mr. Arvind Chandel (M.Sc. Biotechnology)	Orbit Biotech Pvt. Ltd. Mohali, Punjab
5	Mr. Natesh Kumar (M.Sc. Biotechnology)	Panacea Biotech ltd vaccine formulation unit, Baddi
6	Mr. Vishnu (M.Sc. Biotechnology)	Genaxy Scientific Pvt. Ltd
7	Mr. Rupjyoti Kalita (M.Sc. Biotechnology)	JRF, Guwahati University
8	Ms. Anupama (M.Sc. Biotechnology)	SRF, CPRI, Shimla
9	Ms. Sonika Kalia (M.Sc. Biotechnology)	INSPIRE research fellow, Department of Biotechnology, HPKV, Palampur
10	Ms. Kanika Arora (M.Sc. Microbiology)	JRF (INSPIRE), Institute of Nuclear Medicine and Allied Sciences (DRDO), New Delhi
11	Kirti Singh (M.Tech. Biotechnology)	CSIR-JRF, JNU, New Delhi
12	Mamta Kumari (M.Tech. Biotechnology)	Executive, Biocon, Bangalore
13	Mr. Arun Kumar (M.Tech. Biotechnology)	Remote Technical Engineer, Agilent Technologies

44. Give details of student enrichment Programs (special lectures / workshops / seminar) involving external experts.

School of Biotechnology regularly invites Biotechnology/Microbiology experts from academia and industry to share the views with students and the faculty. In addition, students also get exposure to expert's advice during Guru Series lectures as part of Yogananda Knowledge Initiative, Biospectrum lecture series and INSPIRE science camps. List of some of the invited guest speakers in the School of Biotechnology is enumerated as under: **Special lectures organized:**

- Prof. A.K. Bhatt Biotech park of Himachal Pradesh: Status and

future prospects. Department of Biotechnology, H. P. University Shimla.

- Prof. S. P. Vij Plant Diversity: Conservation and Sustainable Development for Community Livelihood. Professor Emeritus & NASI Senior Scientist, Panjab University, Chandigarh.
- Prof. S. S. Kanwar Stem cells in regenerative medicine. Department of Biotechnology, H. P University Shimla
- Prof. I.S. Dua, Understanding self: romance with biology. Emeritus Professor, P. U. Chandigarh.
- Prof. R.K. Kohli, Alien Plant Invasion: Ecological Impact in India. Dean Research, Department of Botany, P. U. Chandigarh.
- Prof. S.C. Verma, Fathoming The Pteridophyte Genome: Challenges And Opportunities. Botany Department, P. U. Chandigarh.
- Prof. H.V. Batra, Director, Defense Food research Laboratory, Mysore
- Prof., N. S. Thakur, University of Horticulture & Forestry, Solan
- Prof. Sonal Malhotra, Addis Ababa Institute of Technology, Ethiopia
- Prof. Duni Chand, HP University, Shimla
- Mrs. Shweta Singh, Director, Innobel, New Delhi
- Prof. Kulwant Rai, University of Horticulture & Forestry, Solan
- Prof. David Bergeron Thoughts from a “Hidden Physicist”. Oliver Wyman, USA.
- Dr. Duni Chand, Role of Plants in Human Life. Department of Biotechnology, H. P. University Shimla.
- Prof. H.S. Dhaliwal, Plant Biotechnology, IIT Roorkee
- Prof. S.K. Sharma, Molecular markers in plants, Vice Chancellor, HPKV, Palampur.
- Prof. Krishan Kumar, Protection of plant varieties, UHF, Nauni.

Workshops organized

- Regular SPRINT workshops are organized in School of Biotechnology by SPRINT team of the University to improve soft skills and to improve employability of the students.
- One day workshop was organized on Basics of Flowcytometry by Dr. T. Bind, BD Biosciences, New Delhi.

45. List the teaching methods adopted by the faculty for different Programs.

Teaching pedagogy of School of Biotechnology involves both online and offline mode of teaching. Day to day lectures are delivered as combination of chalk board and power point presentations, and are supplemented with the online lectures in the local LMS (e-UNIV), which is in line with technology driven global standards of education. School is in the process of providing the online supplementary study material of all the courses on e-UNIV, which will be accessible to the students 24x7. Some of the important teaching methods adopted are listed below

Online lectures (eUniv): Supplementary study material uploaded to eUniv.

ERP system: Assignments, tests, evaluation and student teacher communication are carried out through indigenously developed ERP system.

Imparting technical skills through practical training: Hands on technical training is provided to the students for majority of the courses in the Program as a part of practical training.

Research: In order to inculcate scientific temper in budding scientists, School offers research projects at B.Sc. level.

Educational visit: School of Biotechnology organizes educational visits to Industry and Research institutes to provide exposure to the students.

46. How does the department ensure that program objectives are constantly met and learning outcomes are monitored?

As per the UGC guidelines the curricula of all of the programs are designed with a clear vision and are outcome oriented. The School follows continuous system of evaluation including term exams, regular surprise tests, quizzes, assignments, practical etc. The outcomes are monitored through following modes

- By getting feedback from the stakeholders and faculty members.
- Regular faculty meetings.
- Internal assessment through assignments, surprise tests/quiz and seminars.
- Interaction of students with designated mentors.

47. Highlight the participation of students and faculty in extension activities.

To fulfill the social responsibility, all the faculty members and students participate in various extension activities. Some of the extension programs organized at the level of School of Biotechnology are given below:

- Awareness Program for farmers on protection of plant varieties and farmers rights, sponsored by PPV& FRA, Ministry of Agriculture (February 19, 2013).
- DBT sponsored training cum seminar on molecular biology techniques for college lecturers was conducted from November 11-19, 2012.
- Training was imparted to School level lecturers on practical skills on Biotechnology.
- Faculty members are involved in delivering talks on Biotechnology and Microbiology in various Schools and colleges of Himachal Pradesh.

Extension activities organized at central level, where members of School of Biotechnology are involved are listed below:

- Swatch Bharat Abhiyan
- Tree Plantation Drive
- Blood Donation Camps
- Flower Fest
- Science exhibition
- Seminars organized under the aegis of Him Science Congress Association
- Celebration of World Environment Day, Earth Day, Cancer Awareness Day, Women's Day, Yoga Day etc.
- Marathon on teachers day

48. Give details of “beyond syllabus scholarly activities” of the department.

School of Biotechnology promotes all the students to participate in scholarly activities in addition to the prescribed course curriculum. Some of these activities are listed below

- SPRINT Program helps in developing leadership qualities, personality development and improving communication skills.
- Research students conduct practical training for INSPIRE workshops
- Student participation in inter-departmental and inter University cultural/sports/science/quiz competitions.
- Student participation in various clubs of the University.
- Article writing for magazines
- Guest lectures (Details are mentioned in point 44)
- Participation in national and international conferences
- Voluntary participation of students in all University events.
- Awareness program on Intellectual Property Rights was organized for research students of the School.

49. State whether the Program/ department is accredited/ graded by other agencies? If yes, give details.

- School of Biotechnology has been assessed by UGC
- Shoolini University was ranked sixth amongst private biotech Schools in a survey conducted by Biospectrum in 2010 and improved its ranking to second in 2012. Since then, the University has maintained second rank consecutively for the last two years.
- Awarded Excellent University for research in Biotechnology Sciences by Consortium of Co-Chairpersons (Industry) and Gujarat Technological University in 2014.

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The School of Biotechnology is constantly involved in generating new knowledge both basic and applied, which is either published in reputed peer reviewed journals or has yielded a number of patents that have been filed. The knowledge generated by the school is of societal and industrial relevance. Some of the key research findings are listed below:

- Isolated large number of bacteria and micro-fungi (*Cryptococcus sp.*) and macro-fungi from various regions of Himachal Pradesh, which are capable of producing wide array of industrially important bioactive molecules and enzymes etc.
- Identified novel bioactive molecules from medicinal plants, which are capable of enhancing the efficacy of traditional antibiotics.
- Isolated mycoviruses capable of inducing hypovirulence in plant pathogenic fungi (Potential biocontrol agents).
- Developed a sensitive immunosensor based diagnostic method for the detection of plant viruses.
- Wild mushrooms of Himachal Pradesh have been exploited for novel bioactive compounds.
- Microbes have been isolated having potential to be used for bio remediation.
- Developed peptide based diagnostics for parasitic diseases.
- Established repository of micro and macro flora of North Western Himalayas.
- Developed micro propagation methods of endangered and medicinally important plants using indigenous bioreactors.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

School of Biotechnology strives to provide quality education to students from diverse spheres of the society. School is constantly evolving to meet the emerging trends and demands of Industry, Academia and Society. Within a short span of five years of its establishment, School of Biotechnology has attained primary level of success in education and research. The School aspires to become a knowledge center of global standard. Towards this mission, the School has identified following strengths, weaknesses, opportunities and challenges:

Strengths:

- All the faculty members are Ph.Ds. and 80% are post doctorate from reputed Institutes of USA and Europe. They are committed in imparting quality teaching and research training in modern areas of biotechnology and microbiology.
- The research potential of the faculty has been endorsed by various funding agencies of Government of India. At its infancy of five years, the school has generated research grants worth around rupees four crores.
- School of Biotechnology has established well equipped research facilities for conducting research in the priority areas with the assistance from Government of India funding agencies and Shoolini University.
- School provides hands on training to UG and PG students in specialized research laboratories of Biotechnology and Microbiology.
- The School has produced more than 70 research publications in journals of national and international repute with highest impact factor of 15 and h index of 4.

Weaknesses:

- School has taken initiatives for research collaboration and student exchange. However, more efforts are required to strengthen the national and international collaborations for research and student exchange.
- School has established facilities to conduct basic research in the thrust areas. However, high-end facilities for modern day Biotechnology need to be created to achieve excellence in research.
- School has also initiated collaborations with industry, but more directional efforts are required to promote alliances with industry towards technology transfer and consultancy.

- Inter-institutional and inter-disciplinary collaborations are required to harness Himalayan biodiversity in a holistic manner.
- Limited job opportunities in specialized fields of Biotechnology and microbiology is a major reason that students do not choose these areas for their career.

Opportunities:

- University is strategically located in the Himalayan hotspot, which is rich in biodiversity that need to be explored by the research team of the School in a holistic manner.
- Solan being the hub of biotech /pharma industries, students have the added opportunity to gain exposure of corporate and research culture.
- Research conducted in the School of Biotechnology has generated more than 70 research publications and 7 patents, which opens doors for technology transfer and revenue generation in the future.
- A number of international collaboration have been manifested by the International office of the University; the School of Biotechnology needs to strengthen its alliances at the international level for joint research, student and faculty exchange, and organizing joint conferences and workshops.
- School has adopted curricula to ensure that large number of students qualify state level and national level examinations. This provides additional opportunity to the students to qualify national and international examinations, such as NET, GATE, GRE, TOFEL etc.

Challenges:

- In the era of globalization, School needs to develop a blue print for International collaboration for excellence in research and education.
- School has already attained first level in terms of research and infrastructure development. The challenge is to transform the research and facilities into the next level in terms of research facilities, infrastructure and its output.
- The curricula of School of Biotechnology are in line with the requirements of academia and research. This need to be harnessed to attract quality students for higher studies in Biotechnology and Microbiology.
- Government support for higher education and research in private sector is not easily accessible as compared to public sector.

52. Future plans of the department

- To further strengthen the research and infrastructure, School aims to procure umbrella projects from Government of India like DST-FIST, DBT- Research Center in Biomics, etc.
- School of Biotechnology plans to organize national and international conferences as a platform for exchange of knowledge and scientific findings.
- The School aims to exploit Research collaborations in India and abroad to obtain research funding from international agencies such as HHMI, WELCOME trust, FORD Foundation etc.
- The School has initiated the use of LMS (e-Univ) as a supplement for classroom teaching, and plans to implement it for all the courses.
- The School has filed 7 patents, which will be exploited for technology transfer and their commercialization.
- The School plans to introduce skill based learning programs for the students to improve their employability.
- School is planning to promote awareness on Biotechnology and Microbiology at School and college levels through motivational lectures and training programs for biotechniques.

