



## MCB 422: Problem Solving with Genetic Tools Course Syllabus Fall 2021

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### Course Overview

#### Course Objectives

MCB 422 explores classical and modern principles and techniques in genetics. The course is divided into two parts. Part 1, which is the major part of the course, uses computer simulations to teach you how to approach, execute and interpret a set of experiments in non-Mendelian and *Saccharomyces cerevisiae* (Baker's yeast) genetics. These simulations will require that you understand the key genetic principles behind the problem, devise a method or approach to solve it, and then use your knowledge of genetics to interpret your data-just like researchers do in a lab! The goal of this first part of the course is to develop your 'critical thinking' skills, teaching you how to think through and figure out complicated genetic problems on your own. In the second part of the course you will learn about the most up to date approaches in modern genetics. For this part of the course you will use recent publications to gain information on the newest and most current technological advances in this field, and then present your findings in the form of literature reviews. Here, the goal is to teach you how to research and interpret the published literature and then how to present your findings in the style of a scientific journal review article.

#### Learning Outcomes

We aim for students to develop a deep understanding of current ideas and problems in genetics. At the same time, we help to build foundational skills in logic, reasoning, self-expression and communication-skills relevant to any career. The course emphasizes active learning and problem-solving skills. Our goal is to help prepare students for creative futures in the pursuit of scientific discovery, improvements to human health, and increase knowledgeable representatives of science in society.

### Course Website

All the course materials will be posted on the D2L course website. Please check the site regularly, in particular before lecture, for any announcements. **If you cannot access this site at any time, please contact Stephanie Capaldi immediately.** While every effort will be made to stick to the course schedule assignment deadlines may change due to unforeseen circumstances. In such situations as much advance notice will be given as possible.

### Lecture and Attendance

**Your participation in the discussions during lectures will contribute to your final grade. Therefore, attendance at lecture is required.**

- This class is scheduled to be taught in person.
- **Meeting Times:** The class will meet on Mondays and Wednesdays from 9.30-10.45am in Chavez 105. In class we will discuss all the key biological principles behind the computer simulations (used for many of your assignments) and for the proposals and reviews for the new approaches in genetics module.
- **Classroom attendance:**
  - If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
  - Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
  - Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
    - Please communicate and coordinate any request directly with your instructor.
  - If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office [DOS-deanofstudents@email.arizona.edu](mailto:DOS-deanofstudents@email.arizona.edu) to share documentation about the challenges you are facing.
  - Voluntary, free, and convenient [COVID-19 testing](#) is available for students on Main Campus.
  - If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the [Case Notification Protocol](#).
  - COVID-19 vaccine is available for all students at [Campus Health](#).
  - Visit the [UArizona COVID-19](#) page for regular updates.
- **Staying current:** You are required to complete all the course assignments by the deadlines listed in the course schedule. **Students are responsible for completing any work that they might miss due to illness or the need to quarantine/isolate, including assignments, quizzes, tests and exams.**

*As we enter the Fall semester, the health and wellbeing of everyone in this class is the highest priority. Accordingly, we are all required to follow the university guidelines on COVID-19 mitigation. Please visit [www.covid19.arizona.edu](http://www.covid19.arizona.edu) for the latest guidance.*

- **Class Recordings:**

- The lectures will be recorded and available for you to view via our D2L course site in Panopto (**this does not include the classes from September 27<sup>th</sup>-October 20<sup>th</sup>** (more details of what happens in class during this time will be provided on the first day of class)). If you have concerns regarding being a part of these recordings please contact Stephanie Capaldi.
- For lecture recordings, which are used at the discretion of the instructor, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with [UArizona values](#) and educational policies ([Code of Academic Integrity](#) and the [Student Code of Conduct](#)) are also subject to civil action.

*The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>*

*The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>. If you have religious observances or practices that will cause you to be absent please contact Stephanie Capaldi via email **before the date** and appropriate accommodations will be made.*

*Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>. Please provide Stephanie Capaldi with a copy of your Dean's note **before the date** you will be absent and appropriate accommodations will be made.*

### **Classroom Behavior Policy**

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g. texting, chatting, reading a newspaper, making phone calls, web surfing etc.) Those who consistently disrupt

the classroom will be reported to the Dean of Students. **Please silence your cell phones and refrain from interacting with your text message service during lecture.**

### Office hours

Stephanie Capaldi and Lucas Harrell will be available after each lecture to discuss any questions you may have about the assignments or the material covered. However, if you cannot stay after class or your questions require more time, we can arrange to meet with you outside the class time. You should also make an appointment if you need to speak to us in private. **For office hours by appointment please email us at least 24hrs in advance.** *We can arrange to meet in person or via Zoom.*

### Required Course Materials

- **Equipment and software requirements:** For this class you will need access to a computer and the internet. Most of the assignments require the completion of exercises using university software and therefore a good internet/Wi-Fi connection is essential. If you have a laptop please bring it to class as we will be using some of the computer simulations, but if not you may share the screen with a classmate.

All of the biological principles and ideas behind the computer simulations will be discussed in lecture and therefore there is no assigned course textbook. However, if you do wish to read more about the topics discussed in class below is a list of useful resources.

**Chromosomal Basis of Inheritance (Mendelstar) module-** 'An Introduction to Genetic Analysis by Anthony J. F. Griffiths, Susan R. Wessler, Sean B. Carroll and John Doebley.

***S.cerevisiae* and The Cell Cycle (Pathfinder) module-** Molecular Cell Biology by Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell.

**New methods and approaches in genetics module-** Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts and Peter Walter (6<sup>th</sup> edition).

### Course Assessment

*Your final grade in this course will be determined as follows;*

**Lab Reports (12) = 60%**

**QuikChange Site Directed Mutagenesis Proposal = 8%**

**Literature Reviews = 21%**

**Scientific Communication = 6%**

**Quizzes = 5%**

## ASSIGNMENTS

### Mendelstar (Module 1) and Pathfinder (Module 2) Lab Reports (60%)

After completing each of the assigned computer simulations, you will write up your findings in the form of a short lab report (the format and expectations for this report will be posted). The lab reports are not equally weighted – see grading details below:

MENDELSTAR (30% total)

Mendelstar 3 = 3%

Mendelstar 4 = 3%

Mendelstar 1-4 = 24% (6% each)

PATHFINDER (30% total)

Pathfinder 3 = 2%

Pathfinder 4 = 4%

Pathfinder 5-8 = 24% (6% each)

### New Approaches and Methods in Genetics (Module 3) – (29%)

QuikChange Site Directed Mutagenesis Proposal (8%)

A written proposal discussing the rationale for mutating a residue in an assigned protein. This proposal will include primers designed to achieve this goal.

Literature Reviews (21% total)

Literature Review 1: Screening for inherited forms of cancer = 7%

Literature Review 2: Reviewing a research paper that uses CRISPR = 14%

*While you are encouraged to discuss your ideas and any problems you encounter with your classmates and the instructors. **All assignments must be entirely your own work (no group reports are allowed).** In class and during office hours help and guidance will be provided but we will not give you the answers, check your solutions or edit papers.*

### Scientific Communication (6%)

Oral Presentation (4%): A 5-minute power point presentation on genetic (non-cancer) inherited monogenic diseases. The dates of these presentations are in the course schedule and your attendance at all talk sessions is mandatory.

Class Participation (2%): Participation in class discussions during lecture.

### Quizzes (5%)

Mendelstar Readiness Quiz = 2% (note all 3 quizzes must be completed to access other Mendelstar exercises; a written explanation of **one** of your quiz answers is to be submitted in the appropriate drop box on D2L).

Pathfinder Quiz = 3%

A 30 minutes multiple choice quiz on the material covered in the first two yeast genetics lectures in the *S. cerevisiae* and 'The cell cycle' (pathfinder) module will take place on Friday

September 24th in D2L quizzes. The quiz will open at 12.01am and close at 11.59pm and you make take the quiz anytime during this time-frame. The quiz is open-book. **A make-up quiz will only be given if you missed the quiz due to unforeseen, unavoidable, extreme circumstances such as illness. Therefore, please schedule any appointments or interviews outside the quiz time. No pathfinder quiz grade queries will be discussed in person. If you would like a regrade all requests must be made in writing within the time frame posted on D2L.**

**There is no mid-term exam or final exam for this course.**

**No extra credit assignments are offered in this course. A few bonus points may be given for completing certain non-graded tasks and added to your final score.** *Information regarding these tasks and the conditions under which the additional points will be awarded will be provided if they arise.*

*Please note: This is the expected number and types of assessments for the course. However, due to unexpected circumstances or unanticipated changes these assignments may change, however, the overall grading scheme will remain the same.*

#### **SUBMITTING ASSIGNMENTS – PENALTIES FOR LATE SUBMISSION**

All assignments must be submitted as a **word document** (not pdfs) in the appropriate drop box in D2L by the deadline on the drop box (see schedule). The MCB422 staff are happy to answer any specific questions you might have about expectations for your reports, however, we will not check your solutions or read any papers before submission **except for certain assignments in Module 3 (TBA).**

Late submissions will be penalized as follows; <1hr late receives a 6% deduction, >1-24hrs after the deadline receives a 12% deduction, >24-48hrs late receives a 25% deduction, >48hrs-72hrs late receives a 50% deduction and >72hrs will not be graded. Any extenuating circumstances that you know will prevent you submitting assignments on time must be discussed in advance with Stephanie Capaldi in order for any accommodations to be made.

*PLEASE NOTE THE FOLLOWING;*

- 1) If you experience problems with Mendelstar and Pathfinder you must inform Stephanie Capaldi immediately. Problems with software may arise and therefore all computer simulations must be completed well before the deadline. Since software problems require external IT support certain issues may not be resolved immediately. **PLEASE COLLECT ALL OF YOUR DATA FROM THE COMPUTER SIMULATIONS WELL IN ADVANCE OF THE DUE DATE AND PLEASE REPORT ANY SOFTWARE PROBLEMS IMMEDIATELY. SOFTWARE PROBLEMS MUST BE REPORTED NO LATER THAN 24HRS BEFORE THE ASSIGNMENT DEADLINE.** Late submissions due to software problems arising less than 24hrs before the deadline may not be resolved in time, and in such cases no allowances will be made for submitting incomplete work and if the assignment is submitted late it will be penalized as described above.*

2) *Students sometimes experience problems submitting assignments through D2L. Make sure that you receive confirmation of your submission (keep this for your records). It is your responsibility to ensure that your work is correctly submitted, therefore, give yourself adequate time before the deadline to submit and receive confirmation of submission (submitting work too close to the deadline is most likely to lead to submission problems). Also, make sure you submit the final or correct draft! If you don't receive confirmation of your submission in adequate time before the deadline or if you are unsure, for any reason, that your submission has worked, e-mail your assignment immediately to Stephanie Capaldi. If it is received before the deadline it will be graded without penalty. Therefore, assignments received after the deadline due to any d2l problems or any other computer problems experienced during submission will be penalized or not graded (see above).*

### **Completing missed assignments for Students registering late**

Students that join the course after the first day are expected to catch up on the material they have missed and complete all the assignments set before they joined. Deadlines for the missed assignments will be set by Stephanie Capaldi and the same penalties above will be applied if these deadlines are not met.

**GRADING:** In general, this course is not curved (*unless deemed necessary by the instructor*) and the standard numerical scale (i.e. 90-100% = a etc.) will be applied. Your scores for each assessment will appear as a percentage in your grade book. If you believe there has been an error in the grading of your paper you must notify Stephanie Capaldi **within one week from the day your feedback was posted**. Changes will not be made past this deadline. Procedures and deadlines for regrades for the Pathfinder quiz will be posted after the results have been released.

**Requests for incomplete (I) or withdrawal (W)** must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

### **Academic Ethics**

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

**All of your assignments must be your own work. You cannot copy any material (regardless of the length) from another student (past or present), scientific literature (all forms of research articles), websites or text books. If you discuss material from scientific literature,**

websites or textbooks you must completely paraphrase the material and then cite the source. Paraphrasing another student's work (past or present) is not permitted.

**Plagiarism will not be tolerated under any circumstances. Students caught submitting assignments that contain plagiarized material will be disciplined which may include loss of credit and further action as deemed appropriate according to the rules and regulations of the University of Arizona.** The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

### **Policy Against Threatening Behavior by Students**

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

### **UA Nondiscrimination and Anti-harassment Policy**

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

### **Accessibility and Accommodations**

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let the course instructor know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center to establish reasonable accommodations.



If you have reasonable accommodations, please plan to meet with the course instructor during office hours or by making an appointment to discuss accommodations and how the course requirements and activities may impact your ability to fully participate.

- All exam and certain classroom accommodations will only be granted if we receive appropriate documentation from the DRC. Therefore, the DRC must be notified of all accommodations as soon as possible so that they can verify and then supply us with all the necessary information. **The DRC must be notified of special accommodations at least 2 weeks before the pathfinder quiz.**
- No accommodations will be made retroactively (as stated by the Dean of Students Office and DRC).
- We realize that unforeseen issues may arise during the semester that may impact your performance in this course. Again, please see the course instructor as soon as possible so that we can try to find a good solution that works for all concerned.
  
- **Academic advising:** If you have questions about your academic progress this semester, please reach out to your academic advisor (<https://advising.arizona.edu/advisors/major>). Contact the Advising Resource Center (<https://advising.arizona.edu/>) for all general advising questions and referral assistance. Call 520-626-8667 or email to [advising@arizona.edu](mailto:advising@arizona.edu)
  
- **Life challenges:** If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The [Dean of Students Office](#) can be reached at (520) 621-2057 or [DOS-deanofstudents@email.arizona.edu](mailto:DOS-deanofstudents@email.arizona.edu).
  
- **Physical and mental-health challenges:** If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

### **Changes to the Syllabus and Course Calendar**

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. While every effort will be made to stick to the course schedule assignment deadlines may change due to unforeseen circumstances. In such situations as much advance notice will be given as possible.