

**SHRI SHIVAJI EDUCATION SOCIETY AMRAVATI'S
SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR
PG Department of Microbiology
Add on Course: CRISPR Cas9 Genome Editing
Session 2023-24**

Course Coordinator Report

A free Add-On Course for PG students in the Department Microbiology, Shri Shivaji Education Society Amravati's Science College, Congress Nagar, Nagpur was held from 01st April 2024 to 17th April 2024. The course title was "CRISPR Cas9 Genome Editing". It is the complete beginner to Expert Course was perfect for anyone who wants to learn CRISPR Cas9 Genome Editing.

The CRISPR Cas9 Genome Editing course is designed to provide a comprehensive overview of CRISPR-Cas9 technology, its mechanisms, and its applications in gene editing. It includes both theoretical knowledge and practical experience, equipping students with the skills needed for genome editing and molecular biology techniques.

The course duration was 10 weeks (30 hours). Two theory classes were engaged on Friday & Saturday and one Practical was engaged in every week. The structure of marking system was 50 marks on theory paper and 40 marks on practical examination including 10 marks for internal. The question paper of theory examination was in MCQ type of 25 questions with four multiple choices. Practical examination was also taken on this course for 40 marks. Internal marks assessment was on the basis of regularity, attendance, assignment submission etc. 26 students were present in both theory and practical examination. The result was prepared and certificates were also distributed to the students.

Action Taken: Students gain a thorough understanding of the CRISPR-Cas9 system, including its natural role in bacterial immunity and its adaptation for genome editing in various organisms. Knowledge of the components of the CRISPR-Cas9 system, including guide RNA (gRNA), Cas9 nuclease, and the process of target DNA recognition and cleavage.



Dr. Pranita Gulhane
Add on Course Coordinator



SHRI SHIVAJI EDUCATION SOCIETY AMRAVATI'S
SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
Session 23-24

To,
The Principal
SSES Am's Science College,
Congress Nagar, Nagpur-47

Subject: For permission to conduct the add on courses in Microbiology and
Biotechnology department during the session 2023-2024

Respected Sir,

This is to request you that the teachers of Microbiology and Biotechnology
department have prepared the syllabus and modules of the 30 hours certificate
courses for the session 2023-2024.

The details of the course module, syllabus and time table is submitted here
with.

Hence please permit to run the add on courses and oblige me.

Thanking you

Yours sincerely

Chakraborty

23-07-2023
Department of Microbiology
Science College, Congress Nagar,
Nagpur-47



Permitted
A. D. L. S.

SHRI SHIVAJI EDUCATION SOCIETY AMRAVATI'S
SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR


PG Department of Microbiology

NOTICE

Date: 11/03/2024

All the students are informed that **P.G. Department of Microbiology** runs **Add on Course: CRISPR-Cas9 Genome Editing** for the session 2023-24. Interested students of M.Sc. are requested to register their names to the course Coordinator Dr. Pranita B. Gulhane on or before 29/03/2024.




Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course



U.G. DEPARTMENT OF MICROBIOLOGY, SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR

Accredited with CGPA of 3.51 at 'A+' Grade by NAAC, Bangalore
A College with Potential for Excellence
An Institutional Member of APQN
Recognized Center for Higher Learning & Research
A Mentor College under Paramarsh Scheme of UGC, New Delhi
A Mentor College under Paris Sparsh Scheme of Maharashtra State

Add on Course for the Session 2023-24 on CRISPR-Cas9 Genome Editing

Course Introduction

This course provides a comprehensive overview of CRISPR-Cas9 technology, its mechanisms, and its applications in gene editing. It includes both theoretical knowledge and practical experience, equipping students with the skills needed for genome editing and molecular biology techniques.

Course Objectives

- Understand the fundamentals of CRISPR-Cas9 technology and its historical development.
- Learn the molecular mechanisms of CRISPR-Cas9 and its components.
- Explore the various applications of CRISPR-Cas9 in gene editing across different organisms.
- Gain hands-on experience in designing and executing CRISPR experiments, including data analysis and troubleshooting.

Registration Date: 27/07/2023

Prof. Atul Bobdey
Coordinator

Prof. Mahendra Dhore
Principal

Dr. Pranita Gulhane
Course- Coordinator

PG Department of Microbiology

Add on Course: Syllabus for CRISPR-Cas9 Genome Editing

(Session 2023-24)

Course Co-ordinator: Dr. Pranita B. Gulhane

Course Introduction

This course provides a comprehensive overview of CRISPR-Cas9 technology, its mechanisms, and its applications in gene editing. It includes both theoretical knowledge and practical experience, equipping students with the skills needed for genome editing and molecular biology techniques.

Course Objectives

- Understand the fundamentals of CRISPR-Cas9 technology and its historical development.
- Learn the molecular mechanisms of CRISPR-Cas9 and its components.
- Explore the various applications of CRISPR-Cas9 in gene editing across different organisms.
- Gain hands-on experience in designing and executing CRISPR experiments, including data analysis and troubleshooting.

Instructional Strategies: Theory class, Practical, Video clips, Models etc.

Evaluation Strategies: Oral discussions and Final MCQ examination

Course Outcomes

Upon completing this course, students will be able to:

- Describe the principles and components of the CRISPR-Cas9 system.
- Design CRISPR-Cas9 constructs for specific gene targets.
- Perform CRISPR-Cas9 mediated gene editing experiments.
- Analyze and interpret the results of CRISPR-Cas9 experiments.
- Discuss the ethical and societal implications of genome editing technology.

Duration of course: Ten weeks (30 Hours)



Pranita B. Gulhane
Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

PG Department of Microbiology
Add on Course: Syllabus for CRISPR-Cas9 Genome Editing
(Session 2023-24)

Module: The Structure of Syllabus and system of evaluation

Course	Theory Papers and Practical	Total Marks		
		Theory	Internal	Practical
Certificate Course in CRISPR-Cas9 technology	Theory paper- CRISPR-Cas9 technology * Theory examination will be of MCQ pattern having 25 questions each with equal marks.	50	10	40
	* Practical examination will be based on performance evaluation in the laboratory and hands-on-training	100		

Pranita Gulhane

Dr. Pranita Gulhane
Add on Course Coordinator



Amitabh Halder

Dr. Amitabh Halder
IQAC Coordinator
Internal Quality Assurance Cell
(IQAC)
S. S. E. S. A. Science College
Congress Nagar, Nagpur.

Mahendra Dhore

Prof. Mahendra Dhore
Principal
Principal
S. S. E. S. Amravati's
Science College, Nagpur.

PG Department of Microbiology
Syllabus of Add on Course: Syllabus for CRISPR-Cas9 Genome Editing
(Session 2023-24)

Course Units

Unit 1: Introduction to CRISPR-Cas9

- **History and Discovery of CRISPR-Cas Systems**
- **Mechanisms of CRISPR-Cas9**
- Structure and function of Cas9
- Guide RNA (gRNA) design
- **Types of CRISPR Systems**
- Class 1 and Class 2 CRISPR systems
- Applications and differences

Unit 2: Designing CRISPR-Cas9 Experiments

- **Target Selection**
- Criteria for selecting target sites
- Off-target effects and their minimization
- **gRNA Design and Synthesis**
- Tools and software for gRNA design
- Synthesis and validation of gRNAs
- **CRISPR Vectors and Delivery Methods**
- Plasmid vectors, viral vectors, and ribonucleoprotein complexes
- Methods of delivery (transfection, electroporation, etc.)

Unit 3: Applications of CRISPR-Cas9

- **Gene Knockout and Gene Knock-in**
- Techniques for generating knockouts and knock-ins
- Applications in model organisms and cell lines
- **CRISPR in Disease Models and Therapeutics**
- CRISPR for disease research
- Therapeutic applications and clinical trials
- **CRISPR Beyond Gene Editing**

- CRISPRa and CRISPRi for gene regulation
- Base editing and prime editing

Unit 4: Data Analysis and Ethical Considerations

- **Data Analysis and Validation**
- Methods for detecting and analyzing CRISPR edits
- Sequencing and bioinformatics tools
- **Troubleshooting CRISPR Experiments**
- Common issues and solutions
- **Ethical, Legal, and Social Implications**
- Ethical considerations in genome editing
- Regulatory landscape and public perception

Practical Sessions

Practical 1: Designing gRNAs

- Use of bioinformatics tools to design gRNAs for a given target gene.
- Synthesis and validation of gRNAs.

Practical 2: Cloning and Delivery of CRISPR-Cas9 Constructs

- Cloning gRNA into CRISPR vectors.
- Transfection of CRISPR constructs into cells.

Practical 3: Gene Editing and Screening

- Performing CRISPR-Cas9 mediated gene editing.
- Screening and validating edited cells using PCR and sequencing.

Practical 4: Data Analysis and Troubleshooting

- Analyzing sequencing data to confirm gene edits.
- Troubleshooting common issues in CRISPR experiments.



Pranita B. Gulhane
Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
(Session 2023-24)

Week-wise teaching plan:

Week	Hrs.	Syllabus
Week 1	1	Structure and function of Cas9
	1	Guide RNA (gRNA) design
	1	Class 1 and Class 2 CRISPR systems
Week 2	1	Criteria for selecting target sites
	1	Off-target effects and their minimization
	1	Tools and software for gRNA design
Week 3	1	Synthesis and validation of gRNAs
	1	Plasmid vectors, viral vectors, and ribonucleoprotein complexes
	1	Methods of delivery (transfection, electroporation, etc.)
Week 4	1	Techniques for generating knockouts and knock-ins
	1	Applications in model organisms and cell lines
	1	CRISPR for disease research
Week 5	1	Therapeutic applications and clinical trials
	2	CRISPRa and CRISPRi for gene regulation
Week 6	2	Base editing and prime editing
	1	Methods for detecting and analyzing CRISPR edits

Week 7	2	Sequencing and bioinformatics tools
	2	Common issues and solutions
Week 8	2	Ethical considerations in genome editing
	2	Regulatory landscape and public perception
Week 9	1	Practical 1: Designing gRNAs
	1	Practical 2: Cloning and Delivery of CRISPR-Cas9 Constructs
Week 10	1	Practical 3: Gene Editing and Screening
	1	Practical 4: Data Analysis and Troubleshooting



Pranita B. Gulhane

Dr. Pranita B. Gulhane
 Course- Coordinator
 Add on Course

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
(Session 2023-24)

Time Table

w.ef. 01/04/2024

Day	Theory
Friday	Dr. Pranita Gulhane (R. no C6) Theory 4.00 PM - 5.00 PM
Saturday	Dr. Pranita Gulhane (R. no C6) Practical 4.00 PM - 5.00 PM
	Dr. Pranita Gulhane (R. no C6) Theory 4.00 PM - 5.00 PM



Pranita Gulhane

Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

SHRI SHIVAJI EDUCATION SOCIETY AMRAVATI'S
SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR


PG Department of Microbiology

EXAMINATION NOTICE

Date: 22/04/2024

All the students enrolled for **Add on Course: CRISPR-Cas9 Genome Editing** for the session 2023-24 are informed that Theory and Practical Exam of the course is scheduled on 26/04/2024. All the appearing students are informed to remain present in Microbiology Laboratory at 10:30 - 11:30AM AM for Theory Exam and at 12:30PM - 5:30PM for Practical Exam.




Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

**List of the Students: Add on Course- CRISPR-Cas9 Genome Editing
(Session 2023-2024)**

Sr. No.	Name of Student	Signature
1)	Akanksha R. Bisen	<u>A Bisen</u>
2)	Akanksha V. Tekade	<u>A Tekade</u>
3)	Anisha A. Shende	<u>A Shende</u>
4)	Anuradha P. Khope	<u>A Khope</u>
5)	Arshiya S. Mushtaque	<u>A Mushtaque</u>
6)	Arya S. Walode	<u>A Walode</u>
7)	Ashwini D. Nandanwar	<u>A Nandanwar</u>
8)	Asmita A. Wagh	<u>A Wagh</u>
9)	Astha A. Sakharwade	<u>A Sakharwade</u>
10)	Bhisvani M. Dhurve	<u>B Dhurve</u>
11)	Diksha S. Choube	<u>D Choube</u>
12)	Ishita Y. Padgil	<u>I Padgil</u>
13)	Ishwari N. Gawande	<u>I Gawande</u>
14)	Janhavi D. Parbat	<u>J Parbat</u>
15)	Leena N. Meher	<u>L Meher</u>
16)	Manisha G. Lilhare	<u>M Lilhare</u>
17)	Manisha R. Roy	<u>M Roy</u>
18)	Namrata O. Nagose	<u>N. Nagose</u>
19)	Ojaswini R. Bhagat	<u>O Bhagat</u>
20)	Rujuta R. Ramteke	<u>R Ramteke</u>
21)	Rutuja R. Meshram	<u>R Meshram</u>

22)	Sejal U. Nilatkar	S Nilatkar
23)	Shamim M. Shahzad	S Shahzad
24)	Shivani R. Vikhar	S Vikhar
25)	Simran V. Bode	S Bode
26)	Snehal N. Sahare	S Sahare
27)	Sushma D. Lihare	S Lihare
28)	Vaibhav S. Jaronde	V Jaronde
29)	Vami K. Masram	V Masram
30)	Yashoda R. Wade	Yashoda



Bulkane
Dr. Pranita B. Gulkane

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
(Session 2023-24)

Theory Exam Multiple Choice Questions (MCQs) Pattern

1. **What does CRISPR stand for?**
 - A) Clustered Regularly Interspaced Short Palindromic Repeats
 - B) Clustered Repeatedly Interspaced Short Palindromic Repeats
 - C) Controlled Regularly Interspaced Short Palindromic Repeats
 - D) Clustered Regularly Interspaced Short Polymeric Repeats
 - **Answer: A**
2. **Which enzyme is primarily used in the CRISPR-Cas9 system for cutting DNA?**
 - A) Cas1
 - B) Cas2
 - C) Cas9
 - D) Cas12
 - **Answer: C**
3. **What is the role of the guide RNA (gRNA) in CRISPR-Cas9?**
 - A) To cut the DNA
 - B) To bind to the target DNA sequence
 - C) To repair the DNA break
 - D) To synthesize new DNA
 - **Answer: B**
4. **Which of the following is NOT a method for delivering CRISPR-Cas9 into cells?**
 - A) Transfection
 - B) Electroporation
 - C) Transduction
 - D) PCR
 - **Answer: D**
5. **What is the main advantage of using CRISPR-Cas9 over previous genome editing technologies?**
 - A) Higher specificity
 - B) Lower cost
 - C) Easier design and implementation
 - D) All of the above
 - **Answer: D**
6. **Off-target effects in CRISPR-Cas9 are due to:**
 - A) Inaccurate DNA cutting
 - B) Mismatches between gRNA and non-target DNA
 - C) Incomplete guide RNA
 - D) None of the above
 - **Answer: B**
7. **Which of the following CRISPR systems is classified as a Class 2 system?**
 - A) Type I
 - B) Type II
 - C) Type III

- D) Type IV
 - **Answer: B**
8. **In CRISPR-Cas9 technology, what does PAM stand for?**
- A) Protospacer Adjacent Motif
 - B) Protospacer Additional Motif
 - C) Protospacer Aligned Motif
 - D) Protospacer Altered Motif
 - **Answer: A**
9. **CRISPR-Cas9 can be used to:**
- A) Knockout genes
 - B) Insert genes
 - C) Edit specific DNA sequences
 - D) All of the above
 - **Answer: D**
10. **Which tool is commonly used for designing gRNAs?**
- A) BLAST
 - B) ClustalW
 - C) CRISPRdirect
 - D) ExPASy
 - **Answer: C**
11. **What is a potential application of CRISPR-Cas9 in agriculture?**
- A) Developing disease-resistant crops
 - B) Increasing crop yield
 - C) Enhancing nutritional content
 - D) All of the above
 - **Answer: D**
12. **Which component of the CRISPR-Cas9 system is responsible for recognizing the target DNA sequence?**
- A) Cas9 enzyme
 - B) Donor DNA
 - C) Guide RNA (gRNA)
 - D) PAM sequence
 - **Answer: C**
13. **What type of gene editing involves introducing a new gene at a specific location in the genome?**
- A) Gene knockout
 - B) Gene knock-in
 - C) Gene silencing
 - D) Gene duplication
 - **Answer: B**
14. **CRISPRa and CRISPRi are used for:**
- A) Activating or inhibiting gene expression
 - B) Cutting DNA
 - C) Repairing DNA
 - D) Sequencing DNA
 - **Answer: A**
15. **Which technique can be used to detect CRISPR-Cas9 induced mutations?**
- A) Western blotting

- B) PCR
- C) Gel electrophoresis
- D) Sanger sequencing
- **Answer: D**

16. Which application of CRISPR-Cas9 has entered clinical trials for treating genetic disorders?

- A) Gene knockout
- B) Gene editing in embryos
- C) Gene therapy for inherited diseases
- D) All of the above
- **Answer: C**

17. In CRISPR-Cas9, the Cas9 enzyme creates a:

- A) Single-strand break
- B) Double-strand break
- C) Triple-strand break
- D) None of the above
- **Answer: B**

18. What is the purpose of the repair template in CRISPR-Cas9 gene editing?

- A) To guide the Cas9 enzyme
- B) To provide a sequence for homologous recombination
- C) To cut the DNA
- D) To bind to the target DNA
- **Answer: B**

19. What ethical concern is associated with CRISPR-Cas9 technology?

- A) Off-target effects
- B) Germline editing
- C) Gene drives in wild populations
- D) All of the above
- **Answer: D**

20. Which of the following is a limitation of CRISPR-Cas9?

- A) High specificity
- B) Low cost
- C) Potential for off-target effects
- D) Ease of use
- **Answer: C**

21. Which alternative to CRISPR-Cas9 is known for introducing precise point mutations without double-strand breaks?

- A) TALENs
- B) ZFNs
- C) Base editors
- D) Meganucleases
- **Answer: C**

22. Which of the following is a common method to validate CRISPR-Cas9 edits?

- A) RNA sequencing
- B) Chromatography
- C) Western blot
- D) T7E1 assay
- **Answer: D**

23. The specificity of CRISPR-Cas9 can be increased by:

- A) Using a shorter gRNA
- B) Increasing Cas9 concentration
- C) Designing gRNA with fewer mismatches
- D) Using a high-fidelity Cas9 variant

• Answer: D

24. What is the primary advantage of using CRISPR-Cas9 over traditional breeding methods in agriculture?

- A) Faster generation of desired traits
- B) More cost-effective
- C) More precise changes
- D) All of the above

• Answer: D

25. Which regulatory body oversees the approval of CRISPR-based therapies in the United States?

- A) EPA
- B) FDA
- C) USDA
- D) NIH

• Answer: B



Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
(Session 2023-24)

Practical Exam Question Paper:

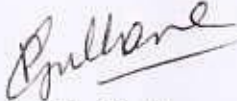
Subject : CRISPR-Cas9 Genome Editing
Center : S.S.E.S.A's Science College, Nagpur
Time : 5 hrs per day
Dates : 26/04/2024

Max. Marks: 40

Q.1. Cloning and Delivery of CRISPR-Cas9 Constructs	10
Q.2. Gene Editing and Screening	10
Q.3. Viva-Voce	10
Q.4. Practical Record	10

Total Marks 40




Dr. Pranita B. Gulhane
Course- Coordinator
Add on Course

PG Department of Microbiology
Add on Course: CRISPR-Cas9 Genome Editing
(Session 2023-24)

OMR Answer Sheet



Shri Shivaji Education Society, Amravati's
SCIENCE COLLEGE
 Congress Nagar, Nagpur-12 (M.S.), India



Accredited with CGPA of 3.51 at 'A+' grade by NAAC, Bangalore
 A "College with Potential for Excellence" identified by UGC New Delhi.
 Institutional Member of APQV
 Recognized Centre for Higher Learning and Research
 Mentor College under 'PARAMARSH Scheme', UGC, New Delhi

P.G. DEPARTMENT OF MICROBIOLOGY

Add-on Course

Course Exam Name: Add on Course in CRISPR-Cas 9 Genome Editing

Name of Student:

Akanksha Bisen

Roll No.:

Session: 2023-24

Test Date: 22/04/2024

Max. Marks: 50

Invigilator Signature

Bisen

Obtained Marks:

48

INSTRUCTIONS FOR FILLING THE SHEET

- This sheet should not be folded or crushed
- Use only blue/black ball point pen to fill the circles
- Use of pencil is strictly prohibited
- Circles should be darkened completely and properly
- Cutting and erasing on this sheet is not allowed
- Do not use any stray marks on the sheet
- Do not use marker or white fluid to hide the mark

WRONG METHODS **CORRECT METHOD**



	A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D		A	B	C	D
1	●	○	○	○	11	○	○	○	●	21	○	○	○	○	31	○	○	○	○	41	○	○	○	○
2	○	○	○	○	12	○	○	○	○	22	○	○	○	○	32	○	○	○	○	42	○	○	○	○
3	○	○	○	○	13	○	○	○	○	23	○	○	○	○	33	○	○	○	○	43	○	○	○	○
4	○	○	○	○	14	○	○	○	○	24	○	○	○	○	34	○	○	○	○	44	○	○	○	○
5	○	○	○	○	15	○	○	○	○	25	○	○	○	○	35	○	○	○	○	45	○	○	○	○
6	○	○	○	○	16	○	○	○	○	26	○	○	○	○	36	○	○	○	○	46	○	○	○	○
7	○	○	○	○	17	○	○	○	○	27	○	○	○	○	37	○	○	○	○	47	○	○	○	○
8	○	○	○	○	18	○	○	○	○	28	○	○	○	○	38	○	○	○	○	48	○	○	○	○
9	○	○	○	○	19	○	○	○	○	29	○	○	○	○	39	○	○	○	○	49	○	○	○	○
10	○	○	○	○	20	○	○	○	○	30	○	○	○	○	40	○	○	○	○	50	○	○	○	○

PG Department of Microbiology
Mark List: Add on Course- CRISPR-Cas9 Genome Editing
(Session 2023-24)

Sr. No.	Name of Student	Marks obtained out of 50 (Theory)	Marks obtained out of 40 (Practical)	Marks obtained out of 10 (Internal)	Total Marks 100	Grade
1)	Akanksha R. Bisen	48	36	10	94	O
2)	Akanksha V. Tekade	42	35	10	87	A+
3)	Anisha A. Shende	48	36	10	94	O
4)	Anuradha P. Khope	44	35	10	89	A+
5)	Arshiya S. Mushtaque	50	34	10	94	O
6)	Arya S. Walode	48	35	10	93	O
7)	Ashwini D. Nandanwar	42	34	10	86	A+
8)	Asmita A. Wagh	48	35	10	93	O
9)	Astha A. Sakharwade	50	37	10	97	O
10)	Bhisvani M. Dhurve	42	34	10	86	A+
11)	Diksha S. Choube	44	35	10	89	A+
12)	Ishita Y. Padgil	48	36	10	94	O

13)	Ishwari N. Gawande	50	38	10	98	0
14)	Janhavi D. Parbat	48	35	10	93	0
15)	Leena N. Meher	46	39	10	95	0
16)	Manisha G. Lilhare	42	35	10	87	A+
17)	Manisha R. Roy	AB	AB	AB	AB	AB
18)	Namrata O. Nagose	48	35	10	93	0
19)	Ojaswini R. Bhagat	42	35	10	87	A+
20)	Rujuta R. Ramteke	50	38	10	98	0
21)	Rutuja R. Meshram	50	34	10	94	0
22)	Sejal U. Nilatkar	42	35	10	87	A+
23)	Shamim M. Shahzad	44	35	10	89	A+
24)	Shivani R. Vikhar	42	34	10	86	A+
25)	Simran V. Bode	50	38	10	98	0
26)	Snehal N. Sahare	48	35	10	93	0
27)	Sushma D. Lilhare	48	35	10	93	0
28)	Vaibhav S. Jaronde	50	38	10	98	0
29)	Vami K. Masram	50	34	10	94	0
30)	Yashoda R. Wade	48	36	10	94	0

Gulhane

Dr. Pranita Gulhane
Add on Course Coordinator





Shri Shivaji Education Society Amravati's
**SCIENCE COLLEGE, CONGRESS NAGAR,
NAGPUR**



Accredited with CGPA of 3.51 at 'A+' Grade
A College with Potential for Excellence

CERTIFICATE

Mr./Ku. Akanksha Bisen is awarded with certificate on successful completion of the course entitled,
Certificate course in "CRISPR-Cash 9 Genome Editing"

Session 2023-24 under Add-on course conducted for 30 hours from 1/04/2024 to 17/04/2024 by
Department of Microbiology, SSES's, Science College, congress Nagar, Nagpur 440012.

He/She has passed the Examination with 'O' Grade.

Dr. Pranita Gulhane

Coordinator, Department of Microbiology

Prof. M. P. Dhore

Principal, Science College, Nagpur

UG Department of Microbiology
Session 2023-24
Add-On Courses : CRISPR-Cas 9 Genome Editing

Feedback form

Que.1 How would you rate the overall quality of the Add-on course CRISPR-Cas 9 Genome Editing?

- A. Excellent
- B. Good
- C. Average

Que.2. How well did the Add-on course CRISPR-Cas 9 Genome Editing?

- A. Exceeded expectation
- B. Met expectations
- C. Below expectations

Que. 3. How effective were the course instructor in delivering the Add-on course CRISPR-Cas 9 Genome Editing?

- A. Very effective
- B. Effective
- C. Ineffective

Que.4. How likely are you to recommend the Add-on course CRISPR-Cas 9 Genome Editing to others?

- A. Very likely
- B. Likely
- C. Unlikely

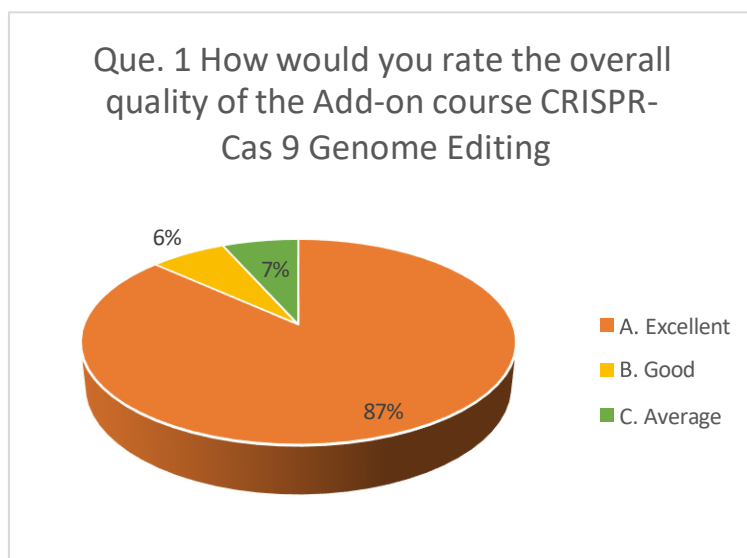
Que. 5. How satisfied are you with the practical sessions of the Add-on course CRISPR-Cas 9 Genome Editing?

- A. Very satisfied
- B. Satisfied
- C. Dissatisfied.

UG Department of Microbiology
Session 2023-24
Add-On Courses : CRISPR-Cas 9 Genome Editing
Feedback Responses:

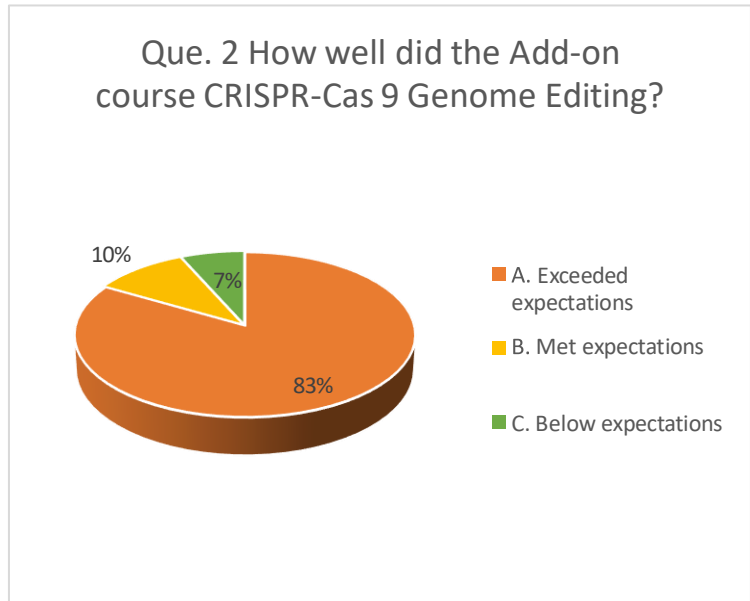
Que.1 How would you rate the overall quality of the Add-on course CRISPR-Cas 9 Genome Editing?

Rating	No. of Students	Percentage
Excellent	26	87 %
Good	2	7%
Average	2	6%
Total	30	100%



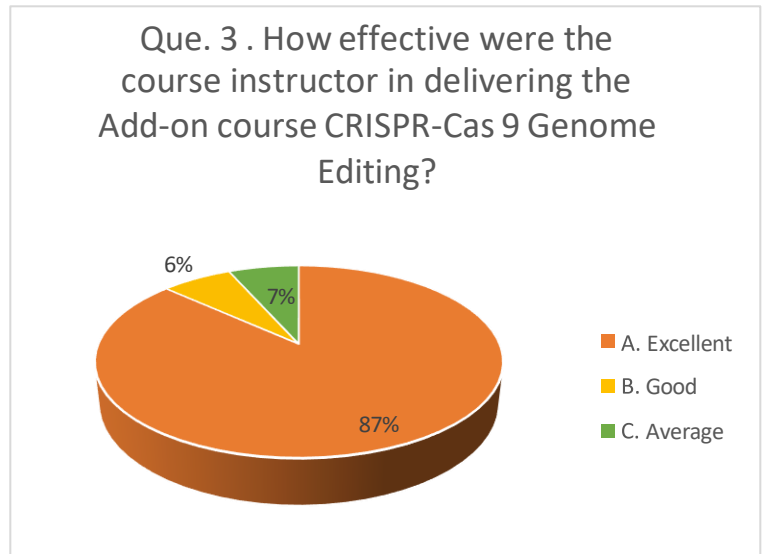
Que.2 How well did the Add-on course CRISPR-Cas 9 Genome Editing?

Rating	No. of Students	Percentage
Exceeded Expectation	25	83%
Met Expectation	3	10%
Below Expectation	2	7%
Total	30	100%



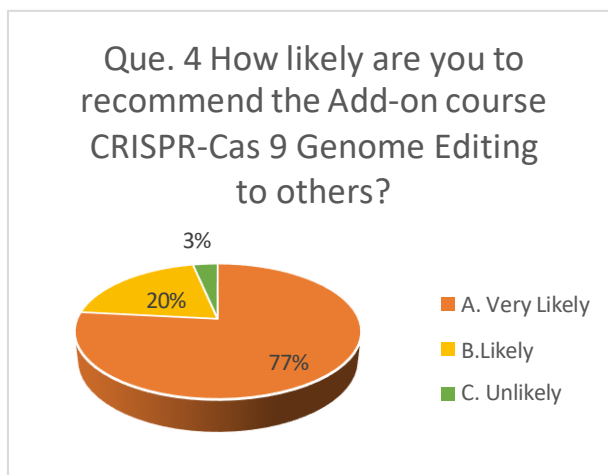
Que. 3. How effective were the course instructor in delivering the Add-on course CRISPR-Cas 9 Genome Editing?

Rating	No. of Students	Percentage
Very Effective	26	87 %
Effective	2	7%
Ineffective	2	6%
Total	30	100%



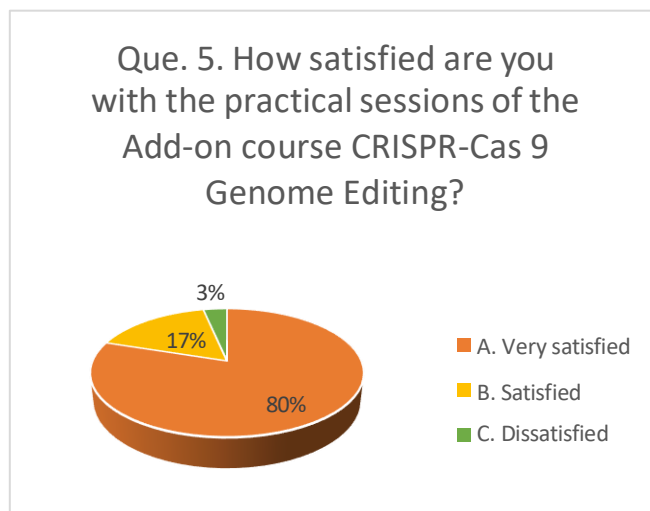
Que.4. How likely are you to recommend the Add-on course CRISPR-Cas 9 Genome Editing to others?

Rating	No. of Students	Percentage
Very Likely	23	77%
Likely	6	20%
Unlikely	1	3%
Total	30	100%



Que. 5 How satisfied are you with the practical sessions of the Add-on course CRISPR-Cas 9 Genome Editing?

Rating	No. of Students	Percentage
Very Satisfied	24	80%
Satisfied	5	17%
Dissatisfied	1	3%
Total	30	100%



Gulhane

Dr. Pranita Gulhane
Course- Coordinator
Add on Course



Dr. Amitabh Halder

Dr. Amitabh Halder
IQAC Coordinator
Internal Quality Assurance Cell
(IQAC)
S. S. E. S. A. Science College
Congress Nagar, Nagpur.

Dr. Mahendra Dhore

Prof. Mahendra Dhore
Principal
Principal
S. S. E. S. Amravati's
Science College, Nagpur.