I Semester

Foundation Studio I

Course Code	2BBD101	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:56:0:80	**Viva Marks**	50
Total Hours of Pedagogy	150 Hrs.	**Total Marks**	100
Credits	5	**Exam Hours**	-

Course Learning

Design begins not with a solution but with the identification and understanding of a meaningful problem.
This semester studio introduces students to the fundamental practice of observing people, environments, objects, services and systems in order to identify opportunities for design intervention. Students learn to distinguish between a symptom, need, user pain point, opportunity and design problem.
The studio follows a simplified human-centred design process:
Observe → Explore → Empathize → Define → Analyse → Reframe → Communicate
Rather than asking students to immediately create finished products, the course emphasizes problem discovery, research, observation, questioning, documentation and problem framing.

Course Objectives

• Understand the role of problem identification in the design process.
• Observe and document people, objects, environments and interactions.
• Identify user needs, pain points and opportunities.
• Conduct basic primary and secondary design research.
• Apply introductory human-centred design methods.
• Analyse qualitative information obtained from users.
• Distinguish between assumptions and evidence.
• Frame and reframe design problems.
• Develop a clear design problem statement.
• Communicate research findings through sketches, diagrams, maps, photographs and presentations.
• Demonstrate ethical, inclusive and socially responsible design thinking.
• Reflect on the design process through a studio journal/portfolio.

Teaching-Learning Process (General Instructions)

The modules and principal competencies define a common academic structure for the course. The instructor may determine the pedagogy, sequencing, examples, projects, exercises, workshops, field/site visits, practitioner or industry interactions, digital tools and other learning experiences according to the course context, student cohort, available resources and professional relevance, provided the stated course outcomes and principal competencies are addressed.

The course may employ learning-by-doing, discussion, demonstration, guided inquiry, studio practice and/or other appropriate pedagogic approaches. The emphasis should remain on active observation, investigation, analysis, reflection and problem framing.

Illustrative Learning Approaches : Studio demonstrations, design exercises, field/site visits, user interviews or other appropriate research engagements, observation exercises, group discussions, peer critique, faculty tutorials, case-study analysis, workshops, community/practitioner/industry interaction, reflective journals, presentations and iterative submissions. The instructor may select, sequence, combine or substitute approaches according to course intent and context.

Module I - UNDERSTANDING DESIGN AND DESIGN PROBLEMS

1.1 Introduction to Design
• What is design? Design as a process, Design as problem solving, Design as communication, Design as human activity, Designer's role in society, Difference between art, craft, engineering and design
• Design disciplines: Product design, Communication design, Interaction design, Fashion design, Interior/spatial design, Service design, Social design, Experience design
1.2 What is a Design Problem?
Problem vs challenge, Need vs want, Symptom vs root problem, User problem vs business problem, Individual vs community problems, Simple vs complex problems, Well-defined vs ill-defined problems, Wicked problems - introductory understanding, Problem spaces and solution spaces
1.3 Design Thinking
Introduction to : Empathy, Define, Ideate, Prototype, Test, Divergent thinking, Convergent thinking, Iterative design
1.4 Design Opportunity
Students explore how an everyday inconvenience can become a design opportunity.
Studio Output : Design observation sheet, a suitable selection of problematic-design photographs sufficient to demonstrate observation and problem discovery. Problem vs solution worksheet, Design problem diary.

Teaching-Learning Process	Teaching-Learning Process 1) Interactive lecture and discussion using familiar everyday examples to distinguish design, art, craft and engineering. 2) Case-study comparison of well-defined, ill-defined and wicked problems. 3) Guided problem-versus-solution sorting exercise and design opportunity diary. 4) Studio exercise: document everyday design problems through photographs and observation sheets. 5) Peer discussion to review problem discovery and initial framing.

Module II - OBSERVATION, EMPATHY AND CONTEXT

2.1 Observation as a Design Skill
Looking vs seeing, Passive vs active observation, Objective vs subjective observation, Visual documentation, Behavioural observation, Environmental observation, Temporal observation
2.2 Understanding Users
Who is the user?, Primary and secondary users, Stakeholders, User groups, Extreme users, Vulnerable users, Non-users
2.3 Empathy
Understanding user experiences, Empathy vs sympathy, User emotions, Motivations, Frustrations, Expectations, Behavioural patterns
2.4 Context
Students examine: Physical context, Social context, Cultural context, Economic context, Technological context, Environmental context
2.5 Observation Methods
Introduction to: Shadowing, AEIOU framework, Fly-on-the-wall observation, Photo documentation, Video documentation, Behaviour mapping, Activity mapping, Spatial mapping, Personal journey documentation
Studio Output : Observation journal, Context photographs, Behaviour map, User profiles, Empathy map, Field notes

Teaching-Learning Process	Teaching-Learning Process 1) Guided observation exercises in campus or other accessible everyday settings. 2) Field observation, shadowing and photo documentation, with consent and respect for privacy. 3) Demonstration of AEIOU, behaviour mapping, activity mapping and context mapping. 4) Individual and group preparation of user profiles, empathy maps and field notes. 5) Faculty tutorials and peer critique to compare observations with assumptions.

Module III - DESIGN RESEARCH AND USER INVESTIGATION

3.1 Primary Research
Observation, Interviews, Questionnaires, Surveys, Contextual inquiry, Informal conversations, Expert interviews
3.2 Interview Techniques
Open-ended questions, Closed questions, Probing questions, Neutral questions, Avoiding leading questions, Active listening, Note-taking, Audio/video documentation with permission
3.3 Secondary Research
Books, Journals, Government reports, Census information, Institutional reports, Websites, News archives, Existing research, Case studies
3.4 Research Ethics
Informed consent, Privacy, Anonymity, Respectful photography, Responsible documentation, Avoiding manipulation of information, Intellectual property, Copyright, Responsible use of AI-generated content
3.5 User Research Tools
Persona, Empathy Map, Journey Map, Stakeholder Map
Studio Output : Research plan, Interview guide, a context-appropriate range and range of user engagements/interviews sufficient to generate credible evidence for the selected problem context. Observation documentation, Secondary research summary, Persona, Empathy map, Journey map, Stakeholder map.

Teaching-Learning Process	Teaching-Learning Process 1) Demonstration and practice of open-ended, neutral and probing interview questions. 2) Conduct supervised user interviews or contextual inquiry with informed consent. 3) Guided secondary research using books, journals, institutional reports and credible websites. 4) Workshop on research ethics, privacy, attribution and responsible documentation. 5) Studio tutorials to develop a research plan, interview guide, persona, empathy map, journey map and stakeholder map.

Module IV - ANALYSIS, SYNTHESIS AND PROBLEM REFRAMING

4.1 From Data to Insight
Learn to distinguish : Data → Observation → Pattern → Insight → Opportunity
4.2 Affinity Mapping
Learn : Write individual observations, Put each observation on a card/sticky note, Group similar observations, Name clusters, Identify relationships, Find patterns.
4.3 Categorisation
Learn to categories : Functional, Emotional, Social, Environmental, Economic, Cultural, Accessibility, Technological
4.4 Root Cause Analysis
Introduction to : 5 Whys, Fishbone diagram, Cause-and-effect mapping, Problem tree
4.5 Reframing
Learn to transform : "How Might We?"
Studio Output : Affinity map, Problem tree, Root-cause analysis, Insight statements, Opportunity map, Three alternative problem framings, "How Might We" questions.

Teaching-Learning Process	Teaching-Learning Process 1) Demonstration of affinity mapping using observations gathered by students. 2) Group workshop to categorise evidence and identify patterns, themes and insights. 3) Guided practice using the 5 Whys, fishbone diagram and problem tree. 4) Peer review of insight statements and alternative problem framings. 5) Faculty-led critique to refine How Might We questions and opportunity maps.

Module V - PROBLEM DEFINITION AND DESIGN OPPORTUNITY

5.1 Selecting a Problem : Evaluate potential effectively
5.2 Problem Statement : Structure User Needs [insight/evidence].
5.3 Design Challenge Statement
A strong statement identifying : User, Context, Need, Evidence, Opportunity, Constraints
5.4 Design Research Report and Portfolio
Final report should contain : Project title, Background, Initial problem, Context, Research objectives, User group, Research methods, Field observations, Interview findings, Secondary research, User profiles, Empathy map, Journey map, Stakeholder map, Affinity mapping, Key insights, Root-cause analysis, Opportunity areas, Problem reframing, Final problem statement, Design challenge, Constraints, Ethical considerations, Reflection, Bibliography

Teaching-Learning Process	Teaching-Learning Process 1) Studio tutorial to evaluate and select a problem using evidence, relevance and feasibility. 2) Demonstration of problem statements and design challenge statements using user, context, need, evidence, opportunity and constraints. 3) Individual or team consultations to organise research findings into a coherent report and portfolio. 4) Pin-up presentations and peer critique of problem framing and supporting evidence. 5) Reflective review of ethical considerations, limitations and next steps; students are not required to solve the problem.

Course Outcome:

•CO1: Analyse design opportunities by examining context, people, systems, meanings and constraints, drawing upon relevant methods and concepts from parallel courses.
•CO2: Synthesise research findings and contextual evidence into design insights, criteria and requirements that inform defensible design decisions.
•CO3: Reframe design opportunities and develop alternative design concepts in response to identified needs, contextual conditions and established design criteria.
•CO4: Develop design propositions through appropriate prototyping and systematic testing, using observations, feedback and evaluation to assess and refine their effectiveness.
•CO5: Critically reflect on the design process and communicate design decisions through reasoned explanations, documented iterations and a coherent studio journal or portfolio.

Assessment Details (both CIE and SEE)

• The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.
• To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of maximum marks for CIE.
• To pass the SEE, a student must score at least 50% of Maximum marks for SEE.
• Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 50% out of 100 marks.

Suggested Learning Resources:

• The Design of Everyday Things, Revised and expanded edition by Don Norman, The MIT Press, 2014
• Change by Design: How Design Thinking Transforms Organizagons and Inspires Innovagon by Tim Brown, Harper Collins, 2009
• 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization by Vijay Kumar, Wiley & Sons Ltd 2012
• This Is Service Design Doing by Marc Stickdorn et al. O'Reilly Media 2018

Additional Reference Books:

• Bruno Munari - Design as Art
• Bruno Munari - How to See
• Mike Press & Rachel Cooper - The Design Experience
• David Kelley & Tom Kelley - Creative Confidence
• Dan Saffer - Designing for Interaction
• Bill Buxton - Sketching User Experiences
• Peter L. Phillips - Creating the Perfect Design Brief
• William Lidwell, Kritina Holden & Jill Butler - Universal Principles of Design
• Ergonomics for Beginners - Jan Dul & Bernard Weerdmeester
• Henry Dreyfuss - Designing for People

Web links and Video Lectures (e-Resources)

• IDEO Design Thinking Resources
• Interaction Design Foundation
• Nielsen Norman Group
• Google Design
• Design Council - Double Diamond

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Design Tasks
• "IDENTIFY A REAL DESIGN PROBLEM" Each student / team selects a real-world context. (examples)
• Campus : Classroom, Library, Canteen, Hostel, Transportation, Student services etc.
• Community : Local market, Public transport, Public toilet, Waste management, Water access, Street vending etc.
• Home : Cooking, Storage, Cleaning, Elderly care, Children's activities etc.
• Digital : College website, Online admission, Digital payment, Government service, Educational platform etc.
• Environment : Waste segregation, Water conservation, Energy consumption, Plastic use, Public cleanliness etc.
• Culture : Local craft, Traditional food, Festivals, Local knowledge, Community practices etc.
• The listed contexts are illustrative. Students and instructors may select other relevant real-world contexts where the same problem-identification competencies can be meaningfully demonstrated.

Skill Development Activities Suggested

• Guest Lecture from expert.
• Case Studies: Choose relevant projects where scope of services to be learnt is more.
• Where appropriate, instructors may also use workshops, field/site visits, practitioner or industry interactions, community engagement or other contextual learning experiences. These are examples of possible enrichment activities and are not mandatory delivery methods.

II Semester

Visual & Material Language I

Course Code	**2BBD102**	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:42:0:64	**Viva Marks**	50
Total Hours of Pedagogy	120 Hrs.	**Total Marks**	100
Credits	4	**Exam Hours**	-

Course Learning

The course develops the student's ability to construct, transform and evaluate three-dimensional form through material, structure, scale, movement and human experience. It builds on the exploratory foundation of Semester I and develops more controlled 3D judgement through physical making, material experimentation, spatial reasoning, human factors and digital-physical representation.

Learning progression: Form → Material → Structure → Movement → Experience → Digital-Physical Integration.

Course Objectives

- Develop the ability to construct, manipulate and evaluate three-dimensional forms through physical making and controlled experimentation.
- Build understanding of material properties, structural systems and fabrication techniques in shaping form and function.
- Develop spatial reasoning and explore scale, movement, stability and human interaction in three-dimensional design.
- Integrate material, structural, spatial and human factors to create and evaluate purposeful design propositions.
- Connect physical making with digital modelling and representation to communicate, refine and document three-dimensional design outcomes.

Teaching-Learning Process (General Instructions)

The course should combine physical making, material experimentation, spatial reasoning, human-scale investigation and digital-physical representation. Faculty may adapt the sequence, material palette, case studies, tools and workshop formats according to cohort, discipline, facilities and professional context.

Illustrative approaches from the source include demonstrations, material laboratory, constraint studio, scale/body study, reverse studio, failure studio, physical-digital translation, open critique, portfolio studio and case studies. Digital tools should support exploration and iteration rather than replace physical understanding. Workshop safety, responsible material use, accessibility, documentation and reflection should be integrated into the making process.

Module 1 - FORM: THREE-DIMENSIONAL VISUAL LANGUAGE

- Elements of three-dimensional design: point, line, plane, volume, mass, void, surface and spatial relationships.
- Principles of 3D composition: proportion, scale, balance, rhythm, hierarchy, repetition, contrast, continuity and figure-ground relationships.
- Relationship between 2D and 3D representation: translating drawings, diagrams and visual studies into three-dimensional propositions.
- Perception of form and spatial composition through viewpoint, light, shadow, enclosure and movement around the object.
- Form as an organised relationship rather than an isolated object.
- Human perception and use introduced as considerations in evaluating 3D composition.

Teaching-Learning Process	3D form demonstration using point, line, plane, volume, mass and void; guided composition studies exploring proportion, scale, balance, rhythm and hierarchy; translate a 2D drawing or diagram into a small 3D proposition; compare viewpoints, light and shadow; peer critique focused on spatial relationships and human perception.

Module 2 - MATERIAL: FORM, SURFACE & ENVIRONMENT

- Experimentation with form, texture, colour and space in relation to nature and environment.
- Transformation of 2D studies into 3D forms through folding, bending, layering, casting, carving, assembling or other appropriate processes.
- Surface, texture, colour, light and shadow as material and experiential variables.
- Natural and manufactured materials and their characteristic behaviour.
- Material properties relevant to design: rigidity, flexibility, weight, thickness, translucency, surface quality and response to process.
- Relationship between material choice, form, process and intended experience.
- Context and environment: how material and form behave within a particular physical setting.
- Material selection, joining/assembly, safety, waste and reuse where feasible.

Teaching-Learning Process	Material laboratory with safe, available natural and manufactured materials; guided folding, bending, layering, casting, carving and assembly experiments; compare texture, colour, light, weight, rigidity and flexibility; document material response and environmental context; discuss joining, waste, reuse and workshop safety.

Module 3 - STRUCTURE: TRANSFORMATION, MORPHOLOGY & STABILITY

- Radial and linear transformation of form.
- Form transition and morphology.
- Aggregation, subtraction, deformation, scaling, proportion, modularity, repetition and continuity.
- Development of formal systems through controlled transformation.
- Relationship between geometry, structure and material behaviour.
- Stability, centre of gravity, balance and load awareness at an introductory design level.
- Joints, connections and methods of assembly appropriate to the materials being explored.
- Students explain what a transformation or structural decision achieves rather than producing formal effects without rationale.

Teaching-Learning Process	Controlled morphology workshop using radial and linear transformation, aggregation, subtraction, deformation, modularity and repetition; test centre of gravity, balance and introductory load awareness; demonstrate joints and connections; compare structural outcomes and require students to explain the purpose of each transformation.

Module 4 - MOVEMENT: FORM, KINETICS & HUMAN INTERACTION

• Exposure to form and movement. • Static versus dynamic form; kinetic and sequential possibilities. • Movement generated through transformation, articulation, joints, rotation, translation, folding or other appropriate mechanisms. • Gesture, rhythm and sequence as ways of organising movement. • Relationship between form, movement and use. • Human scale, reach, posture, body position and basic ergonomic considerations. • Embodied experience: how a user approaches, handles, occupies, passes through or interacts with a form. • Accessibility and variation in bodily experience considered where interaction is involved.	
Teaching-Learning Process	Kinetic-form demonstration using articulation, joints, rotation, translation and folding; movement and sequence studies; scale/body study of reach, posture and body position; observe how users approach, handle or occupy a form; critique accessibility and variation in bodily experience where interaction is involved.
Module 5 - EXPERIENCE: DIGITAL-PHYSICAL INTEGRATION & ITERATION	
• Basic digital 3D modelling as a transferable capability for representing, exploring and iterating form. • Digital to physical and physical to digital workflows where appropriate. • Using digital models to test proportion, assembly, variation, spatial relationships or fabrication possibilities. • Using physical models, scans, photographs or measurements to inform digital development. • File organisation, versioning and responsible tool selection. • Digital and physical representations are treated as complementary rather than as substitutes for one another. • Documentation of iterations, decisions, failures and revisions. • Software names remain instructor/institution dependent; the learning objective is transferable modelling and representation capability.	
Teaching-Learning Process	Guided digital-to-physical and physical-to-digital translation; create basic 3D models and physical mockups to compare proportion, assembly and spatial relationships; use photographs, scans or measurements to inform iteration; demonstrate file organisation and versioning; document failures, revisions and design decisions; verify material or structural claims through appropriate tests.
Course Outcome (Course Skill Set) By the end of the course, students should be able to: • CO1: Identify and analyse material properties, including flexibility, rigidity, strength, weight, porosity and durability. • CO2: Analyse how material colour, texture, grain, pattern, transparency and finish influence visual composition and perception. • CO3: Experiment with basic material manipulation and construction techniques, including folding, bending, moulding, weaving, joining and layering. • CO4: Select appropriate materials and construction methods based on structural behaviour, functional requirements, fabrication processes and intended use. • CO5: Evaluate material choices in terms of sustainability, resource efficiency, waste reduction, reuse, repairability and recyclability.	
Assessment Details (both CIE and SEE) **Assessment Structure** Continuous Internal Evaluation (CIE): 50 marks. Progressive 3D studies, material experiments, transformation and morphology work, structural and movement studies, integrated proposition, documentation and reflection. Viva Voce: 50 marks. Ability to explain and defend formal, material, structural, movement and human-experience decisions; demonstrate understanding of process, iterations, limitations and learning. Total: 100 marks. Assessment should recognise process, experimentation, material understanding, iteration and design judgement, not only the visual polish of the final model.	
Suggested Learning Resources: Books • Lefteri, C. (2019). Making It: Manufacturing Techniques for Product Design (3rd ed.). Laurence King Publishing. • Lefteri, C. (2014). Materials for Design. Laurence King Publishing. • Ashby, M. F., & Johnson, K. (2014). Materials and Design: The Art and Science of Material Selection in Product Design (3rd ed.). Butterworth-Heinemann. • McDonough, W., & Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things. North Point Press. • Brunner, T. A., Guberan, C., Lefteri, C., & Tannir, A. Aesthetics of Sustainability. ÉCAL and Triest.	
Web links and Video Lectures (e-Resources) The source syllabus does not prescribe specific URLs. Faculty may select relevant demonstrations, material-process videos, case studies and digital-physical modelling resources according to institutional facilities and the materials available. Any selected resources should support the stated learning outcomes and be checked for relevance before use.	
Activity-Based Learning / Practical-Based Learning • Material property investigation through touch, observation and comparative testing. • Visual composition exercises exploring colour, texture, grain, pattern and finish. • Material transformation experiments using folding, bending, moulding, weaving, joining and layering. • Construction studies testing material behaviour, connection methods, stability and durability. • Material selection exercises matching properties, structure, function and fabrication techniques. • Sustainability audits comparing material sourcing, waste, reuse, repairability and recyclability. • Integrated material study combining visual composition, construction technique and functional performance. • Case-study analysis of material applications across diverse cultural and environmental contexts.	

I Semester			
Visual Representation-I			
Course Code	2BBD103	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**Viva Marks**	50
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning

Introduces students to the fundamental ability of a designer to observe, understand, construct, represent and transform visual information. The course develops visual intelligence through the progression SEE → OBSERVE → ANALYSE → REPRESENT → CONSTRUCT → TRANSFORM → COMMUNICATE. Students learn to represent objects, people, spaces, environments, materials, light, form, movement, proportion, perspective and visual relationships, and to transform representations through simplification, abstraction, distortion, cropping, scaling, rotation, repetition, fragmentation, combination and recomposition. Analogue observation and image-making are connected with introductory digital workflows, documentation, critique and portfolio communication, without turning the subject into software training.

Course Objectives:

•Develop visual observation, perception and analytical skills to understand objects, people, spaces, materials, light, form and movement.
•Build proficiency in visual representation through drawing, proportion, perspective and the communication of visual relationships.
•Develop skills in constructing and transforming images through simplification, abstraction, distortion, cropping, scaling, rotation, repetition, fragmentation and recomposition.
•Integrate analogue image-making with introductory digital workflows for visual development, documentation and communication.
•Foster critical reflection, visual critique and portfolio presentation to communicate ideas and design processes effectively.

Teaching-Learning Process (General Instructions)

The studio should use active and participatory pedagogies. Use short demonstrations followed by supervised practice, independent application and critique. Connect selected tasks with later Product, Communication, Interaction, Spatial and Visual Communication studios so students can understand the transferability of image-making competencies. Faculty may select and sequence methods according to cohort needs, disciplinary context, facilities and intended learning outcomes.

Module I - Seeing, Observation and Visual Recording

1.1 Seeing versus observing: visual attention, selective observation, contour, silhouette, negative space, proportion, relationships, detail and visual memory.
1.2 Drawing as a thinking tool for recording, analysing, exploring, communicating, remembering and imagining.
1.3 Basic drawing vocabulary and drawing from observation.
1.4 Contour drawing: blind, modified, continuous-line, cross-contour and structural contour techniques.
1.5 Gesture drawing: speed, movement, weight, direction, action and posture.
1.6 Visual journaling through quick sketches, objects, people, places, textures, visual notes, photographs, collages and reflections.
1.7 Observation of scale, sequence, movement and contextual relationships, supported by short annotations explaining observations and representational choices.
1.8 Use of camera/phone photography as observational evidence, distinguishing direct observation, photographic reference and digitally altered imagery.

Teaching-Learning Process	Instructor demonstration of looking, seeing and systematic observation; guided contour and gesture drawing exercises; timed observational drawing from objects, people and spaces; field sketching and visual walks; negative-space and memory-drawing exercises; sketchbook tutorials and peer review; photographic reference comparison; reflective annotations and visual-journal reviews.

Module II - Form, Proportion, Perspective and Spatial Representation

Construct and represent three-dimensional forms convincingly on a two-dimensional surface. Geometric construction: cube, cuboid, cylinder, cone, sphere, pyramid and prism; break complex objects into simple forms, such as chairs, cameras and bottles. Proportion: comparative measurement, relative proportion, visual measurement, alignment, ratio and scale. Human proportion: head unit, body proportions, standing, sitting and action figures, and simplified mannequin, with focus on design representation rather than detailed anatomical study. Scale: human, object, architectural and visual scale. Perspective: one-point, two-point and three-point; horizon line, eye level, vanishing point, convergence and foreshortening. Spatial representation. Studio output: geometric construction sheets, proportion studies, perspective exercises, human figure studies, interior/exterior studies, field sketches and spatial visualization portfolio. Introduce orthographic views, perspective, section/detail views and simple exploded views where appropriate. Represent varied body types, mobility, posture and accessibility contexts where relevant.

Teaching-Learning Process	Step-by-step demonstrations of geometric construction and perspective; measured drawing and comparative proportion exercises; supervised object-to-basic-form analysis; perspective drawing from interior/exterior settings; figure and human-scale studies; field sketching; model or object observation; individual tutorials and desk critiques; comparative review of orthographic, perspective, section/detail and exploded representations.

Module III - Light, Shade, Texture and Material Representation

3.1 Representation of volume, surface and material through drawing and rendering.
3.2 Light: source, direct, diffused, ambient and reflected light.
3.3 Shadow: form shadow, cast shadow, contact shadow and reflected light.
3.4 Tonal representation: light, mid-tone, dark, gradation, contrast and tonal hierarchy.
3.5 Rendering techniques for communicating form, depth, surface and material qualities.
3.6 Material representation of hard, soft and natural materials through appropriate drawing and rendering methods.
3.7 Texture representation: actual texture experienced through physical touch and visual texture created through representation.
3.8 Comparison of hand-rendered, photographic and digital rendering strategies, focusing on visual evidence, material properties and representational conventions.
3.9 Controlled lighting and photographic documentation to examine how light conditions affect perceived form, value, colour and material.

Studio Output: Value scales, light and shadow studies, form rendering, material library, texture studies, still-life drawings and reflective-surface studies.

Teaching-Learning Process	Lighting demonstrations using simple objects and controlled light sources; tonal-scale and shadow exercises; still-life rendering sessions; tactile and visual texture sampling; material observation and comparison; hand-rendering versus photographic/digital representation analysis; instructor feedback on tonal hierarchy and material legibility; process documentation and peer critique.

Module IV - Image Transformation, Abstraction and Visual Manipulation

4.1 Image transformation principles: modifying an image while retaining a recognisable relationship with the original.
4.2 Transformation methods: enlargement, reduction, cropping, rotation, reflection, repetition, scaling, distortion, fragmentation, recomposition, overlap, layering, transparency, inversion and simplification.
4.3 Simplification: transforming a tree photograph into detailed drawing, basic contour, simplified shape, geometric abstraction and symbol.
4.4 Abstraction: transforming real forms into simplified, abstract and symbolic representations through reduction, exaggeration, distortion, fragmentation, repetition and combination.
4.5 Image-to-image transformation: object to pattern, photograph to illustration, architecture to abstract composition and human figure to symbol.
4.6 Collage and recomposition using photographs, drawings, textures, shapes, found images and transparent layers.
4.7 Digital image transformation: scanning, cropping, layering, resizing, masking, opacity, colour adjustment, digital collage, basic raster editing and image sequencing.
4.8 Digital image preparation: non-destructive editing, resolution, output considerations, file formats and preparation for screen and print.
4.9 Process documentation: retaining source images, references and intermediate stages. Optional AI-assisted image exploration with documented intervention, verification, human authorship and design judgement.

Studio Output: Transformation matrix, abstract image studies, collage experiments, object-to-symbol studies, photograph-to-graphic studies, digital transformation exercises and process documentation.

Teaching-Learning Process	Demonstrate transformation operations using a common source image; guided simplification and abstraction sequences; iterative image-transformation matrices; collage and recomposition workshops; analogue-to-digital translation exercises; supervised raster-editing demonstrations focused on transferable concepts; source and intermediate-stage documentation; critique comparing original intent with transformed outcomes; optional, documented AI-assisted exploration where appropriate.

Module V - Integrated Image Representation and Design Communication

5.1 Integration of observation, geometric construction, perspective, rendering and image transformation into a cohesive studio project.
5.2 Image as communication: object, function, emotion, process, space, instruction, story, identity and concept.
5.3 Visual narrative: sequence, before-and-after, continuity, time, movement, storytelling and visual hierarchy.
5.4 Multiple-view representation: front, side, top, perspective, section and detail views, recognising the limitations of individual representational modes.
5.5 Exploded and sequential representation: exploded views, assembly sequences, process diagrams and visual instructions.
5.6 Conceptual image-making through the integration of observation, representation and transformation to communicate ideas.
5.7 Introductory digital image workflows: resolution, pixels, raster and vector images, scanning, cropping, layering, transparency, masking, basic colour correction, digital collage, image sequencing, file formats, image ethics and copyright.
5.8 Software categories: raster image editors, vector drawing software, tablet drawing applications, presentation and layout software, and open-source image-editing tools, with emphasis on visual thinking rather than software certification.
5.9 Accessibility-oriented visual communication: legibility, contrast, scale, visual hierarchy and alternative modes of explanation.
5.10 Portfolio development: observation, construction, rendering, transformation, digital work and a final project incorporating research, process, iterations, final images and reflection.
5.11 Process documentation: source references, exploration, alternatives, iterations, critique response and final communication. Translate at least one observed real-world subject into multiple representational modes.

Studio Output: Integrated visual communication project, multiple-view representation, visual narrative, exploded or sequential diagrams, digital image studies and a process-oriented portfolio demonstrating research, experimentation, iteration and reflection.

Teaching-Learning Process	Studio brief integrating observation, construction, rendering and transformation; visual narrative and multiple-view demonstrations; sequential/exploded representation exercises; individual tutorials and structured peer critique; digital laboratory sessions for image preparation and layout; accessibility and image-ethics review; portfolio curation with process evidence; final presentation with a concise rationale and reflective review.

Course Outcome (Course Skill Set)
By the end of the course, students should be able to:
• CO1: Observe and analyse visual information to identify form, proportion, spatial relationships and defining characteristics.
• CO2: Represent objects, forms and spaces using appropriate proportions, geometric construction and perspective techniques.
• CO3: Depict light, shade, texture and material qualities through appropriate visual representation methods.
• CO4: Transform and abstract images through systematic visual operations and select suitable representational modes for ideation, documentation and presentation.
• CO5: Apply introductory digital image workflows responsibly, articulate representational decisions, and maintain a process-oriented portfolio demonstrating experimentation, iteration and response to critique.

Assessment Details (both CIE and SEE)

The source syllabus describes a 50/50 CIE-SEE structure. The approved Semester I scheme lists 50 CIE marks and 50 Viva Voce marks for Course 2BBD103, with 100 total marks. Assessment should evaluate observation, construction, representational accuracy, transformation logic, visual communication, process/iteration, technical handling, reflection and ethical image practice rather than drawing polish alone. CIE evidence may include sketchbook/process journal, observational studies, perspective/spatial studies, material/lighting studies, transformation exercises, digital exercises, critique participation and integrated portfolio. Viva evidence may include a representation/transformation task and concise rationale explaining observation, construction, transformation and communication decisions. Confirm detailed assessment regulations against the approved university scheme.

Suggested Learning Resources:

- Drawing: A Creative Process, Francis D. K. Ching, Wrightbooks, 1989.
- Design Drawing, Francis D. K. Ching, John Wiley & Sons, 2010.
- How to Draw: Drawing and Sketching Objects and Environments from Your Imagination, Scott Robertson and Thomas Bertling, Design Studio Press, 2013.
- Drawing on the Right Side of the Brain, Betty Edwards, Tarcher, 2012.
- The Natural Way to Draw, Kimon Nicolaïdes, Souvenir Press, 2008.
- Perspective Made Easy, Ernest Norling, Dover Publications Inc., 1999.
- Rendering in Pen and Ink, Arthur L. Guptill, Watson-Guptill, 1997.
- Principles of Form and Design, Wucius Wong, Wiley, 1993.
- Art and Visual Perception, Rudolf Arnheim, University of California Press, 2004.10. A Primer of Visual Literacy, Donis A. Dondis, The MIT Press, 1974.

Additional Reference Books

Design as Art, Bruno Munari, Penguin Classics, 2008; The Drawing of a Tree, Bruno Munari, Corraini Editore, 2004; Graphic Thinking for Architects and Designers, Paul Laseau, Wiley, 2000; Visual Dictionary of Architecture, K. Ching, Wiley, 2011; Understanding Comics: The Invisible Art, Scott McCloud, William Morrow Paperbacks, 1994.

Web links and Video Lectures (e-Resources)

The source section proposes non-mandatory resource categories: digital museum and archive collections for visual reference; Creative Commons and other openly licensed image repositories with attribution and licence checking; open educational resources for perspective, observational drawing, visual literacy and image-making; official documentation/tutorials for institutionally supported raster/vector/image-editing platforms; digital drawing and annotation applications; image metadata, resolution and file-format references for screen/print preparation; accessibility resources covering contrast, legibility, visual hierarchy and inclusive communication; and institution-approved generative-AI tools, if used, for controlled exploratory exercises with documented prompts, outputs, source/reference checking and human modification. Named platforms are examples, not compulsory applications.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visual journal with regular observation sketches and short annotations.
- Contour, gesture, negative-space and memory-drawing exercises.
- Geometric construction, proportion, human-scale and perspective studies.
- Light, shadow, tonal value, texture and material-rendering experiments.
- Transformation matrix moving from observed object or photograph to abstraction, pattern or symbol.
- Analogue-to-digital image transformation and collage, retaining source and intermediate stages.
- Integrated portfolio project translating an observed real-world subject into multiple representational modes.
- Peer critique, reflection and presentation of process and final outcomes.

I Semester			
Design and Human Experience			
Course Code	2BBD104	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	28:0:0:0:32	**Viva Marks**	-
Total Hours of Pedagogy	60 Hrs.	**Total Marks**	100
Credits	2	**Exam Hours**	3

Course Learning

Design, Culture & Human Experience introduces the fundamental relationship between human beings, needs, environment, technology, materials, culture and designed artifacts. The course examines design as a phenomenon that has evolved alongside human civilization. It establishes a conceptual foundation for understanding design as a human response to needs, opportunities, environments and cultural conditions, rather than merely the creation of objects.

Course Objectives

- Introduce design as a human and cultural activity.
- Explain the relationship between human evolution and technological development.
- Introduce early human tools and artifacts as examples of problem-solving.
- Examine the evolution of materials and manufacturing.
- Understand the relationship between environment and human habitation.
- Introduce the evolution of craft, agriculture, settlement and urban life.
- Examine Indian design traditions within their cultural context.
- Understand the relationship between technology and social change.
- Examine industrialization, mass production, modernism and twentieth-century design.
- Examine the impact of digital technology on contemporary design.
- Develop critical thinking about technology, sustainability and responsible design.
- Develop research, discussion and visual analysis skills.

Students should interpret artifacts as evidence of human needs, technologies, materials, cultural systems and consequences. They should observe an artifact, identify evidence, compare sources, construct an argument and communicate the interpretation clearly.

Teaching-Learning Process (General Instructions)

This 2-credit theory course should not become a purely lecture-based history survey. Teaching should combine illustrated lectures with visual and artifact analysis, inquiry, discussion and short research activities. Faculty may vary the balance of lecture, discussion, case study, fieldwork and project work according to the cohort, resources and learning outcomes.

Illustrative approaches: illustrated lectures; artifact/object analysis; short documentaries; group discussion and debate; timeline exercises; case studies; museum/heritage visits; local craft documentation; student presentations; visual research; reflective writing and peer questioning. Use primary and visual evidence wherever feasible, including artifacts, photographs, drawings, museum records, archival material and practitioner accounts. Where physical visits are not possible, use virtual museum/archive collections and recorded practitioner interactions.

Module I - Human Evolution, Need and the Emergence of Design

1.1 What is Design?

Design as problem solving, making, planning, communication, cultural expression, technological intervention and social activity. Did design begin with professional designers?

1.2 Human Needs and Design

Food, water, shelter, clothing, safety, mobility, communication, social interaction, identity and belonging.

1.3 Human Evolution and the Hand

Hand-eye coordination, grip, dexterity, tool use, manipulation and making. The hand as an interface between human intention, tool, material and environment.

1.4 Humans and Artifacts

The concept of the artifact: tool, vessel, weapon, shelter, garment, ritual object, machine, product and digital interface.

1.5 Design as a Historical Construct

How the meaning of design changes according to time, geography, technology, culture, economy and social structure. Distinguish artifact, technique, system, service and designed experience. Ask what evidence supports a claim that an artifact addressed a particular human need; distinguish evidence from interpretation and compare examples from different regions.

Learning focus: identify human need, interpret artifacts and support claims with evidence.

Teaching-Learning Process	Illustrated introductory lecture using artifacts and images from different periods and regions; guided object observation; think-pair-share on everyday human needs; comparison of artifact, technique, system, service and experience; evidence-versus-interpretation worksheet; short group discussion and reflective note.

Module II - Tools, Materials, Technology and Early Human Civilization

2.1 Prehistoric Tools
Oldowan tools, Acheulean hand axes, scrapers, blades, spears, bone tools and fishing tools.
2.2 Stone Tool Evolution
Simple stone, chipped stone, shaped tool and specialized tool. Material selection, edge, sharpness, grip, efficiency, manufacturing and function.
2.3 Fire as a Design and Technological Transformation
Effects on cooking, food processing, protection, lighting, material transformation, ceramics, metallurgy and settlement patterns. Consider how one technological development creates new design possibilities.
2.4 Materials and Human Civilization
Stone in architecture, tools and sculpture; wood in tools, shelter and transport; clay in pottery, storage and architecture; metal in tools, weapons, machines and construction; glass in containers, architecture and optics.
2.5 Agriculture and the Design of Objects
Plough, sickle, storage vessel, grinding stone, irrigation system, shelter and settlement.
2.6 Early Cities and Designed Environments
Settlement, streets, water systems, storage, public spaces and defensive structures. Use an evidence-based artifact-analysis template: need/use, material, process/technology, ergonomics/use, cultural context, environmental consequence and evidence/source. Address uncertainty and contested interpretations in archaeological evidence. Digital museum/archive research may complement physical artifact study.

Teaching-Learning Process	Visual lecture using archaeological images and museum records; compare tools by material, grip, edge and function; documentary excerpts followed by structured discussion; artifact-analysis worksheet; small-group material/technology timeline; source-checking exercise on archaeological interpretation; virtual museum/archive exploration.

Module III - Culture, Craft, Agriculture, Settlement and Indian Design Traditions

3.1 Culture and Design
Belief, religion, climate, geography, materials, economy, social organization, ritual and identity.
3.2 Indian Craft Traditions
Pottery, weaving, wood carving, metal craft, stone carving, bamboo craft, basketry, jewellery and textile printing.
3.3 Indian Visual Traditions
Madhubani, Warli, Gond, Kalamkari, Pattachitra, Phad, Ajrakh and Kolam/Rangoli. Analyse pattern, symbol, repetition, geometry, material, function and cultural meaning.
3.4 Traditional Knowledge and Sustainability
Local materials, local climate, repair, reuse, community production, low-energy processes and cultural continuity.
3.5 Architecture and Human Environment
Stepwells, courtyards, vernacular houses, temple architecture, forts and traditional urban settlements. Examine how climate influences building form.
3.6 Craftsperson as Designer
Craftsperson, material, technique, object and community. Challenge the idea that design belongs only to formally trained modern designers. Use local/regional case studies and, where feasible, interaction with craftspeople or community knowledge holders. Distinguish documentation of living traditions from appropriation or extraction of motifs. Ask whose knowledge is represented, who maintains the practice, how value is distributed and how it is changing. Include regional diversity and ethical digital documentation, oral-history recording and visual archiving where appropriate.

Teaching-Learning Process	Comparative case studies of regional crafts and built environments; visual analysis of pattern, material and process; guided discussion on climate and cultural context; local craft documentation or practitioner interaction where feasible; consent and attribution briefing; peer presentation that identifies makers, knowledge holders and changing contexts; virtual archive alternative where fieldwork is unavailable.

Module IV - Industrial Revolution, Modern Design and Mass Production

4.1 From Craft Production to Industrial Production
Compare individual maker, small scale, local material, handmade variation, repair-oriented processes and slower production with factory production, mass scale, global supply chains, machine manufacture, standardization, replacement and speed.
4.2 Industrial Revolution
Steam power, mechanization, factory production, railways, mass manufacturing, standardization and interchangeable parts.
4.3 Changing Role of the Designer
Product development, manufacturing, packaging, graphic communication, transportation, architecture and consumer products.
4.4 Modernism
Function, simplicity, standardization, rationality, geometry and mass production.
4.5 Bauhaus
Art, craft and technology; functional design; material experimentation; design education and industrial production. Analyse material, manufacturing, form, function and user.
4.6 Design and Consumer Culture
Branding, packaging, advertising, fashion, consumer products and planned obsolescence. Consider industrial design, labour, supply chains and social consequences. Compare a craft-to-industry transition to identify what is gained, lost or transformed in material knowledge, labour, scale, repairability and cultural meaning. Use visual analysis of objects, posters or packaging.

Teaching-Learning Process	Comparative lecture and visual analysis of craft and industrial products; case study of a craft-to-industry transition; group activity mapping material, manufacturing, labour, supply chain and user; Bauhaus object/poster analysis; structured debate on standardization, consumer culture and planned obsolescence; short evidence-based presentation.

Module V - Digital Evolution, Sustainability and the Future of Design

5.1 Information Revolution
Computers, internet, mobile phones, digital manufacturing, CAD and digital fabrication.
5.2 From Physical Products to Digital Products
Compare map with Google Maps, camera with smartphone camera, diary with digital notes, library with digital library, and clock with smartphone. Discuss what is gained and lost when physical artifacts become digital services.
5.3 Human-Technology Relationship
Human-computer interaction, interfaces, automation, artificial intelligence, robotics, wearable technology and smart products.
5.4 Design and Sustainability
Sustainable and circular design, repair, reuse, recycling, material efficiency, life-cycle thinking, renewable materials and responsible consumption. Include life-cycle/circularity analysis of a contemporary case; do not assume that digital or new technology is automatically sustainable.
5.5 Design Ethics
Who benefits, who is excluded, who produces the object, what happens after disposal, hidden environmental cost and whether everything that can be designed should be designed. Include algorithmic bias, privacy, surveillance, automation and accessibility. Treat AI critically in relation to authorship, labour, data, bias, environmental cost and human agency.
5.6 Future of Human Evolution and Design
Artificial intelligence, generative design, robotics, biotechnology, 3D printing, smart materials, wearables, brain-computer interfaces and human augmentation. Distinguish technological possibility from desirable design: Can we? Should we? For whom? At what cost? Under whose control?

Teaching-Learning Process	Compare physical and digital service equivalents using a benefits/losses matrix; guided case study on life-cycle impact; structured debate using "Can we? Should we? For whom? At what cost?"; ethical scenario analysis on privacy, bias, labour and accessibility; student presentations; reflective writing linking historical transitions to a contemporary design decision.

Course Outcome (Course Skill Set)
By the end of the course, students should be able to:
• CO1: Analyse design artefacts in relation to human needs, materials, technology, culture and consequences.
• CO2: Explain relationships among human behaviour, tools, materials, technology and designed environments across historical and cultural contexts.
• CO3: Interpret Indian craft and design traditions with contextual and ethical sensitivity, and compare design practices across different periods and cultures.
• CO4: Explain major transitions from craft production and industrialisation to digital and intelligent technologies, evaluating their implications for sustainability, ethics, inclusion and human agency.
• CO5: Research and communicate design-history findings using visual and verbal evidence, and connect historical knowledge to contemporary design decisions and emerging practices.

Central learning progression: Human → Need → Environment → Tool → Material → Artifact → Technology → Culture → Industry → Digital System → Intelligent Technology → Future Human-Design Relationship.

Assessment Details (both CIE and SEE)
The source syllabus states a 50/50 CIE and SEE structure, with minimum thresholds of 40% in CIE to qualify for SEE, 35% in SEE, and 40% combined overall. It also proposes evidence aligned to course outcomes: artifact analyses, visual timeline, case-study comparison, local/Indian design documentation, discussion/debate participation, short presentations and reflective writing for CIE; concise factual/conceptual and analytical/case-based questions for SEE. Assessment should reward historical understanding, evidence-based interpretation, comparison, critical reasoning, visual analysis, communication and reflection rather than recall alone.

Suggested Learning Resources
• Design: A Very Short Introduction - John Heskett, Oxford University Press, 2005.
• World History of Design: Prehistoric Times to World War I - Victor Margolin, Bloomsbury, 2017.
• The Evolution of Technology - George Basalla, Cambridge University Press, 1989.
• Meggs' History of Graphic Design - Philip B. Meggs and Alston W. Purvis, Wiley, 2016.
• Objects of Desire: Design and Society Since 1750 - Adrian Forty, Thames & Hudson, 1992.

Additional Reference Books
• The Story of Art - E. H. Gombrich, Phaidon, 2007.
• History of Modern Design - David Raizman, Thames & Hudson, 2010.
• An Introduction to Design and Culture: 1900 to the Present - Penny Sparke, Routledge, 2025.
• Design as Art - Bruno Munari, Penguin, 2008.
• The Design of Everyday Things - Donald A. Norman, Basic Books, 2013.
• The Evolution of Useful Things - Henry Petroski, Vintage Books, 1994.
• The Principles of Art - R. G. Collingwood, Case Press, 2016.
• The Indian Craft Tradition - Kamaladevi Chattopadhyay, Publications Division, Government of India, 1980.

Web links and Video Lectures (e-Resources)
• Digital museum and heritage collections for artifact study and visual comparison.
• Open-access archaeological and anthropological databases where appropriate.
• Indian museum, craft and cultural-heritage archives and government cultural resources.
• Digital library/catalogue resources for historical design research.
• Documentary/video resources from reputable museums, universities and cultural institutions.
• Digitised historical photographs, drawings, maps and archives for timeline construction.
• Open educational resources for design history, technology history and sustainability.
• Current technology/design case studies from reputable professional and academic sources.
• Digital mapping/timeline tools for collaborative visual chronology.
AI tools, if used, should be limited to critical study or controlled research aids; students must verify sources and distinguish generated summaries/images from primary evidence. Record source details and distinguish primary evidence from secondary commentary.

Activity Based Learning (Suggested Activities in Class)

- Guest lecture from a design historian, curator, archaeologist, craft practitioner, anthropologist, industrial designer or cultural researcher.
- Case study of one artifact across changing materials, technologies, users and contexts.
- Local craft/heritage documentation with consent and appropriate attribution.
- Small-group debate on a technology/design controversy.
- Visual timeline and artifact-analysis portfolio review.
- Short presentation translating research into a design-relevant insight.
- Digital museum/archive research, visual comparison, image annotation and comparative boards.
- Virtual museum/heritage visit where physical access is not possible.
- Source/provenance tracking and digital bibliography practice.

Transferable skills include artifact observation, contextual research, source evaluation, evidence-based argument, comparative analysis, visual timeline construction, discussion and debate, concise communication, ethical documentation and applying design-history reasoning to contemporary design problems.

I Semester

Digital Making I

Course Code	2BBD105	**CIE Marks**	100
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**Viva Marks**	-
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning

Digital Making I develops transferable digital design capabilities rather than mastery of particular software brands. The course builds two complementary abilities: technical capability and design intelligence. It introduces digital tools used in contemporary design, raster and vector workflows, image editing, illustration, typography, layout, UI/UX, prototyping, digital presentation and generative AI.

Course Learning Objectives

- Introduce digital tools used in contemporary design.
- Develop fundamental digital design literacy and raster/vector workflows.
- Develop basic digital image-editing, illustration and graphic-making skills.
- Introduce typography, layout systems, information design, UI/UX and prototyping.
- Develop digital presentation and professional file-management practices.
- Introduce generative AI concepts, AI-assisted ideation and visualization, and prompt-writing.
- Develop the ability to critically evaluate AI-generated outputs and document human intervention.
- Develop ethical awareness regarding AI, copyright, authorship, privacy, bias and attribution.
- Develop accessibility awareness and audience-appropriate digital communication.
- Build a foundation-level digital design portfolio with process documentation and professional handoff.

Course philosophy: Design thinking - digital tools - AI as an assistive capability - human judgment throughout. Students should demonstrate tool-independent problem solving, visual judgment, technical production, iterative experimentation, documentation, communication, accessibility awareness, ethical AI use and professional handoff practices. Assessment should evaluate design capability and evidence of process rather than software-brand familiarity.

Teaching-Learning Process (General Instructions)

The course should use a studio-based experiential model combining demonstration, guided practice, independent practice, AI experimentation, peer critique, faculty critique, iteration and reflection. Faculty may select the sequence, toolset and pedagogic method according to the cohort, available infrastructure and project brief. Methods are illustrative rather than mandatory.

Illustrative approaches: studio-based experiential learning; demonstrations; guided and independent practice; short workshops; AI experimentation; peer and faculty critique; iterative design exercises; practitioner demonstrations; usability testing; digital production clinics; accessibility and quality checks; reflective documentation; portfolio review.

Indicative workflow: concept/brief - analogue exploration - digital construction - tool/AI exploration - critique/testing - refinement - production - documentation - presentation. Use formative checkpoints for technical skills, design critique, AI-use documentation, accessibility/quality and final portfolio review. Tool choice should remain flexible and capability-focused, with open-source or institution-supported alternatives and fallback pathways where paid tools or cloud services are unavailable.

Module I - Digital Design Foundations, Raster Imaging & Visual Editing

1.1 Introduction to Digital Design: Digital canvas, artboards, layers, objects, alignment, grids, transformation and digital workflow.
1.2 Raster and Vector Graphics: Pixel-based and path-based graphics, applications and file formats.
1.3 Resolution and Image Quality: Pixels, dimensions, PPI, DPI, scaling, cropping, compression and screen/print outputs.
1.4 Digital Colour: RGB, CMYK, grayscale, hue, saturation, brightness, contrast and colour profiles.
1.5 Image Editing: Cropping, resizing, layers, masks, retouching, colour correction and compositing; non-destructive editing and export settings.
1.6 AI in Digital Design: AI, machine learning, generative AI, language models, image generation, AI-assisted editing and limitations.
1.7 AI-Assisted Image Exploration: Generate and refine visual alternatives through sketching, AI exploration, selection and manual intervention.

Practical Requirements: Use institution-supported tools; manage file sizes, metadata, licensing, provenance and print/screen exports. Document AI use and asset sources. Apply accessible colour contrast, legibility, typography and non-colour cues.

Teaching-Learning Process	Demonstration of digital canvas, artboards, frames, layers, selection, alignment, grids and transformation; guided raster-versus-vector comparison; hands-on resolution, colour-mode and export exercises for screen and print; guided image-editing practice using layers and masks; AI-assisted image exploration followed by student selection and manual refinement; critique of image provenance, accessibility, file size and quality; process log recording source assets, edits and human contribution.

Module II - Vector Graphics, Illustration & Generative Visual Exploration

2.1 Vector Drawing: Shapes, paths, anchor points, Bézier curves, fills, strokes, Boolean operations and transformations.
2.2 Logo and Symbol Design: Wordmarks, monograms, combination marks, simplicity, scalability and recognition; research, sketching, vectorisation and refinement.
2.3 Icon Design: Develop a consistent six-icon system using common proportions, strokes, spacing and visual logic.
2.4 Digital Illustration: Flat, line and geometric illustration; character basics, patterns, textures, gradients and layering.
2.5 Pattern Design: Geometric, organic and repeat patterns, including half-drop repeats; applications across textiles, packaging and product surfaces.
2.6 AI Prompting for Design: Subject, purpose, style, composition, colour, lighting, material, context and output requirements.
2.7 AI Visual Iteration: Explore visual directions, select alternatives and manually refine the final design language.

Practical Requirements: Demonstrate design-system consistency, minimum-size legibility, monochrome/reversal tests, pattern repeat quality and export integrity. Address licensing and intellectual property for fonts, icons, images and AI-assisted outputs.

Teaching-Learning Process	Demonstration and guided practice in paths, anchor points, Bézier curves, fills, strokes and Boolean operations; iterative logo, symbol and six-icon system development; peer critique using consistency, geometry, spacing, scalability and recognition; pattern-generation and application exercise; controlled AI prompt iteration across visual directions, followed by manual refinement; production checks for minimum-size behaviour, monochrome/reversal, repeat quality, licensing and export integrity.

Module III - Typography, Layout, Information Design & AI-Assisted Content

3.1 Typography Fundamentals: Typeface classifications, font families, weights and styles.
3.2 Typographic Anatomy: Baseline, x-height, ascenders, descenders, counters, stems, bowls and serifs.
3.3 Typographic Hierarchy: Headlines, subheadings, body text, captions, scale, weight and spacing.
3.4 Type Spacing: Kerning, tracking, leading, alignment and paragraph spacing.
3.5 Grid Systems: Margins, columns, rows, modules, baseline grids and responsive grids.
3.6 Layout Design: Posters, flyers, brochures, magazine spreads, presentation pages and digital graphics.
3.7 Information Design: Infographics, timelines, diagrams, flowcharts, visual statistics and information hierarchy.
3.8 AI for Design Research: Brainstorming, keywords, research questions, content organisation, headlines, audience profiles and design briefs; verify AI-generated information using reliable sources.

Practical Requirements: Develop an infographic with student-defined hierarchy and visual logic. Verify claims, cite traceable sources, distinguish primary and secondary evidence, and apply accessible typography, contrast, plain language and appropriate data visualisation. Submit a brief design rationale explaining the audience, communication objective, hierarchy and production decisions.

Teaching-Learning Process	Typography specimen analysis and guided exercises on type anatomy, hierarchy, kerning, tracking and leading; demonstration of grid systems and layout structures; studio production of a poster, editorial page or digital communication graphic; information-design workshop using timelines, diagrams or infographics; AI-supported headline and content-structure alternatives followed by source verification; accessibility review for legibility, contrast and hierarchy; peer critique and short written design rationale.

Module IV - UI/UX, Wireframing, Prototyping & AI-Assisted Design

4.1 Introduction to UI/UX: User interfaces, user needs, tasks, navigation, interaction, usability and feedback.
4.2 User-Centred Design: Relationships between users, needs, tasks, interfaces and outcomes.
4.3 User Persona and Journey: User goals, context, needs, frustrations, behaviour and journey mapping.
4.4 Information Architecture: Sitemaps, navigation, content hierarchy, menu structures and user flows.
4.5 Wireframing: Low-, mid- and high-fidelity wireframes for apps, websites, kiosks and digital services.
4.6 UI Components: Buttons, cards, navigation, forms, input fields, icons and interaction states.
4.7 Responsive Design: Adapt content hierarchy, layouts, components and interactions across mobile, tablet and desktop.
4.8 Prototyping: Screen transitions, interactions, navigation and interactive user flows.
4.9 AI for UI/UX: Assist with research questions, user-flow alternatives, content structures, microcopy, accessibility checks and design critique. Ground personas and user needs in evidence, not AI-generated assumptions.

Practical Requirements: Develop a persona, user journey, information architecture, user flow, wireframes, 5–7 UI screens and an interactive prototype. Conduct task-based usability testing, document iterations and design decisions, and address accessibility, interaction states, touch targets, readable contrast and meaningful labels. Include AI-use documentation and design rationale.

Teaching-Learning Process	Illustrated introduction to UI and UX; guided user-centred mapping from user and need to task, interface and outcome; persona and journey-map workshop grounded in research or clearly identified assumptions; sitemap and user-flow exercises; low- to mid-fidelity wireframing and component demonstrations; prototype creation for a mobile app, website, kiosk or digital service; task-based usability testing with peers or representative users; iteration based on observed findings; accessibility and responsive-behaviour review; documented and critically evaluated AI assistance.

Module V - AI Design Workflow, Ethics, Portfolio & Integrated Digital Project

5.1 AI in the Design Process: AI applications in research, ideation, visual development, production, evaluation and presentation.
5.2 Prompt Engineering: Prompts for concept generation, transformation, refinement, critique and variation.
5.3 Prompt Iteration: Refine prompts through audience, medium, visual language, composition and constraints.
5.4 AI Ethics: Copyright, authorship, attribution, consent, privacy, bias, cultural appropriation, misinformation and academic integrity.
5.5 Human-AI Collaboration: Human-led research, definition, selection, critique, modification and presentation, with AI supporting exploration and variation.
5.6 AI Use Declaration: Document tools, dates, purposes, prompts, outputs, modifications and respective AI and student contributions.
5.7 Digital File Management: Folder organisation, version control, naming conventions, source files, assets, linked files, exports and backups.
5.8 Professional File Naming and Handoff: Consistent naming, packaged source files, asset and font licensing, export specifications, version history and README/handoff notes.
5.9 Digital Portfolio: Present the design brief, research, process, iterations, final outcomes and reflection through a structured portfolio.

Practical Requirements: Compile research boards, design briefs, mood boards, concepts, AI explorations, visual identities, posters, infographics, digital communications, UI prototypes and process documentation. Include AI-use declarations, risk and verification checks, collaborative feedback where applicable, and a final presentation. Assess the portfolio for process, evidence and design decisions, not only final visuals.

Teaching-Learning Process	Studio project integrating research, brief, mood board, visual identity, poster, infographic or digital communication, and a UI screen/prototype as appropriate; structured prompt iteration with selection, critique and manual modification; AI-risk and verification checkpoint covering provenance/rights, accuracy, privacy/consent, bias/inclusivity and audience suitability; peer and faculty critique; AI-use declaration; version control and professional file packaging; portfolio review assessing process, judgment, iteration, ethics, accessibility and final presentation rather than polished output alone.

Course Outcome (Course Skill Set)
By the end of the course, students should be able to:
• CO1: Apply raster, vector, typography, layout and interface workflows to address digital design briefs.
• CO2: Select and use appropriate digital tools based on design requirements, independent of specific software brands.
• CO3: Generate, test and refine visual alternatives through iterative experimentation and critical evaluation.
• CO4: Use AI as a documented assistive tool while critically evaluating accuracy, bias, provenance, copyright, privacy and authorship.
• CO5: Create accessible, audience-appropriate digital communication and present a coherent digital design portfolio with professional file organisation, version control, export and handoff practices.

Learning progression: Idea - sketch - digital development - AI-assisted exploration - iteration - final design - professional presentation, while retaining human authorship, design judgment and ethical responsibility. The course establishes digital, AI and visual-communication competencies for later work in Design Studio, Graphic Design, UI/UX, Product Design, Visual Communication, Interaction Design, Animation and Portfolio Development.

Assessment Details (both CIE and SEE)
The source syllabus describes a practice-led digital course and states a 50% CIE and 50% SEE structure, while also noting that the course header lists CIE Marks 100. This is an internal inconsistency in the source and should be reconciled with the approved scheme before final approval. The 2026 scheme lists Digital Making I with 100 CIE marks, no separate theory SEE or viva marks, 90 total hours and 3 credits.

Assessment design recommendations in the source: CIE should capture process journals, exercises, tool demonstrations, studio outputs, critique response, AI-use documentation and portfolio evidence. The SEE, where retained as an institutional requirement, should test applied design judgment through a practical or analytical task rather than software recall.

Rubric dimensions: problem framing, visual communication, technical execution, iteration, user/accessibility awareness, critical AI evaluation, ethical practice, documentation, presentation and professional file hygiene. AI evaluation should consider prompt iteration, rejected alternatives, reasons for selection, manual intervention and final design rationale. Students should not submit unmodified AI output as their own design work where original design development is required.

Suggested Learning Resources
• Graphic Design Solutions - Robin Landa, Wadsworth Pub Co, 2013.
• Thinking with Type - Ellen Lupton, Princeton Architectural Press, 2010.
• Making and Breaking the Grid - Timothy Samara, Rockport Publishers, 2017.
• The Fundamentals of Graphic Design - Gavin Ambrose & Paul Harris, Bloomsbury, 2019.
• Layout - Gavin Ambrose & Paul Harris, Bloomsbury, 2018.
• The Design of Everyday Things - Don Norman, Basic Books, 2013.
• Don't Make Me Think - Steve Krug, New Riders, 2014.
• The Elements of User Experience - Jesse James Garrett, New Riders, 2010.
• Co-Intelligence: Living and Working with AI - Ethan Mollick, Portfolio / Penguin, 2023.
• Artificial Intelligence: A Guide for Thinking Humans - Melanie Mitchell, Farrar, Straus and Giroux, 2019.

Resource strategy: retain books as conceptual foundations and supplement them with current official documentation, accessibility guidance, platform-neutral production references and current AI literacy guidance. Digital resources should be reviewed annually.

Web Links and Video Lectures (e-Resources)
The source does not provide specific web links. It recommends institution-curated resources in these categories:
• Official documentation for institution-supported tools.
• Open-source design software documentation.
• W3C/WCAG accessibility resources.
• Typography and information-design resources.
• UI/UX accessibility and prototyping guidance.
• Image licensing, copyright and provenance guidance.
• Responsible AI and generative AI literacy/ethics resources.

Links should be reviewed periodically. The institution should maintain a tool-agnostic core and a periodically updated list of approved tools. Students should not upload confidential client information, personally identifiable information, unpublished institutional material or restricted project assets to external AI services without appropriate permission. Learning outcomes should remain achievable when a paid tool, cloud service or AI platform is unavailable.

Activity Based Learning (Suggested Activities in Class)
• Guest lecture or practitioner demonstration.
• Tool-neutral workflow clinic and digital production clinic.
• Typography and layout critique.
• UI/UX usability test.
• AI prompt-and-critique lab with documented iterations.
• Accessibility audit of a digital communication or interface.
• Digital portfolio review.
• Professional file-handoff exercise.
• Collaborative design review and short industry brief.
• Case study of an integrated digital design workflow.

Employability evidence can include a mini portfolio, one documented case study, a production-ready file package and a 3-5 minute design presentation explaining decisions, iterations and tool/AI usage. Transferable skills include raster/vector editing, image preparation, typography, layout, iconography, pattern, prototyping, responsive thinking, file management, visual judgment, iteration, critique, information verification, AI-output evaluation, user-centred reasoning, documentation, collaboration, presentation, portfolio development, licensing awareness and responsible use of emerging tools.

I Semester			
Applied Science in Design			
Course Code	2BBD106	**CIE Marks**	100
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**Viva Marks**	-
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning
Introduces the scientific principles that influence the design of products, spaces, graphics, interfaces and everyday environments. The emphasis is on design application rather than conventional science theory translating scientific concepts into design knowledge and decision-making. The intended outcome is a designer who can connect science → observation → experimentation → design solution.

COURSE OBJECTIVES
• Develop observation and measurement skills.
• Explain the properties and behaviour of materials.
• Introduce fundamental principles of mechanics relevant to products and structures.
• Explain heat, energy and thermal behaviour in designed environments.
• Introduce light, optics and colour from a scientific perspective.
• Introduce sound and acoustics in design.
• Connect human perception with design decisions.
• Introduce environmental science and sustainable design.
• Develop basic experimentation skills.
• Enable students to collect and interpret simple data.
• Develop evidence-based design reasoning.
• Connect scientific principles with everyday products and spaces.
• Develop scientific communication through diagrams, reports and presentations.
• Encourage curiosity, experimentation and problem solving.
• Scientific literacy is not separate from design practice. It provides the foundation for evidence-based design.
• Add an explicit competency statement: students should be able to frame a design-relevant scientific question, identify variables, select an appropriate simple measurement/experiment, record evidence, distinguish observation from inference, interpret limitations and translate findings into a design decision.
• Add uncertainty and limitations at foundation level: students should understand that measurements have error, instruments have limits and a small classroom experiment does not automatically establish a universal conclusion.

Teaching-Learning Process (General Instructions)
1. Theory classes to evaluate the structural properties of materials used in Design to understand the workability and strength, limitations of different materials. → Illustrative approaches: short concept lectures followed by material demonstrations, measurement exercises, comparative testing and design applications.
2. Documenting learning through sketches, notes, assignments. → Maintain a scientific-design notebook containing sketches, questions, hypotheses, measurements, diagrams, data, reflections and design implications.
3. Theoretical understanding through lectures theory classes to evaluate the properties of various materials. → Use blended inquiry: lecture + demonstration + experiment + discussion + interpretation + design application.
Faculty should retain autonomy to select the appropriate balance of lecture, laboratory/practicum, field observation, workshops, demonstrations and project work according to facilities and cohort needs.
problem-based learning, hands-on experiments, field observation, material/structure testing, collaborative investigation, visual data communication, peer critique and practitioner interaction.
Use safety briefings and risk assessment before experiments involving heat, tools, loads, electrical equipment, chemicals or unfamiliar materials.

Module I - SCIENTIFIC THINKING, MEASUREMENT, MATTER & MATERIALS

1.1 Science and Design: Applied science, observation, hypothesis, experimentation, evidence, analysis and design decisions.
1.2 Measurement for Designers: SI units, dimensions, area, volume, density, scale, accuracy, precision, error and measuring instruments.
1.3 Scale and Proportion: Actual size, scale drawings, ratios, proportions and model-making.
1.4 Matter and Materials: States of matter, material structure and physical, mechanical, thermal, optical and acoustic properties.
1.5 Material Properties: Strength, stiffness, hardness, toughness, elasticity, density, porosity, flexibility, conductivity, insulation, colour, texture, transparency and reflectance.
1.6 Material Classification and Investigation: Natural and manufactured materials; specimen collection, property documentation, basic testing, design applications, responsible sourcing, safe handling, reuse and disposal. Distinguish observations from measured properties.

Teaching-Learning Process	Concept briefing on scientific observation and measurement; guided SI-unit and instrument demonstrations; material sample observation; scientific-design notebook entries; discussion of accuracy, precision, error and limitations.

Module II - FORCE, MOTION, STRUCTURE, ENERGY & MECHANICS IN DESIGN

2.1 Force: Push, pull, gravity, friction, compression, tension, shear and torque.
2.2 Force in Products: Torque, loads and forces in doors, chairs, shelves, bicycles and scissors.
2.3 Balance and Stability: Centre of mass, base of support, balance and tipping.
2.4 Friction: Static, sliding and rolling friction; applications in shoes, tyres, drawers, door stops and grips.
2.5 Simple Machines: Levers, pulleys, wheel and axle, inclined planes, screws and wedges; mechanical advantage.
2.6 Structures: Loads, beams, columns, frames, trusses, shells and cantilevers.
2.7 Structural Forms: Arches, domes, triangular trusses, corrugated sheets and honeycomb structures. Paper-bridge experiment testing load capacity, material use and failure.
2.8 Motion: Distance, displacement, speed, velocity and acceleration; applications in products and mechanisms.
2.9 Energy: Mechanical, thermal, electrical, chemical, solar and light energy; applications in lamps, vehicles, turbines and appliances.

Practical Requirements: Identify independent, dependent and controlled variables; conduct repeated trials where feasible; document results and limitations; analyse failure causes; practise safe prototyping, load-path reasoning and clear communication of design constraints.

Teaching-Learning Process	Demonstration and guided testing of force, balance, friction and simple machines; paper-bridge or comparable load-testing exercise; students record variables, observations, failure points and limitations.

Module III - HEAT, THERMAL COMFORT, LIGHT, OPTICS & COLOUR

3.1 Heat and Temperature: Heat, temperature, thermal equilibrium, conduction, convection and radiation.
3.2 Heat Transfer in Design: Heat transfer mechanisms and their design applications.
3.3 Thermal Properties of Materials: Compare metals, wood, glass, foam, fabric and ceramics; investigate surface temperature and thermal feel.
3.4 Thermal Comfort and Insulation: Temperature, humidity, air movement, activity, clothing, surface temperature and insulating materials.
3.5 Light and Design: Natural and artificial light, intensity, reflection, refraction, absorption, transmission and shadows; applications across products, interiors, exhibitions and architecture.
3.6 Reflection and Refraction: Specular and diffuse reflection, light direction, lenses and optical distortion.
3.7 Colour Science: Visible spectrum, wavelength, colour perception, colour temperature, RGB additive colour and CMYK subtractive colour.
3.8 Colour and Lighting: Compare object appearance under different lighting conditions; relate illuminance, reflectance and perceived colour.

Practical Requirements: Record and graph observations, distinguish measurements from perceptions, and identify design implications. Consider contrast, glare, visual adaptation and inclusive communication without relying on colour alone.

Teaching-Learning Process	Comparative demonstrations of heat transfer and thermal properties; observation of shade, surface and material effects; simple light/colour investigations; record conditions and compare results without overgeneralizing.

Module IV - SOUND, ACOUSTICS, HUMAN PERCEPTION & ENVIRONMENTAL CONDITIONS

4.1 Sound: Vibration, frequency, amplitude, wavelength, pitch, loudness and timbre.
4.2 Sound and Acoustics in Design: Reflection, absorption, diffusion, reverberation, echo and sound insulation; applications in classrooms, offices, auditoriums and products.
4.3 Materials and Sound: Compare sound behaviour of concrete, glass, wood, fabric, foam and carpet; investigate classroom acoustics and noise sources.
4.4 Sound Level: Decibels (dB), comparative sound measurements and limitations of mobile sensing tools.
4.5 Human Perception: Visual, auditory, tactile, olfactory, gustatory and proprioceptive perception; sensory interaction in design.
4.6 Perception and Design: Contrast, readability, alarms, tactile grip and thermal comfort.
4.7 Ergonomics: Anthropometry, posture, reach, clearance, comfort and repetitive movements in everyday products and workspaces.
4.8 Human Factors and Inclusion: Physical and sensory capabilities, attention, fatigue, error, accessibility, ageing and mobility.
4.9 Sensory Audit: Document campus conditions through photographs, measurements, observation maps, diagrams, scientific interpretation and design recommendations.

Practical Requirements: Distinguish measured, observed and interpreted data; understand sensor calibration and limitations; obtain informed consent and protect participant identity.

Teaching-Learning Process	Listening walks and sound-source mapping; simple acoustic and lighting observations; guided discussion of perception, measurement limits and how environmental conditions influence design decisions.

Module V - SUSTAINABILITY, ENVIRONMENTAL SCIENCE & EVIDENCE-BASED DESIGN

5.1 Environment and Design: Ecosystems, natural resources, resource consumption, waste and pollution.
5.2 Material Life Cycle: Raw material, manufacturing, distribution, use and disposal.
5.3 Life-Cycle Thinking: Sourcing, energy, durability, repair, reuse, recycling and disposal.
5.4 Circular Design: Reduce, reuse, repair, refurbish, remanufacture and recycle.
5.5 Biomimicry: Design inspiration from lotus leaves, termite mounds, honeycombs and kingfisher beaks.
5.6 Sustainable Materials: Bamboo, cork, recycled materials, natural fibres, reclaimed wood and bio-based materials; critically evaluate sustainability claims and trade-offs.
5.7 Water and Design: Water conservation, rainwater harvesting, greywater and water-efficient products.
5.8 Energy-Efficient Design: Passive strategies, efficient lighting, solar energy, natural ventilation and insulation.
5.9 Science and Climate: Greenhouse effect, carbon emissions, urban heat and climate-sensitive design.
5.10 Evidence-Based Design: Distinguish observation, measurement, interpretation, assumption and design decision.

Practical Requirements: Compare environmental impacts using tables, ratios and graphs; investigate relevant local conditions; consider life-cycle trade-offs and rebound effects; and avoid unsupported conclusions from limited observations.

Teaching-Learning Process	Contextual environmental observation or audit; compare material, water, energy or climate-related evidence using simple tables/graphs; discuss life-cycle trade-offs, local context and responsible design implications.

COURSE OUTCOME

By the end of the course, students should be able to:

• CO1: Identify scientific principles relevant to design problems across material, mechanical, thermal, optical, acoustic, human-factor and environmental contexts.
• CO2: Conduct basic observations and measurements to investigate scientific phenomena relevant to design.
• CO3: Plan, conduct and document simple experiments to test design-related assumptions and questions.
• CO4: Interpret quantitative and qualitative evidence, acknowledge limitations, and communicate scientific findings visually and verbally.
• CO5: Apply responsible, evidence-based scientific reasoning to evaluate alternatives and inform design decisions.

Assessment Details (both CIE and SEE)

ASSESSMENT STRUCTURE

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.
To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of maximum marks for CIE.
To pass the SEE, a student must score at least 50% of Maximum marks for SEE.
Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 50% out of 100 marks.
For CIE, assess experiment notebook/process, observation and measurement, data handling, interpretation, design application, scientific communication and reflection.
For SEE, favour applied reasoning: interpret a design-related scientific situation, identify relevant principles, propose an experiment or measurement strategy, analyse simple evidence and justify a design implication. Avoid making the examination primarily a recall test.
Recommended rubric: scientific understanding 20%; observation/measurement 15%; experimental reasoning 20%; evidence/data interpretation 15%; design application 15%; communication/documentation 10%; safety/ethical practice 5%. The numerical distribution should be approved within the institution's assessment framework.
Course header states CIE Marks 100 while the assessment structure states 50% CIE + 50% SEE. → Reconcile the course header and institutional assessment scheme before publication; do not invent a new CIE/SEE numerical split.

Web Links and Video Lectures (e-Resources)

Web links and Video Lectures (e-Resources): [blank in source] → Curate annually: university/open science resources; introductory measurement and experimental-method resources; materials databases; climate/environmental data portals; accessibility/human-factors guidance; acoustics/light resources; and verified scientific visualization/data-literacy tutorials.
Digital technology should be used for data collection and communication where appropriate: spreadsheets, simple plotting, mobile sensing, photographic documentation, digital diagrams and annotated observation maps. Tool use should remain subordinate to scientific reasoning.

Suggested Learning Resources

• Hewitt, P. G. (2009). Conceptual Physics. Pearson.
• Giancoli, D. C. (2013). Physics: Principles with Applications. Pearson.
• Young, H. D., & Freedman, R. A. (2019). University Physics with Modern Physics. Pearson.
• Callister, W. D., Jr., & Rethwisch, D. G. (2020). Materials Science and Engineering: An Introduction. Wiley.
• Ashby, M. F. (2005). Materials Selection in Mechanical Design. Butterworth-Heinemann.
• Ashby, M. F. (2015). Materials and Sustainable Development. Butterworth-Heinemann.
• Norman, D. A. (2013). The Design of Everyday Things. Basic Books.
• Ullman, D. G. (2009). The Mechanical Design Process. McGraw-Hill.
• Papanek, V. (2005). Design for the Real World. Thames & Hudson.
• Benyus, J. M. (2002). Biomimicry: Innovation Inspired by Nature. Harper Perennial.
• Ching, F. D. K. (2014). Building Construction Illustrated. Wiley.

Supplement conventional physics/materials texts with accessible introductory resources on measurement, experimental design, human factors, climate-responsive design, life-cycle thinking and inclusive design. The source does not currently specify these digital resources.

Activity Based Learning (Suggested Activities in Class)

Guest Lecture from expert.
Case Studies: Choose relevant projects where scope of services to be learnt is more.
Expand to: material-testing demonstration; field measurement exercise; product/structure failure analysis; climate/environment observation; acoustics or lighting audit; data-visualization clinic; scientific communication workshop; practitioner interaction with product/architectural/material specialists.
Where feasible, connect a small investigation to a real workplace context. UGC guidance emphasizes experiential learning, workplace exposure, research aptitude, emerging technologies, teamwork and decision-making as employability-oriented outcomes.

DESIGN TASKS

Design Tasks contribute to: Scientific temper, Critical thinking, Design reasoning, Problem solving, Creativity, Observation, Experimentation, Data literacy, Environmental responsibility, Communication, Multidisciplinary thinking, Lifelong learning.
Add transferable professional skills: measurement discipline, experiment planning, technical documentation, data visualization, evidence-based argument, material comparison, risk awareness and communicating constraints to designers/engineers/clients.
Suggested integrated mini-project: identify a real design condition, formulate a measurable question, conduct a small investigation, visualize findings and propose a design response with explicit evidence and limitations. Keep the brief open-ended rather than prescribing a single artifact.

EXPERIMENT / STUDIO OUTPUT

Each experiment should follow: Experiment No., Title, Design Question, Scientific Principle, Hypothesis, Materials / Equipment, Procedure, Observation, Measurement, Data Table, Result, Interpretation, Design Implication, Reflection.
include Variables/Controls, Measurement uncertainty or limitations, Source/reference where external scientific information is used, and a short 'What would I test next?' section.
Assessment should reward the quality of the question, evidence and reasoning-not merely a successful or aesthetically pleasing prototype.

II Semester

Foundation Studio II

Course Code	2BBD201	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:56:0:80	**Viva Marks**	50
Total Hours of Pedagogy	150 Hrs.	**Total Marks**	100
Credits	5	**Exam Hours**	-

Course Learning

The course develops the student's ability to move from a framed design opportunity to defensible design decisions. Students analyse context, people, systems, meanings and constraints; synthesise evidence into design criteria; reframe opportunities; develop alternative concepts; prototype and test propositions; and communicate the reasoning behind design decisions.

Studio role: The studio is the integration space of Semester II. It does not attempt to reteach every theory course in full. Instead, it creates situations in which students use methods, concepts and disciplinary lenses from parallel courses to make, compare, decide, prototype and test design propositions.

Learning progression: Analyse → Synthesise → Reframe → Conceptualise → Develop → Prototype → Test → Reflect → Communicate. The course advances the observation, evidence, insight, opportunity and framing capabilities established in Semester I toward design criteria, concept development, prototyping, testing and design judgement.

Course Objectives

- Develop the ability to analyse design opportunities by examining context, people, systems, meanings and constraints.
- Build skills in synthesising evidence into design insights, criteria and requirements to support defensible design decisions.
- Enable students to reframe opportunities and develop alternative design concepts using methods and perspectives from parallel courses.
- Develop proficiency in creating, prototyping, testing and refining design propositions through iterative experimentation and evaluation.
- Foster critical reflection and effective communication of design decisions through documented processes, evidence and a coherent design portfolio.

Teaching-Learning Process (General Instructions)

The studio should use an active, evidence-led and iterative model. Faculty may sequence and combine methods according to the design brief, student cohort, available facilities and professional context. The studio should integrate relevant methods from parallel Semester II courses without duplicating their full teaching.

Illustrative approaches: evidence studio; question studio or living laboratory; theory-to-studio transfer; demonstrations and workshops; critique; peer review; prototype and test clinics; practitioner or community interaction; field/site visits; documentation lab; case studies; and reflective portfolio work. Videos and documentaries featuring designers from different disciplines and regions, including Indian and Asian design contexts, may be used. Site visits and practitioner interactions may be selected according to the studio brief.

Module I - ANALYSE: FROM FRAMED OPPORTUNITY TO DESIGN UNDERSTANDING

- Analysis of a framed design opportunity in its physical, social, cultural, functional, technological and environmental context.
- Mind Maps, Affinity Mappings, TemporalSpatial Mappings and Physical (Sensory) - Social - Cognitive Mappings.
- Stakeholder and actor relationships; direct, indirect and affected stakeholders.
- System/actor mapping and identification of dependencies, interactions and points of influence.
- Contextual evidence: what is observed, what is reported, what is inferred and what remains unknown.
- Constraints, assumptions, contradictions and tensions.
- Semiotic analysis - syntax, semantic and pragmatic dimensions - where meanings, signs, communication or cultural interpretation are relevant.
- Functional, experiential, material, cultural and environmental analysis as appropriate to the discipline.
- Application of research methods introduced in Design Research Methods, with emphasis on using evidence to make design decisions.
- Research ethics, consent and privacy applied where relevant to fieldwork and design development.

Teaching-Learning Process	Guided analysis of a framed design opportunity using physical, social, cultural, functional, technological and environmental lenses; demonstrate mind maps, affinity mapping, temporal-spatial and physical-social-cognitive mapping; stakeholder and system mapping workshop; distinguish observed, reported and inferred evidence; identify assumptions, constraints, contradictions and tensions; apply semiotic analysis where relevant; discuss research ethics, consent and privacy.

Module II - SYNTHESISE: FROM EVIDENCE TO DESIGN CRITERIA

- Observation → pattern → interpretation → insight → design implication.
- Evidence quality and confidence: what can reasonably be concluded and what remains uncertain.
- Comparing competing interpretations and identifying contradictions.
- Clustering and synthesis of human, contextual, functional, cultural, material and systemic findings.
- Translation of insights into design requirements, design criteria, priorities and tradeoffs.
- Development of design principles that can guide concept generation.
- Opportunity areas: where intervention may create meaningful change.
- Criteria for judging alternatives: user value, contextual fit, feasibility, accessibility, sustainability, meaning, performance and other brief-specific criteria.
- Use of matrices, diagrams, mappings and visual synthesis to make reasoning visible.

Teaching-Learning Process	Evidence-sorting and affinity-mapping workshop; guided progression from observation to pattern, interpretation, insight and design implication; compare competing interpretations and discuss evidence confidence; develop synthesis matrices and visual maps; translate insights into requirements, criteria, priorities and trade-offs; peer review design principles and opportunity areas against user value, contextual fit, feasibility, accessibility, sustainability and performance.

Module III - REFRAME: FROM OPPORTUNITY TO ALTERNATIVE DIRECTIONS

• Questioning the original problem statement and its assumptions.
• Reframing the user, context, scale, time horizon, system boundary or desired outcome where evidence supports it.
• Alternative opportunity statements and 'How Might We…?' formulations.
• Exploring different value propositions, experiences, relationships or system interventions.
• Generating multiple concept directions rather than converging on the first plausible solution.
• Comparing alternative directions against design criteria and identified constraints.
• Selecting a direction with an explicit decision rationale.
• Documenting what was rejected, why it was rejected, and what evidence informed the choice.

Teaching-Learning Process	Facilitated questioning of the original problem statement and its assumptions; reframe users, context, scale, time horizon, system boundaries or desired outcomes where evidence supports it; generate alternative opportunity statements and “How Might We” questions; small-group divergent-thinking workshop; compare directions against design criteria and constraints; document selected and rejected directions with evidence-based rationale.

Module IV - CONCEPTUALISE: FROM DESIGN PRINCIPLES TO CONCEPT

• Concept generation from design principles, opportunity areas and contextual evidence.
• Alternative concept directions across product, communication, spatial/environmental, service or interaction possibilities as appropriate.
• Design intent: what the concept is trying to change, enable, communicate or improve.
• Form, image, typography, material, interaction, spatial, technological and systemic decisions as appropriate to the discipline.
• Use of theory from parallel Semester II courses as active design inputs.
• Concept comparison using explicit criteria rather than aesthetic preference alone.
• Early feasibility and consequence checks: material, technical, social, environmental, accessibility and contextual implications.
• Concept statement, design rationale and decision trail.

Teaching-Learning Process	Concept-generation workshop using design principles, opportunity areas and contextual evidence; cross-course transfer activity using relevant Semester II theories; develop varied concept directions across product, communication, spatial, service or interaction possibilities; articulate design intent; use a decision matrix and explicit criteria to compare concepts; conduct early feasibility and consequence checks; produce a concept statement, rationale and decision trail.

Module V - DEVELOP & PROTOTYPE: FROM CONCEPT TO TESTABLE PROPOSITION

• Low and mediumfidelity prototyping appropriate to the design problem.
• Sketch models, storyboards, spatial mockups, material studies, visual sequences, roleplay, service scenarios, interface flows, physical/digital simulations and other appropriate formats.
• Prototype selection: what question is the prototype intended to answer?
• Testing form, function, meaning, interaction, usability, experience, communication or system behaviour as appropriate.
• Iterative development based on evidence rather than polishing a single first concept.
• Accessibility and inclusive use considered during development.
• Material/resource implications and sustainability considered during development.
• Documentation of prototype versions, failures, feedback and changes.

Teaching-Learning Process	Demonstrate low- and medium-fidelity prototype formats; prototype-selection clinic beginning with the question to be answered; guided making of sketch models, storyboards, spatial mockups, material studies, visual sequences, roleplay, service scenarios, interface flows or simulations as appropriate; peer and faculty critique; iterative development based on evidence; accessibility and sustainability checks; document versions, failures, feedback and changes.

Module VI - TEST, REFLECT & COMMUNICATE: FROM ITERATION TO DESIGN POSITION

• Test planning: what is being tested, with whom, under what conditions, and what evidence would change the decision?
• Feedback and observation from users, peers, faculty, practitioners or other relevant stakeholders.
• Interpreting feedback without treating every comment as an instruction.
• Iteration and refinement based on identified evidence and design criteria.
• Reflection on assumptions, failures, unexpected findings, limitations and unresolved issues.
• Final design proposition and rationale.
• Development narrative: context → evidence → analysis → synthesis → reframing → concept → prototype → test → iteration.
• Professional case study documentation and Foundation Portfolio II evidence.
• Verbal and visual communication appropriate to an internal/external studio review.

Teaching-Learning Process	Develop a test plan identifying what is tested, with whom, under what conditions and what evidence could change a decision; conduct user, peer, faculty, practitioner or stakeholder feedback sessions; interpret feedback against criteria rather than treating every comment as an instruction; refine the proposition; facilitate reflection on assumptions, failures, limitations and unresolved issues; prepare a coherent development narrative, case study and portfolio evidence; conduct verbal and visual studio review.

Course Outcomes:
By the end of the course, students should be able to:
• CO1: Analyse a framed design opportunity using appropriate human, contextual, functional, cultural, material, technological and systemic perspectives.
• CO2: Synthesise evidence into design implications, criteria, priorities, constraints and design principles.
• CO3: Reframe a design opportunity by questioning assumptions, boundaries and inherited interpretations.
• CO4: Generate, compare and develop alternative concepts using explicit design criteria and contextual evidence.
• CO5: Develop, prototype and test design propositions using appropriate physical, visual, spatial, digital, experiential or systemic methods.

Assessment Details (both CIE and SEE)

• Continuous Internal Evaluation (CIE): 50 marks. Ongoing studio evidence including analysis, synthesis, reframing, concept development, prototype/test cycles, documentation and reflection.

• Viva Voce: 50 marks. Ability to explain and defend the design journey, evidence quality, framing, criteria, decisions, prototype/test learning, limitations and next steps.

• Total: 100 marks.

Assessment should recognise the quality of the design process and decisions, not only the polish of the final artefact. Evidence of productive failure, iteration and reasoned change is valid studio evidence.

Suggested Learning Resources:

• Lawson, B. (2005). How Designers Think: The Design Process Demystified (4th ed.). Architectural Press.

• Pahl, G., Beitz, W., Feldhusen, J., & Grote, K.-H. (2007). Engineering Design: A Systematic Approach (3rd ed.). Springer.

• Jones, J. C. (1992). Design Methods (2nd ed.). John Wiley & Sons.

• Lidwell, W., Holden, K., & Butler, J. (2010). Universal Principles of Design (2nd ed.). Rockport Publishers.

• Ambrose, G., & Harris, P. (2010). Design Thinking. AVA Publishing.

Web links and Video Lectures (e-Resources)

The source syllabus does not prescribe specific URLs. Videos and documentaries featuring designers from different disciplines and regions, including Indian and Asian design contexts, may be selected according to the studio brief. Site/field visits, practitioner interactions and case studies may also be used where appropriate.

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

• Context and framing: define a design opportunity, context, assumptions and stakeholder/actor relationships.

• Analyse: produce observation/evidence sets, mappings and identify tensions and constraints.

• Synthesise: develop evidence clusters, insights, design implications, criteria, priorities and opportunity areas.

• Reframe: generate alternative frames/opportunity statements and justify the selected direction.

• Conceptualise: generate multiple concepts, compare them using explicit criteria and document rationale.

• Develop, prototype and test: create appropriate prototypes, define test questions, gather feedback and iterate.

• Communicate and reflect: present the final proposition, development narrative, limitations, reflection and portfolio documentation.

II Semester

Visual & Material Language II

Course Code	2BBD202	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:42:0:64	**Viva Marks**	50
Total Hours of Pedagogy	120 Hrs.	**Total Marks**	100
Credits	4	**Exam Hours**	-

Course Learning

This course builds on Semester I material observation, visual composition, material behaviour, construction techniques, performance and sustainability. Students progress from identifying and experimenting with individual materials to designing and evaluating integrated material systems, interfaces and assemblies. Emphasis is placed on how material structure and behaviour inform visual expression, fabrication, durability, maintenance and environmental responsibility.

Course objectives

- Compare material systems and predict how their properties influence form, performance and visual character.
- Develop material-led compositions using deliberate relationships among colour, texture, grain, pattern, light and finish.
- Select fabrication, joining and assembly methods in response to material behaviour, scale, loads and intended use.
- Evaluate interfaces, tolerances, durability, maintenance and failure risks in combined material systems.
- Apply life-cycle thinking, circular strategies and evidence-based criteria to an integrated material proposal.

Teaching-Learning Process (General Instructions)

Conduct the course through material-system investigations, comparative testing, fabrication demonstrations, detail studies, iterative prototypes and evidence-based critique. Semester I foundations should be revisited briefly where needed, then extended toward combined materials, more complex assemblies and justified selection decisions.

Illustrative approaches: material system mapping, comparative performance tests, material-composition studios, joint and interface mock-ups, fabrication trials, failure analysis, life-cycle comparisons, circular redesign and integrated prototype reviews. Students should record methods and observations, identify limitations in tests, use tools safely, minimise waste and support material decisions with evidence rather than appearance alone.

Module I - MATERIAL SYSTEMS: STRUCTURE, BEHAVIOUR & SELECTION

1.1 Progression from individual material properties to material systems: substrate, core, surface, reinforcement, coating and connection.
1.2 Comparative behaviour of timber and engineered boards, metals, ceramics, glass, polymers, textiles, paper-based materials, composites and bio-based or reclaimed materials.
1.3 Relationships among grain, fibre, orientation, porosity, thickness, section, stiffness, flexibility, strength and weight.
1.4 Material response to bending, compression, tension, impact, moisture, heat, wear and repeated use.
1.5 Selection based on function, geometry, fabrication capability, availability, safety, maintenance and intended visual effect.
Studio output: comparative material-system atlas and a selection rationale supported by observed properties and simple test evidence.

Teaching-Learning Process	Material-system mapping and comparative sample tests; instructor demonstrations of material response; cross-section and layer analysis; guided selection matrix linking properties, intended function, fabrication and visual effect.

Module II - MATERIAL-LED VISUAL COMPOSITION & PERCEPTION

2.1 Composing with material relationships: contrast, continuity, hierarchy, rhythm, scale, repetition and visual weight.
2.2 Colour, texture, grain, pattern, translucency, reflectance, gloss and finish as outcomes of material choice and treatment.
2.3 Visual effects created by orientation, layering, perforation, weave, relief, edge condition and joint pattern.
2.4 Interaction of materials with light, shadow, viewing distance, touch and surrounding context.
2.5 Coordinating or contrasting materials while maintaining legibility, coherence and functional suitability.
Studio output: material composition studies and a resolved palette with annotated reasons for each material, finish and junction.

Teaching-Learning Process	Material palette and composition studio; controlled tests of colour, texture, orientation and light; compare surface treatments and edge conditions; peer critique using visual intent, material evidence and functional suitability as criteria.

Module III - FABRICATION, JOINING & ASSEMBLY LOGIC

3.1 Matching processes to material behaviour: cutting, scoring, bending, moulding, casting, weaving, laminating, machining and surface treatment.
3.2 Assembly systems: mechanical fasteners, adhesives, interlocking, stitching, welding as a demonstrated process, tensioned connections and reversible joints.
3.3 Structural configurations: frames, shells, panels, skins, ribs, folded systems, layered systems and modular assemblies.
3.4 Joint design, edge treatment, tolerances, sequencing, access for assembly and disassembly, and finish continuity.
3.5 Choosing a construction method according to material limits, scale, stability, precision, repairability, safety and production constraints.
Studio output: a set of joint and assembly prototypes with annotated fabrication sequence and material-process justification.

Teaching-Learning Process	Demonstrations and supervised fabrication trials; joint-detail workshop; build and compare alternative connections; test fit, stability and ease of assembly; document process sequence, limitations and safe working practices.

Module IV - PERFORMANCE, INTERFACES & SERVICE LIFE

4.1 Performance of combined materials under use: wear, impact, moisture, heat, weathering, corrosion, fading and cleanability.
4.2 Interfaces between dissimilar materials: movement, expansion, moisture transfer, abrasion, galvanic or chemical incompatibility, delamination and failure at joints.
4.3 Design for durability, maintenance, repair, replacement, access and safe handling.
4.4 Relationship between material thickness, section, support, span, connection and overall stability at an introductory design level.
4.5 Evidence-based evaluation: define criteria, conduct simple comparative tests, record failure and state the limits of conclusions.
Studio output: interface mock-up, performance record and revised material/assembly proposal based on test findings.

Teaching-Learning Process	Case studies of material and joint failure; supervised interface and durability tests; failure analysis; students revise details against defined performance criteria and present evidence-based decisions.

Module V - CIRCULAR MATERIAL SYSTEMS & INTEGRATED STUDIO

5.1 Life-cycle considerations for material systems: sourcing, processing, transport, fabrication, use, maintenance and end-of-life.
5.2 Comparing embodied resource use, waste, emissions, toxicity, durability and local availability without relying on unsupported environmental claims.
5.3 Circular design strategies: reduce, reuse, repair, refurbish, recover, recycle and design for disassembly.
5.4 Material provenance, reclaimed and recycled content, renewable resources, traceability and responsible sourcing.
5.5 Trade-offs among performance, aesthetics, cost, maintenance, longevity and environmental impact.
5.6 Integrated studio: develop a material system for a defined function, combining composition, fabrication, interfaces, performance and circularity.
Studio output: prototype or detailed mock-up, material and assembly schedule, selection matrix, life-cycle rationale and process portfolio.

Teaching-Learning Process	Material life-cycle comparison and sourcing audit; circular redesign exercise; integrated prototype studio; final review assessing visual intent, material compatibility, construction logic, performance evidence, repairability and end-of-life planning.

Course Outcome (Course Skill Set)
By the end of the course, students should be able to:
• CO1: Analyse how material structure and behaviour influence form, function, fabrication and visual character.
• CO2: Develop coherent material-led compositions using colour, texture, grain, pattern, light and finish.
• CO3: Select and demonstrate appropriate fabrication, joining and assembly methods for a defined material system.
• CO4: Evaluate material interfaces and assemblies against performance, durability, maintenance, safety and use requirements.
• CO5: Develop and communicate an integrated material proposal that considers sourcing, resource efficiency, repair, reuse and end-of-life.

Assessment Details (both CIE and SEE)
Assessment Structure
The assessment in this course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.
• To qualify and become eligible to appear for SEE, a student must score at least 40% of maximum marks for CIE.
• To pass the SEE, a student must score at least 50% of maximum marks for SEE.
• A student passes the course when the combined total of CIE and SEE is at least 50 out of 100 marks.
Course-level assessment should evaluate material reasoning, composition, fabrication trials, interface testing, iterative improvement and the quality of documented evidence, in accordance with approved university regulations.

Suggested Learning Resources:
• Ashby, M. F., & Johnson, K. (2014). Materials and Design: The Art and Science of Material Selection in Product Design (3rd ed.). Butterworth-Heinemann.
• Lefteri, C. (2014). Materials for Design. Laurence King Publishing.
• Thompson, R. (2017). The Materials Sourcebook for Design Professionals (2nd ed.). Thames & Hudson.
• Brownell, B. (Ed.). (2013). Material Strategies: Innovative Applications in Architecture. Princeton Architectural Press.
• McDonough, W., & Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things. North Point Press.

Web links and Video Lectures (e-Resources)
• Material ConneXion or equivalent material-library resources for material properties, finishes and applications.
• Materiom: bio-based and circular material research.
• Ellen MacArthur Foundation: circular design and material life-cycle resources.
• Manufacturer and workshop demonstrations showing forming, joining, finishing, repair and disassembly methods.
Faculty should verify the relevance and reliability of selected resources and align them with available workshop facilities.

Activity Based Learning (Suggested Activities in Class) / Practical Based learning
• Build a comparative material-system atlas showing layers, properties, likely uses and constraints.
• Create material-led compositions exploring colour, texture, grain, light and finish.
• Make and compare alternative joints or assembly details for selected materials.
• Conduct a simple performance test and document method, results and limitations.
• Analyse an interface failure and propose a revised detail.
• Redesign a small object or spatial element for repair, disassembly, reuse and reduced waste.
• Develop an integrated prototype with material schedule, fabrication sequence and evidence-based selection rationale.

II Semester

Visual Representation II

Course Code	2BBD203	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**SEE Marks**	50
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning

The course develops the student's ability to use images as a deliberate means of seeing, representing, interpreting, transforming and communicating design ideas. It builds on the visual exploration and representation capabilities of Semester I by introducing greater intentionality: students distinguish observed, remembered, imagined, symbolic and transformed imagery, select representation strategies according to design intent and audience, and construct visual sequences and narratives through analogue and digital processes.

Course objectives

•Develop the ability to use images to observe, represent, interpret, transform and communicate design ideas.
•Build skills in distinguishing and working with observed, remembered, imagined, symbolic and transformed imagery.
•Enable students to select appropriate visual representation strategies based on design intent, context and audience.
•Develop proficiency in constructing visual sequences and narratives through analogue and digital processes.
•Foster intentional visual communication through image-making, experimentation, critique and reflective evaluation.

Teaching-Learning Process (General Instructions)

The course should develop deliberate, contextual and defensible representational choices. Combine observational practice, image analysis, analogue and digital experimentation, visual sequencing, critique and reflective documentation. Select tools according to learning objectives and institutional resources.

Module 1 - SEE: REPRESENTING THE OBSERVED & THE CONCEPTUAL

• Representing the observed.
• Representing concepts and sketching for ideation.
• Observation through proportion, structure, spatial relationships, selective detail and visual hierarchy.
• Distinguishing direct observation from photographic reference, tracing, memory and interpretation.
• Visual notation and sketching as tools for thinking rather than only final representation.
• Selecting what to show, what to omit and what to emphasise according to visual intent.
• Relationship between observation, representation and design decision.

Teaching-Learning Process	Image laboratory: guided observational drawing and visual notation; instructor demonstrations of proportion, structure, selective detail and visual hierarchy; short sketching exercises for observed subjects and design concepts.

Module 2 - REPRESENT & ABSTRACT: MIMETIC, SELECTIVE, SYMBOLIC & IMAGINED IMAGERY

• Mimetic imagery and abstraction.
• Memory and imagination.
• Distinguishing what is observed, remembered, inferred, imagined, symbolic and invented.
• Levels of abstraction: retaining essential structure while changing detail, scale, context or visual language.
• Symbolic representation and metaphor where appropriate.
• Comparing direct, selective, diagrammatic, symbolic and abstract modes of representation.
• Choosing an appropriate representational mode for a specific design intention and audience.

Teaching-Learning Process	Representation shift exercises: represent one subject through mimetic, selective, diagrammatic, symbolic and abstract modes; compare memory, imagination and observation; critique choices against intent and audience.

Module 3 - CONTEXTUALISE: ART, AESTHETICS, EXPRESSION & VISUAL LANGUAGE

• History of Art and Aesthetics as a source of visual understanding.
• Expression and imagery.
• Connecting historical and contemporary visual references to design decisions.
• Visual language: composition, contrast, rhythm, scale, colour, texture, framing and visual emphasis.
• Cultural context and the interpretation of visual references.
• Responsible use of cultural imagery, references and visual traditions.
• Attribution and source acknowledgement where external references materially inform the work.

Teaching-Learning Process	Seminars and case studies on art, aesthetics and visual expression; reference-to-abstraction exercises using contextualised historical and contemporary imagery; discuss cultural context, attribution and responsible reference use.

Module 4 - TRANSFORM: TIME, SPACE, MIGRATION OF FORMS & IMAGE MANIPULATION

• Time and space in image.
• Migration of forms and image manipulation.
• Cropping, scaling, layering, recomposition, juxtaposition, repetition, distortion and visual displacement.
• Colour and tonal transformation.
• Transformation across different contexts, scales, media or meanings.
• Metamorphosis through form, colour and structure.
• Every major transformation should have an identifiable design intention rather than functioning only as a formal effect.
• Analogue and digital transformation processes may be combined.

Teaching-Learning Process	Transformation studio using cropping, scaling, layering, recomposition, juxtaposition, repetition, distortion, colour and tonal changes; analogue-digital translation and iterative comparison of meaning.

Module 5 - SEQUENCE & COMMUNICATE: VISUAL NARRATIVE AND IMAGE MAKING

- Visual sequencing: ordering images to create progression, comparison, tension, explanation or narrative.
- Relationship between image, time, space, rhythm and audience attention.
- Construction of a coherent visual narrative or design communication using transformed and/or original imagery.
- Image preparation for print, screen, presentation and portfolio contexts as appropriate.
- Nondestructive digital editing and versioned development.
- Image quality, resolution, file organisation and appropriate output preparation.
- Reflection on visual choices, transformations, audience and communication effectiveness.
- Software remains toolagnostic; tools are selected according to the learning objective and institutional resources.

Teaching-Learning Process	Visual narrative studio: sequence images to create progression, comparison or narrative; prepare outputs for print, screen and portfolio; peer critique, failure/iteration review and portfolio documentation including source/provenance records.

Course Outcome (Course Skill Set)

By the end of the course, students should be able to:

- CO1: Construct and communicate three-dimensional form using appropriate spatial, proportional and representational conventions.
- CO2: Select and combine physical and digital modelling approaches to explore, iterate and communicate 3D design ideas.
- CO3: Analyse the relationship among form, material, structure, movement, human scale and experience.
- CO4: Experiment with materials and processes, document outcomes and use evidence to refine form and process decisions.
- CO5: Apply basic structural, ergonomic and material reasoning to the development of three-dimensional design propositions.

Assessment Details (both CIE and SEE)

Assessment Structure

Continuous Internal Evaluation (CIE): 50 marks. Progressive 3D studies, material experiments, transformation and morphology work, structural and movement studies, integrated proposition, documentation and reflection.

Viva Voce: 50 marks. Ability to explain and defend formal, material, structural, movement and human-experience decisions; demonstrate understanding of process, iterations, limitations and learning.

Total: 100 marks. Assessment should recognise process, experimentation, material understanding, iteration and design judgement, not only the visual polish of the final model.

Suggested Learning Resources:

- Ching, F. D. K. (2023). Architectural Graphics (7th ed.). Wiley.
- Ching, F. D. K., & Juroszek, S. P. (2019). Design Drawing (3rd ed.). Wiley.
- Montague, J. (2013). Basic Perspective Drawing: A Visual Approach (6th ed.). Wiley.
- Hoffmann, A. R. (2020). Sketching as Design Thinking. Routledge.
- Kantrowitz, A. (2022). Drawing Thought: How Drawing Helps Us Observe, Discover, and Invent. MIT Press.

Web links and Video Lectures (e-Resources)

The source syllabus does not prescribe specific URLs. Faculty may select relevant demonstrations, material-process videos, case studies and digital-physical modelling resources according to institutional facilities and the materials available. Any selected resources should support the stated learning outcomes and be checked for relevance before use.

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- 3D elements and principles study using point, line, plane, volume, mass, void, scale and balance.
- Material transformation study using folding, bending, layering, casting, carving or assembly.
- Morphology and form-transition study with an articulated rationale.
- Structure and connection study testing stability, balance, joints and material behaviour.
- Movement and human-scale study exploring gesture, reach, posture or interaction.
- Integrated 3D proposition combining form, material, structure and experience.
- Digital-physical translation with process documentation and iterative refinement.
- Case-study discussion of relevant design, architecture, craft, product and material practices from Indian, Asian and global contexts.

II Semester

Design Research Methods

Course Code	2BBD204	**CIE Marks**	50
Teaching Hours/Week (L:T:S:P:SL)	28:0:0:0:32	**SEE Marks**	50
Total Hours of Pedagogy	60 Hrs.	**Total Marks**	100
Credits	2	**Exam Hours**	3

Course Learning

The course develops research as a disciplined design capability. Students learn to frame useful questions, define the scope and boundaries of inquiry, gather and evaluate evidence, analyse and synthesise findings, distinguish observation from interpretation, and communicate defensible insights. It equips students to produce reliable evidence that can inform design decisions in Studio II and other Semester II courses.

Course objectives

•Develop the ability to formulate relevant research questions and define the scope and boundaries of inquiry.
•Build skills in gathering, evaluating and documenting reliable evidence using appropriate research methods.
•Develop analytical and synthesis skills to identify patterns, relationships and meaningful insights from research findings.
•Enable students to distinguish observation from interpretation and formulate evidence-based, defensible conclusions.
•Foster clear communication of research findings to inform design decisions in Studio II and other Semester II courses.

Teaching-Learning Process (General Instructions)

Use research demonstrations, guided practice, short research clinics, evidence-sorting exercises, case-based ethics discussions and critique. Students should work with real design contexts and document the source, quality, limits and interpretation of evidence. Digital tools may support documentation and analysis, but software names are not prescribed as curriculum outcomes.

Module 1 - RESEARCH: QUESTIONS, SCOPE & BOUNDARIES

• Design research as intentional inquiry: why research is undertaken and what makes evidence useful to design.
• Research questions: exploratory, descriptive and evaluative forms; question quality; scope and feasibility.
• Defining the unit of inquiry, context, participants/materials and boundaries of investigation.
• Assumptions, positionality and the difference between what is known, suspected and still unknown.
• Research ethics, respectful participation, privacy, consent and responsible documentation.
• Research planning: inquiry sequence, evidence needs, constraints and an appropriate level of depth for a small design research study.

Teaching-Learning Process	Research-question clinic: students convert broad topics into feasible exploratory, descriptive or evaluative questions; define the unit of inquiry and boundaries; review assumptions, consent and privacy through short design-research cases.

Module 2 - EVIDENCE: SOURCES, CREDIBILITY & PROVENANCE

• Primary and secondary evidence and when each is appropriate.
• Observation, artefacts, documents, interviews/conversations, surveys and digital sources.
• Source credibility, relevance, bias, provenance, citation and attribution.
• Evidence logs and source maps: recording where information came from, why it matters and how it will be used.
• Distinguishing direct evidence, reported information, interpretation and assumption.
• Responsible use of images, participant information and digitally sourced material.

Teaching-Learning Process	Source-evaluation workshop: compare primary and secondary sources for credibility, relevance, bias and provenance; create an evidence log and source map; distinguish direct evidence from reported information, interpretation and assumption.

Module 3 - INVESTIGATE: FIELD INQUIRY & DOCUMENTATION

• Structured observation and contextual inquiry.
• Interview and conversation protocols: purpose, sequencing, neutral questioning, listening and notetaking.
• Visual and spatial documentation: photographs, sketches, diagrams, mapping and annotated records.
• Sampling logic at an introductory level: deciding what, who, where and when to investigate.
• Field notes: separating description from interpretation and recording context, uncertainty and anomalies.
• Responsible handling of participant information and research records.

Teaching-Learning Process	Guided field inquiry: practise structured observation and neutral questioning; prepare a simple sampling plan; document a setting through field notes, sketches, photographs or maps while separating description from interpretation.

Module 4 - SYNTHESISE & INTERPRET: FROM EVIDENCE TO INSIGHT

• Organising raw evidence for analysis.
• Coding and categorisation; affinity mapping; thematic analysis.
• Identifying patterns, relationships, contradictions, exceptions and anomalies.
• Triangulation: comparing different sources or methods rather than relying on a single account.
• Moving from finding to interpretation to insight.
• Testing alternative explanations and avoiding premature conclusions.
• Insight and opportunity statements as outputs of evidence-based interpretation; opportunity framing remains connected to, but distinct from, Studio II design development.

Teaching-Learning Process	Evidence Studio: students sort and code a small evidence set, build an affinity map, identify patterns and contradictions, compare sources through triangulation, and develop an insight statement with alternative explanations and limitations noted.

Module 5 - COMMUNICATE: RESEARCH NARRATIVE & EVIDENCE

• Building a concise research narrative: question, method, evidence, analysis, interpretation and insight.
• Visual evidence and research communication: maps, matrices, diagrams, annotated images, quotations and concise summaries.
• Precedent and case study analysis: selecting, comparing and documenting relevant examples.
• Research summaries and insight statements for a design audience.
• Limitations, uncertainty and reflective commentary.
• Citation, provenance and attribution in written and visual research.
• Presenting evidence clearly without overstating what the research can support.

Teaching-Learning Process	Research communication workshop: build a concise question-to-insight narrative using a map, matrix, annotated image or summary; compare precedents; peer-review clarity, citation, provenance, limitations and whether claims are supported by evidence.

Course Outcome (Course Skill Set)

By the end of the course, students should be able to:
• CO1: Frame a feasible design research question and define its scope, unit of inquiry and ethical boundaries.
• CO2: Select and evaluate primary and secondary evidence for credibility, relevance, bias and provenance.
• CO3: Plan and conduct introductory field inquiry using observation, conversation and responsible documentation.
• CO4: Organise, code and synthesise evidence, identify patterns and compare explanations through triangulation.
• CO5: Communicate research findings and insights through a concise, clearly attributed visual and written narrative that acknowledges limitations.

Assessment Details (CIE and Theory)

Assessment Structure
Continuous Internal Evaluation (CIE): 50 marks. May assess research process evidence, source and evidence quality, analysis and synthesis, research communication and reflection.
Theory Examination: 50 marks. Assesses conceptual understanding of research questions, methods, ethics, evidence, analysis and interpretation.
Total: 100 marks. No separate Term Work or Viva Voce marks are assigned to this course in the approved scheme.

Suggested Learning Resources: Books and Articles

• Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE Publications.
• Martin, B., & Hanington, B. (2012). Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions. Rockport Publishers.
• Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. CoDesign, 4(1), 5-18.
• Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). This is service design doing. O'Reilly Media.
• Cross, N. (2023). Design thinking: Understanding how designers think and work (2nd ed.). Bloomsbury Visual Arts.

Web links and Video Lectures (e-Resources)

The source syllabus does not prescribe specific URLs. Faculty may select research-method demonstrations, field inquiry examples, source-evaluation resources and case studies relevant to the stated learning outcomes. Check selected resources for relevance, credibility and accessibility before use.

Activity Based Learning / Practical Based Learning

• Convert a broad design topic into a focused research question and scope statement.
• Create a source map and evidence log for a small design inquiry.
• Conduct structured observation and a short, consent-aware conversation.
• Produce field notes and annotated visual documentation, separating description from interpretation.
• Code a small evidence set and develop an affinity map or thematic grouping.
• Compare evidence from different sources and formulate a defensible insight statement.
• Present a concise research narrative with citations, limitations and reflective commentary.

II Semester

Typography and Information Design

Course Code	2BBD205	**CIE Marks**	100
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**SEE Marks**	-
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning

The course develops typography as a visual, technical and material communication system. Students progress from letterform observation and construction to typographic hierarchy, composition, information systems, contextual and multilingual use, and physical/digital application. Emphasis is placed on visual judgement, technical control, experimentation and communication rather than software-specific training.

Course objectives

- Develop an understanding of letterforms, typography and their role in visual communication.
- Build skills in constructing and arranging type through hierarchy, composition and information systems.
- Enable students to apply typography appropriately across contexts, languages and communication formats.
- Develop technical control and visual judgement through experimentation and physical and digital applications.
- Foster effective typographic communication through critical evaluation, contextual sensitivity and audience awareness.

Teaching-Learning Process (General Instructions)

Combine visual analysis, short demonstrations, controlled typographic exercises, hand-to-digital workflows, material and print experiments, critique and reflective documentation. Select tools and production processes according to learning objectives and available institutional resources. Evaluate typographic decisions for hierarchy, legibility, context, craft and communication.

Module 1 - TYPOGRAPHY: VISUAL LANGUAGE, CONTEXT & VOCABULARY

- Typography as visual language and a means of communication.
- Brief historical and contemporary context of type; recognition of typefaces and type families.
- Fundamental typographic terminology and vocabulary.
- Indian, regional and vernacular type contexts; typography as culturally situated communication.
- Observation of typography in signage, publications, interfaces, packaging, identity and public environments.
- Relationship between typographic form, audience, context and communicative intent.

Teaching-Learning Process	Visual audit and discussion: collect and analyse examples from signage, publications, interfaces, packaging and public environments; identify type families, vocabulary, audience, context and communicative intent.

Module 2 - LETTERFORM: STRUCTURE, ANATOMY & CONSTRUCTION

- Letterform construction and anatomy: baseline, cap height, x-height, ascenders, descenders, counters, terminals and stroke.
- Proportion, rhythm, repetition and internal/external relationships within letterforms.
- Hand construction and exploratory drawing of letterforms.
- Recognition and comparison of type families and structural characteristics.
- Hand-to-digital translation: preserving proportion, rhythm and construction logic.

Teaching-Learning Process	Instructor demonstration followed by hand-drawn letterform construction, comparative type-family analysis and a hand-to-digital translation exercise focused on anatomy, proportion and rhythm.

Module 3 - WORD & HIERARCHY: VARIABLES, COMPOSITION & INFORMATION

- Typographic variables: kerning, tracking, leading, spacing and alignment.
- Scale, contrast, hierarchy and grids.
- Word, line, block and page/screen relationships.
- Expressive versus functional typographic composition.
- Type-image relationships and the role of typography in organising information.
- Legibility and readability as contextual design considerations.

Teaching-Learning Process	Controlled composition exercises testing spacing, scale, contrast, alignment and grids; students compare expressive and functional arrangements and critique legibility, readability and information hierarchy.

Module 4 - SYSTEM: CLASSIFICATION, SEMANTICS & CONTEXTUAL TYPOGRAPHY

- Type classification and selection.
- Semantics of type: how typographic choices contribute to meaning, tone and context.
- Applied hierarchy and typographic systems.
- Multilingual and vernacular considerations; appropriate handling of Indian and regional language contexts.
- Accessibility: legibility, contrast, size, spacing, reading conditions and non-colour-dependent communication.
- Typography for print and screen; differences in medium, scale and reading behaviour.

Teaching-Learning Process	Case-study seminar on type classification, meaning and contextual use; develop a small typographic system for a defined audience, including multilingual, accessibility and print/screen considerations.

Module 5 - SEQUENCE & PRINT/SCREEN: EXPLORATION, PRODUCTION & APPLICATION

• Exploratory representation: expressive typography and selected 3D/physical typography studies.
• Print experiments using appropriate processes such as block printing, screen printing and hot stamping.
• Substrate, registration, ink/material behaviour, proofing and production constraints.
• Sustainable production choices: substrate, ink, waste, reuse and print quantities.
• Digital/screen output and file preparation.
• Testing, refinement and application: collect, analyse, construct, test, refine and apply.
• Technical documentation of process, failures, iterations and final decisions.

Teaching-Learning Process	Material/print laboratory exploring appropriate physical processes and substrates; prepare print and screen outputs, test proofs, document failures and iterations, and present a refined typographic application for critique.

Course Outcome (Course Skill Set)

By the end of the course, students should be able to:
• CO1: Identify and analyse typographic structures, terminology, typefaces and type families in context.
• CO2: Construct and manipulate letterforms using hand and digital methods, demonstrating control of proportion, anatomy, spacing and rhythm.
• CO3: Apply hierarchy, alignment, scale, contrast, grids and typographic relationships to organise information clearly.
• CO4: Select and adapt typography for contextual, multilingual, vernacular, print and screen applications with attention to legibility, accessibility and audience.
• CO5: Experiment with physical and digital representation/printing processes and explain how material, technical and production constraints affect typographic outcomes.

Assessment Details (CIE)

Continuous Internal Evaluation (CIE): 100 marks. Assessment may include typographic knowledge and visual judgement; exploratory process and iteration; hierarchy and composition; technical execution; print/screen production; contextual and multilingual awareness; documentation and reflection. No separate Theory, Term Work or Viva Voce marks are assigned to this course in the official scheme. Internal weightage may be determined by faculty within the approved 100-mark CIE structure.

Suggested Learning Resources:

• Bringhurst, R. (2012). The elements of typographic style (4th ed., version 4.0). Hartley & Marks.
• Carter, R., Maxa, S., Sanders, M., Meggs, P. B., & Day, B. (2018). Typographic design: Form and communication (7th ed.). John Wiley & Sons.
• Lupton, E. (2024). Thinking with type: A critical guide for designers, writers, editors, and students (3rd ed., revised and expanded). Princeton Architectural Press.
• Meggs, P. B., & Purvis, A. W. (2016). Meggs' history of graphic design (6th ed.). Wiley.
• Wong, W. (1993). Principles of form and design. John Wiley & Sons.

Web links and Video Lectures (e-Resources)

The source syllabus does not prescribe specific URLs. Faculty may select relevant typography demonstrations, case studies, lettering and print-process videos, and digital production resources according to institutional facilities. Check all selected resources for relevance and accessibility before use.

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

• Contextual typography collection and visual analysis.
• Hand-constructed letterforms and anatomy studies.
• Typographic variable exercises using kerning, tracking, leading, spacing and alignment.
• Hierarchy and grid-based information composition.
• Contextual or multilingual typography study.
• Physical typography and exploratory print/material experiments.
• Print/screen application with proofing and technical file preparation.
• Critique, iteration and documentation of decisions, failures and final outputs.

II Semester

Digital Making II

Course Code	2BBD206	**CIE Marks**	100
Teaching Hours/Week (L:T:S:P:SL)	14:0:28:0:48	**SEE Marks**	-
Total Hours of Pedagogy	90 Hrs.	**Total Marks**	100
Credits	3	**Exam Hours**	-

Course Learning

This course introduces electronics as a material, system and interaction medium for designers. Students develop foundational circuit literacy, sensing, actuation, control and physical computing capability to formulate and prototype design responses. The emphasis is on understanding, building, testing and integrating electronics into designed experiences.

Course objectives

- Develop foundational understanding of electronic components, circuits and their applications in design.
- Build skills in sensing, actuation and control to enable interactive design solutions.
- Introduce physical computing concepts to connect electronic systems with designed objects and experiences.
- Develop proficiency in building, testing and troubleshooting basic electronic prototypes.
- Enable students to integrate electronics into design propositions through experimentation, evaluation and iterative refinement.

Teaching-Learning Process (General Instructions)

Use short concept demonstrations followed by hands-on studio/lab application. Organise learning around build, observe, test, troubleshoot and iterate. Use low-voltage educational components and make polarity, current limits, safe handling and fault diagnosis explicit. Connect electronic behaviour to user experience, form, context and design intent. Document circuit diagrams, photographs, test notes, failures and reflections.

MODULE 1 - SENSE: ELECTRONICS AS A DESIGN MEDIUM

- What electronics does in designed environments: sensing, processing, actuation, feedback and communication.
- Basic electrical quantities: voltage, current, resistance and power; DC circuits and polarity.
- Open and closed circuits; identifying inputs, outputs, power and ground.
- Components as design materials: resistor, capacitor, diode/LED, switch, transistor, motor and buzzer.
- Reading simple circuit diagrams.
- Electronics as a material, system and interaction medium rather than an isolated technical object.

Teaching-Learning Process	Component identification and circuit-reading demonstration followed by a low-voltage circuit build. Students map inputs, outputs, power and ground, then explain electronics as a design medium.

MODULE 2 - CONNECT: CIRCUIT LOGIC & PROTOTYPING

- Series and parallel circuits; basic resistance/current relationships and power awareness.
- Breadboarding, connectors, polarity and safe low voltage prototyping.
- Digital versus analogue signals.
- Switches, buttons, potentiometers and simple indicators.
- Multimeter use for basic continuity, voltage and resistance checks.
- Fault finding: observe → isolate → test → modify → retest.

Teaching-Learning Process	Guided breadboarding exercises using series and parallel circuits, switches and indicators. Students use a multimeter, diagnose an introduced fault and record the observe-test-modify-retest process.

MODULE 3 - SENSE: SENSING THE PHYSICAL ENVIRONMENT

- Sensors as ways of translating physical conditions into data.
- Introductory sensing categories: light, distance/proximity, temperature, pressure/touch and motion.
- Input → condition → output logic; thresholds and simple mappings.
- Contextual sensor selection: what is being sensed, where, by whom and for what decision?
- Data quality, calibration, noise and limitations of sensor readings.
- Interpreting sensor outputs cautiously rather than treating sensor data as automatically accurate.

Teaching-Learning Process	Sensor stations for light, proximity, temperature, touch and motion. Students compare readings, test thresholds and calibration, and discuss context, noise and limits of sensor data.

MODULE 4 - CONTROL: PHYSICAL COMPUTING & BEHAVIOUR

- Microcontroller concept and the relationship between hardware and programmed behaviour.
- Digital input/output, analogue input, timing and conditional logic.
- Actuators: LEDs, buzzers, servos and small motors as introductory outputs.
- Event response, feedback loops and simple interactive behaviours.
- Toolagnostic programming/configuration using an appropriate educational platform.
- Connecting input, programmed/configured logic and output into an intentional system.

Teaching-Learning Process	Build a simple input-logic-output behaviour using an educational microcontroller platform. Demonstrate timing, conditional logic and an actuator, then test the response against intended behaviour.

MODULE 5 - INTERACT: ELECTRONICS, FORM & EXPERIENCE

• Electronics as part of an interaction system. • Affordances, feedback, visibility, timing and user interpretation. • Mapping user/context observations from Studio II into electronic opportunities. • Accessibility and inclusive interaction: sensory, motor and cognitive considerations. • Physical form, enclosure, ergonomics and material choice. • Safe integration of electronics into physical design prototypes.	
Teaching-Learning Process	Interaction scenario workshop linking user/context observations to a responsive prototype. Students critique feedback, affordance, accessibility, enclosure, ergonomics and safe physical integration.
MODULE 6 - RESPONSIBLE ELECTRONICS: SUSTAINABILITY, SAFETY & ETHICS	
• Energy use, repairability, modularity, durability and material/ewaste awareness. • Component sourcing, responsible disposal and safe handling. • Low voltage educational circuits, appropriate current limits, component inspection and fault isolation. • Privacy and responsible sensing when data about people, spaces or behaviour is collected. • Responsible use of AI/automation in code, ideation, troubleshooting or documentation: human decisionmaking, verification, provenance, disclosure and privacy. • Designing within technical, ethical, environmental and user constraints.	
Teaching-Learning Process	Demonstrations, safety audits and case studies on low-voltage circuits, e-waste management, privacy, and responsible AI use. Practical exercises in component inspection, fault isolation and evaluating prototypes against technical, ethical and environmental constraints.
MODULE 7 - TEST, REFLECT & COMMUNICATE: FUNCTIONAL PROTOTYPING	
• Rapid electronic prototype development from problem framing to functional test. • Test plans: expected behaviour, variables, observations, failures and iteration. • Documentation: circuit diagram, component list, wiring/connection logic, code/configuration notes, photographs and test record. • Demonstrating and explaining a working prototype to a nonspecialist audience. • Reflection: what worked, what failed, what was learned and what should change next. • Evidence-based iteration and communication of the final functional prototype.	
Teaching-Learning Process	Prototype test session using an explicit test plan. Students document circuit and connections, code/configuration, results, failures and iterations, then demonstrate and explain the prototype to a non-specialist.
Course Outcome (Course Skill Set) By the end of the course, students should be able to: • CO1: Identify basic electronic components and interpret simple circuit diagrams. • CO2: Construct and test low-voltage circuits and diagnose basic faults. • CO3: Select and interpret sensors with awareness of calibration and data limitations. • CO4: Develop a simple physical-computing prototype linking input, logic and output. • CO5: Evaluate and communicate prototypes with attention to safety, accessibility, sustainability and privacy.	
Assessment Details (CIE) Continuous Internal Evaluation (CIE): 100 marks. Assess foundational circuit literacy, safe construction, sensing and physical-computing behaviour, iterative testing, documentation and communication. The official scheme specifies CIE 100 and no separate SEE marks.	
Suggested Learning Resources: Books and Online Resources • Monk, S., & Scherz, P. (2016). Practical electronics for inventors (4th ed.). McGraw-Hill Education. • Platt, C. (2015). Make: Electronics (2nd ed.). Maker Media. • Igoe, T. (2017). Making things move: DIY mechanisms for inventors, hobbyists, and artists (2nd ed.). McGraw-Hill Education. • Arduino. (n.d.). Language reference. https://docs.arduino.cc/language-reference/ • McRoberts, M. (2013). Beginning Arduino (2nd ed.). Apress.	
Web links and Video Lectures (e-Resources) Use relevant educational resources for low-voltage circuit basics, component identification, breadboarding, multimeter use, sensor calibration, microcontroller inputs/outputs and prototype testing. Check platform suitability, safety guidance and accessibility before use.	
Activity Based Learning (Suggested Activities in Class) / Practical Based learning • Identify and classify electronic components. • Build and test a simple low-voltage circuit. • Diagnose an introduced circuit fault. • Compare sensor readings and thresholds. • Create a simple input-logic-output interaction. • Conduct a safety, sustainability and privacy audit. • Test, document and present a functional prototype.	