STUDENT LAB SAFETY, HIRARC, DATASHEET VERIFICATION CHECKLIST, AND BRIEF REPORT SUBMISSION

EXPERIMENT PCB2: PCB Layout Design 2

STUDENT NAME : _____
MATRIC NO. : _____
GROUP : _____
DATE : _____

STUDENT FABRICATION OBSERVATION RECORD
Students shall observe and briefly record: (i) PCB loading/alignment, (ii) direct photoresist printing, (iii) printed-pattern inspection, (iv) subsequent board processing demonstrated by technical staff, and (v) final PCB inspection.

A. PCB Design and Fabrication Verification Checklist

Item	**Verification Requirement**	✓
Previous Project	PCB1 project successfully loaded	☐
Schematic Verification	Original schematic verified before conversion	☐
PCB Conversion	Schematic converted to PCB successfully	☐
Board Outline	PCB size set to 20 mm × 20 mm	☐
Component Placement	Components positioned appropriately	☐
Trace Routing	All electrical connections completed	☐
Design Rule Check (DRC)	No DRC errors detected	☐
Copper Clearance	Clearance complies with DRC settings	☐
Track Width	Appropriate track width selected	☐
Pad Dimensions	Pads suitable for manufacturing	☐
Ground Connections	Ground nets connected correctly	☐
Silkscreen	Component labels visible and readable	☐
Export File	PCB artwork exported correctly	☐
BMP Conversion	2-bit monochrome BMP generated	☐
Resolution Verification	1440 dpi verified	☐
Fabrication File Approval	Instructor/Technician approval obtained	☐

B. HIRARC Checklist

Hazard / Unsafe Condition	**Potential Consequence**	**Control Measure**	✓
Incorrect PCB outline size	Fabrication failure	Verify dimensions before export	☐
Components placed too close	Assembly difficulty	Follow recommended spacing rules	☐
Insufficient trace clearance	Short circuit risk	Run DRC before submission	☐
Incorrect pad size	Poor solderability	Verify footprint specifications	☐

Missing ground connection	Circuit malfunction	Perform electrical rule verification	☐
Improper file conversion	Fabrication defects	Verify bitmap specifications	☐
Exposure to fabrication chemicals	Chemical injury	Students observe only; staff handle chemicals	☐
Contact with printing equipment	Physical injury	Maintain safe observation distance	☐
Laser measurement exposure	Equipment misuse risk	Operated only by technical staff	☐
Incorrect measurement recording	Invalid engineering conclusions	Verify measurements before reporting	☐
Data falsification	Breach of engineering ethics	Record actual observed results only	☐
Failure to save PCB files	Loss of design work	Maintain file backup	☐

C. Engineering Practice Verification

Requirement	✓
PCB layout follows good engineering practice	☐
Component placement justified	☐
Trace routing optimized	☐
DRC completed successfully	☐
Manufacturing constraints considered	☐
PCB dimensions verified	☐
Fabrication file validated	☐
KEYENCE measurements compared with design values	☐
Measurement results recorded accurately	☐
Design prepared for fabrication stage	☐

D. Student Declaration

I confirm that:

☐ The PCB layout has been verified before fabrication file export.

☐ All DRC errors have been resolved.

☐ PCB dimensions comply with laboratory requirements.

☐ The fabrication BMP file satisfies the required specifications.

☐ PCB fabrication activities were observed in accordance with laboratory safety requirements.

☐ KEYENCE measurements were recorded based on actual observations.

☐ Results presented in this report represent actual measured and observed data.

☐ Engineering ethics and data integrity requirements were maintained throughout the experiment.

Student Signature : _____

Date : _____

E. Experiment Data Results and Discussion
In-Lab Task (During Lab)

PCB Design Parameters

Parameter	Design Value
PCB Size	
Copper Layer	
Minimum Trace Width	
Minimum Clearance	
Number of Components	
Number of Nets	
Number of Pads	

Fabrication File Verification

Parameter	Required Value	Actual Value
File Format	BMP	
Colour Mode	2-bit Monochrome	
Resolution	1440 dpi	
Pixel Pitch	≈17.6 μm	
Artwork Size	≈1134 × 1134 pixels	

PCB Pattern Measurement Results (KEYENCE)

Parameter	Nominal Design Value	Measured Value	Deviation	% Error
Track Width				
Track Spacing				
Pad Diameter				
Feature Width				
Surface Step Height				

Fabrication Verification Item	Required / Recorded Value	✓
PCB physical size	20 mm × 20 mm	☐
BMP colour format	2-bit monochrome bitmap (*.bmp)	☐
Resolution	1440 dpi	☐
Pixel pitch	≈ 17.6 μm	☐
Expected image size for 20 mm square	≈ 1134 × 1134 px	☐
DRC	Passed / Error-free	☐
Artwork scale	Verified; no rescaling during conversion	☐
Orientation / mirroring	Verified with instructor/technician for the laboratory printer	☐
Printed resist pattern	Observed and compared with approved PCB layout	☐
Final PCB	Final PCB inspection observed; verification recorded as directed	☐
Final BMP filename	_____	☐

Student measurement observation / discussion:

DISCUSSION:
CONCLUSION:

LAB LECTURER
SIGNATURE : _____

DATE : _____

INSTRUCTOR
SIGNATURE : _____

DATE : _____