



Course Specification

— (Postgraduate Programs) عبدالمحسن بن عبدالعزيز آل سعود

Course Title: Cell Imaging

Course Code: BIO-6310 (Lab Course)

Program: Master of Science in Applied Biology

Department: Biology عبدالمحسن بن عبدالعزيز آل سعود

College: Science

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1

Last Revision Date: Pick Revision Date.

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A. General information about the course:

1. Course Identification:

1. Credit hours: 2(Lecture 1+ Lab 2)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track

B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 3 / second year)

4. Course general Description:

This graduate course offers a comprehensive exploration of cell imaging techniques, encompassing fundamental principles and practical applications. It equips biology students with the necessary knowledge to employ imaging techniques and processing of images for the benefit of their research. The course content covers specialized topics related to light microscopy as well as fluorescence microscopy. Additionally, the students through studying this course become familiar with some imaging techniques such as flow cytometry, cell migration, and electron microscopy. The course allows the students to gain hands-on experience in using Image software for image processing. The course further covers the imaging techniques of cell migration and software employed for image analysis.

5. Pre-requirements for this course (if any):

None

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6. Co-requisites for this course: (if any):

None.

7. Course Main Objective(s):

The course aims to provide students with a comprehensive understanding of cell imaging techniques. Acquaintance of light microscopy and fluorescence microscopy, and mastering staining techniques such as DAPI for nuclear visualization are among the course objectives. Through research projects, students will apply the appropriate imaging techniques as research tools to elucidate and confirm research results. The application of multiple imaging techniques with the other techniques in cell and molecular biology enhances the research quality and integrity.



2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%
2	E-learning		-
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	15
2.	Laboratory/Studio	30
3.	Field	-
4.	Tutorial	
5.	Others (specify).....	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Outline the principles of cell culture imaging and its application.	K1	-Lab Presentations and group discussions to introduce the cell imaging techniques	-Active participation in lab discussions. -Lab reports -lab exam



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	Demonstrate acquaintance with diverse imaging modalities such as light microscopy, fluorescence microscopy, electron microscopy, and flow cytometry.	K2	-Practical sessions to demonstrate types of microscopy and flow Cytometry technique -Lab discussions	-Active participation in lab discussions. -Lab reports -Lab exam
1.3	Identify a range of software used to process and analyze cell images.	K3	Laboratory sessions to demonstrate software applications	-Active participation in lab discussions. -Lab reports -Lab exam
2.0	Skills			
2.1	Apply practical skills to operate and optimize the various imaging instruments including light and electron microscopes, and flow cytometers.	S1	-Guided Lab work -Lab tutorials	-Active participation in lab sessions. -Lab reports -Lab exam
2.2	Design and conduct research work that is based on imaging and microscopy analysis of living cells.	S2	-Guided lab experiments -Group discussions	-Lab reports -Presentations
2.3	Use the Image software, and employ professional skills to apply digital image processing and analysis.	S3	-Guided hands-on lab work to apply digital imaging and analysis using proper software -Group discussions	-Active participation in lab applications -Presentations
3.0	Values, autonomy, and responsibility			
3.1	Show independence in carrying out research projects and cooperate effectively with a research team.	V1	-Guided lab research work -Group discussions	-Lab reports -Presentations by research groups
3.2	Share in discussions of scientific issues and demonstrate proficiency in presenting	V2	-Tutorials on presenting research data -Seminars	-Presentations -Lab reports



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	research results to varied audiences.		-Group discussions	
3.3	Adhere to values of responsibility in handling cell imaging techniques.	V3	-Tutorials on research ethics	-Lab reports

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C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction to Cell Imaging: -Overview of Cell Biology. -Historical Perspectives of cell imaging techniques. -Importance of cell imaging in research	2
2.	Light Microscopy Basics: -Principles of Light Microscopy. -Bright field and phase-contrast microscopy. -Microscope components and operation.	2
3.	Fluorescence Microscopy: -Introduction to fluorescence microscopy -Principles of fluorescence and fluorophores. -Fluorescent dyes used in cell Imaging.	2
4.	Applications of Fluorescence Microscopy (Dye Staining): -Nuclear staining techniques. -Applications in chromatin and DNA Studies -DAPI staining and Hoechst.	3
5.	Flow Cytometry Basics: -Introduction to flow cytometry. -Principles of flow cytometry: Light scattering and fluorescence	2
6.	Applications of Flow Cytometry: -Cell cycle analysis. -Detection of apoptotic cells by flow cytometry. -Imaging of flow cytometry analysis	3



7.	Cell Imaging of Cell Migration: -Overview of cell migration and its applications in molecular research. -Scratch assay (wound healing assay) -Imaging of migrating cells	2
8.	Electron Microscopy: -Principles of transmission electron microscopy (TEM). -Structure of TEM -Stains used to contrast cells in TEM -Imaging of cellular ultrastructural details	2
9.	Electron Microscopy: -Principles of scanning electron microscopy (SEM). -Structure of SEM -Coating of specimen surface -Imaging of surface details	2
10.	Imaging of DNA	2
11.	Introduction to Imaging Software: -Overview of digital imaging and its capabilities. - Importance of Image analysis in the procedures of cell imaging.	2
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exams	5 th & 10 th weeks	30 %
2.	Quizzes, presentations, lab reports, participation, attendance, data search, assignments	Throughout the semester duration	30 %
4	Final lab exam	16 th week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A. Matsudaira, P. (2021). Molecular Cell Biology (9th ed.). W. H. Freeman D.J. Taatjes, J. Roth.(2013). Cell imaging Techniques: Methods and Protocols (2nd ed.), Humana Press, New York. Kubitscheck, U. (2019). Fluorescence Microscopy: From Principles to Biological Applications. Wiley. Ormerod, M. G. (2006). Flow Cytometry: A Practical Approach (3rd ed.), Wiley.
Supportive References	https://www.gu.se/sites/default/files/202008/SC00004_Course_syllabus.pdf
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Well-equipped lab
Technology equipment (Projector, smart board, software)	Projector and smart board
Other equipment (Depending on the nature of the specialty)	Light and fluorescent microscopes

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect



Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of students assessment	Faculty	Direct
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

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G. Specification Approval Data:

COUNCIL /COMMITTEE	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445

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