Facility available and Workshop / Training programs organized through DBT- BIF Centre, Mizoram University

1.	**Name of the Centre**	Bioinformatics Infrastructure Facility Department of Biotechnology Mizoram University, Aizawl
2.	**Date of sanction**	No. BT/BI/12/042/2007 Dated 11 February, 2008
3.	**Name of the Coordinator with Address, Landline Number, Mobile Number and Email**	Prof. N. Senthil Kumar Professor Department of Biotechnology Mizoram University (A Central University) Aizawl - 796 004, Mizoram Mobile: 9436352574 Email: mizoramuniv.btisnet@nic.in nskmzu@gmail.com
4.	**Name of the Co-coordinator with Address, Landline Number, Mobile Number and Email**	Ms. Esther Lalnunmawii Department of Biotechnology Mizoram University (A Central University) Aizawl - 796 004, Mizoram Mobile:09774753027 Email: essie.zadeng@gmail.com
5.	**Main focus of the centre / Broad area of Life Sciences (Health, Agriculture etc…. or basic/general Bioinformatics)**	General Bioinformatics (Human Disease Genetics, DNA Barcoding and Molecular Phylogenetics, Metagenomics)
6.	**Main objective(s) of the Centre**	**To conduct and support bioinformatics related:** • Teaching courses in all the Academic and Research Departments in the state of Mizoram as well as in the Country. • Research and Development activities reaching out even to non-bioinformatics professionals, leading to benefits to the Society. • Train and nurture human resource in bioinformatics and computational biology in the form of conducting specialized Workshops/ Training programs. • Sensitization and Creating awareness through outreach programs in Schools, Colleges and University Departments. • Collaborations at National and International levels to imbibe and transfer the technology to our Centre.

7. **Facilities/infrastructure funded by DBT** [Total and presently working may please be mentioned separately]

(i) Basic infrastructure like computers, servers (give nos. and details)

Name of equipment/ facility	***Specification***	***Quantity***	***Status***
High-end HP Server	Proliant ML 370G5	**1**	working
Mid-range Server	ML350G5Servers	**1**	working
Apple Macintosh Systems	iMac	**2**	working
Laptop	HP ProBook 4320s Notebook	**1**	working
HP Computers	Core i5, 4GB RAM	**2**	working
	Core2 Duo, 4GB RAM	**11**	working
	Core 2 Duo, 3GB RAM	**6**	working
	Core 2 Duo, 2GB RAM	**1**	working
HP Color DeskJet Printer	(L7380)	**1**	working
HP LaserJet printer	(2015N)	**1**	working
Projector	Epson USB Projector	**1**	working
TP-Link Wi-Fi Router	150 mbps WiFi Connectivity	**1**	working

(ii) **Mega/ Specific Facility**:

Next Generation Sequencing (NGS) Data Analysis Facility:

Hardware	**Specification**	**Funding Organization**	**Quantity**	**Status**
Dell Workstation 5810	Intel Xeon Processor, 8 Core, 16 Threads, 32 GB RAM and 2TB HDD with NVIDIA 4GB Graphics, Windows 10 Pro and Ubuntu 16.	DBT-Advanced Level State Biotech Hub, Govt. of India	2	Working
HP Workstation	Intel Xeon Processor, 32GB RAM, 2TB HDD, Ubuntu 16 .	Uexcel- DBT, Govt. of India	1	Working

NGS Data Analysis free Softwares: QIIME, FastQC, MG-Rast, Pic-Rast, SRA Toolkit, FastX-Toolkit, USEARCH, Pandaseq, Cytoscape, Velvet, Cutadapt, Ea-utilis, Minion, REAPER, MOTHUR, Prokka, MitoSeq.

Other Software:

a) **Commercial package:**
Sigma Plot 11, Genious Pro 6.1, Visual Studio 2008

b) Freewares:

Modeller 9.13, AutoDock 4.2, Gromacs 4.5, Pyrx 0.8, Pymol, MEGA 7, Mr. Bayes, Phylip, TreeView, FinchTV, RNA Structure 4.5, Bio Edit, Codon code Alinger, Gromacs 4.5, BioLinux 8, R-Bioconductor, PyMOL, Molegro Viewer.

c) Programming Packages:
C/C++, JAVA with Bio-JAVA, ActiveState Perl 4.2 with Bio-perl Module, Python 3.6 with Bio-Python.

d) Operating Systems:
SQL server 2008, Windows 7 Professional 32 Bit with HP Recovery, Ubuntu 14 (64-bit), Ubuntu 16 (64-bit), Ubuntu 17 (64-bit), Bio-Linux 8 (64-bit).

8. **Outcome so far [From the date of start till 2012, 2012 – 2017, 2017- 2018] in terms of the following:**

(i)Research Outcome

	Research Publications	Books	Book Chapters	No. of Ph.D produced	No. of M.Phil produced	No. of M.Sc dissertation
2008 – 2012	21	-		02	03	54
2012 – 2017	95	1	1	12	03	66
2017 - 2018	06	1	1	03	06	20
Total	**122**	**2**	**2**	**17**	**12**	**140**

2008-2012

- DNA Barcoding and phylogenetic analysis of Wild Silk Moth, Dragon Fly, Mosquitoes, Beetles, Soil Arthropods, and *Bacillus* sp. collected in Mizoram were successfully carried out using Sanger sequencing and BIF Lab Facility.

2012-2017

- In our BIF lab, we used shotgun sequencing of the environmental DNA to explore the functional potential of the microbial communities and the generated data were analysed by the tools such as **MG-RAST**, **HUMANN2**, and **PROKKA** etc. We also analysed the complete genome of the bacterial pathogen using NGS technology to illustrate the pathogenic island as well as variance genes present. The raw **Nanopore** fast5 read files were converted to fastq output and further trimmed adapter sequences using Poretools. The assembly was constructed using canu software and annotation was carried out by **PROKKA**.
- The BIF centre of Mizoram University also used NGS technology to sequence the complete mitochondrial genome of **butterflies, honey bees** as well as humans. The raw fastq reads in generated from the sequencer were filtered for high-quality reads and trimmed for adapters, and the mitochondrial genome was created using a combined **de novo (spades)** and **reference-assisted (bowtie)** strategies. The assembled metagenome was annotated using **Mitos web server** and tRNA genes were identified with **tRNA scans SE-search**. Further, the phylogenetic position of the sequenced genome was analysed using the tools involved **Clustal X, MEGA 6s.0**.
- The BIF facility was actively being used for analysis of Sanger sequencing data for

polymorphisms, mutations and haplotypes in Gastric Cancer, Breast Cancer, Diabetes patients in Mizoram. Moreover, Sanger sequencing and data analysis was also done to find out DNA Barcoding and Genetic relatedness study using chloroplast matK gene in *Oryza* sp., Snakes and Earthworm found in Mizoram.

2017-18

- With the recent advancement of the sequencing technology, generation of biological data has increased exponentially which increases the importance's of computational biologist in research. In the **BIF centre of Mizoram University**, we are trying to use our skills in computation in diverse areas of Life Sciences. Microorganisms and their community plays an important role in ecosystem functioning. In our lab, we combine our expertise and interest in microbiology and computation to investigate the diversity and functioning of microbial communities in environments ranging from the forest soil, hot springs, river sediments, fermented foods, infected plants, earthworm guts, crabs intestine, bat buts as well as human gastrointestinal tracts. We design experiments and develop pipelines using different software to deal with the high-throughput sequencing data for marker genes and metagenomes to find different biological answer different fundamental questions. We are using different NGS tools like **FASTQC, USEARCH, PEAR, NGS Toolkit, ChimeraSlayer, QIIME, MOTHUR, MICCA and PICRUSt** for analyzing the amplicon sequencing data which deals with the marker genes targeted by (universal) primers mostly amplify hyper-variable regions of the ribosomal RNA genes, whereas metagenomics dataset which involves the collective genomes of microbes in an environment.

- Many more works are still going on which involve Sanger Sequencing as well as Next Generation Sequencing (DNA Sequencing, Whole exome sequencing, RNA-Seq) in Tuberculosis, Gastric Cancer, Pediatric Leukemia and BIF infrastructure facilities will be required in analyzing those data.

Honey Bee Complete mitochondrial Genome (NGS)

Apis cerana cerana (NCBI-SRP056583) *Apis dorsata* (NCBI-SRP056587)
Apis laboriosa (NCBI-SRP056586) *Apis florea* (NCBI-SRP056589)
Apis andreniformis (NCBI-SRP056590)

16S rRNA Endophytic actinomycetes Sequences

KJ914903 - KJ913910, KP128838 - KP128890, KP128838 – KP128890, KP264911 – KP264914, KP914911, KJ914905

PKSI antimicrobial gene from actinomycetes - KU956018 – KU956041

PKSII antimicrobial gene from actinomycetes - KU879295 – KU879329

NRPS antimicrobial gene from actinomycetes - KU899056 – KU899086

16S rRNA of Endophytic Bacteria - KU158235 – KU158237

16S rRNA of Rhizosphoric Bacteria- KT028674–KT028688, KU158218–KU158234

MLH1, MDM2 and P21 genes of *Homo sapiens* - LN997431-LN997630

(ii) Database/ Software

a) created (Please mention if these databases are validated and by whom)

b) procured (What is the basis/ need to procure this database)

c) Availability of the expertise who maintains these databases and ensures its utility by users

a) ***Database being developed:***

A Database on "**Snakes of Mizoram"** was developed using PHP, Apache and MySql Server (Web -Server technology).
A Database on "**Butterflies and Beetles of Mizoram**" was developed using VB 2008 and SQL server 2005 (Client-Server technology).

Software developed

Software	Date of Creation	Validated By
BIF Training Module: Java based offline training module.	2016	Dept. of Biotechnology, MZU
PROT-PROP: A Java-application to predict the subcellular location of a protein based on physiochemical properties.	2010	Interdisciplinary Sciences: Computational Life Sciences journal
GC-Graphing: A Java-application to plot GC contents of Intergenic and Intragenic regions of genome	2012	Dept. of Biotechnology, MZU

b. Nil

c. These softwares are being hosted in Mizoram University website and is used by the students and maintained by the Coordinator, DBT-BIF, MZU.

(iii) Workshop/ Conferences/ Trainings organized

S. No	Title of the Workshop/ Training organized	Date	Level of Participants	No. of Participants
1.	Training Course On Bioinformatics – Concepts And Applications	26 -27 March 2009	M.Sc and Ph.D Students	76
2.	Training Course on Bioinformatics – Current Approaches and Applications	27 Nov. 2009	M.Sc and Ph.D Students	30
3.	Training Course on Bioinformatics – An Introduction	29 – 30 March 2010	Undergraduate students (15 no.s) on 29 March 2010 10 +2 School students (15 no.s) on 30 March 2010	30
4.	Workshop on Molecular Phylogenetics and Evolution was conducted	22-24 Nov. 2010	Students	75
5.	Training course on Bioinformatics – An	12 March	Synod Higher	15

	Introduction	2011	Secondary School students	
6.	Workshop on Bioinformatics – Structure and Determination of Macromolecules	28-29 March 2011	Students and Research Scholars	100
7.	Training course on “Bioinformatics - An Introduction”.	02 April 2011	St. Paul’s school students	15
8.	Workshop on Random Amplified Polymorphic DNA (RAPD) Marker its applications.	19-23 May 2011	Students and Research Scholars	75
9.	Training Course on Bioinformatics – Proteins and their structure and prediction	23-24 Nov. 2011	Research Scholar	30
10.	Workshop on Molecular Phylogenetics	26 - 28 Nov. 2012	Research Scholars	30
11.	National workshop on Structural Determinations of Macromolecule	26-28 March 2013	Research Scholars	40
12.	A special lecture cum Interactive “Pharmacogenomics: Polymorphism and Genotype-Phenotype correlation of drug response in Indian population”	16 May 2013	M.Sc Students, Research Scholars and faculty	30
13.	A training Course on Bioinformatics “A primer in Bioinformatics and Biotechnology” for school students	08 June 2013	Class XII	23
14.	A special workshop on “Advanced techniques in Biotechnology & Bioinformatics”	19-23 Aug. 2013	Research Scholars	27
15.	A training Course on Bioinformatics “Introduction to Bioinformatics” for school students	02 Oct. 2013	Class XII	25
16.	A training Course on Bioinformatics “Introduction to Bioinformatics” for RIPANS College students	26 Oct. 2013	UG III Sem	35
17.	A training Course on “Introduction to Bioinformatics” for M. Sc. students	05 - 06 Nov. 2013	M.Sc I and IV Sem	32
18.	A special lecture on “Structural Biology and Drug Discovery” was delivered by Prof. T.P Singh	07 Nov. 2013	Research Scholars and Faculty	19
19.	A special lecture on “Diversity of Algal forms and their significance” was delivered by Prof. D.N. Tiwari	08 Nov. 2013	Research Scholars and Students	29
20.	Training Course on Browsing Genomes with Ensembl	09 Nov 2013	Research Scholars and Students	16
21.	A special lecture on “Single Nucleotide polymorphism and their association with human diseases” and “Complex etiology of genetic diseases”, delivered by Prof. Madhusudan Das.	12 Dec 2013	PG Students, Research Scholars and Faculty	35
22.	A workshop on Techniques in “Molecular Biology and Bioinformatics”	26-31 Jan. 2014	M.Sc Students and Research Scholars	21

23.	A workshop on "Molecular modelling and Docking analysis"	21-22 March 2014	Research Scholars	27
24.	Basics of Bioinformatics	3 June 2014	M.Sc Students and Research Scholars	28
25.	State Level Hands-on Workshop in Biostatistics using SigmaPlot	27 June 2014	M.Sc Students and Research Scholars	29
26.	Statistical analysis using SPSS Software	12 July 2014	Research Scholars	21
27.	Molecular Phylogenetics and Evolution	21-23 July 2014	Research Scholars	23
28.	A primer to Biotechnology and Bioinformatics	16 Aug. 2014	M.Sc Students and Research Scholars	32
29.	Effective Management of Intellectual Property Rights in Biotechnology by Universities and Research Institutes in Mizoram	August 27-28, 2014	M.Sc Students, Research Scholars and Faculty	33
30.	Special lecture cum Interactive session on "Importance of Medicinal & Marine Biotechnology Research for Disease management".	8 Sept 2014	Students, Research Scholars and Faculty	45
31.	An introduction to Bioinformatics and Biotechnology	27 Sept. 2014	Graduate students	25
32.	Workshop On Molecular Docking and Virtual Screening	02- 04 Oct. 2014	M.Sc Students and Research Scholars	26
33.	Training Course on Browsing Genomes with Ensembl	17-18 Oct 2014	Students and Research Scholars	20
34.	An introduction to Bioinformatics and Endnote	28-29 Nov. 2014	M.Sc Students and Research Scholars	25
35.	An introduction to Bioinformatics for Inspire students	04-05 Dec. 2014	M.Sc Students and Research Scholars	24
36.	User Awareness/ Orientation Program for DeLCON e-journals - Nature Publications	19 March 2015	M.Sc Students , Research Scholars and faculty	34
37.	Techniques in Molecular Biology and Bioinformatics for Zirtiri College students.	13 - 14 April 2015	UG Students Zirtiri College	35
38.	Cancer Mutations - Detection and Analysis	17-18 April 2015	Research Scholars	19
39.	Browsing Genomes with Ensembl	29-30 May 2015	Research Scholars and M.Sc Students	27
40.	Molecular Docking using AutoDock and Schrodinger Suite	05-06 June 2015	Research Scholars, Faculty and M.Sc Students	32

41.	Gene Ontology and Cytoscape	13-14 July 2015	Students and Research Scholars	23
42.	North-East Autumn School On Human Genetics in joint collaboration With ISI Kolkata	08-11 Sept. 2015	PG Students, Research Scholars	26
43.	Techniques in Molecular Biology and Bioinformatics	29 Oct. -1, Nov. 2015	M.Sc Students	32
44.	DBT Sponsored One Day Awareness Program on the “Recent Developments and Basic Tools in Biotechnology”	03, Oct. 2015	PG Students, Research Scholars	26
45.	National Workshop on Microbial Genomics And Informatics	02-09 Nov. 2015	PG Students, Research Scholars	23
46.	Electronic Library and Information Resources	07 March 2016	PG Students, Research Scholars and faculty	34
47.	Basics of Molecular Biology	11 March 2016	UG III Sem, Pachhunga University College	33
48.	Basics of Molecular Biology	12 March 2016	UG III Sem, Zirtiri College	32
49.	One day orientation course for Inspire School students	14 March 2016	Class XII	32
50.	Basics of Molecular Biology	19 March 2016	UG III Sem, Zirtiri College	
51.	Workshop on “Basics of Molecular Biology”.	04 – 08 April 2016	M.Sc. II nd Sem Students	22
52.	National Level Workshop on Biostatistics and Bioinformatics for Research Scholars in Life Sciences	01 - 07 Sept. 2016	Research Scholars	20
53.	Workshop on “Understanding Basic Principles in Human Molecular Genetics”	07 - 11, Sept. 2016	M.Sc. ,Research Scholars and Post Doc.	20
54.	Awareness Program On “Recent Developments and Basic Tools in Biotechnology”	24 Sept. 2016	St. Pauls Hr. Sec. School (XII Sc.)	24
55.	Balani Info. Tech, i Thenticate – Anti plagiarism Software, Online Demonstration	12 Sept. 2016	Research Scholars	
56.	Balani Info. Tech, Online Training Program on DELCON for accessing the E-Journals (AAAS and PNAS)	20 Sept. 2016	Research Scholars and Faculty	
57.	Awareness Program On “Recent Developments and Basic Tools in Biotechnology”	16 Oct. 2016	St. Pauls Hr. Sec. School (XII Sc.)	21
58.	Awareness Program On “Recent Developments and Basic Tools in Biotechnology”	22 Oct. 2016	Providence Hr. Sec. School (XII Sc.)	21
		29 Oct. 2016	Don Bosco Hr. Sec. School (XII Sc.)	19

		12 Nov. 2016	Dawrpui School of Science and Technology (XII Sc.)	25
59.	Prof. Hemant Kr. Gautam, IGIB, New Delhi- Special talk on Animal Microbiome	5 Nov. 2016	Research Scholars and Faculty	
60.	Prof. KaruthaPandian, Alagappa University, Karaikudi - Lecture on NGS and MALDI	15 - 16 Nov. 2016	Research Scholars and Faculty	
61.	Dr. Ashok K Varma, TMC – ACTREC, Mumbai- Lecture on Structural evaluation and functional implications of BRCA1	16 Nov. 2016	Research Scholars and Faculty	20
62.	Workshop on DNA Barcoding and Phylogenetics	20-25 March 2017	Research Scholars	20
63.	Workshop on “Homology Modelling and Docking”	18-22 April 2017	M.Sc Students, Research Scholars	24
64.	Invited Guest Lecture on “ Role of Flavanoid and antioxidants in curing gastric disease: Proteinase as player”	07 June 2017	Faculty, Research Scholars	29
65.	GIAN- International Workshop on Molecular Phylogeny and Next generation Sequencing	19 – 28 June 2017	Research Scholar, Post Doc fellow, Faculty	30
66.	Training for School Students (Home Mission School, Aizawl).	21 Oct 2017	Class 12 –	9
67.	National Workshop on “Application of NGS in Microbial Ecology”	30Oct – 02 Nov. 2017	Research Scholars, Post Doc Fellows	13
68.	Workshop on “Statistical Method in Biological Research ”	03-05 Nov. 2017	Research Scholars	23
69.	Workshop on “Basic Techniques in Molecular Biology and Bioinformatics”	8 – 11 Nov 2017	M.Sc Horticulture Students	25
70.	Research Training Workshop On “Understanding Human Disease and Improving Human Health Using Genomics-Driven Approaches”	20 – 26 Nov 2017	Research Scholar, Young Faculty	35
71.	Workshop on protein Structure Prediction, Analysis and molecular Docking and molecular Phylogenetics.	30 Nov. – 02 Dec. 2017	Research Scholar	10
72.	Lecture Series in Real-time PCR, Human Microbiome,Antibiotic Resistance genes, Cancer Mutation detection methods, Anti-cancer activity screening, NGS methods and Applications	04 – 7 Dec 2017	Research Scholars	10
73.	A Talk on “Scopus: A Peer-reviewed Literature Database”	14 Dec 2017	Research Scholar, Faculty	30
74.	Conducted Refresher Course in “Bioinformatics in Life Sciences”	22 March to 11 April 2018.	Teachers all over the country	45
75.	Elsevier – Author workshop on paper	24 April	Research	30

	writing.	2018	Scholars and Teachers	
76.	Workshop on Predicting Protein Structures and Molecular Docking	07 - 08 May 2018.	M.Sc biotechnology students	20
77.	Statistics workshop	23-25 May 2018	M.Sc II Sem. Biotechnology students	27

(iv) Manpower Trained (Ph.D., M.Sc., Short-term training and others)

2008-2012 : Ph.D students - 02 Traineeship: 04
M.Phil students - 03 Studentship: 04
M.Sc students - 54

2012-2017: Ph.D students - 12 Traineeship: 12
M.Phil students - 03 Studentship: 14
M.Sc students - 66

2017-2018 : Ph.D students - 02 Traineeship: 02
M.Phil students - 06 Studentship: 02
M.Sc students - 20

Students from other Departments/ Universities were also trained:

2012-2017	
Jeremy Lalhminghlua Ralte	Summer training Dept. Biotechnology, Amity University, Lucknow
Rebecca Lalmuanpuii	Summer training Dept. of Chemistry, Mizoram University
Joel	Summer training Dept. Biotechnology, Meerut College
Bavithiran and Jeeva	Summer training Bharatidasan University, Tamilnadu
Zohmangaiha	Ph.D student Department of EVS,. Mizoram University
Tasi Chera Marak	M.Sc dissertation Dept. of HAMP, Mizoram University
Phoebe Lalremruati	Ph.D. Scholar Dept of Zoology Mizoram University,
David Lalvohbika Kaipeng	Ph.D. Scholar Dept. of Microbiology Tripura University
Michael Lalchhuanawma	Project Fellow Dept. of Zoology, Mizoram University
Karuppasamy Chellapandi	Ph.D. Scholar Dept. of Microbiology, Assam University
Folguni Laskar	Training IBH, Karimganj College. Research Associate

	Krishna Murthy	M.Phil student Dept. of Zoology, Mizoram University
9.	**Facility/ Database/ Software/ Portals/ Web server usage** **(i) What kind of users** **(ii) No. of users** **(iii) Whether fee is charged or it's in public domain** **(iv) Mode of publicity to attract more no. of users**	(i) The facility is used by the M.Sc Students, M. Phil and Ph.D research scholars of Biotechnology. Botany, Zoology, Chemistry, Horticulture Departments of Mizoram University and also from other Universities/ Institutes. (ii) More than 1600 users of BIF Centre till date. (iii) ----- (iv) By conducting trainings, awareness programmes, outreach programmes and special guest invited lectures.
10.	**Linkages with other centres funded by DBT or other institutions**	ACTREC, Navi Mumbai IISc, Bangalore University of Calcutta Mizoram State Cancer Institute, Aizawl Civil Hospital Aizawl, Mizoram ISI, Kolkatta NIBMG, Kalyani, Kolkatta RIPANS, Aizawl, Mizoram NHM, London Cachar Cancer Hospital, Silchar, ASSAM CSIR-NEIST, Jorhat, Assam Manipur University, Manipur CDRI, Lucknow