

## **New courses proposed for Genetics and Biotechnology (GNBT) major**

### **GNBT010 Genetics and Society (3)**

*Prerequisites: none*

Explores how genetic discoveries and technology are shaping human society on issues ranging from healthcare to reproduction to engineering food and the environment. Science concepts are introduced at a level accessible to non-majors. Emphasizes bioethical analyses and considering the cost-benefit tradeoffs of genetic advances.

### **GNBT110 Advanced Genetics (4)**

*Prerequisites: BIOL102*

This course is designed to teach students the process of associating genes with biological function. Topics will include genetics screens, gene characterization, and discovery of genetic pathways. Students will learn the rationale and design of experiments to investigate hypothesis driven questions using genetic approaches.

### **GNBT114 Molecular Genetics Laboratory (4)**

*Prerequisites: BIOL102; BIOL107A*

Reinforce important concepts in classical and molecular genetics through laboratory work in basic molecular biology and genetics including DNA manipulation techniques and cloning, gene mapping, and isolation and characterization of mutants in eukaryotic model systems.

### **GNBT120 Analysis of Genomes Laboratory (4)**

*Prerequisites: BIOL 005C with a grade of C- or better; BIOL 102; MATH 007B or MATH 009B or MATH 09HB*

Introduces the key computational approaches used in the analysis of genomes and their functional outputs. Topics include genome assembly and annotation, identification and analysis of genomic sequence variation, modern molecular mutant identification, quantitative trait mapping, genome-wide association mapping, mRNA and small RNA profiling, network analysis, and comparative genomics. Computer programming experience is not required.

*coming soon..*

### **GNBT100 Biotechnology (4)**

### **GNBT130 Genomes (4)**

**Course title**

Genetics and Society (3 units)

**Course catalog description from CRS proposal**

Explores how genetic discoveries and technology are shaping human society on issues ranging from healthcare to reproduction to engineering food and the environment. Science concepts are introduced at a level accessible to non-majors. Emphasizes bioethical analyses and considering the cost-benefit tradeoffs of genetic advances.

**Faculty contact hours**

Lecture - 3 hours per week

**Learning objectives**

- be able to form rational arguments for and against a genetic technology based upon bioethical principles and cost-benefit tradeoffs
- understand how modern genetic technologies work at an introductory level
- understand how emerging genetic technologies are likely to impact human society now and in the coming decades
- be able to think critically about popular science news, identify reliable sources of information, and distinguish hype and opinions from facts

**Grading breakdown**

Homework 60%  
Term paper 20%  
Final exam 20%

**Grading scale**

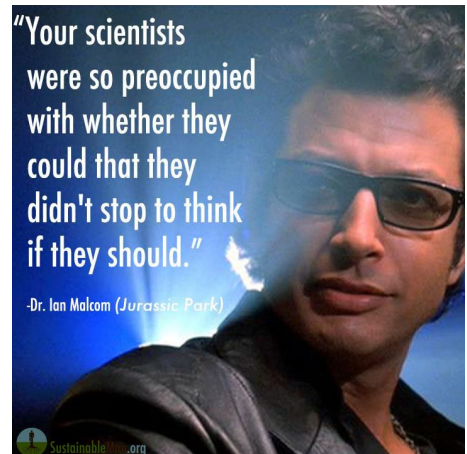
A 90-100%  
B 80-89%  
C 70-79%  
D 60-69%  
F <60%

**Description of course activities**

**Lectures (3 hours per week).** Lectures will be partly didactic (introducing students to genetic concepts/technology) and partly socratic (small-group discussions and lecturer-led question and answers, e.g. regarding ethical considerations and trade-offs).

**Reading (2 hours per week).** Reading assignments will include popular news articles, case studies, and texts on bioethics. In some cases, videos/film will be used to supplement readings.

**Homework (1/2 hour per week).** Students will provide written answers (typically paragraph-length responses) to a few questions each week intended to provoke reflections on assigned readings and lecture topics. For example, questions may query students' understanding of a genetic technology or topic, or ask them to imagine specific scenarios in which the genetic technology may have a positive or negative outcome, construct and evaluate an ethical argument, or discuss how a specific bioethical principle may be met or violated during the use of a genetic technology.

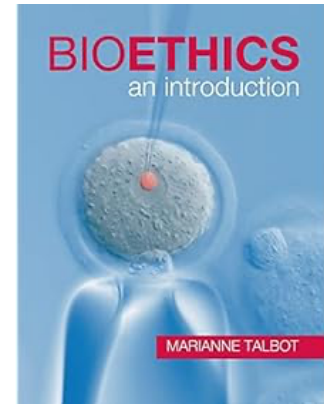


**Term paper (1/2 hour per week).** Students will identify a recent genetics-related news article and write a 3-page report on it. They will identify the source of the information in the article, assess whether the article is accurately reporting the findings, whether the article appears to be biased or not, discuss the major findings/concepts in the news article and the practical and ethical implications of the genetic discovery/advance.

**Final exam.** The final exam will be held in-person and will emphasize essay responses.

### **List of required texts and readings**

Talbot, Marianne. (2012). *Bioethics: An Introduction* (1st ed.). Cambridge University Press. ISBN 978-0521714594



### **Course policies**

#### **Conduct**

You are expected to be professional and courteous in your class interactions, whether online or in person. This includes

- avoiding distracting other students from learning
- keeping comments and questions limited to the course subject matter
- being aware that there are a diversity of views, beliefs, backgrounds, and experiences within the class which may not be similar to your own; do your best to be respectful of others
- refraining from intentionally offensive (e.g. sexist, racist, political, etc.) comments or behavior
- maintaining academic integrity
- following campus health guidelines

#### **Academic Integrity**

All students are expected to maintain high standards for academic integrity. Students are strongly encouraged to review UCR policies for student conduct and integrity (<https://conduct.ucr.edu/>). If you have any questions, please ask the instructor before you act.

Plagiarism is the most common form of academic misconduct at UCR. It is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit. This includes the copying of language, structure, or ideas of another and attributing (explicitly or implicitly) the work to one's own efforts. Plagiarism means using another's work without giving credit. Note that placing text within quotes and citing it is also not an acceptable substitution for providing original thoughts. For more information about plagiarism, see Academic Integrity Policies and Procedures. While you are encouraged to engage in discussions with other students during homework assignments, submissions for all graded assignments must be your own, original work. ChatGPT and other LLMs are not allowed for the development or revision of rough or final drafts. Plagiarism is a violation of academic integrity and will be handled accordingly. Any suspected cases of cheating, plagiarism, etc. will be forwarded directly to the Office of Student Conduct for their independent review and academic sanctions.

## List of topics and readings by week

|                | Topic   | Reading   |
|----------------|---|---|
| <b>Week 1</b>  | Introduction to ethical theories  | Bioethics Ch. 2-4 (p.11-49) "Ethics in general", "Ethics in the context of society", and "Ethical theories: virtue, duty and happiness"   |
|                | Core principles of bioethics: Non-maleficence, justice, autonomy, beneficence, truth telling, and confidentiality |   |
| <b>Week 2</b>  | Forming and evaluating ethical arguments  | Bioethics Ch. 5-6 (p. 50-90)  |
|                | A history of eugenics   | National Human Genome Research Institute. "Eugenics: Its Origin and Development (1883 - Present)" <a href="https://www.genome.gov/about-genomics/educational-resources/timelines/eugenics">https://www.genome.gov/about-genomics/educational-resources/timelines/eugenics</a><br>Bioethics Ch. 9 (p. 139-158 ) "Reproductive freedom: rights, responsibilities, and choice"   |
| <b>Week 3</b>  | Genetic determinism and genetic risk  | Niccol, Andrew. (1997). "Gattaca". <i>Columbia Pictures</i>   |
|                | Genetic testing and genome sequencing technologies  |   |
| <b>Week 4</b>  | Implications of personalized genetic knowledge  |   |
|                | Privacy and ownership of genetic information  | Seife, Charles. (2013). "23andMe Is Terrifying, but Not for the Reasons the FDA Thinks". <i>Scientific American</i><br>Bioethics Ch. 18 (p. 348-370), "Bio-ownership: who owns the stuff of life?"  |
| <b>Week 5</b>  | Genetic discrimination  | Bioethics Ch. 15 (p.273-296), "Bio-information: databases, privacy and the fight against crime"   |
|                | Genetics in crime - use as evidence and in recidivism prediction models   |   |
| <b>Week 6</b>  | Soft eugenics - <i>in vitro</i> fertilization, embryonic selection, prenatal sequencing                           | Zhang, Sarah. (2020). "The Last Children of Down Syndrome". <i>The Atlantic</i><br>Bioethics Ch. 11 (p. 181-202) "Screening and embryonic selection: eliminating disorders or people?"  |
|                | Changing reproduction - three-parent babies and <i>in vitro</i> gametogenesis                                     | Cohen et al. (2017). "Disruptive reproductive technologies" <i>Science</i><br>Stein, Rob. (2023). "Creating a sperm or egg from any cell? Reproduction revolution on the horizon". <i>NPR</i> . <a href="https://www.npr.org/sections/health-shots/2023/05/27/1177191913/sperm-or-egg-in-lab-breakthrough-in-reproduction-designer-babies-ivg">https://www.npr.org/sections/health-shots/2023/05/27/1177191913/sperm-or-egg-in-lab-breakthrough-in-reproduction-designer-babies-ivg</a> |
| <b>Week 7</b>  | Genome editing technologies   | Bioethics Ch. 14 (p. 251-272), "Human enhancement: the more the better?"  |
|                | Gene therapies  |   |
| <b>Week 8</b>  | Cell replacement therapies  |   |
|                | Embryonic stem cells and xenotransplantation  | Bioethics Ch. 8 (p. 116-136), "Therapeutic cloning: the moral status of embryos"  |
| <b>Week 9</b>  | Genetically modified or edited foods  | Bioethics Ch. 17 (p. 321-347), "Food and energy security: GM food, biofuel, and the media"  |
|                | Gene drives   | Bioethics Ch. 21 (p. 418-444), "The living and non-living environment: Spaceship Earth"   |
| <b>Week 10</b> | Organismal cloning  | Bioethics Ch. 7 (p. 95-115), "Reproductive cloning science and science fiction"   |
|                | De-extinction   | Odenbaugh, Jay. (2023). "Philosophy and ethics of de-extinction". <i>Cambridge Prisms: Extinction</i> , 1, e7, 1–7 <a href="https://doi.org/10.1017/ext.2023.4">https://doi.org/10.1017/ext.2023.4</a>  |

# Worksheet - Request for a New Course

\*\* Place your pointer on the underlined fields and start typing to fill in text, \*\*  
or use an X or a number to fill in “check-box” or numbered fields.

## Level:

- Undergraduate 001 -199  
 Graduate 200 -299  
 Professional 300 -499

**Subject:** The subject code has to be approved and available in Banner

GNBT

**Course number** (if known). Only courses that have been discontinued for 3 or more years can be used as a new course or find a course number that has not been used.

010

**Course Long Title:** Maximum length is 100 characters. The students will see the long title in the Schedule of Classes. No slashes (/,\) or dashes (-) allowed.

Genetics and Society

**Course Short Title:** Maximum length is 30 characters. The students will have this title listed on their transcripts. This title will also appear in SSASECT. No slashes (/,\) or dashes (-) allowed.

Genetics and Society

## Course Type:

- Standard Course  
 Standard Course with Topics  
 Umbrella with title in description  
 umbrella without title in description  
 E-Z segment ( segment is not listed within the umbrella description)

**Effective term:** (Quarter and Year). Review the Academic Senate Courses [web site](#) .  
Once a course is approved it can be offered any term.

Fall 2024

**Offered in Summer only:** A course can be offered in any term as long as it is approved.

- Yes  
 No

**Offered Once:**

Yes

No

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**UNITS AND ACTIVITIES:**

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**OVERALL UNITS:** Enter in Fixed (4 units) or Variable (1 to 4 units) Units.

3

**Hours per week per unit of credit may not be less than but may exceed those listed below.**

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop
  - One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems. Use the schedule type "Activity" to describe an activity that is not listed.
  - One unit for each two to three hours per week (1:2-3) of studio
-

**Activities and hours per week:** Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

|                      |                      |                      |                      |
|----------------------|----------------------|----------------------|----------------------|
| Activity             | Field                | Research individual  | Term Paper           |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | 0.5                  |
| Clinic               | Internship           | Research Scheduled   | Thesis               |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Colloquium           | Individual Study     | Screening Individual | Tutorial             |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Consultation         | Laboratory           | Screening Scheduled  | Workshop             |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| Discussion           | Lecture              | Seminar              | Written Work         |
| <input type="text"/> | 3                    | <input type="text"/> | 0.5                  |
| Extra Reading        | Practicum            | Studio               |                      |
| 2                    | <input type="text"/> | <input type="text"/> |                      |

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**Cross-listing with:** List all cross-listed partners.



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**Course Prerequisite Information:** There are multiple types of Prerequisites that are acceptable. Please review all.

**Corequisite:** A corequisite is a course that is 100% concurrent enrollment for both proposals. Both proposals will have each other's course listed here. Multiple corequisites cannot be listed here. Only one course can be consider a corequisite area in CRS.

**Prerequisite(s):** A prerequisite must be an active course. In this section you will also decide if the prerequisite requires a minimum grade and if the course may be taken concurrently or if the course is only a prerequisite.

none

**Other Prerequisite(s):** Enter additional prerequisite information that will display in the Catalog. Example: "or equivalent" ;

**Major Restrictions:** Indicate the Major restriction(s) for this course. List the Major codes of the restriction here; Example: Education, Society, Human Dev – (ESHD)

**Class Standing Restriction:** If your course is a graduate course you do not need to select any of the following if your course prerequisite is the minimum of "graduate standing or consent of instructor". If your course is a course that undergraduate and graduate students can enroll in then you will select class information here.

- Freshman
- Sophomore
- Junior
- Senior
- Credential
- Masters

**Other Restrictions:** List any special required restriction; Example: "a sufficiently high score on the placement examination, as determined by the Mathematics Department"

**Special Requirements:** Enter special requirements that will display in the Catalog Description. Example: "permission by faculty". This special requirement is enforced by the department and not the Registrar Office during registration.



## Prerequisite Information Continued.

**Consent of Instructor:** Use the selection below to indicate that the course requires consent of instructor. The department is responsible for enforcement of “and consent of instructor.” Or “or consent of instructor”: For all courses 200 and above, the selection of "OR" is required. The department is responsible for enforcement of this restriction. Select one of the following if you want “consent of instructor” to appear with in the description within the general catalog.

AND

OR

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## Description Information:

**Read the guidelines in this box before writing the Catalog description.**

Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:

Instead of "This course will introduce students to the history of . . . ," use one of the following formats:

Introduces the history of . . .

An introduction to the history of . . .

Introduction to the history of . . .

Instead of “Functions, equations, and graphs,” use a format similar to one of the following examples:

Explores functions, equations, and graphs . . .

Topics include functions, equations, and graphs . . .

A study of functions, equations, and graphs . . .

For "New" courses that will only be offered online the description must include "Offered online only." at the end of the description and included in the 50 word limit.

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## Catalog description:

|  |
|--|
| Explores how genetic discoveries and technology are shaping human society on issues ranging from healthcare to reproduction to engineering food and the environment. Science concepts are introduced |
|--|

**Grading:** Please see the [General Rules and Polices Governing Courses of Instruction](#).  
Select the grade type that is in accordance with the guidelines.

- Letter Grade or petition for Satisfactory/No Credit (S/NC) (undergraduate course default type).
- Letter Grade or S/NC, no petition required (Not per policy for undergraduate courses).
- Letter Grade only (graduate course default type).
- S/NC only
- In Progress (IP)

**Grading Statement** (if required)- Select the approved grading statement per grade types from the [General Rules and Policies Governing Courses of Instruction](#). Select the grading statement that corresponds to the Grading Type per policy.

- Satisfactory (S) or No Credit (NC) grading is not available.
- Graded Satisfactory (S) or No Credit (NC).
- Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.
- May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.
- May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.
- Students who submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar or submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

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**Course is Repeatable:** Review the [General Rules and Policies Governing Courses of Instruction](#) to determine if your course can be considered to be repeatable.

- Yes
- No

**Repeatability Statement:** If you selected "Yes" for this course to be repeatable, you must enter a statement and follow the [General Rules and Policies Governing Courses of Instruction](#) for repeatable courses.

- Course is repeatable
- Course is repeatable as topic/content changes

**Repeatable units:** Enter the amount of repeatable units.

If repeatable, may the student take more than one section of the course in a single quarter?

Yes

No

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**Credit Overlap:** Bi-directional (on both proposals) Bi-directional (on both proposals) **Example:** "Credit is awarded for only one of ANTH 007 or ANTH 007S." Provide in the course subject and numbers.

**Credit Overlap:** One directional (on one proposal only), or is a sequential course and is enforced by the department. **Example:** "Credit is awarded for only one of the following sequences: CHN 001, CHN 002, CHN 003, and CHN 004; CHN 001, CHN 002, and CHN 020B; CHN 020A and CHN 020B."

Credit Overlap: (students can get credit for both courses but there is overlap). Provide/describe the overlap. Also provide the justification for one-directional, bi-directional, and if students can get credit for both in this field.

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### Syllabus Information:

**Syllabus:** Provide a syllabus for a New or Restore course. Attach to an email or enter here. Please see the [Faculty Checklist](#) on page three to help with your syllabus

**Syllabus:** This new course proposal is for online and in-person instruction. The syllabus for the online and in-person section are the same?

Yes

No

**Online Course Information:** Select the appropriate only course information

- UCR Only
- ILTI/UCOP Funded (cross-campus enrolling; seats coordinated with UCOP)
- MSOL
- Undergraduate
- Graduate

### **BREADTH REQUIREMENT STATEMENTS**

To change the breadth requirement information included on the college Breadth websites for please provide a memo to the course proposal requesting the course be considered Breadth. Select one of the statements below or provide a statement to correspond to breadth attributes. The memo will be entered into CRS in the attachments area. A comment will be entered into the comments field stating that a memo has been attached for consideration for a breadth course.

Select one of the following and attach the memo to CRS attachments

- Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.
- Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
- Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
- See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences for breadth requirement information.
- Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Other breadth statement

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### **ADDITIONAL INFORMATION**

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at <http://senate.ucr.edu/committee/8>

Justification for the New Course

Introduces lower division undergraduates to current genetics and biotechnology advances, potentially attracting students to related careers and the GNBT major. Could satisfy science req for CHASS

MMiller updated 11/04/2022

**Course Title: Advanced Genetics**

**Prerequisites:** Introduction to Genetics, BIOL 102

**Faculty Contact Hours: 3 hours (3 hours lecture and 1 hour discussion)/week (4 units)**

**Course Catalog Description:** This course is designed to teach students the process of associating genes with biological function. Topics will include genetics screens, gene characterization, and discovery of genetic pathways. Students will learn the rationale and design of experiments to investigate hypothesis driven questions using genetic approaches.

**Textbook:** Genetic Analysis (Genes, Genomes, and Networks in Eukaryotes). Third Edition Philip Meneely. ISBN: 9780198809906. \$99  
(<https://global.oup.com/academic/product/genetic-analysis-9780198809906?cc=us&lang=en&>)

**Student Enrollment:** ~ 40 students.

**Desired Learning Outcomes:**

- 1) Upon completion of this course, students would have gained comprehensive knowledge of the theory and design principle of genetic analysis and approaches.
- 2) Students will become comfortable in reading and analyzing primary literature.
- 3) Understanding the process and logic of genetic investigations.
- 4) Understand how genetic and molecular biology tools are used to understand gene function.
- 5) Understanding how genetic analysis can be used to address the causes of heritable diseases, and diagnostic tool development.

**Grading:**

30% Final Exam (Concept based and paper)

30% Midterm (Concept based and paper)

30% Homework Exercises/Assignment (Related to paper analysis, what is the rationale?, what are the controls?, etc).

10% Discussion Section

**Grading Scale:**

A+: 95-100

A: 90-94

A-: 87-89

B+: 84-86

B: 80-83

B-: 77-79

C+: 74-76

C: 70-73

C-: 67-69  
D+: 64-66  
D: 60-63  
D-: 57-59  
F: 56 and below

### **List of Topics and/or Reading Assignments by Week**

**Week 1** Bootcamp for analysis of scientific literature. Strategies for critical analysis of scientific literature (What are journals? How does peer-review work? How do we recognize what is trustworthy? What are ways to analyze a paper? What should be considered during that process? What are controls? How are experiments performed?).

*Assigned reading: Pain E., How to (seriously) read a scientific paper. 2016 Science (doi: 10.1126/science.caredit.a1600047).*

**Week 2** Lecture on Concepts, identifying and classifying mutants. Assigned paper reading from references taken from the end of the chapter. Chapter 4 (4.1-4.4).

*Assigned reading: Jürgens, G., et al., (1984). Mutations affecting the pattern of the larval cuticle in Drosophila melanogaster - II. Zygotic loci on the third chromosome. Wilhelm Roux's Archives of Developmental Biology, 193(5), 283-295.*

**Week 3** Lecture on Concepts, identifying and classifying mutants. Chapter 4 cont'd (4.5 - 4.7). Case Study 4.1. Assigned paper reading from references taken from the end of the chapter.

*Assigned reading: Nüsslein-Volhard, C., Wieschaus, E. Mutations affecting segment number and polarity in Drosophila. Nature 287, 795–801.*

**Week 4** Connecting phenotypes with DNA sequences, Chapter 5.

*Assigned reading: Ng SB, et al., Exome sequencing identifies MLL2 mutations as a cause of Kabuki syndrome. Nat Genet. 2010 Sep;42(9):790-3.*

**Week 5** Mutant phenotypes and gene activity, Chapter 6.

*Assigned reading: Gumienny TL, Savage-Dunn C. TGF- $\beta$  signaling in C. elegans. In: WormBook: The Online Review of C. elegans Biology [Internet]. Pasadena (CA): WormBook; 2005-2018.*

**Week 6 Midterm 1**, Reverse genetics, Chapter 7.

*Assigned reading: van der Weyden, L., White, J.K., Adams, D.J. et al. The mouse genetics toolkit: revealing function and mechanism. Genome Biol 2011 12, 224*

**Week 7** Genome editing Chapter 8.

*Assigned reading: Farboud B, Severson AF, Meyer BJ. Strategies for Efficient Genome Editing Using CRISPR-Cas9. Genetics. 2019 Feb;211(2):431-457.*

**Week 8** Genome-wide mutant screens Chapter 9.

*Assigned reading: Walhout AJM. If two deletions don't stop growth, try three. Science. 2018 Apr 20;360(6386):269-270.*

**Week 9** Gene interactions: suppressors and synthetic enhancers Chapter 10.

*Assigned reading: Richards K L et al. 2000. Structure function relationships in yeast tubulins. Molecular Biology of the Cell 11:1887-903*

**Week 10** Epistasis and genetic pathways Chapter 11.

*Assigned reading: Avery, L and S. Wasserman, 1992. Ordering gene function: The interpretation of epistasis in regulatory hierarcgies. Trends in Genetics 8:312-16*

**Description of Course Activities:**

**Lecture (3 hours/week):** One lecture will be focused on genetics concepts related to the assigned chapter study. Second lecture will be focused on the discussion of a case study.

**Reading (4 hours/week):** Reading assigned Chapter from textbook. Read one primary literature article assigned for the case study.

**Homework Exercises/Assignments (1 hour/week):** Relevant to assigned reading of literature. Practical application of paper analysis approaches. For example, draw an experimental set up, analyze a figure to determine the rationale, conclusions and controls, etc.

**Discussion (1 hour/week):** Discuss lecture and experimental design concepts.

**Midterm and Final Exam:** Part based on lecture concepts and part based on case studies. In addition, for the final exam, students will analyze an assigned paper not previously discussed in class.

# Worksheet - Request for a New Course

\*\* Place your pointer on the underlined fields and start typing to fill in text, \*\*  
or use an X or a number to fill in “check-box” or numbered fields.

## Level:

Undergraduate 001 -199

Graduate 200 -299

Professional 300 -499

**Subject:** The subject code has to be approved and available in Banner

**Course number** (if known). Only courses that have been discontinued for 3 or more years can be used as a new course or find a course number that has not been used.

**Course Long Title:** Maximum length is 100 characters. The students will see the long title in the Schedule of Classes. No slashes (/,\) or dashes (-) allowed.

**Course Short Title:** Maximum length is 30 characters. The students will have this title listed on their transcripts. This title will also appear in SSASECT. No slashes (/,\) or dashes (-) allowed.

## Course Type:

Standard Course

Standard Course with Topics

Umbrella with title in description

umbrella without title in description

E-Z segment ( segment is not listed within the umbrella description)

**Effective term:** (Quarter and Year). Review the Academic Senate Courses [web site](#) .  
Once a course is approved it can be offered any term.

**Offered in Summer only:** A course can be offered in any term as long as it is approved.

Yes

No



**Offered Once:**

Yes

No

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**UNITS AND ACTIVITIES:**

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**OVERALL UNITS:** Enter in Fixed (4 units) or Variable (1 to 4 units) Units.

**Hours per week per unit of credit may not be less than but may exceed those listed below.**

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop
  - One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems. Use the schedule type "Activity" to describe an activity that is not listed.
  - One unit for each two to three hours per week (1:2-3) of studio
-

**Activities and hours per week:** Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

|               |                  |                      |              |
|---------------|------------------|----------------------|--------------|
| Activity      | Field            | Research individual  | Term Paper   |
| Clinic        | Internship       | Research Scheduled   | Thesis       |
| Colloquium    | Individual Study | Screening Individual | Tutorial     |
| Consultation  | Laboratory       | Screening Scheduled  | Workshop     |
| Discussion    | Lecture          | Seminar              | Written Work |
| Extra Reading | Practicum        | Studio               |              |

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**Cross-listing with:** List all cross-listed partners.

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**Course Prerequisite Information:** There are multiple types of Prerequisites that are acceptable. Please review all.

**Corequisite:** A corequisite is a course that is 100% concurrent enrollment for both proposals. Both proposals will have each other's course listed here. Multiple corequisites cannot be listed here. Only one course can be consider a corequisite area in CRS.

**Prerequisite(s):** A prerequisite must be an active course. In this section you will also decide if the prerequisite requires a minimum grade and if the course may be taken concurrently or if the course is only a prerequisite.

**Other Prerequisite(s):** Enter additional prerequisite information that will display in the Catalog. Example: "or equivalent" ;

**Major Restrictions:** Indicate the Major restriction(s) for this course. List the Major codes of the restriction here; Example: Education, Society, Human Dev – (ESHD)

**Class Standing Restriction:** If your course is a graduate course you do not need to select any of the following if your course prerequisite is the minimum of "graduate standing or consent of instructor". If your course is a course that undergraduate and graduate students can enroll in then you will select class information here.

Freshman  
Sophomore  
Junior  
Senior  
Credential  
Masters

**Other Restrictions:** List any special required restriction; Example: "a sufficiently high score on the placement examination, as determined by the Mathematics Department"

**Special Requirements:** Enter special requirements that will display in the Catalog Description. Example: "permission by faculty". This special requirement is enforced by the department and not the Registrar Office during registration.

## Prerequisite Information Continued.

**Consent of Instructor:** Use the selection below to indicate that the course requires consent of instructor. The department is responsible for enforcement of “and consent of instructor.” Or “or consent of instructor”: For all courses 200 and above, the selection of "OR" is required. The department is responsible for enforcement of this restriction. Select one of the following if you want “consent of instructor” to appear with in the description within the general catalog.

AND

OR

---

## Description Information:

**Read the guidelines in this box before writing the Catalog description.**

Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:

Instead of "This course will introduce students to the history of . . . ," use one of the following formats:

Introduces the history of . . .

An introduction to the history of . . .

Introduction to the history of . . .

Instead of “Functions, equations, and graphs,” use a format similar to one of the following examples:

Explores functions, equations, and graphs . . .

Topics include functions, equations, and graphs . . .

A study of functions, equations, and graphs . . .

For "New" courses that will only be offered online the description must include "Offered online only." at the end of the description and included in the 50 word limit.

---

**Catalog description:**

**Grading:** Please see the [General Rules and Polices Governing Courses of Instruction](#).  
Select the grade type that is in accordance with the guidelines.

Letter Grade or petition for Satisfactory/No Credit (S/NC) (undergraduate course default type).

Letter Grade or S/NC, no petition required (Not per policy for undergraduate courses).

Letter Grade only (graduate course default type).

S/NC only

In Progress (IP)

**Grading Statement** (if required)- Select the approved grading statement per grade types from the [General Rules and Policies Governing Courses of Instruction](#). Select the grading statement that corresponds to the Grading Type per policy.

Satisfactory (S) or No Credit (NC) grading is not available.

Graded Satisfactory (S) or No Credit (NC).

Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.

May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.

May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.

Students who submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar or submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

---

**Course is Repeatable:** Review the [General Rules and Policies Governing Courses of Instruction](#) to determine if your course can be considered to be repeatable.

Yes

No

**Repeatability Statement:** If you selected "Yes" for this course to be repeatable, you must enter a statement and follow the [General Rules and Policies Governing Courses of Instruction](#) for repeatable courses.

Course is repeatable

Course is repeatable as topic/content changes

**Repeatable units:** Enter the amount of repeatable units.

If repeatable, may the student take more than one section of the course in a single quarter?

Yes

No

---

---

**Credit Overlap:** Bi-directional (on both proposals) Bi-directional (on both proposals) **Example:** "Credit is awarded for only one of ANTH 007 or ANTH 007S." Provide in the course subject and numbers.

**Credit Overlap:** One directional (on one proposal only), or is a sequential course and is enforced by the department. **Example:** "Credit is awarded for only one of the following sequences: CHN 001, CHN 002, CHN 003, and CHN 004; CHN 001, CHN 002, and CHN 020B; CHN 020A and CHN 020B."

Credit Overlap: (students can get credit for both courses but there is overlap). Provide/describe the overlap. Also provide the justification for one-directional, bi-directional, and if students can get credit for both in this field.

---

### Syllabus Information:

**Syllabus:** Provide a syllabus for a New or Restore course. Attach to an email or enter here. Please see the [Faculty Checklist](#) on page three to help with your syllabus

**Syllabus:** This new course proposal is for online and in-person instruction. The syllabus for the online and in-person section are the same?

Yes

No

**Online Course Information:** Select the appropriate only course information

UCR Only

ILTI/UCOP Funded (cross-campus enrolling; seats coordinated with UCOP)

MSOL

Undergraduate

Graduate

## **BREADTH REQUIREMENT STATEMENTS**

To change the breadth requirement information included on the college Breadth websites for please provide a memo to the course proposal requesting the course be considered Breadth. Select one of the statements below or provide a statement to correspond to breadth attributes. The memo will be entered into CRS in the attachments area. A comment will be entered into the comments field stating that a memo has been attached for consideration for a breadth course.

Select one of the following and attach the memo to CRS attachments

Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences for breadth requirement information.

Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Other breadth statement

---

## **ADDITIONAL INFORMATION**

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at <http://senate.ucr.edu/committee/8>

Justification for the New Course

MMiller updated 11/04/2022

**Course title: Molecular Genetics Laboratory**

**Prerequisites:** Prerequisite or concurrent enrollment: BIOL 107A, BIOL 102.

**Faculty contact hours:** 2 hours lecture; 6 hours lab (4 units)

**Student enrollment:** 2 sections (48 per lecture; 24 per lab)

**Course catalog description (50 words):** Reinforce important concepts in classical and molecular genetics through laboratory work in basic molecular biology and genetics including DNA manipulation techniques and cloning, gene mapping, and isolation and characterization of mutants in eukaryotic model systems.

**Description of course activities:**

Learn to integrate important concepts in classical and molecular genetics into an overall picture of genetic inheritance, the molecular basis of gene function and how gene function can be altered. This course is designed to introduce students to a wide range of molecular biology methods currently in use in both academic and industrial research laboratories. This includes theoretical and practical introduction to molecular biology basics including the properties of plasmids, recombinant DNA techniques, subcloning, bacterial transformation and selection, and the isolation of nucleic acids. Recent advances in biotechnology that have genetic implications and advances in genetic engineering technology will also be introduced. These core competencies in molecular biology will be applied to genetic mapping, mutant identification, and complementation in a eukaryotic system.

Students will learn the basics of experimental design and record keeping, data analysis, and how to present the results in the form of an oral presentation. The course will foster creative, critical thinking, and effective communication skills and prepare students to be contributing members of research labs. The following in-course activities are required: Instruction is based on a combination of lectures (2 hours), direct experimentation (two 3-hour labs). Each lab will begin with a short pre-laboratory quiz to reinforce understanding of key concepts and skills. Students will submit worksheets at the end of each lab period and will prepare one full-length lab report during the quarter. The course will include three in class exams (two midterms and a final).

Desired learning outcomes

1. Develop a basic understanding of inheritance patterns and experimental genetic tools used to isolate genes.



2. Establish a working knowledge of methods in Molecular Biology, including the ability to use standard laboratory equipment and methods frequently used in Molecular Biology research.
3. Practice record keeping and communicating their results in written and oral form.
4. Learn to exercise critical thinking skills to troubleshoot experiments and in the interpretation and reporting of scientific data.

**Grading breakdown:**

- 25% Final exam
- 25% Midterms (2)
- 20% Pre-lab quizzes
- 10% Lab worksheets
- 10% Oral presentation
- 10% Laboratory notebook

**Grading scale:**

A+: 98-100

A: 93-97

A-: 90-92

B+: 87-89

B: 83-86

B-: 80-82

C+: 77-79

C: 73-76

C-: 70-72

D+: 67-69

D: 63-66

D-: 60-62

F: 59 and below

**List of topics and readings by week:**

The lecture topics and laboratory activities for each lecture and lab meeting are detailed in the attached spreadsheet. Each quarter students will perform a series of molecular experiments to introduce basic molecular biology techniques. These experiments will be the same for each course offering and section. In addition, each section will carry out a genetics experiment. Here we have introduced two possible course-long experiments designed using the plant model system *Arabidopsis thaliana*. Similar concepts can be introduced using any eukaryotic model system and this aspect of the course is intended to be flexible to accommodate instructors with expertise in *C. elegans*, *S. cerevisiae*, *D. melanogaster*.

**List of required text and readings:**

Students will be provided with copies of Powerpoint presentations that are part of the lecture. A laboratory manual will be developed to include background information, required reagents, and a step by step guide to each laboratory experiment.

**Description of course activities:**

Lecture: (2 hours/week) Lectures will introduce fundamental concepts related to the molecular and genetics experiments to be performed each week.

Midterm and Final exam: Exams will be based on both lecture material and laboratory experiments. Pre-lab quizzes and lab worksheets will be designed to prepare students for these examinations.

Pre-lab quizzes: During the first 15 minutes of every lab period the students will take a short, 2-3 question quiz. This is meant to reinforce important concepts related to molecular biology techniques and/or genetic experiments introduced during lecture or the previous meeting.

Lab worksheets: Lab worksheets will include exercises to be completed during the current lab period. This will guide students through the completion of the daily molecular and/or genetics experiment. Lab worksheets will also serve to document student attendance and participation.

Lab notebooks: Throughout the course students will maintain a lab notebook. Best practices for record keeping will be introduced early on in the course. Students will update their lab notebook each meeting and include periodic peer evaluations.

Oral presentation: In teams of two, students will present a 12 minute presentation. Presentations will focus on an experiment performed during the course and include the following sections: introduction, materials and methods, and results.

| Week/Lab | Lecture topic  | Molecular biology experiments  | Genetic experiments:<br><i>Arabidopsis thaliana</i> example  | Alternative <i>Arabidopsis thaliana</i> experiments   |
|----------|--|--|--|---|
| 1.1      | Intro to Arabidopsis as a molecular/genetic model system   | Intro to Molecular Biology: pipetman use and accurate measurement  | Intro into root develop and cell types   | Intro to Arabidopsis, root develop and lateral root formation   |
| 1.2      | Introduction into elements of genetic change in plants: Transposable elements, T-DNAs, mutagens, overview of forward and reverse genetic screens | Discuss lab notebooks, purposes and best practices.  | Intro into sterile technique laminar flow hood, Plate seeds (e.g. RML/rml1-1 on GSH+ and GSH- media, sensitive/insensitive to exogenous substance)     | Intro into sterile technique, Plate various T2 lines on selection media   |
| 2.1      | Basic molecular biology: Principles and theory of agarose gel electrophoresis; EtBr, markers; analysis of fragment sizes                         | Intro to Mol. Biol.: dilution, sterile technique for microorgs, plating/streaking bacteria, Mol Exp. 1: Agarose gel electrophoresis. | Introduction to GFP reporters and transgenic plants  | Introduction to GFP reporters and transgenic plants   |
| 2.2      | Restriction enzymes, mapping, plasmid properties (repl origin, selectable markers, polylinker); competent cells and transformation               | Examine bacterial plates; Mol Exp 2: Restriction enzymes, plasmid mapping.   | Examine segregation ratios for rml1-1 phenotype on GSH+/- plates   | Perform selection of T2 lines for various reporters, determine resistant:sensitive ratios   |
| 3.1      | Subcloning, ligation, directional cloning, blue-white selection  | Mol Exp. 3: Transformation of competent cells; Mol Exp. 4: Subcloning- digest vectors and donor DNA                                  | Plate seeds WT, SCR/scr-3 and SHR/shr-2 with pSCR reporter   | Plate DR5:GFP, DR5:GFP alf4-1   |
| 3.2      | Review genetic crosses and segregation ratios (phenotypic vs genotypic). Review subcloning procedures, plasmid properties, transformation        | Mol Exp. 3: Count transformation results   | Learn to use fluorescence dissecting microscope and take images, Introduce FIJI image analysis tools   | Learn to use fluorescence dissecting microscope and take images, Introduce FIJI image analysis tools                                      |
| 4.1      | <b>Exam 1</b>  | Mol Exp. 4: Subcloning: run gel, cut out and freeze band   | Examine segregation ratios for scr and shr plants, examine pSCR reporter expression, image root phenotypes and GFP                                     | Examine LR phenotypes, examine pDR5 reporter expression, image root phenotypes and GFP, excise root tips to examine lateral root          |
| 4.2      | Subcloning cont.; intro into modern types of cloning (Gateway recombination-based, Golden gate cloning, Gibson assembly, etc.                    | Mol Exp. 4: Purify fragments, set up ligations   | Transplant mutants and WT siblings to soil   | Count LRs to assess LR capacity   |
| 5.1      | Review Meiosis, recombination with respect to crosses  | Mol Exp. 4: transform ligations into competent cells (CaCl2, electroporate)  | Analyze segregation and GFP image data   | Analyze phenotypic and GFP image data   |
| 5.2      | Principles of nucleic acid isolation; Intro to PCR: Theory and concepts  | Review lab notebooks, share and give comments on a classmates lab notebook.  | Review experimental procedures, discuss graphical presentation of data and use of statistical tests.   | Review experimental procedures, discuss graphical presentation of data and use of statistical tests.                                      |
| 6.1      | PCR methods: primers, reaction parameters. Applications: analysis of allelic variation   | Mol Exp. 4: Analyze transformation results, start bacterial cultures for plasmid minipreps   | Extract plant DNA, PCR for SCR alleles, plate SCR/scr-3 and SHR/shr-2 seeds  | Plate DR5:GFP, DR5:GFP alf4-1 on auxin (NAA)  |
| 6.2      | Review PCR methods and applications; discuss best practices for lab manuals, graphical representation of data and oral presentations.            | Mol Exp. 4: Minipreps and restriction digestion of miniprep DNA  | Analyze data and label pots with genotypes   | Review data and graphical presentations in small groups   |
| 7.1      | Review: introduction of DNA into plants - review transgenic plants and transposons, introduce enhancer and gene traps                            | Finish minipreps/digests as needed   | Perform shoot and root gravitropism experiments (short term, 2 hours) and image plates and plants turned 6 hours before the lab. (e.g. WT, scr-4, shr) | Examine LR phenotypes, examine pDR5 reporter expression, image root phenotypes and GFP, excise root tips to examine lateral root capacity |
| 7.2      | Review Reverse genetics concepts, Intro to targeted mutagenesis: RNAi, CRISPR-Cas9-mediated  | Mol Exp. 4: Electrophoresis and analysis of miniprep digests   | Analyze gravitropism data  | Count LRs to assess LR capacity   |
| 8.1      | <b>Exam 2</b>  | Mol Exp. 4: Continued, Electrophoresis and analysis of miniprep digests  | Review data and graphical presentations in small groups  | Analyze phenotypic and GFP image data   |
| 8.2      | Introduce DNA repair mechanisms, homologous recombination in plants, why do difficult?   | Mol Exp. 5: PCR amplification of human cheek cell DNA  | Finalize lab notebook entries  | Finalize lab notebook entries   |
| 9.1      | Molecular mapping of transposon and T-DNA insertions; - inverse PCR ; Blast searches of sequence databases.                                      | (TA runs class gel to analyze human cheek cell PCR results), Mol Exp. 5: Analyze human DNA PCR results;                              | Peer evaluations of two lab notebook entries   | Peer evaluations of two lab notebook entries  |
| 9.2      | Prepare for presentations  |  | Presentations on lab topic of choice   | Presentations on lab topic of choice  |
| 10.1     | Prepare for presentations  |  | Presentations on lab topic of choice   | Presentations on lab topic of choice  |
| 10.2     | <b>Exam 3/Final</b>  |  | <b>Submit updated lab notebooks</b>  | <b>Submit updated lab notebooks</b>   |
|          |  |  | *course can be adapted to use other organisms based on instructor's preference (e.g. <i>Drosophila melanogaster</i> , <i>Caenorhabditis elegans</i> )  |   |

# Worksheet - Request for a New Course

\*\* Place your pointer on the underlined fields and start typing to fill in text, \*\*  
or use an X or a number to fill in “check-box” or numbered fields.

## Level:

Undergraduate 001 -199

Graduate 200 -299

Professional 300 -499

**Subject:** The subject code has to be approved and available in Banner

**Course number** (if known). Only courses that have been discontinued for 3 or more years can be used as a new course or find a course number that has not been used.

**Course Long Title:** Maximum length is 100 characters. The students will see the long title in the Schedule of Classes. No slashes (/,\) or dashes (-) allowed.

**Course Short Title:** Maximum length is 30 characters. The students will have this title listed on their transcripts. This title will also appear in SSASECT. No slashes (/,\) or dashes (-) allowed.

## Course Type:

Standard Course

Standard Course with Topics

Umbrella with title in description

umbrella without title in description

E-Z segment ( segment is not listed within the umbrella description)

**Effective term:** (Quarter and Year). Review the Academic Senate Courses [web site](#) .  
Once a course is approved it can be offered any term.

**Offered in Summer only:** A course can be offered in any term as long as it is approved.

Yes

No

**Offered Once:**

Yes

No

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**UNITS AND ACTIVITIES:**

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**OVERALL UNITS:** Enter in Fixed (4 units) or Variable (1 to 4 units) Units.

**Hours per week per unit of credit may not be less than but may exceed those listed below.**

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop
  - One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems. Use the schedule type "Activity" to describe an activity that is not listed.
  - One unit for each two to three hours per week (1:2-3) of studio
-

**Activities and hours per week:** Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

|               |                  |                      |              |
|---------------|------------------|----------------------|--------------|
| Activity      | Field            | Research individual  | Term Paper   |
| Clinic        | Internship       | Research Scheduled   | Thesis       |
| Colloquium    | Individual Study | Screening Individual | Tutorial     |
| Consultation  | Laboratory       | Screening Scheduled  | Workshop     |
| Discussion    | Lecture          | Seminar              | Written Work |
| Extra Reading | Practicum        | Studio               |              |

---

**Cross-listing with:** List all cross-listed partners.

---

**Course Prerequisite Information:** There are multiple types of Prerequisites that are acceptable. Please review all.

**Corequisite:** A corequisite is a course that is 100% concurrent enrollment for both proposals. Both proposals will have each other's course listed here. Multiple corequisites cannot be listed here. Only one course can be consider a corequisite area in CRS.

**Prerequisite(s):** A prerequisite must be an active course. In this section you will also decide if the prerequisite requires a minimum grade and if the course may be taken concurrently or if the course is only a prerequisite.

**Other Prerequisite(s):** Enter additional prerequisite information that will display in the Catalog. Example: "or equivalent" ;

**Major Restrictions:** Indicate the Major restriction(s) for this course. List the Major codes of the restriction here; Example: Education, Society, Human Dev – (ESHD)

**Class Standing Restriction:** If your course is a graduate course you do not need to select any of the following if your course prerequisite is the minimum of "graduate standing or consent of instructor". If your course is a course that undergraduate and graduate students can enroll in then you will select class information here.

Freshman  
Sophomore  
Junior  
Senior  
Credential  
Masters

**Other Restrictions:** List any special required restriction; Example: "a sufficiently high score on the placement examination, as determined by the Mathematics Department"

**Special Requirements:** Enter special requirements that will display in the Catalog Description. Example: "permission by faculty". This special requirement is enforced by the department and not the Registrar Office during registration.

## Prerequisite Information Continued.

**Consent of Instructor:** Use the selection below to indicate that the course requires consent of instructor. The department is responsible for enforcement of “and consent of instructor.” Or “or consent of instructor”: For all courses 200 and above, the selection of "OR" is required. The department is responsible for enforcement of this restriction. Select one of the following if you want “consent of instructor” to appear with in the description within the general catalog.

AND

OR

---

## Description Information:

**Read the guidelines in this box before writing the Catalog description.**

Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:

Instead of "This course will introduce students to the history of . . . ," use one of the following formats:

Introduces the history of . . .

An introduction to the history of . . .

Introduction to the history of . . .

Instead of “Functions, equations, and graphs,” use a format similar to one of the following examples:

Explores functions, equations, and graphs . . .

Topics include functions, equations, and graphs . . .

A study of functions, equations, and graphs . . .

For "New" courses that will only be offered online the description must include "Offered online only." at the end of the description and included in the 50 word limit.

---

**Catalog description:**



**Grading:** Please see the [General Rules and Polices Governing Courses of Instruction](#).  
Select the grade type that is in accordance with the guidelines.

Letter Grade or petition for Satisfactory/No Credit (S/NC) (undergraduate course default type).

Letter Grade or S/NC, no petition required (Not per policy for undergraduate courses).

Letter Grade only (graduate course default type).

S/NC only

In Progress (IP)

**Grading Statement** (if required)- Select the approved grading statement per grade types from the [General Rules and Policies Governing Courses of Instruction](#). Select the grading statement that corresponds to the Grading Type per policy.

Satisfactory (S) or No Credit (NC) grading is not available.

Graded Satisfactory (S) or No Credit (NC).

Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.

May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.

May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.

Students who submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar or submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

---

**Course is Repeatable:** Review the [General Rules and Policies Governing Courses of Instruction](#) to determine if your course can be considered to be repeatable.

Yes

No

**Repeatability Statement:** If you selected "Yes" for this course to be repeatable, you must enter a statement and follow the [General Rules and Policies Governing Courses of Instruction](#) for repeatable courses.

Course is repeatable

Course is repeatable as topic/content changes

**Repeatable units:** Enter the amount of repeatable units.

If repeatable, may the student take more than one section of the course in a single quarter?

Yes

No

---

---

**Credit Overlap:** Bi-directional (on both proposals) Bi-directional (on both proposals) **Example:** "Credit is awarded for only one of ANTH 007 or ANTH 007S." Provide in the course subject and numbers.

**Credit Overlap:** One directional (on one proposal only), or is a sequential course and is enforced by the department. **Example:** "Credit is awarded for only one of the following sequences: CHN 001, CHN 002, CHN 003, and CHN 004; CHN 001, CHN 002, and CHN 020B; CHN 020A and CHN 020B."

Credit Overlap: (students can get credit for both courses but there is overlap). Provide/describe the overlap. Also provide the justification for one-directional, bi-directional, and if students can get credit for both in this field.

---

### Syllabus Information:

**Syllabus:** Provide a syllabus for a New or Restore course. Attach to an email or enter here. Please see the [Faculty Checklist](#) on page three to help with your syllabus

**Syllabus:** This new course proposal is for online and in-person instruction. The syllabus for the online and in-person section are the same?

Yes

No

**Online Course Information:** Select the appropriate only course information

UCR Only

ILTI/UCOP Funded (cross-campus enrolling; seats coordinated with UCOP)

MSOL

Undergraduate

Graduate

## **BREADTH REQUIREMENT STATEMENTS**

To change the breadth requirement information included on the college Breadth websites for please provide a memo to the course proposal requesting the course be considered Breadth. Select one of the statements below or provide a statement to correspond to breadth attributes. The memo will be entered into CRS in the attachments area. A comment will be entered into the comments field stating that a memo has been attached for consideration for a breadth course.

Select one of the following and attach the memo to CRS attachments

Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences for breadth requirement information.

Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Other breadth statement

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## **ADDITIONAL INFORMATION**

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at <http://senate.ucr.edu/committee/8>

Justification for the New Course

MMiller updated 11/04/2022

## **GNBT120: Analysis of Genomes Laboratory**

Credit Hours: 4

Faculty contact hours: 1 hour lecture, 1 hour discussion, 6 hours laboratory

### **Prerequisite(s):**

BIOL 005C with a grade of C- or better; BIOL 102; MATH 007B or MATH 009B or MATH 09HB.

### **Example course times:**

Lecture + Lab: TR 1:00-4:50 PM

Discussion: F 1:00-1:50 PM

### **Course Catalog description:**

Introduces the key computational approaches used in the analysis of genomes and their functional outputs. Topics include genome assembly and annotation, identification and analysis of genomic sequence variation, modern molecular mutant identification, quantitative trait mapping, genome-wide association mapping, mRNA and small RNA profiling, network analysis, and comparative genomics. Computer programming experience is not required.

### **Learning Objectives:**

1. Develop an understanding of how genomics data is stored and manipulated in modern computing environments.
2. Gain experience analyzing data and recording results using the tools of computational biology.
3. Perform several of the common analyses used to understand genomes.

### **Grading breakdown:**

Lab Assignments: 45%

Take Home Midterm: 25%

Take Home Final: 25%

Lecture Quizzes and Class participation: 5%

### **Course activities:**

A series of topic videos will be made ahead of the course meeting, and the beginning of each meeting will be used to discuss the contents of the readings and the course videos. The remainder of the time will be devoted to working through the laboratory material. Graded material includes:

- 1) Weekly assignments which will include questions about the laboratory content that you can fill in as you work through the material.
- 2) Short quizzes that will cover the lecture material specifically.
- 3) A midterm and final exam, both of which will test your knowledge of the course material by requiring you to complete a series of related tasks.

**Texts (Both O'Reilly and available for free for UC students):**

Bioinformatics Data Skills, Vince Buffalo

R for Data Science, Hadley Wickham

Selected methods primers

**Grading scale:**

A+: 98-100

A: 93-97

A-: 90-92

B+: 87-89

B: 83-86

B-: 80-82

C+: 77-79

C: 73-76

C-: 70-72

D+: 67-69

D: 63-66

D-: 60-62

F: 59 and below

**Enrollment:**

25 students / lab

**Example Schedule:**

| Week | Day | Topic                            | Reading  |
|------|-----|----------------------------------|--|
| 1    | T   | JetStream; Markdown; Intro Linux | Buffalo: p. 1 - 54<br>(Chapters 1-3)                               |
| 1    | R   | Intro Linux Continued; Git       | Buffalo: p. 67 - 97<br>(Chapter 5); 125 -<br>165 (Chapter 7)       |
| 1    | F   | Discussion: Linux, Git           |  |
| 2    | T   | For Loops; BLAST I               | Chapter 6 of<br>Bioinformatics for<br>Beginners                    |
| 2    | R   | BLAST II                         |  |
| 2    | F   | Discussion: For loops, BLAST     |  |
| 3    | T   | R: Intro                         | Buffalo: p. 175 - 206<br>(Start of Chapter 8 to<br>Exploring Data) |

|   |   |   |   |
|---|---|---|---|
|   |   |   | Visually with ggplot2 1: Scatterplots and Densities); R for data science Chapters 27, 4   |
| 3 | R | R: Tidyverse                                  | R for data science Chapters 5, 6, 10, 18  |
| 3 | F | Discussion: R                                 |   |
| 4 | T | Multiple Sequence Alignment and Tree Building | Chapter 9 of Bioinformatics for Beginners   |
| 4 | R | R SNPS; ggplot                                | Buffalo: p. 207 - 224 (Chapter 8 Exploring Data Visually with ggplot2 1: Scatterplots and Densities to Using ggplot2 Facets); R for data science Chapters 3, 12 |
| 4 | F | Discussion: Tidyverse, trees, etc             |   |
| 5 | T | GWAS  | Genome-wide association studies Uffelmann et al.  |
| 5 | R | Work on midterm                               |   |
| 5 | F | Discussion: QTLs and GWAS                     |   |
| 6 | T | Shiny Midterm Due @ 1:10                      |   |
| 6 | R | Illumina Sequence Data: QC and mapping        | Buffalo: p. 339 - 351 (Start of Chapter 10 to Indexed FASTA Files)<br>Wikipedia FastQ<br>U Mich SAM wiki  |
| 6 | F | Discussion: Sequencing methods                |   |
| 7 | T | Illumina: SNPs and IGV                        | Buffalo p. 355 - 377 (Start of Chapter 11 to Pileups with samtools pileup)  |

|    |   |   |   |
|----|---|---|---|
| 7  | R | Illumina: RNAseq                          | RNA Sequencing Data: Hitchhiker's Guide to Expression Analysis (up to single cell sequencing)                                     |
| 7  | F | Discussion: Genetic variation             |   |
| 8  | T | Illumina: RNAseq                          | RNA Sequencing Data: Hitchhiker's Guide to Expression Analysis (remainder)  |
| 8  | R | Motif discovery                           | How does DNA sequence motif discovery work? And What are DNA sequence motifs? D'haeseleer 2006                                    |
| 8  | F | Discussion: Transcriptional Regulation I  |   |
| 9  | T | Clustering                                | Ospina et al. A Primer on Preprocessing, Visualization, Clustering, and Phenotyping of Barcode-Based Spatial Transcriptomics Data |
| 9  | R | Networks                                  | Modeling and analysis of gene regulatory networks Karlebach 2008  |
| 9  | F | Discussion: Transcriptional Regulation II |   |
| 10 | T | Metagenomics                              | A Primer on Metagenomics Wooley et al. 2010   |
| 10 | R | Metagenomics                              |   |
| 10 | F | Discussion: Metagenomics                  |   |

# Worksheet - Request for a New Course

\*\* Place your pointer on the underlined fields and start typing to fill in text, \*\*  
or use an X or a number to fill in “check-box” or numbered fields.

## Level:

Undergraduate 001 -199

Graduate 200 -299

Professional 300 -499

**Subject:** The subject code has to be approved and available in Banner

**Course number** (if known). Only courses that have been discontinued for 3 or more years can be used as a new course or find a course number that has not been used.

**Course Long Title:** Maximum length is 100 characters. The students will see the long title in the Schedule of Classes. No slashes (/,\) or dashes (-) allowed.

**Course Short Title:** Maximum length is 30 characters. The students will have this title listed on their transcripts. This title will also appear in SSASECT. No slashes (/,\) or dashes (-) allowed.

## Course Type:

Standard Course

Standard Course with Topics

Umbrella with title in description

umbrella without title in description

E-Z segment ( segment is not listed within the umbrella description)

**Effective term:** (Quarter and Year). Review the Academic Senate Courses [web site](#) .  
Once a course is approved it can be offered any term.

**Offered in Summer only:** A course can be offered in any term as long as it is approved.

Yes

No



**Offered Once:**

Yes

No

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**UNITS AND ACTIVITIES:**

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**OVERALL UNITS:** Enter in Fixed (4 units) or Variable (1 to 4 units) Units.

**Hours per week per unit of credit may not be less than but may exceed those listed below.**

- One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop
  - One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems. Use the schedule type "Activity" to describe an activity that is not listed.
  - One unit for each two to three hours per week (1:2-3) of studio
-

**Activities and hours per week:** Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

|               |                  |                      |              |
|---------------|------------------|----------------------|--------------|
| Activity      | Field            | Research individual  | Term Paper   |
| Clinic        | Internship       | Research Scheduled   | Thesis       |
| Colloquium    | Individual Study | Screening Individual | Tutorial     |
| Consultation  | Laboratory       | Screening Scheduled  | Workshop     |
| Discussion    | Lecture          | Seminar              | Written Work |
| Extra Reading | Practicum        | Studio               |              |

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**Cross-listing with:** List all cross-listed partners.

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**Course Prerequisite Information:** There are multiple types of Prerequisites that are acceptable. Please review all.

**Corequisite:** A corequisite is a course that is 100% concurrent enrollment for both proposals. Both proposals will have each other's course listed here. Multiple corequisites cannot be listed here. Only one course can be consider a corequisite area in CRS.

**Prerequisite(s):** A prerequisite must be an active course. In this section you will also decide if the prerequisite requires a minimum grade and if the course may be taken concurrently or if the course is only a prerequisite.

**Other Prerequisite(s):** Enter additional prerequisite information that will display in the Catalog. Example: "or equivalent" ;

**Major Restrictions:** Indicate the Major restriction(s) for this course. List the Major codes of the restriction here; Example: Education, Society, Human Dev – (ESHD)

**Class Standing Restriction:** If your course is a graduate course you do not need to select any of the following if your course prerequisite is the minimum of "graduate standing or consent of instructor". If your course is a course that undergraduate and graduate students can enroll in then you will select class information here.

Freshman  
Sophomore  
Junior  
Senior  
Credential  
Masters

**Other Restrictions:** List any special required restriction; Example: "a sufficiently high score on the placement examination, as determined by the Mathematics Department"

**Special Requirements:** Enter special requirements that will display in the Catalog Description. Example: "permission by faculty". This special requirement is enforced by the department and not the Registrar Office during registration.

## Prerequisite Information Continued.

**Consent of Instructor:** Use the selection below to indicate that the course requires consent of instructor. The department is responsible for enforcement of “and consent of instructor.” Or “or consent of instructor”: For all courses 200 and above, the selection of "OR" is required. The department is responsible for enforcement of this restriction. Select one of the following if you want “consent of instructor” to appear with in the description within the general catalog.

AND

OR

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## Description Information:

**Read the guidelines in this box before writing the Catalog description.**

Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:

Instead of "This course will introduce students to the history of . . . ," use one of the following formats:

Introduces the history of . . .

An introduction to the history of . . .

Introduction to the history of . . .

Instead of “Functions, equations, and graphs,” use a format similar to one of the following examples:

Explores functions, equations, and graphs . . .

Topics include functions, equations, and graphs . . .

A study of functions, equations, and graphs . . .

For "New" courses that will only be offered online the description must include "Offered online only." at the end of the description and included in the 50 word limit.

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**Catalog description:**

**Grading:** Please see the [General Rules and Polices Governing Courses of Instruction](#).  
Select the grade type that is in accordance with the guidelines.

Letter Grade or petition for Satisfactory/No Credit (S/NC) (undergraduate course default type).

Letter Grade or S/NC, no petition required (Not per policy for undergraduate courses).

Letter Grade only (graduate course default type).

S/NC only

In Progress (IP)

**Grading Statement** (if required)- Select the approved grading statement per grade types from the [General Rules and Policies Governing Courses of Instruction](#). Select the grading statement that corresponds to the Grading Type per policy.

Satisfactory (S) or No Credit (NC) grading is not available.

Graded Satisfactory (S) or No Credit (NC).

Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.

May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.

May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.

Students who submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

Students who present a seminar or submit a term paper receive a letter grade, other students receive a Satisfactory (S) or No Credit (NC) grade.

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**Course is Repeatable:** Review the [General Rules and Policies Governing Courses of Instruction](#) to determine if your course can be considered to be repeatable.

Yes

No

**Repeatability Statement:** If you selected "Yes" for this course to be repeatable, you must enter a statement and follow the [General Rules and Policies Governing Courses of Instruction](#) for repeatable courses.

Course is repeatable

Course is repeatable as topic/content changes

**Repeatable units:** Enter the amount of repeatable units.

If repeatable, may the student take more than one section of the course in a single quarter?

Yes

No

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**Credit Overlap:** Bi-directional (on both proposals) Bi-directional (on both proposals) **Example:** "Credit is awarded for only one of ANTH 007 or ANTH 007S." Provide in the course subject and numbers.

**Credit Overlap:** One directional (on one proposal only), or is a sequential course and is enforced by the department. **Example:** "Credit is awarded for only one of the following sequences: CHN 001, CHN 002, CHN 003, and CHN 004; CHN 001, CHN 002, and CHN 020B; CHN 020A and CHN 020B."

Credit Overlap: (students can get credit for both courses but there is overlap). Provide/describe the overlap. Also provide the justification for one-directional, bi-directional, and if students can get credit for both in this field.

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### Syllabus Information:

**Syllabus:** Provide a syllabus for a New or Restore course. Attach to an email or enter here. Please see the [Faculty Checklist](#) on page three to help with your syllabus

**Syllabus:** This new course proposal is for online and in-person instruction. The syllabus for the online and in-person section are the same?

Yes

No

**Online Course Information:** Select the appropriate only course information

UCR Only

ILTI/UCOP Funded (cross-campus enrolling; seats coordinated with UCOP)

MSOL

Undergraduate

Graduate

## **BREADTH REQUIREMENT STATEMENTS**

To change the breadth requirement information included on the college Breadth websites for please provide a memo to the course proposal requesting the course be considered Breadth. Select one of the statements below or provide a statement to correspond to breadth attributes. The memo will be entered into CRS in the attachments area. A comment will be entered into the comments field stating that a memo has been attached for consideration for a breadth course.

Select one of the following and attach the memo to CRS attachments

Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences for breadth requirement information.

Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.

Other breadth statement

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## **ADDITIONAL INFORMATION**

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at <http://senate.ucr.edu/committee/8>

Justification for the New Course

MMiller updated 11/04/2022