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| **Course Name: Industrial Microbiology** | | |
| **Course Code: BIOL 473** | **Course Type : Elective** | **Course Credits: 3** |
| **Class Timings:**  Mon Wed Fri 14:00 – 14:50  Room: S410 | **Section: A** | **Student Meeting Hours/ Office Hours:**  Tuesday and Thursday 11:00 – 13:00 |
| **Instructor Name: Dr. Muhammad Imran** | | |
| **A Note from the Instructor:**  Instruction for this course will be through blended approach. Off-campus students will join the class online by google meet. Lecture recording will be made available to students on Moodle. Course management will be done through Moodle. | | |
| **Instructor Contact Details**  Email: [muhammadimran@fccollege.edu.pk](mailto:muhammadimran@fccollege.edu.pk), 0333-9990735  Office Hours (face to face and/ or online): M-F 09:00 – 10:00 or by appointment  Guidelines for contacting instructor: for in-person consultation, students can appear during the time mentioned. For online meeting, send an email to get appointment. | | |
| **Course Description**:  You know it or not we are using industrial microbiology products when we go for PCR test for Covid-19 or take insulin shots or antibiotics just few to name. In this course we will learn which micro-organisms are used to develop many such products at an industrial level. Starting from isolation of the micro-organisms, their improvement, fermentations to harvesting. We will also learn about product purification to acceptable commercial level. In this course we will go through microbial nutrition growth kinetics, industrial fermentation media, fermentation systems, control and monitoring.  Pre-requisites if any: --  Mode of Instruction: Synchronous | | |
| **Main Mode of Instruction:** Moodle, Google Meet/Zoom  **Technology Requirements** Be familiar with the use of Moodle and Google Meet/Zoom  **Technology Etiquettes:**  Join the session on time.  Rename yourself to your name and roll number.  Mute yourself when not speaking.  Be ready to be presentable on camera.  If allowed to speak, be mindful of your tone and expressions during the session. This is not an anonymous session. Your voice and video are viewed by all who are participating in the session.  **Considerations for Students with Limited Internet/Technology Access:** Lecture recordings and other relevant material will be made available on Moodle | | |
| **Course Objectives or** [**Student Learning Outcomes**](https://docs.google.com/document/d/1me9vpl8iKR_zNX9gIODm7gkVFY9VkuSKpUJe1VyI57M/edit) **(SLOs)**   1. Describe and synthesize on the significance of microorganisms in real life situations to solve problems. 2. Explain about important classes of microorganisms used currently in industries. 3. Utilize their knowledge of microorganisms to independently work on various industrial processes (using microorganisms). 4. Demonstrate, analyze and compare various techniques for using microorganisms for various processes. 5. Find innovative ways to explore microbial world for industrial applications 6. Work collaboratively with one or more lab partners and work with various instruments in microbiology 7. Perform experiment on culturing and identification of microorganisms, measure microbial growth and analyze their sensitivity 8. Develop models of industrial processes using microorganisms | | |

**Course Content, Learning Material & Activities Schedule**

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| **Wk** | **Topic/ Title** | [**Teaching-Learning Activities**](https://docs.google.com/document/d/1jY2UWb3QuOogkiSMdPvZd33eKe2kRpfzsTm2LSrnLko/edit#heading=h.4dy4q49omahn) | | | [**Assessment**](https://docs.google.com/document/d/1Z4W_utaHpwMJP6B2jJlb9ofxFHmcagrWWOT5cUM9lj4/edit?usp=sharing)  **&** [**Rubrics**](https://docs.google.com/document/d/1IdFfZ8WRSRKSceBYC4jfAyKEYdb1M6Z4GSSLueP8HD0/edit)  (with the due date) |
| **Synchronous**  **(Simultaneously conducted)**  *Presentation / Lecture*  *Live Video-Audio*  *Small-Group Discussion/ Breakout Rooms*  *In-class quiz*  *Q&A/ Live Chat* | | **Asynchronous**  (postal/ Moodle/ email)  *Discussion blogs*  *WhatsApp*  *Readings*  *Moodle Quizzes*  *Assignment Submission*  *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Experiential learning* |
| In-Person | Online | Off-campus and offline |
| 1 | Introduction to the course, review of previous knowledge, significance and applications of microorganisms in industries. | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 2 | Important groups of industrial microorganisms | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 3 | Fermentation media – choosing the best for your microbes and system | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 4 | Fermentation systems – collaborating with engineers | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 5 | Fermentation systems - continued | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 6 | Downstream processing – how to get the product out of medium and system | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
|  |  | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 7 | Downstream processing – continued | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 8 | Product development – regulation, safety | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 9 | Industrial products of microorganisms - important microbial enzymes, | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 10 | Industrial products of microorganisms -industrial chemicals and fuels, | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 11 | Industrial products of microorganisms -health care products, food related products, | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 12 | Industrial products of microorganisms – foods and beverages | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 13 | Environmental microbial biotechnology | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Presentation / Lecture*  *Discussion/ Breakout Rooms*  *Q&A/ Live Chat* | *Online Content/ Recordings*  *Lecture notes/ Annotated PPT*  *Readings* |  |
| 14 | Application of rDT in industrial microbiology |  |  |  |  |

**‘Out-of-class’ Study Required (across all 3 categories of students -- those attending in-person, online, or asynchronously)**

Typically, this course requires 2-3 hours of out-of-class work each week. Students may also be required to go through pre-class material.

### **Textbooks, Materials, Supplies, and other Resources**

1. Waites MJ, Morgan NL, Rockey, JL, and Higton G. 2001. Industrial Microbiology – An Introduction. 1st ed. Blackwell Science, USA.
2. Kavit and Arora MP. 2007. Industrial Biotechnology. Paramount Publishing, New Delhi.

**Course Requirements:**

**Class Participation/attendance 10 %**

**Assignments:** 20 %

**Quizzes:**  15 %

**Midterm exam**: 25 %

**Final term exam:**  30 %

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**TOTAL 100%**

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**Attendance Policy:**

80% attendance is required in lectures as well as in lab. If a student fails to fulfill the requirement, he/she may not be allowed to appear in final examination.

**Grading Legend**

Below is the grading legend of FCCU (published in all catalogues and available on the FCCU website) as approved by the Academic Council

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| --- | --- | --- | --- |
| **Grade** | **Point Value** | **Numerical Value** | **Meaning** |
| A | 4.00 | 93-100 | Superior |
| A- | 3.70 | 90-92 |
| B+ | 3.30 | 87-89 | Good |
| B | 3.00 | 83-86 |
| B- | 2.70 | 80-82 |
| C+ | 2.30 | 77-79 | Satisfactory |
| C | 2.00 | 73-76 |
| C- | 1.70 | 70-72 |
| D+ | 1.30 | 67-69 | Passing |
| D | 1.00 | 60-66 |
| F | 0.00 | 59 or below | Failing |

**Student Conduct & Other Issues:**

There will be no tolerance for cheating/plagiarism. Detailed policy of classroom misconduct, cheating and plagiarism given in the Student Handbook will be followed. Non-academic use of mobile phone in the class and exams is prohibited. Students are advised to silence their mobiles before coming to class.

**Changes to the Syllabus:**

This syllabus was designed to convey course information and requirements as accurately as possible. It is important to note however that it **may** be subject to change during the course depending on the needs of the class and other situational factors. Such changes would be for your benefit and you will be notified of them as soon as possible.

**Student Support Services**

[Student Counseling Services](https://www.fccollege.edu.pk/ccc/campus-counseling-center/).Students can contact the [Campus Counseling Center](https://www.fccollege.edu.pk/ccc/campus-counseling-center/) at 0331-444-1518 or email [ccc@fccollege.edu.pk](mailto:ccc@fccollege.edu.pk).

[Writing Center](https://www.fccollege.edu.pk/faculty-of-humanities/writing-center/)

[Mercy Health Center](https://www.fccollege.edu.pk/mercy-health-center/)

**Other Useful FCCU Policy Documents:**

[Sexual Harassment Policy](https://www.fccollege.edu.pk/wp-content/uploads/2018/05/Doc1.pdf)

[Anti-Corruption Policy](https://www.fccollege.edu.pk/wp-content/uploads/2018/05/Anti-corruption.pdf)

[Academic integrity](https://www.fccollege.edu.pk/policy-on-academic-integrity/)

[Plagiarism Policy](https://www.fccollege.edu.pk/wp-content/uploads/2018/05/FCCU-Plagiarism-Policy.pdf)

[Academic Calendar](https://www.fccollege.edu.pk/academic-calendar/)