

Course Description Form

<p>1. Course Name: Infrared and Thermal Imaging</p> <p>2. Course Code: WBM-51-02</p> <p>3. Semester / Year: First Semester / Five Year</p> <p>4. Description Preparation Date: 12/24/2025</p> <p>5. Available Attendance Forms: Bologna system attendance form</p> <p>6. Number of Credit Hours (Total) / Number of Units (Total) 30 Hours / 2 Units</p> <p>7. Course administrator's name (mention all, if more than one name) Name: Karrar Aqeel Hussein Email: karrar.aqeel@uowa.edu.iq</p>																	
<p>8. Course Objectives</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">Course Objectives</td> <td style="width: 50%; padding: 5px;">Infrared thermal imaging aims to identify the technology of generating quantitative radiometric digital images of object scenes recorded at infrared thermal wavelengths. Besides qualitative visualization as well, it allows measuring the surface temperatures of objects.</td> </tr> </table>						Course Objectives	Infrared thermal imaging aims to identify the technology of generating quantitative radiometric digital images of object scenes recorded at infrared thermal wavelengths. Besides qualitative visualization as well, it allows measuring the surface temperatures of objects.										
Course Objectives	Infrared thermal imaging aims to identify the technology of generating quantitative radiometric digital images of object scenes recorded at infrared thermal wavelengths. Besides qualitative visualization as well, it allows measuring the surface temperatures of objects.																
<p>9. Teaching and Learning Strategies</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 5px;">Strategy</td> <td style="width: 85%; padding: 5px;"> <input type="checkbox"/> Giving detailed theoretical lectures. <input type="checkbox"/> Request periodic reports on the basic topics of the subject. </td> </tr> </table>						Strategy	<input type="checkbox"/> Giving detailed theoretical lectures. <input type="checkbox"/> Request periodic reports on the basic topics of the subject.										
Strategy	<input type="checkbox"/> Giving detailed theoretical lectures. <input type="checkbox"/> Request periodic reports on the basic topics of the subject.																
<p>10. Course Structure</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Week</th> <th style="width: 10%;">Hours</th> <th style="width: 10%;">Required Learning Outcomes</th> <th style="width: 40%;">Unit or subject name</th> <th style="width: 15%;">Learning method</th> <th style="width: 15%;">Evaluation method</th> </tr> </thead> <tbody> <tr> <td>1,2</td> <td>4</td> <td>1</td> <td>Introduction: Infrared and Thermal Imaging, History of IR, General Definition Of</td> <td>Lecture</td> <td>NA</td> </tr> </tbody> </table>						Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method	1,2	4	1	Introduction: Infrared and Thermal Imaging, History of IR, General Definition Of	Lecture	NA
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method												
1,2	4	1	Introduction: Infrared and Thermal Imaging, History of IR, General Definition Of	Lecture	NA												

			Thermography, Principle Used In Thermography, Thermal Imaging Cameras, History Of Electromagnetic Waves. Electromagnetic Waves and the Electromagnetic Spectrum, Nature of electromagnetic Waves, Radio Waves, Micro Waves, Infrared Waves, Visible Light, Ultra violet, X-rays, Gamma Rays.		
3,4,5	6	1	Basics of Geometrical Optics for Infrared Radiation, Behavior of Waves, Reflection, Refraction, Interference, Diffraction, Laws of Reflection and Refraction, Reflection of Light from Optical Surface, Smooth Surface Reflection, Rough Surface Reflection, Reflection Index, Snell's Law, Refraction in Prism. Basic Radiometry, Radiant Power, Excitance, Irradiance, Spectral Densities of Radiometric Quantities, Radiant intensity, Radiance and Lambertian Emitter, Radiation Transfer between surfaces.	Lecture	HW
5,6,7	6	1	Blackbody Radiation, Blackbody Radiation Definition, Planck Distribution Function for Blackbody Radiation, Different Representations of Planck's Law, Stefan-Boltzmann Law, Band Emission. Emissivity definition, Classification of Objects According to Emissivity, Emissivity and Kirchhoff's Law, Parameters Affecting the Value of Emissivity. Instruments Overview, Introduction and Classification of Instruments, Instrument Manufacturers, Discussion of Instruments, Infrared thermocouples and probes, Portable hand-held instruments, Infrared cameras (thermal imagers).	Lecture	Quizzes

8	2	1	Diagnostic Thermal Image-Processing Capabilities, Quantitative Thermal Measurements of Targets, Detailed Processing and Image Diagnostics, Image Recording, Storage and Recovery, Image Comparison, Thermal Image Fusion, Report and Database Preparation.	Lecture	HW
9	2	1	Camera Systems, Standards, and Calibration, The Imaging System, Temperature Reference, Mounting the Imager, Camera Initialization, Patient Position and Image Capture, Location for Thermal Imaging, Ambient Temperature Control, Pre-Imaging Equilibration, Positions for Imaging, Field of View.	Lecture	Quizzes
10	2	1	Usage of IR-based technologies in medical applications: Screening of breast cancer, Screening of diabetic neuropathy and vascular disorders.	Lecture	HW
11	2	1	Usage of IR-based technologies in medical applications: Usage in Raynaud's phenomenon, Usage for body temperature monitoring.	Lecture	Quizzes
12	2	1	Usage of IR-based technologies in medical applications: Usage for diagnosis of skin diseases, Usage for diagnosis of rheumatic diseases.	Lecture	HW
13	2	1	Usage of IR-based Technologies in Medical Applications Usage for Diagnosis of Ocular Diseases, Usage for Diagnosis of Pain.	Lecture	HW
14	2	1	Why use Thermal Imaging Cameras, Infrared Thermometers		

15	2	1	<p>- Thermal Imaging Cameras, Finding Problems Faster and with Extreme Accuracy, Use Thousands of Infrared Thermometers at the Same Time.</p> <p>Camera Types, Thermal Detector Types, The lens.</p>	Lecture	HW
----	---	---	--	---------	----

11. Course Evaluation

- 1- Daily exams scientific questions.
- 2- Establishing grades for environmental duties and the reports assigned to them.
- 3- Semester exams for the curriculum, in addition to the mid-year exam and final exam

12. Learning and Teaching Resources

1. Practical applications of infrared thermal sensing and imaging equipment / by Herbert Kaplan. — 3rd ed.
2. Infrared Thermal Imaging Fundamentals, Research and Applications/ Michael n and Klaus-Peter Mollmann