




**Ahmedabad  
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Course	BPS103 Microscopy and Imaging	Semester	Monsoon Semester 2024	
Faculty Name(s)	Ritesh Shukla	Contact	ritesh.shukla@ahduni.edu.in	
School	SAS	Credits	3	
GER Category:	Not Applicable	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP	
Schedule	Section 1	11:00 am to 12:30 pm	Thu	01-08-24 to 26-11-24
		11:00 am to 12:30 pm	Tue	01-08-24 to 26-11-24
Prerequisite	BIO101 Introductory Biology & BIO102 Introductory Biology practical/BIO106 Introductory Biology practical			
Antirequisite	Not Applicable			
Corequisite	Not Applicable			
Course Description	<p>Microscopy &amp; Imaging is an elective course designed at teaching the fundamentals of microscopy by introducing the students to concepts of optics, principle, instrumentation, Applications of different microscope, sample preparation, staining (if required) and image formation. Students will also be acquainted to the use of microscope in the laboratory through hands on sessions.</p> <p>It is an entry level course aimed at preparing the undergraduate and doctoral students for better understanding about microscopy &amp; its application in biological sciences.</p>			

Course Objectives	<p>The objectives of the course are:</p> <ol style="list-style-type: none"> <li>1. Provide fundamentals of optics and its correlation with microscopy</li> <li>2. Provide hands on knowledge about light microscopy and its parts</li> <li>3. To give comprehensive information about various type of microscope &amp; its application in biological sciences.</li> <li>4. To provide descriptive knowledge about sample preparation of material and biological samples for Electron Microscope</li> </ol>
Learning Outcomes	<p>At the end of this course, students shall be able to</p> <ol style="list-style-type: none"> <li>1. Understand the basics of different microscopes</li> <li>2. Handle the bright field microscope independently (especially focusing the specimen under microscope)</li> <li>3. Choose the appropriate microscope for the required application.</li> </ol>
Pedagogy	Lectures, Experimental Learning (Learning by Observation & Learning by Experience), Group Discussions, Quiz.
Expectation From Students	Regular attendance, pre-reading is requisite. Students are expected to know the basics of class 12th Physics (Laws of optics) and participate in the class discussion.
Assessment/Evaluation	<ul style="list-style-type: none"> <li>• End Semester Examination: <ul style="list-style-type: none"> <li>◦ Written - 40%</li> </ul> </li> <li>• Other Components: <ul style="list-style-type: none"> <li>◦ Class Test - 30%</li> <li>◦ Lab Based Assignment - 30%</li> </ul> </li> </ul>
Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	<p>As part of the continuous evaluation, students are expected to do individual assignment. The details of which are given below:</p> <ul style="list-style-type: none"> <li>• Each student will handle the light microscope (Bright field and Phase) and fluorescent microscope independently.</li> <li>• The objective of this assignment is to encourage students to get the hands on exposure to the various microscope and also get information about its parts.</li> </ul> <p>The assignment will be carried out after mid-term examination and evaluated before term end examination.</p>

Course Material	<p>Text Book(s)</p> <ul style="list-style-type: none"> <li>• Fundamentals of Light Microscopy and Electronic Imaging, Douglas B. Murphy, John Wiley &amp; Sons Inc Publishers, ISBN: 0-471-25391-X,</li> <li>• Fundamentals of Light Microscopy and Electronic Imaging, Douglas B. Murphy, John Wiley &amp; Sons Inc Publishers, ISBN: 0-471-25391-X,</li> <li>• Forensic Microscopy-Truth under the Lenses, Ritesh K Shukla, Neeti Kapoor, Ashish Badiye, 1 Edition, TAYLOR &amp; FRANCIS, ISBN: 9781032283289, Year: 2022,</li> </ul> <p>Reference Book</p> <ul style="list-style-type: none"> <li>• Electron Microscopy and Analysis, Peter J. Goodhew , John Humphreys, Richard Beanland, 3 Edition, TAYLOR &amp; FRANCIS, ISBN: 0748409688,</li> <li>• Electron Microscopy and Analysis, Peter J. Goodhew , John Humphreys, Richard Beanland, 3 Edition, TAYLOR &amp; FRANCIS, ISBN: 0748409688,</li> </ul>
Additional Information	Students should be aware about the basic handling of Light Microscope in the Laboratory.

## Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introductory Session	Introduction	Text Book: The Microscope	Lecture	
2	Basics of optics	Introduction & Terminology	Text Book: The Microscope Chapter 2 / Microscopy and photomicrography Chapter 1	Power point presentation & Class interaction & participation	
3	Mirror	Convex mirror & Image Formation	Text Book: The Microscope Chapter 2 / Teaching material (Class notes)	Chalk & Talk, Class participation	
4		Concave mirror & Image Formation	Text Book: The Microscope Chapter 2 / Teaching material (Class notes)	Chalk & Talk, Class participation	
5	Lens	Convex Lens & Image Formation	Text Book: The Microscope Chapter 2 / Teaching material (Class notes)	Chalk & Talk, Class participation	
6		Concave Lens & Image Formation	Text Book: The Microscope Chapter 2 / Teaching material (Class notes)	Chalk & Talk, Class participation	
7		Lens Formula derivation	Teaching material (Class notes)	Chalk & Talk, Class participation	
8		Wavelength, Magnification power, Resolution limit	Text Book: The Microscope Chapter 2 / Microscopy and photomicrography Chapter 3	Power point presentation & Class interaction & participation	
9	History of microscopes	Introduction	Text Book: The Microscope Chapter 1	Lecture, Class interaction & participation	

10	Simple Microscope	Parts of simple microscope and their functions	Microscopy and photomicrography Chapter 2	Power point presentation & Class interaction & participation/ Lab visit	
11	Bright field Microscope	Principle, Instrumentation, Image Formation	Microscopy and photomicrography Chapter 4	Power point presentation & Class interaction & participation/ Lab visit	
12		Preparation of specimens & applications	Teaching material (Class notes)	Class interaction & participation/ Hands on	
13	Dark field microscopy	Principle, Instrumentation, Image Formation	Microscopy and photomicrography Chapter 11	Lecture, Class interaction & participation	
14	Class Test/ Quiz			Written Exam/ Viva	
15	Phase Contrast microscopy	Principle, Instrumentation, Image Formation	Microscopy and photomicrography Chapter 6	Class interaction & participation/ Hands on	
16	Stereo Microscope	Principle, Instrumentation, Image Formation	Microscopy and photomicrography Chapter 4	Class interaction & participation/ Hands on	
17	Fluorescence Microscopy	Basics of Fluorescence	Microscopy and photomicrography Chapter 9	Power point presentation & Class interaction & participation/ Lab visit	
18		Principle, Instrumentation, Image Formation, Application	Teaching material (Class notes)	Class interaction & participation/ Hands on	
19	Confocal Microscopy	Principle, Instrumentation, Image Formation, Application	Microscopy and photomicrography Chapter 9/ Teaching material (Class notes)	Power point presentation & Class interaction & participation	
20	Electron microscopy	Introduction & Application	Bioimaging, Current Concepts in Light and Electron Microscopy Chapter 1	Lecture	

21	Transmission Electron Microscopy	Principle, Instrumentation	Teaching material (Class notes)	Class interaction & participation/ Hands on	
22		Sample Preparation & Application	Teaching material (Class notes)	Class interaction & participation/ Hands on	
23	Scanning Electron Microscopy	Principle, Instrumentation	Teaching material (Class notes)	Class interaction & participation/ Hands on	
24		Sample Preparation & Application	Teaching material (Class notes)	Class interaction & participation/ Hands on	
25	Energy Dispersive X Ray	Principle\n& Application	Teaching material (Class notes)	Class interaction & participation/ Hands on	
26	Class Test/ Quiz			Written Exam/ Viva	
27	Revision				
28	Revision				

