

## Course Description Form of Infrared and Thermal Imaging

1. Course Name:				
<b>Infrared and Thermal Imaging</b>				
2. Course Code:				
WBM-51-02				
3. Semester / Year:				
Semester 1/2023				
4. Description Preparation Date:				
2024-03-20				
5. Available Attendance Forms:				
presence in the classroom				
6. Number of Credit Hours (Total) / Number of Units (Total)				
30 Hours / 2 Units				
7. Course administrator's name (mention all, if more than one name)				
Name: Maryam Abdullah Saib Email: Mayram.ab@uowa.edu.iq				
8. Course Objectives				
<b>Course Objectives</b>		<ul style="list-style-type: none"> <li>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.</li> </ul>		
9. Teaching and Learning Strategies				
<b>Strategy</b>		<ul style="list-style-type: none"> <li>Giving detailed theoretical lectures.</li> <li>Request periodic reports on the basic topics of the subject.</li> </ul>		
10. Course Structure				
<b>Week</b>	<b>Hours</b>	<b>Unit or subject name</b>	<b>Learning method</b>	<b>Evaluation method</b>
1, 2	4	Introduction: Infrared and Thermal Imaging, History of IR, General Definition Of 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	Lectures presented in PDF format	Daily exams + homework assignments + monthly exams

		Light, Ultra violet, X-rays, Gamma Rays.		
3, 4	4	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.	Lectures presented in PDF format	Daily exams homework assignments monthly exams
5, 6, 7	6	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).	Lectures presented in PDF format	Daily exams homework assignments monthly exams
8	2	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.	Lectures presented in PDF format	Daily exams homework assignments monthly exams
9	2	Camera Systems, Standards, and Calibration, The Imaging System,	Lectures presented	Daily exams homework

		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.	d in PDF format	assignments monthly
10	2	Usage of IR-based technologies in medical applications: Screening of breast cancer, Screening of diabetic neuropathy and vascular disorders.	Lectures presented in PDF format	Daily exams homework assignments monthly
11	2	Usage of IR-based technologies in medical applications: Usage in Raynaud's phenomenon, Usage for body temperature monitoring.	Lectures presented in PDF format	Daily exams homework assignments monthly
12	2	Usage of IR-based technologies in medical applications: Usage for diagnosis of skin diseases, Usage for diagnosis of rheumatic diseases.	Lectures presented in PDF format	Daily exams homework assignments monthly
13	2	Usage of IR-based Technologies in Medical Applications Usage for Diagnosis of Ocular Diseases, Usage for Diagnosis of Pain.	Lectures presented in PDF format	Daily exams homework assignments monthly
14	2	Why use Thermal Imaging Cameras, Infrared Thermometers - Thermal Imaging Cameras, Finding Problems Faster and with Extreme Accuracy, Use Thousands of Infrared Thermometers at the Same Time.	Lectures presented in PDF format	Daily exams homework assignments monthly
15	2	Camera Types, Thermal Detector Types, The lens.	Lectures presented in PDF format	Daily exams homework assignments monthly

## 11. Course Evaluation

- Daily exams scientific questions.
- Establishing grades for environmental duties and the reports assigned to them.
- 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 M'ollmann