



**ACADEMIC EXCELLENCE, REDEFINED**

**American University of Ras Al Khaimah**

**BIOL 493: Research Methodology in the Biological**

**Sciences**

**Spring 2018**

- I. Course Title: Research Methodology in the Biological Sciences  
Course Number: BIOL 493  
Course Credit Hours: 2
  
- II. Pre-requisites or Co-requisites: Senior standing
  
- III. Class Time and Location: Sunday & Tuesday 9:00 AM – 9:50 AM  
Room No. G211
  
- IV. Instructor Information:  
Dr. Rawad Hodeify  
Assistant Professor of Medical Biotechnology  
Room No. 47, Building C  
Phone extension: 1174  
Email: [rawad.hodeify@aurak.ac.ae](mailto:rawad.hodeify@aurak.ac.ae)
  
- V. Catalogue Description:

(2:2:0) this course is intended for senior year Biotechnology students to develop essential research skills and methodology. It includes studies in research methods and scientific communication. Under the guidance of Biotechnology faculty mentors, students will design a research project and write a literature

review and research proposal. Research methods and experimental design will be emphasized in this course.

#### VI. Course Goals and Objectives:

- To enable students develop valuable research skills and apply scientific knowledge to answer biological questions
- To enable students generate their own ideas for new research and gain experience in the development of research proposals.

#### VII. Course Student Learning Outcomes (CSLOs):

At the end of this course students will be able to:

CSLO No.	Course Student Learning Outcomes (CSLOs)
1	Explain the essential components of the scientific method with respect to experimentation in the Biological Sciences and discuss the need to perform experiments in replicates, account for likely sources of error, appropriate safety and ethical considerations etc.
2	Demonstrate skills relating to the process of conducting scientific research and the scientific method including team work, experimental design, hypothesis testing, data collection, data analysis, data interpretation and writing research proposals.
3	Critically analyze and synthesize recent published research in primary scientific literature.
4	Convey scientific knowledge and experimental outcomes through both written and oral communication.

#### VIII. Course Materials and Basic Resources:

Course material and resources include selected readings from books and journal articles which are placed on reserve in the University library as well as links on the World Wide Web, handouts, video clips and other interactive and visual resources.

#### Books/References:

Experimental design for the Life Sciences, 3<sup>rd</sup> edition, Ruxton, G. and Colegrave, N. 2010, Oxford University Press, ISBN-13: 9780199569120 (Recommended)

Practical Skills in Biomolecular Sciences, 4th edition, Wyers, J., Reed, R., Jones, A. and Holmes, D., 2012, Pearson Higher Ed, ISBN-13: 9781408245521 Chapters 15-20, 32- 34 (Recommended)

Research methods for the Biosciences, 2<sup>nd</sup> edition, Holmes, D., Moody, P. and Dine, D. 2010, Oxford University Press, ISBN-13: 9780199545766 (Recommended)

Research Methodology in the Medical and Biological Sciences, Laake P., Benestad H.B. and Olsen B.R. 2007, Elsevier-AP, ISBN-13: 9780123738745 (Recommended)

Online resources for “Experimental design for the Life Sciences” available at <http://www.oxfordtextbooks.co.uk/orc/ruxton3e> includes useful weblinks, extra questions and self-test questions and answers

Online resources for “Research methods for the Biosciences” available at <http://www.oup.com/uk/orc/bin/9780199545766> includes statistical software walk-throughs, integrative exercises, details of calculations etc.

Online access to AURAK library databases for journals <http://www.aurak.ae/library/library.html>

Course materials will be available through AURAK Blackboard, including the syllabus, PowerPoint slides of lectures, assignments, model answers to quizzes etc

#### IX. Weekly Topics:

Week #	Topics	Major Assignment and Examination Dates	CSLO
<b>1</b> 28 <sup>th</sup> Jan – 2 <sup>nd</sup> Feb	Overview of Course/ Scientific Information		
Last day to Add/Drop course: 4 <sup>th</sup> February 2018			
<b>2</b> 4 <sup>th</sup> Feb – 11 <sup>th</sup> Feb	Sources and searches for scientific information		
<b>3</b> 18 <sup>th</sup> Feb - 22 <sup>nd</sup> February	Reading Scientific Papers – Critical analysis		

<b>4</b> 25 Feb- 1 <sup>st</sup> March	Reading Scientific Papers – Critical analysis		
<b>5</b> 4 <sup>th</sup> -8 <sup>th</sup> March	Writing reports and scientific papers		
<b>6</b> 11 -15 <sup>th</sup> March	Writing research proposals		
<b>7</b> 18 <sup>th</sup> March – 22 <sup>nd</sup> March	Formulating hypotheses and predictions of outcome		
29 <sup>th</sup> March	<b>Mid Terms Grades Report Due</b>		
25 <sup>th</sup> March- April 7 <sup>th</sup>	<b>SPRING BREAK</b>		
March 31 <sup>st</sup>	<b>Last date to withdraw a course without grade “F”</b>		
<b>8</b> April 7 <sup>th</sup> – 12 <sup>th</sup>	Testing of hypotheses		
<b>9</b> 15 -19 <sup>th</sup> April	Experimental design		
<b>10</b> 22 <sup>nd</sup> -26 <sup>rd</sup> April	Experimental design		
<b>11</b> 29 <sup>th</sup> April - 3 <sup>rd</sup> May	Execution of experiments		
<b>12</b> 6 <sup>th</sup> -10 <sup>th</sup> May	Analysis of experimental results		

<b>13</b> 13 -17 <sup>th</sup> May	Presentation of experimental results	+ Student Presentations	
<b>14</b> 20-24 <sup>th</sup> May	Communication of results		
<b>15</b>	<b>FINAL EXAMINATION</b> <b>29<sup>th</sup> May 2018 (Room G211)</b>		
<b>June 5</b>	<b>Final Grades Due</b>		

- a. Guidelines for the essay and presentation will be provided at the time topic is provided.
- b. Several short homework assignments will be provided during the course and these will usually be due a week after being given unless informed otherwise by the instructor.
- c. In addition to the quizzes mentioned above, extra quizzes may be given and you will be informed of the dates of these quizzes in advance
- d. Please note that the above is a tentative schedule and is subject to change. You will be informed of any changes in advance.

X. Evaluation of Learning:

Evaluation Plan

- Assignments 20%
- Quizzes 20 %
- Presentations 15%
- Literature review 10%
- Research Proposal 30%
- Class participation and Discussion 5%

Assessment Tool (number)	CSLO achieved	Weightage
Assignments (4)	CSLO 1, CSLO 2, CSLO 3, CSLO 4	20%
Quizzes (4) [closed book, consisting of multiple choice questions and questions requiring True or False responses (40%) as well as short answer questions (60%)]	CSLO 1, CSLO 2, CSLO 4	20%

Presentations (4) (Presentation: 5-7 minutes)	CSLO 1, CSLO 2, CSLO 3, CSLO 4	15%
Literature review (5000 – 6000 words)	CSLO 1, CSLO 2, CSLO 3, CSLO 4	20%
Research Proposal	CSLO 1, CSLO 2, CSLO 3, CSLO 4	30%
Class participation/Discussion	CSLO 1, CSLO 2, CSLO 3, CSLO 4	5%

Assignments will consist of case studies, critiques of research articles and written data analysis and interpretation. Quizzes will examine students' knowledge and understanding of the basic principles and concepts underlying research methodology in the Biological sciences. Students will also be assigned four presentations that will require students to perform literature searches and utilize critical thinking, synthesis, and presentation skills. The literature review and research proposal will allow students to explain and apply the various aspects of the scientific method learned in the course and includes a summary what is currently known, key areas that require further study, the specific aims of the proposal, the proposed methodology, and provides a timeline and a budget for the proposed study. Written feedback will be provided to students on assignments, quizzes, presentations and drafts and final versions of the literature review and research proposal to highlight positive aspects of responses that need to be maintained as well as any deficiencies in student responses and aspects that need particular attention by way of improvement. Class participation and discussion sessions will allow students to verbally explain and apply the scientific method.

#### XI. Grading System and Scale:

University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture or recitation or not fewer than two hours per week of independent or laboratory work throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. According to the Resolution No. 80-1-106/2015 "Grading Scale" effective Fall 2015 is described below:

Grade	GPA Points	Percentage Score
A	4	90 -100
A <sup>-</sup>	3.7	87 - 89
B <sup>+</sup>	3.3	84 - 86
B	3.0	80 - 83
B <sup>-</sup>	2.7	77 - 79
C <sup>+</sup>	2.3	74 - 76
C	2.0	70 - 73
C <sup>-</sup>	1.7	67 - 69
D <sup>+</sup>	1.3	64 - 66
D	1.0	60 - 63
F	0	0 - 59

## XII. Teaching and Learning Methodologies:

The course will be based on formal lectures as well as experiential learning of the methodology used in Biological research. Lectures will be based on usage of a combination of audio-visuals, whiteboard and hand-outs and will expose students to various aspects of the methodology required to approach a Biological research question. Students will be expected to work in teams on several of the assignments, presentations and the research proposal in order to mimic the work ethic of a research laboratory in a University or industrial setting. Students will interact with a Biotechnology faculty researcher to gain exposure to a specific research area and develop a research question relevant to this area. This interaction is also expected to expose students to the various ways of approaching a research question and the relevant techniques that could be used to answer the question. Students will be expected to incorporate these experiences with the theoretical aspects of the course. Students will write a critical literature review of their chosen research area, focusing on at least 3-5 published research papers of key importance which will demonstrate students' knowledge of the research area and their ability to critically evaluate research papers. This literature review provides the basis for development of the hypothesis to be tested and a research proposal. The research proposal will include the hypothesis to be tested and its basis, the experimental design and methodology/techniques to be applied and their justification (in a clear step wise trajectory of experiments), the expected result of each experiment, potential problems that could be encountered and how these could be addressed and any ethical/safety considerations. Additionally, students will be able to exercise their writing and presentation skills whilst applying their knowledge of the material learnt in class through written assignments and oral presentations. These exercises will include written critiques, discussion and presentation of journal articles related to their chosen research area. Quizzes will test student



knowledge and application of the theoretical aspects of the course. Group work being an important element of this course, students will also be required to engage in peer evaluation of in class assignments and presentations.

### XIII. Class Attendance System

Attendance is a core aspect of student retention, progression and academic achievement. It is the University's view that students who actively participate in their learning by attending classes regularly, are more likely to achieve better results and successfully complete their course.

The University expects students to attend all learning and teaching sessions associated with their program, as set out in course schedules and syllabi. Such learning and teaching sessions include, but are not limited to, lectures, seminars, tutorials, workshops, laboratory and practical sessions, professional placements, field trips, industrial visits, and in the case of directed or independent study students, scheduled meetings with supervisors.

Students are required to arrive on time for classes and remain for the duration of the teaching session. Late arrival at, and early departure from, teaching sessions is deemed disruptive, discourteous, unprofessional and unfair to other class members and tutors.

Students will be expected to:

- Attend all learning and teaching sessions associated with their program of study
- Notify their course instructors in advance (in person, by phone or e-mail) that they will be absent from time-tabled class sessions
- Obtain prior permission from their instructor or course manager, for planned absences of two or more consecutive class sessions during the semester
- Provide a medical certificate or other corroborating evidence to explain their absence, if required by the University.

Unsatisfactory student attendance includes failure regularly to attend learning and teaching sessions without providing a satisfactory reason to instructors for absence and/or persistent late arrival at, or early departure from, learning and teaching sessions.

Where a student fails to attend classes for two weeks cumulatively without the University's permission, the student will receive a "non-attendance warning

(NAW)”, and will be required to provide satisfactory explanation for the non-attendance. With each subsequent NAW issued, a formal report on the student’s non-attendance is made to his or her sponsor.

Where a student fails to attend classes for four or more weeks cumulatively, or where a recurring pattern of non-attendance (that is more than two NAWs) is observed, over the course of the semester, the student may be deemed to have failed the course, in which case he or she will receive an “F (Fail)” or “U (Unsatisfactory)” grade, as appropriate.

Course Instructors are responsible for reminding students of the importance of regular attendance at learning or teaching sessions, and for accurately recording student attendance. Instructors and Course Managers (Department Chairs or Program Coordinators) will be required to consult with the relevant School Deans, to ensure timely issuance of NAWs, non-attendance reports to sponsors (subject to data confidentiality stipulations) and to provide relevant academic counselling where necessary.

It is the policy of AURAK to make every reasonable effort to allow members of the University community to observe their religious holidays without academic penalty. Absence from class or examinations for religious reasons does not, however, relieve students from responsibility for any part of the course work required during the period of absence.

#### XIV. Additional information

##### A. The American University of Ras Al Khaimah Student Handbook:

Be sure that you read the latest edition of The American University of Ras Al Khaimah Student Handbook available at: <http://media.aurak.ac.ae/wp-content/uploads/2017/01/Student-Handbook-2016-17-23-Oct-16-24-Oct-2016.pdf>

You will be held responsible for all that is contained therein. The following points repeat or supplement, but in no way are intended to contradict, the policies in your handbook. In case of conflict, the last word is the Student Handbook.

##### B. Make-up for missed exams or quizzes:

Ordinarily, a student will receive a score of ‘0’ for any missed exam or quiz. However, at the instructor’s discretion, this rule may be relaxed, and a make-up exam may be given, or an alternative method of evaluating the student’s

knowledge of the course materials devised, only in the case of extreme emergencies (e.g., death in the family, severe illness) that are beyond the control of the student or when a student provides a written ‘excuse’ from a responsible party for missing the exam the next time he/she arrives on campus.

#### C. Late assignment/homework policy:

Assignments and homework should be handed in on the due date at the beginning of the class session. No late homework will be accepted for any reason.

#### D. Academic Misconduct:

Students should consult the American University of Ras Al Khaimah Catalog Book 2016 – 2017 that is available online <http://media.aurak.ac.ae/wp-content/uploads/2016/11/Catalog-2016-2017.pdf>

for the University policies on Academic Integrity, Plagiarism and Misconduct.

#### The Honour Code and Honour System:

The Honour Code is an integral part of university life. Students are responsible, therefore, for understanding the code’s provisions. Cheating and attempted cheating, plagiarism, lying, and stealing of academic work and related materials constitute Honour Code violations. In the spirit of the code, a student’s word is a declaration of good faith acceptable as truth in all academic matters. To maintain an academic community according to these standards, students and faculty must report all alleged violations to the Honour Committee.

AURAK expects its students to uphold high standards of academic integrity and conduct. In particular, students are required to:

- Attend classes regularly and punctually.
- Be actively involved in class discussions and other course related

classroom activities.

- Complete assignments on time.
- Meet the requirements for course and program completion.
- Abide by high standards of academic integrity, ethics, and honesty.
- Refrain from cheating on homework and examinations, plagiarizing other people's work by submitting it as their own, or any other forms of academic dishonesty.
- Adhere to the published test or examination rules and regulations.
- Make every effort to maintain good academic standing.

Given the internet and easy access to information and knowledge sources, the University is committed to students' learning in an ethical manner. For all academic assignments, project work, and presentations, students need to ensure that due acknowledgement is given to the source of any information which they incorporate in their work. The following are some examples of academic misconduct:

- Cheating/using unfair means in examinations
- Significant paraphrasing in written academic work that is unacknowledged
- Unacknowledged use of information or ideas unless such ideas are commonplace
- Citing sources which student has not read or referred to
- Breaching the word limit of assignments and mentioning wrong word count
- Plagiarism

Plagiarism:

Plagiarism is a serious academic offense. Plagiarism is the use of someone else's ideas, words, projects, artwork, phrasing, sentence structure or other work without properly acknowledging the ownership (source) of the property (item). Plagiarism is dishonest because it misrepresents the work of someone else as one's own. It is intellectual theft as it robs others of credit for their work. Plagiarism takes many forms including:

- Using someone else’s words without putting those words in quotation marks and providing full information about their source, sufficient information so that another person could easily locate the words that are being quoted, whether it is in an article, a book, or on the web.
- Using unique, original ideas, phrases, sentences, paragraphs, or other materials, etc. from a single source or a variety of sources such as a text, journal, web page, electronic source, design, artwork, etc. in one’s work without citing all sources. For a student found plagiarizing, the punishment will be a failing grade in the assignment without the right to redo the assignment up to a failing grade in the course.

#### Examples of Cheating:

Acts of cheating include, but are not limited to, the following:

1. Copying from another student’s paper during an exam, or allowing or encouraging another student to copy from your paper during an exam.
2. Having someone else take your exam in your place, or taking an exam for someone else.
3. Obtaining unauthorized access to exams and accepting exams obtained by unauthorized access.

#### Examples of Plagiarism:

Acts of plagiarism include, but are not limited to, the following:

1. Handing in as ‘original’, work prepared by someone else or preparing/completing someone else’s work.
2. Copying from a book or other publication without citing sources.
3. Using the same work to satisfy the requirements of two or more courses (during the same or different terms).
4. Having someone else rewrite a rough draft or rewriting a rough draft that is not your own work.

Violations of plagiarism are subject to evaluation according to the criterion of “reasonable doubt”. The student’s right to appeal and the procedures to be

followed in carrying out the appeal of the University's decision is clearly stated in the Student Handbook.

Any violations of the University's academic rules, regulations or directives are reported to the DVCAA and may result in one of the following disciplinary measures.

- Verbal or written warning
- Repeating the term
- Dismissal

Please refer to the relevant section in the Handbook and ensure a clear understanding of the provisions of the University honor code and honor system in order to avoid infringement of the policy and attendant penalization.

#### E. Mobile Phones:

All mobile phones, pagers and/or other communication devices should be turned off before entering the classroom. If your mobile device sounds off during class, you will be asked to leave the room, thereby incurring one-half absence. If your mobile device sounds off during an exam or quiz, you will not be allowed to make-up the exam or quiz.

#### F. Diversity and the Use of English:

English is the common language of the AURAK campus, the use of which includes everyone. It is the only language to be used in the classroom. AURAK brings together students and faculty from diverse cultural and linguistic backgrounds, which is one of the strengths of the university. This diversity provides an opportunity to share our different experiences and enlarge our understanding of the world. Classroom discussions and other activities are to be conducted with courtesy and civility and respect for one another and for our differences.