Date: 04/09/2019

To
The Principal
Shri. Mohatadevi Shikshan Sanstha
Pragati Mahavidyalaya
Sawkheda, Tq. Sillod
Dist. Aurangabad

Subject: Request to Run a Certificate Course Entitled ***"Microbial Genetics"***

Respected Sir,

I am writing to request your approval to introduce a new certificate course entitled ***"Microbial Genetics"*** in the Microbiology department for the academic year 2019-20.

The proposed course will be conducted over a span of 32 hours and aims to provide our students with advanced knowledge and practical skills in the field of microbial genetics. This course will cover various aspects of genetic mechanisms in microorganisms, including gene regulation, genetic engineering, and applied genetics.

Given the significance of this field in contemporary biological research and its relevance to our curriculum, we believe that this course will greatly benefit our students by enhancing their understanding and employability in the field of microbiology.

We request your kind approval to run this certificate course and also seek your support in facilitating the necessary resources and arrangements required for its successful implementation.

Thank you for considering our proposal. We look forward to your positive response.

Yours sincerely,

Head of Department, Microbiology
Pragati Mahavidyalaya
Sawkheda, Tq. Sillod
Dist. Aurangabad

Shri Mohatadevi Shikshan Sanstha, Aurangabad.

PRAGATI MAHAVIDYALAYA

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Website: www.pragatisawkheda.co.in

Email: pragatiiqac2016@gmail.com, pragatimahavidyalaya442@gmail.com

Contact: 9822021784, 8888611717

Estd: 2016

Mrs. Kaveri Palkar — President

Mrs. Archana Mukhekar — Secretary

Dr. Varsha Phalke — Principal

Ref No.: PMS/2019 -2020 / 02

Date : 06 / 09 /2019

To,
Head of Department, Microbiology
Pragati Mahavidyalaya
Sawkheda, Tq. Sillod
Dist. Aurangabad

Subject: Sanction for Certificate Course in ***"Microbial Genetics"***

Dear Sir,

I am pleased to inform you that your proposal to run a certificate course entitled ***"Microbial Genetics"*** has been reviewed and approved. The course, as outlined in your application, will be conducted over 32 hours and will be an excellent addition to the Microbiology department's offerings.

The course is sanctioned for the academic year 2019-20, and we trust that it will provide valuable knowledge and skills to our students, enhancing their academic and professional prospects in the field of microbiology.

Please proceed with the necessary preparations and arrangements to ensure the smooth implementation of this course. Should you require any additional resources or support, do not hesitate to reach out.

Thank you for your dedication and effort towards enriching our academic programs.

Yours sincerely,

Varsha

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Pragati Mahavidyalaya
Sawkheda ,Tq.Sillod, Dist. Aurangabad

Varsha

Principal
Shri. Mohatadevi Shikshan Sanstha
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Contact: 9822021784, 8888611717

Estd: 2016

Ref No.: PMS/2019-2020/82

Date : 06/09/2019

Notice

Subject: Introduction of Certificate Course in "Microbial Genetics"

Dear Students,

We are pleased to announce the introduction of a new certificate course entitled ***"Microbial Genetics"*** in the Microbiology department for the academic year 2019-20. This course is designed to enhance your knowledge and skills in the field of microbial genetics.

Course Details:

- **Title:** Microbial Genetics
- **Duration:** 32 hours
- **Objective:** To provide an in-depth understanding of genetic mechanisms in microorganisms, including gene regulation, genetic engineering, and applied genetics.

The course will be a valuable addition to your academic journey and will offer practical insights into contemporary research and applications in microbial genetics. We encourage all interested students to enroll and take full advantage of this opportunity to advance your expertise in this exciting field.

For any immediate questions or concerns, please contact the department office.

We look forward to your active participation.

Head of Department, Microbiology

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Ref No.: PMS/20 - -20 -/ Date : - / - /20

Syllabus of Certificate Course in Microbial Genetics

Duration: 32 Hours

Course Objectives:

1. To provide comprehensive knowledge of genetic mechanisms in microorganisms.
2. To explore techniques and applications in microbial genetics.
3. To develop practical skills in genetic manipulation and analysis.

Course Outline:

Week 1: Introduction to Microbial Genetics (4 hours)

- **Overview of Microbial Genetics**
  - Importance and scope of microbial genetics.
  - Comparison with genetic studies in higher organisms.
- **Genetic Material in Microorganisms**
  - Structure and function of DNA and RNA.
  - Differences between prokaryotic and eukaryotic genomes.

Week 2: Gene Structure and Function (4 hours)

- **Gene Organization**
  - Operons and gene clusters in bacteria.
  - Promoters, enhancers, and regulatory sequences.
- **Gene Expression**
  - Transcription and translation processes.
  - Gene regulation mechanisms.

Week 3: Genetic Variation and Mutations (4 hours)

- **Types of Mutations**
  - Point mutations, insertions, deletions, and frame shifts.
- **Mutation Detection and Repair Mechanisms**
  - Methods for detecting mutations.
  - DNA repair pathways.

Week 4: Genetic Transfer Mechanisms (4 hours)

- **Horizontal Gene Transfer**
  - Transformation, transduction, and conjugation.
- **Genetic Exchange and Evolution**
  - Role of plasmids and mobile genetic elements.

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Week 5: Recombinant DNA Technology (4 hours)

Basic Techniques

- Restriction enzymes, ligases, and cloning vectors.

- **Applications in Microbiology**
  - Gene cloning, expression, and mutagenesis.

Week 6: Functional Genomics and Proteomics (4 hours)

- **Functional Genomics**
  - Gene knockout and knockdown studies.
- **Proteomics**
  - Protein expression analysis and functional studies.

Week 7: Applied Microbial Genetics (4 hours)

- **Biotechnology Applications**
  - Production of recombinant proteins, antibiotics, and vaccines.
- **Environmental and Industrial Applications**
  - Bioremediation and bioengineering.

Week 8: Practical Applications and Case Studies (4 hours)

- **Laboratory Techniques**
  - Hands-on sessions with PCR, gel electrophoresis, and sequencing.
- **Case Studies**
  - Review and discussion of recent research and applications in microbial genetics.

Assessment:

- **Assignments:** Regular assignments based on lecture topics and practical work.
- **Quizzes:** Periodic quizzes to test understanding of key concepts.
- **Final Examination:** A comprehensive exam covering all course topics.

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Final Examination: Microbial Genetics

Duration: 1.5 Hours

Total Marks: 30

Instructions:

1. Choose the correct answer for each question.
2. Each question carries 1 mark.
3. There is no negative marking for incorrect answers.

Questions:

1. **Which of the following is the primary genetic material in most bacteria?**
   a) RNA
   b) DNA
   c) Protein
   d) Carbohydrates
2. **What is the function of an operon in bacterial genetics?**
   a) DNA replication
   b) Gene expression regulation
   c) Protein synthesis
   d) Cellular respiration
3. **Which process involves the uptake of free DNA from the environment by a bacterial cell?**
   a) Conjugation
   b) Transformation
   c) Transduction
   d) Binary fission
4. **What is a plasmid?**
   a) A type of virus
   b) A small, circular DNA molecule
   c) A large, linear DNA molecule
   d) A ribosomal RNA
5. **Which enzyme is used to cut DNA at specific sequences?**
   a) DNA polymerase
   b) RNA polymerase
   c) Restriction enzyme
   d) Ligase
6. **Which technique is used to amplify specific DNA sequences?**
   a) Gel electrophoresis
   b) PCR (Polymerase Chain Reaction)
   c) Southern blotting
   d) Northern blotting

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What is the role of a promoter in gene expression?
a) To degrade RNA
b) To initiate transcription
c) To terminate transcription
d) To replicate DNA

8. **Which of the following mutations is characterized by the addition of one or more nucleotides into a gene?**
a) Point mutation
b) Silent mutation
c) Insertion mutation
d) Deletion mutation

9. **Which type of genetic transfer involves the exchange of genetic material through direct contact between bacterial cells?**
a) Transformation
b) Conjugation
c) Transduction
d) Mutation

10. **Which of the following is a common application of recombinant DNA technology?**
a) DNA sequencing
b) Gene cloning
c) Protein electrophoresis
d) Cytogenetic analysis

11. **What is the purpose of using a restriction enzyme in genetic engineering?**
a) To amplify DNA
b) To create DNA fragments
c) To repair DNA
d) To transcribe RNA

12. **Which component of the operon model binds to the operator and blocks transcription?**
a) Promoter
b) Repressor
c) Activator
d) Enhancer

13. **Which type of genetic variation is caused by a single nucleotide change?**
a) Insertion
b) Deletion
c) Point mutation
d) Frame shift mutation

14. **What is the function of the lac operon in E. coli?**
a) To metabolize lactose
b) To synthesize proteins
c) To repair DNA
d) To replicate DNA

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15. **Which of the following is NOT a method of horizontal gene transfer in bacteria?**
    a) Conjugation
    b) Transformation
    c) Transduction
    d) Binary fission
16. **Which technique is used to separate DNA fragments based on size?**
    a) PCR
    b) Gel electrophoresis
    c) Western blotting
    d) Northern blotting
17. **Which process involves the use of bacteriophages to transfer genetic material between bacterial cells?**
    a) Transformation
    b) Conjugation
    c) Transduction
    d) Replication
18. **In which organelle does transcription occur in eukaryotic cells?**
    a) Nucleus
    b) Mitochondria
    c) Ribosome
    d) Endoplasmic reticulum
19. **What is the function of DNA ligase in genetic engineering?**
    a) To cut DNA
    b) To replicate DNA
    c) To join DNA fragments
    d) To transcribe RNA
20. **Which type of gene expression regulation involves small RNA molecules?**
    a) Translational control
    b) Post-transcriptional control
    c) Transcriptional control
    d) Epigenetic control
21. **What is the primary method used to determine the sequence of a DNA molecule?**
    a) PCR
    b) DNA sequencing
    c) Gel electrophoresis
    d) Northern blotting
22. **Which of the following is a technique used to detect specific RNA molecules?**
    a) Southern blotting
    b) Western blotting
    c) Northern blotting
    d) ELISA

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23. **What is the main advantage of using bacterial plasmids as vectors in genetic engineering?**
    a) They are large and complex
    b) They can replicate independently
    c) They have no regulatory sequences
    d) They integrate into the host chromosome
24. **Which of the following mutations usually does not change the amino acid sequence of a protein?**
    a) Missense mutation
    b) Nonsense mutation
    c) Silent mutation
    d) Frame shift mutation
25. **What is a gene knockout?**
    a) A technique to increase gene expression
    b) A technique to delete or disrupt a gene
    c) A process to insert a new gene
    d) A method to amplify a gene
26. **What is the primary purpose of functional genomics?**
    a) To sequence genomes
    b) To study gene functions and interactions
    c) To analyze protein structures
    d) To identify genetic mutations
27. **Which type of genetic element can move from one location to another within a genome?**
    a) Plasmid
    b) Transposon
    c) Operon
    d) Ribosome
28. **What is the role of the lac repressor in the lac operon system?**
    a) To promote gene expression
    b) To inhibit gene expression in the presence of lactose
    c) To facilitate gene expression in the absence of lactose
    d) To regulate DNA replication
29. **Which of the following is a technique used to analyze protein expression?**
    a) PCR
    b) Western blotting
    c) Northern blotting
    d) Southern blotting

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30. Which term describes the introduction of new genes into an organism's genome through genetic engineering?
a) Transformation
b) Transduction
c) Gene therapy
d) Cloning

Answer Key:

1. b) DNA
2. b) Gene expression regulation
3. b) Transformation
4. b) A small, circular DNA molecule
5. c) Restriction enzyme
6. b) PCR (Polymerase Chain Reaction)
7. b) To initiate transcription
8. c) Insertion mutation
9. b) Conjugation
10. b) Gene cloning
11. b) To create DNA fragments
12. b) Repressor
13. c) Point mutation
14. a) To metabolize lactose
15. d) Binary fission
16. b) Gel electrophoresis
17. c) Transduction
18. a) Nucleus
19. c) To join DNA fragments
20. b) Post-transcriptional control
21. b) DNA sequencing
22. c) Northern blotting
23. b) They can replicate independently
24. c) Silent mutation
25. b) A technique to delete or disrupt a gene
26. b) To study gene functions and interactions
27. b) Transposon
28. c) To facilitate gene expression in the absence of lactose
29. b) Western blotting
30. c) Gene therapy

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