**Syllabus/ Course Outline**

**BIOT 408**

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| **Course Name: Recombinant DNA Technology**  |
| **Course Code: BIOT 408** | **Course Type: Core** | **Course Credits: 4**  |
| **Class Timings:** 12:00 to 12:50,M, W and F**Lab Timing:** 2:00 to 3:50 pm on Monday | **Section: A**  | **Student Meeting Hours/ Office Hours: 1:00 to 2:00 pm**Monday through Friday |
| **Instructor Name: Prof. Dr. Aftab Bashir** |
| **A Note from the Instructor:****-**I got my Ph.D. in molecular biology in 1994 from the University of Illinois, USA. I have been in teaching since the completion of my degree. I am a very ambitious teacher and researcher. I joined Forman Christian College University in 2014. I expect my students to be as competent and knowledgeable as the students in advanced countries. I suggest very strongly that you take this core course as a very serious student as it will develop a strong foundational knowledge of recombinant DNA Technology. My philosophy of teaching is based on “Significant Learning.” I follow the philosophy for best learning processes. I expect every student to have a very sound background in the Recombinant DNA Technology both in medical or agricultural sciences at the end of this course.**-** The course is expected to be taught in a **face-to-face mode but may involve blended mode per situation and**per government and FCC policies. The students will get the information about when to be in the class and online. The attendance and class discipline will be monitored along with student-teacher interactions. The name of any student may be called for discussion to evaluate the student’s attention in the class. The attendance, class discipline and interaction will carry specific marks as described in this document later. |
| **Instructor Contact Details**Email: aftabbashir@fccollege.edu.pk Mobile No: 03206687953Office Hours (face to face and/ or online): 1:00 pm to 2:00 pm (Monday through Thursday, Friday 12:00 to 1:00 pm)Guidelines for contacting instructor: I prefer email contact for scheduling meeting times |
| **TA Name and Contact Details (if applicable): Not applicable**Name: Email: Other: Office Hours:Guidelines for contacting TA/s:  |
| **Course Description:**Pre-requisites if any: BIOT 313Mode of Instruction: Both Synchronous and Asynchronous |
| **Main Mode of Instruction:** Face to Face and/or ZOOM**Technology Requirements:** Online lectures require the students to have a laptop having a web cam and headphone with speakers and mic. The minimum available hard disk space on C-drive should be atleast 10 GB for video streaming. **The students must be familiar with ZOOM application installed on their laptops.** **Technology Etiquettes: If on online mode*** It is recommended to log in at least 10 minutes before the start of the session to do the necessary checks
* Video conferencing is a new communication platform. There are bound to be technical glitches; be patient during the session.
* Be sure to name yourself for your slot on the screen. It will make it easy to get a report of the students’ attendance. If your slot carries a different name, to rename: click 3 dots near your video window OR in the participants’ list, hover over your name, and click “rename” to make the change
* Please stay muted when not speaking, and ask questions in the chat.
* If you face a bandwidth issue please turn off your video.
* 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
* Remember you are on camera and live. The advantage of video conferencing is that you can take advantage of facial expressions, inflection, and tone of voice.
* Remember to think before you respond to make your thoughts and ideas clear and coherent to the other participants.
* Please be mindful of the time, keep your contributions brief and to the point
* Allow other participants/students time and opportunities to contribute to the discussion and share their ideas with the group.
* Be respectful of others’ opinion
* If the session is recorded do not post isolated comments that may be taken out of context.
* For Break out rooms:
	+ If you end up in a breakout room alone (or something goes wrong), don’t panic, just click “Leave breakout room” and you will return to the main room where the host will guide you
	+ If you click ‘Ask for Help’, it will notify the meeting host that you need assistance and they will be asked to join your breakout room. Click ‘Ask for Help’ in the meeting controls. Confirm that you would like assistance by clicking Invite Host
	+ Some more guidelines for [Effective Use of Videoconferencing](https://docs.google.com/document/d/14Awqu7dJRfqZBfMemGtRP-45keBPybR1IwLh8dscUzk/edit)

**Considerations for Students with Limited Internet/Technology Access:**Almost every student has a mobile or laptop and may access the internet through mobile or a service provider. Occasionally, there is a problem of bandwidth resulting in a very poor connection or frequent connection drops. In such cases, immediately inform the instructor through SMS, WhatsApp or email. This provision for attendance and class discipline is only available during the class time. The absence from class due to net problem will only be considered as leave if the information is provided during the class time for that particular class. |
| **Lab Resources (if relevant):** Lab coats will be arranged by the students. The description of labs is given at the end of activities. **Maintenance of an updated hard bound practical Note Book is mandatory** |
| **Program Objectives Addressed:** [Optional] *An academic program could refer to a group of courses that may or may not lead to a certificate/degree, or to a department or a major. But all at the campus will have to use this terminology to mean the same for all*1. To understand the basic concepts of Recombinant DNA Technology.
2. Apply the knowledge and techniques in research for the benefit of society.
3. Organize research data into graphs and tables and also identify the relationship between Recombinant DNA Technology and various other disciplines.
4. Live in society positively.
5. Identify the major issues in population and play a role to solve them.
6. Capability to analyze the research literature critically.
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| **Course Objectives/By the end of the course students will be able to:**To develop the knowledge of:1. Recombinant DNA Technology (RDT)
2. Develop sound foundation in gene cloning technology, transgene screening and expression analysis
3. Learn the techniques and skills applicable in research, diagnostic and industry.
4. Develop the ability to integrate the knowledge of RDT with other disciplines of science.
5. To have the opportunity to work in team, and to create sense of responsibility and respect for others.
6. Have the ability to apply the knowledge for the welfare of humankind and to solve real life problems.
7. To develop the skills to search, analyze and write the research articles critically and interpret the result.
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**Course contents, Learning Material & Activities Schedule**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Wk**  | **Lec-ture No.** | **Course** **Objectives/**[**Student Learning**](https://docs.google.com/document/d/1me9vpl8iKR_zNX9gIODm7gkVFY9VkuSKpUJe1VyI57M/edit)[**Outcome**](https://docs.google.com/document/d/1me9vpl8iKR_zNX9gIODm7gkVFY9VkuSKpUJe1VyI57M/edit)**s****(SLOs)** | **Topic/ Title**  | **Instructional Material** [**(OERs)**](https://docs.google.com/document/d/1Q39AquqpDVjsrUYiy_iuTZ_I3bo6_crOTVS8-pLQU3U/edit)[**&**](https://docs.google.com/document/d/1x4tgPQAqun7cS2MEA9mAoy3pQf36WUbPHWCy_BdhPQE/edit) **Relevant** [**Technology**](https://docs.google.com/document/d/1x4tgPQAqun7cS2MEA9mAoy3pQf36WUbPHWCy_BdhPQE/edit)(material or links or videos etc) | [**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) | [**Teaching-Learning Activities**](https://docs.google.com/document/d/1jY2UWb3QuOogkiSMdPvZd33eKe2kRpfzsTm2LSrnLko/edit#heading=h.4dy4q49omahn) |
| 0 | e.g | After successful completion of the module, student will be able to:**1.****2.****3.****4.****5.****6.** | **Title:** Intro to….. | **Reading**Chapter 1 of.. and Module 1 Exploration of…. | **Writing Assignment/** Assignment rubric: **Homework**Problems involve concepts like... | **Discussion/ Group Project/ Presentation** |
| 1 | 1 |  | Gene Expression 1 | Reading Material\* |  |  |
| 2 |  | Gene Expression 2 |  |  |  |
| 2 | 3 | 1. To understand vector construction | Gene Expression 3 |  |  |  |
| 4 |  | Acquisition of Gene Sequences |  | Low Stakes Assignment-1 | Summary of a recent manuscript |
| 3 | 5 |  | Primer Designing |  |  |  |
| 6 |  | PCR/Gene Synthesis |  |  |  |
| 4 | 7 | 2. Learn how to obtain a gene | PCR/Gene Synthesis |  |  |  |
| 8 |  | RT-PCR |  |  |  |
| 5 | 9 |  | Structure, function and types of RNA |  |  |  |
|  | **Quiz 1** |
| 6 | 10 | 3. Understand structure and function of RNA’s | Structure, function and types of RNA |  | Low Stakes Assignment-2 | Summary of a recent manuscript |
| 11 |  | Cloning Vectors and Bacterial Strains |  |  |  |
| 7 | 12 |  | Cloning Vectors and Bacterial Strains |  |  |  |
| 13 | 4. Will learn about different types of vectors and bacterial strains | Cloning Vectors and Bacterial Strains |  |  |  |
| 8 | 14 |  | Transformation Technologies-1 |  |  |  |
| 15 |  | Transformation Technologies-2 |  |  |  |
| **MIDTERM EXAM** |
|
| 9 | 16 | 5. Will know different types of transformation techniques for bacterial, plant and animal cells | Transformation Technologies-3 |  | Low Stakes Assignment-3 | Review of an assigned title |
| 17 |  | Southern Hybridization-1 |  |  |  |
| 10 | 18 | 6. Learn transgene detection | Southern Hybridization-2 |  |  |  |
| 19 |  | Real Time PCR-1 |  |  |  |
| 11 | 20 |  | Real Time PCR-2 |  |  |  |
| 21 | 7. Will learn gene expression analysis | Real Time PCR-3 |  |  |  |
| 12 |  |  **Quiz 2** |
| 22 |  | NGS: 454 Sequencing |  |  |  |
| 13 | 23 |  | NGS: 454 Sequencing |  |  |  |
| 24 |  | NGS: Illumina Sequencing |  |  |  |
| 14 | 25 | 8. Will learn basic principles of NGS sequencing | NGS: Illumina Sequencing |  |  |  |
| 26 |  | **Revision** |  |  |  |
| 16 | **Final Exams**  |

**Labs**

|  |  |  |
| --- | --- | --- |
| Lab1 | Isolation of total genomic DNA from a cereal crop | Hands on Training  |
| Lab 2 | Quantification and analysis of the total genomic DNA | Hands on Training |
| Lab 3 | PCR amplification of a selected gene from Chromosomal DNA | Hands on Training |
| Lab 4 | Column purification and salt precipitation of the PCR product | Hands on Training |
| Lab 5 | Restriction Digestion and ligation of PCR product in a cloning vector | Hands on Training |
| Lab 6 | Preparation of Electrocompetent Cells and transformation of the ligation mix | Hands on Training |
| Lab 7 | Screening of the colonies for desired insert by restriction digestion | Hands on Training |
| Lab 8 | Screening of the colonies for desired insert by colony PCR | Hands on Training |
| Lab 9 | Preparation and testing of chemically competent cells | Hands on Training |
| Lab 10 | Southern Blotting of Digested Plasmid/chromosomal DNA | Hands on Training |

**Note:**

* Assessments can be divided into formative and summative:
	+ Formative:
		- study materials in the form of lectures, videos, example papers, etc. will be provided
		- How will students practice what they learn (e.g., non-graded quizzes, discussions, worksheets, activities, etc.)?
	+ Summative:
		- Will be assessed by quizzes and discussions.

**Out-of-Class Study Required:**

After the evaluation of first quiz, the students will be divided into groupswith a group leader to facilitate the group learning process.

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

**Reading Material**\*: The soft copies will be provided to students by email

1. T. A. Brown. 2010. Gene Cloning and DNA Analysis; An Introduction (6th Edition). Wiley-Blackwell, A Jhon Wiley and Sons LTD publication. (pdf will be emailed to students)
2. Primrose S. B., Twyman R.M. and Old R.W. Principles of Gene Manipulation, 6th Edition. (pdf will be emailed to students)
3. Dale J. W. and Schantz M.V. 2002 From Genes to Genomes: Concepts and Applications of DNA Technology. John Wiley and Sons Ltd, UK. (pdf will be emailed to students).

The lecture slides will be posted on Moodle and will also be emailed to students. If the lectures are recorded, the recorded videos will also be emailed to the students.

**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

|  |  |  |  |
| --- | --- | --- | --- |
| **Grades** | **Quality Points** | **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 |
| NS | 0.00 | 0.00 | Did not show up in class |
| W | - | - | Officially Withdrawn |
| AW | - | - | Administrative Withdrawal/Dismissal |
| AU | - | - | Audit/Listener Status |
| I | - | - | Incomplete |
| T | - | - | Transferred credit |

The entire course is worth 100%, the breakup is as follows (for example):

|  |  |
| --- | --- |
| Two quizzes  | 20% |
| Midterm exam | 20% |
| Final Exam | 25% |
| Assignments (three assignments, 5 marks each) | 15% |
| Attendance and class/online discipline | 10% |
| Written lab exam | 10% |
| **Total** | **100%** |

### **Missed Assignments/Make-Ups/Extra Credit**

There will be no makeup or extra credit. The deadlines must be met

**Course Requirements**

**Attendance Policy:**

Students are required to attend classes and online lectures. Atleast80% attendance is required. The students are also required to study the materials at subject specific URL given in resource materials.

* Due Dates:
* All assignments are to be submitted by 11:59 p.m. on the due date.
* Late activities will not be graded, unless previous accommodations have been made. In case of any limitations (internet/sickness), inform immediately and much ahead of deadline.
* Integrity Statement:
* All work that you submit in this course must be your own, no plagiarism.
* Unauthorized group efforts are considered academic dishonesty.
* You may discuss homework (Assignments, Lab Exams) in a general way with others, but you may not consult anyone else's written work.
* You are guilty of academic dishonesty if you examine another's solution, allow (actively or passively) another student to examine your work, or you copy from the Internet without complete understanding of what you have done. University policy of plagiarism will be applicable in the case.

All cases no matter how trivial they are will be reported to Academic Integrity Committee (AIC) of FCCU. Cheating or violation of academic integrity in any exam will result in F grade.

**Student Conduct & Other Issues:**

*-Consider including ground rules for appropriate classroom interactions, as well as a clear statement of expectations that classroom interactions will remain civil, respectful, and supportive.*

-If any student faces any issues or has any concerns regarding the classroom climate and interactions, please feel free to contact: gloriacaleb@fccollege.edu.pk

**Changes to the Syllabus:**

This syllabus has been 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**

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

-[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/)

*I expect that you will strictly follow the core values of FCCU and put your entire efforts to learn as per the course requirements, attend classes, read the textbook(s)/other assigned reading material and do the assignments in the stipulated time period*

**Developed by CLT (2021)**