(ISO 9001:2015 Certified)

B.DES_TRANSPORTATION & MOBILITY DESIGN

(w.e.f. 2023)

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UPES

UNIVERSITY OF TOMORROW

School of Design

Transportation & Mobility Design

Course book, 2023

Bachelor of Design

Transportation Design

Transportation and mobility is a basic need of human in society. With changing lifestyle, technological development and environmental issues, mobility products are constantly upgrading fulfilling changing requirements. Design issues are not just technical but also connected to cultural and deeper socio-economic sensibilities.

The program offer focused areas of development in vehicle exteriors, vehicle interiors (including user interface and user experience) and alternative transportation in personal mobility, public transit systems, 2- wheelers and water craft vehicle.

Intent

This program develop skill and knowledge, which makes the students a competent designer for auto industry in India and abroad. Students develop creative skills required to work futuristic mobility solutions. It includes identifying and understanding the mobility issues in a broad spectrum of public and personal transportation, creating vehicle concepts with distinct personality, improved functions and with broad social impact.

Transportation and Mobility Design, in its true sense, is multi-disciplinary in nature where digital and physical worlds merge, it can revolutionize urban transportation, dissolve infrastructure issues and increase quality of life.

POs / Program Outcomes

PO 1:
Develop Creative Mind-set

Develop the ability to think out of the box and come up with alternative solutions for every problem. Prepare the mind for the unexpected and develop the ability to explore the unknown

PO 2:
Empathy

Develop the empathy towards end users, which will help arrive at solutions that have a long term benefit for them.

PO 3:
Creative Articulation

Develop the ability to articulate and communicate ideas and concepts verbally, through visual representation and through writing

PO 4:
Discovery to Realization

Develop a strong process oriented mind-set and the ability to identify Insights ranging from small incremental changes to undiscovered value additions for both the end consumer and all stakeholders

PO 5: Design for Future

Developing an analytical thinking process which can look and dig into the Uncertainties and the promises of the intelligent objects and technologies of the

Future and finding scope of design to enhance the lives of people.

PO 6: Inter-Disciplinary Approach

Inculcate inter-disciplinary mindset to bring a holistic approach
Towards the overall design process in order to deliver a cohesive outcome.

PO 7: Entrepreneurial Spirit

Develop the ability to think innovatively, take risks, develop and successfully
Commercialize solutions in evolving market conditions

PO 8: Teamwork

Demonstrate knowledge and understanding of the design principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 9: Professional Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the design practice.

PO 10: Sustainable Solutions

Understand the impact of design in the societal and environmental contexts, and demonstrate the knowledge of, and ability to come up with sustainable solutions.

PO 11: Local & Global Context

To demonstrate the knowledge and sensitivity towards local needs and come up with solutions that contribute towards nation building while achieving international quality and benchmarks.

PO 12: Lifelong learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs / Program Specific Outcomes

PSO1 – Fundamentals of Vehicle Research

Students will gain fundamental knowledge on research methods and process for vehicle.

PSO2 - Digital Mock-ups and Clay Modelling

Student will learn to develop and present vehicle design concepts using digital tools and software. Thus, they will gain digital sculpting skills for vehicles. In addition, students will gain the clay modeling skills in this program.

PSO3 - Vehicle Packaging

Students will learn skills related to vehicle packaging and ergonomics for optimal accommodation of car occupants, considering aesthetics of the vehicle in mind.

Foundation program course grid over view

This is being the starting semester, most basic courses are taught here. Students spend enough time developing hands on skill and creativity. They are exposed to materials and work on applied geometry.

Foundation Year 1, Semester 1

Hours

SUBJECT CODE	Course Name	C	L	T	P
SDCS 1014	Sketching & Drawing- 1	5	4	0	2
SDCS 1015	Elements of Design	3	1	1	2
SDCS 1016	Colour	4	1	2	2
SDCS 1017	Geometry	5	2	2	2

SDCS1018	SLA	2	1	1	0
SDCS1006	Material exploration I	2	1	0	2
SLICL01	Learning how to learn	2	2	0	0
SLICL02	Living Conversations	2	2	0	0
		25	14	6	10

30

In this semester, students keep on strengthening the fundamental skills like sketching and learn essential knowledge through learning design process and computer skills.

Foundation Year 1, Semester 2

SUBJECT CODE	Course Name	C	L	T	P	
SDCS 1019	Sketching & Drawing- II	5	4	0	2	
SDCS 1020	Principles of design	5	1	3	2	
SDCS 1021	Design Process	6	3	2	2	
SDCS 1023	Computer Applications	2	1	0	2	
SDCS 1010	Material Explorations II	2	1	0	2	
SLICL03	Leadership and Teamwork	2	2	0	0	
SLICS01	Critical Thinking and Writing	3	3	0	2	
		25	15	5	10	30

Year 2, Semester 3

This year's semester's program's intensive curriculum is to build basic skills like sketching and visualization of 3D forms. The student starts doing research on Transportation vehicle design and study on history of automobile to build a knowledge base. Learning 3D software like Alias is basic requirement of a transportation designer. They start learning from this semester. The students do simple mobility projects to apply knowledge and creative problem solving in this semester.

Semester 3, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P	
SDTD2011	Automotive Sketching and Illustration- I	3	0	1	4	
SDTD2012	Forms and Aesthetics	3	0	1	4	
SDTD2013	Design Research	2	1	1	0	
SDPJ2106	***Project 1:*** Simple Mobility Product Design Project 1: Bicycle, Skate Board, Wheel Chair etc.	5	1	2	4	
	Professional Electives 1	3	1	2	0	
SDTD 2018	Material & Manufacturing Process					
SDTD2015	History of Transportation Design					
SLICL04	Design Thinking	2	1	1	0	
SLICS02	Ethical Leadership in the 21st Century (Human Values and Ethics)	3	2	1	0	
SLICE01	Exploratory Elective 1	3	2	1	0	
	Total	**24**	**8**	**10**	**12**	**30**

Year 2, Semester 4

This year's 4th semesters program's intensive curriculum is to develop yet again the core skills like sketching and illustration, develop essential knowledge base like Ergonomics, Materials & manufacturing and Automotive Technology etc.
While the student sharpen the skills on clay modeling and digital modeling, they also do projects on future mobility concepts.

Semester 4, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P
SDTD 2016	Automotive Sketching and Illustration -II	3	0	1	4
SDTD 2019	Clay Modeling	3	1	2	0
SDTD 2014	Digital Sculpting-1	3	0	2	2
	Project 2: TDP2 Vehicle Design Project(2- Wheel Vehicle); Eg; Bike, Scooter, Scooty etc.	5	1	2	4
	Professional Elective 2	3	1	2	0
	Trends in Automotive Technology				
	Automotive Engineering & Technology				
SLICL05	Working With Data	2	1	1	0
SLICS03	Environment and Sustainability - Himalaya Fellowship	3	1	2	0
SLICE02	Exploratory Elective 2	3	1	2	0
	Total	**25**	**6**	**14**	**10**

Year 3, Semester 5

The Third year takes the work and understanding of the tools to a higher level. Students learn special areas of vehicle design and packaging concepts. They apply knowledge in assignment projects, which require study of users and technology platforms. Here they start integrating practical scenario in class room projects.

Semester 5, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P
SDTD 3014	Ergonomics & Vehicle Packaging	3	1	1	4
	Project 3: Vehicle Styling Project (Exterior Design)	5	1	1	6

	Professional Elective 3:	3	1	1	2
SDTD 3015	Vehicle Graphics				
SDTD 3016	Advanced Digital Rendering				
	Professional Elective 4	3	1	1	2
SDTD 3020	FRP Manufacturing				
SDTD 3021	3D printing				
	Advanced Digital Sculpting				
SLICL06	Persuasive Presence	2	1	1	0
SLICS04	Start your Start-up	3	1	2	0
SLICE03	Exploratory Elective 3	3	1	2	0
	Total	22	7	9	14

Year 3, Semester 6

This year's 6th semester's program's intensive curriculum is to combine special areas of vehicle design and manufacturing processes. They do learn about portfolio making and presentation skills.

The students consider not only the vehicle but the system and infrastructure required to make a much advanced human society in future. They do choose special subjects of their need to find a direction of their career interest.

Semester 6, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P
	Digital Representation Techniques	3	1	1	2
SDTD3018	Visual Communication and Portfolio Creation	2	1	1	0
	Advanced Digital Sculpting 2 : (ALIAS)	3	0	1	4
	Professional Elective 5	3	2	1	0
	Ui/Ux in Transportation Design				
	Service Design in Transportation				
	Self-Driving Vehicle Technology				
	Industrial visit	1	0	1	0
	Project 4: Public Transport/Commercial Transport (Exterior, Interior etc.)	5	1	2	4

SLICE04	Exploratory Elective 4	3	1	1	2
SLIES01	Solving Complex Problems	3	1	1	2
SLIES02	Technologies of the Future				
SLIES03	Future Casting				
SLIES04	Managing Relationships and Being Happy				
	Total	**23**	**7**	**9**	**14**

Year 4, Semester 7

The fourth year semester 7, acquired students typically move to the advanced level in their major project, and working in a group and team. They learn Design management, Vehicle standards and advanced digital sculpting in this semester. This will add professional touch to their skills. The project in this semester include bigger scenario and practical constraints.

Semester 7, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P
SDTD 4006	Design Management & IPR	2	1	1	0
	Professional Elective 6	3	1	2	0
	Advanced Materials in Automotive				
	Aerodynamics				
	CMF & Vehicle Interiors	3	1	2	0
SIIB 4101	Summer Internship	2	0	0	4
	Project 5: Futuristic Transportation/ Concept Design/System Design etc	5	0	0	10
SLICE05	Exploratory Elective 5	3	1	1	2
SLIES05	India and Its Place in the Contemporary World	3	1	1	2

SLIES06	Theory of Everything				
SLIES07	Digital Transformation				
SLIES08	Finding your purpose in Life				
		21	5	7	18

Year 4, Semester 8

The fourth year semester 8 is one of the most important semester in terms of final product out comes, which would reflect understanding and skill of a transportation designer. The student undertake project from industry based on actual requirement and work on providing feasible solutions. They come to know professional practice of transportation design.

The industry project will have one mentor from industry and two mentors from academics to guide student to deliver value added solutions to industry. The follow research methodology and do proper documentation for the project.

Semester 3, Course grid with CLTP allocation

SUBJECT CODE	Course Name	C	L	T	P
SDPJ 4111	Graduation Project: Transportation & Mobility Design Project with Industry	15	0	0	30

All Courses over view from year 2, year 3 and year 4

Core Courses **Projects**

Automotive Sketching and Illustration- I
Forms and Aesthetics
Design Research
Automotive Sketching and Illustration -II
Clay Modeling
Digital Sculpting-1
Ergonomics & Vehicle Packaging
Digital Representation Techniques
Visual Communication and Portfolio Creation
Advanced Digital Sculpting 2 : (ALIAS)
Design Management & IPR
Professional Elective 6
Advanced Materials in Automotive
Aerodynamics
CMF & Vehicle Interiors

(Project-1)
Simple Mobility product design
(Project-2)
Vehicle Design Project(2- Wheel Vehicle); Eg; Bike, Scooter, Scooty etc.
(Project-3)
Project 3: Vehicle Styling Project (Exterior Design)
(Project-4)
Public Transport/Commercial Transport (Exterior, Interior etc.)
(Project-5)
Futuristic Transportation/ Concept Design/System Design etc.
(Project 6)
Final Individual Project
Graduation project

Program electives

Professional Elective 1:
Option 1: Material & Manufacturing Process
Option 2: History of Transportation Design

Professional Elective 2: Trends in Automotive Technology
Automotive Engineering & Technology

Professional Elective 3: Vehicle Graphics, Advanced Digital Rendering

Professional Elective-4: FRP Manufacturing, 3D printing
Professional Elective 5: Vehicle Prototyping
Self Driving Vehicle Technology

(Professional Elective 6: Advanced Materials in Automotive,

Aerodynamics)

Pedagogy and Evaluation Methodology

Internal:

For Lecture Component:

- *Presentations:* written exam, written assignment (time bound in studio), skill test, written essay & oral test
- *Audio-Visual:* written exam, written assignment (time bound in studio), skill test
- Experience share: written assignment (time bound in studio), skill test, written essay & oral test
- *Case studies:* written analysis of presented case studies
- *Project briefing:* written assignment (time bound in studio), skill test, written essay & oral test, written analysis of presented case studies
- *Assignment context explanation:* deriving written inferences & methodology on presented assignment context
- *Theory & Principles:* written exam, written assignment (time bound in studio), written essay & oral test

For Tutorial Component:

- *Demonstrations:* skill test with studio skill assessment

- *Explanation of assignment approach and process:-* submission of proposed methodology
- *Group discussions:* deriving written inferences & methodology on presented assignment context
- *Group briefing:* deriving written inferences & methodology on presented assignment context
- *Citing relevance of assignments through demonstration:* skill test with cognitive & studio skill assessment
- *Analysis technique demonstration:* skill test with studio skill assessment
- *Process Demonstrations:* skill test with cognitive &studio skill assessment

For Practical Component:

- *Practice for refining skills:* skill test with cognitive, studio & innovative skill assessment
- *Iterations and alternative concept generation:* cognitive, studio & innovative skill assessment
- *Execution of idea:* cognitive, studio & innovative skill assessment
- *Implementation of project idea:* cognitive, studio & innovative skill assessment
- *Surveys & recording:* cognitive & studio skill assessment
- *Developing understanding by iterations:-* cognitive, studio & innovative skill assessment
- *Design Projects:* cognitive, studio & innovative skill assessment
- *Workshop skills:* studio & innovative skill assessment
- *Prototyping:* studio & innovative skill assessment
- *Model making:* studio & innovative skill assessment
- *Brain storming:* cognitive & innovative skill assessment
- *Documentation:* cognitive, studio & innovative skill assessment

***** All of the teaching pedagogy and its corresponding evaluation methods shall be kept as per the requirement of the course and the course faculty is solely responsible for selection of teaching pedagogy and shall adapt the suggested evaluation methods as listed above.**

End-Semester Examination:

Jury:

- A panel of jury members will be formed with at least three members (one subject matter expert specific to the design program, one internal design faculty member and one industry expert/ another internal design faculty member).
- Jury panel will evaluate all the course outcomes based on evaluation criteria (Cognitive skill, Studio Skill, and Innovative Skill). The jury panel will assign the both quantitative markings and qualitative feedbacks in a prescribed format. Feedbacks for each course will be recorded in a prescribed format.

Criteria of Assessment and its Definition:

- **Cognitive skill (CS)-** The CS are related to understanding of a particular subject in the design programme
- **Studio Skill (SK) –** The SS are related to quality of modeling/ illustration / digital representation skill of a student during studio practice for respective design problem
- **Innovative Skill (IS) -** Innovative skills are related to the quality of a student to bring unique creative solutions to an assigned design problem to a particular context.
- **Attitude Towards Learning (ATL) –** This is depending on the frequency of faculty-student interaction, which could be measured as number of classroom attendance and one to one meeting of student with a faculty, for assignment guidance required by a student.

*****Weightage (from 10 % to 100%) could be assigned for these above mention criteria (CS, SS, IS and ATL) as per the requirement of evaluation of a particular course. However, a maximum weightage for ATL should be kept as 10 %.**

2023-27

Foundation

Year 1

Semester 1

SKETCHING AND DRAWING-I

Foundation @ SOD

L	T	P	C
4	0	2	5

COURSE BRIEF

Drawing is a language /tool which help design student represent their concept and ideas. Since primitive age drawing was a best way of communicating thought or Idea. Ability to use lines and draw is a basic requirement of design practice. This module introduces students to the essentials of freehand drawing and enables them to draw what the eye observes, and the mind perceives. They are guided on how to use drawing as a powerful communication tool and about coordination of hand, eye and mind.

LEARNING OBJECTIVES

The module introduces the students to

- The fundamentals of Visual Perception and Spatial Positioning of Figures/ Objects in two dimensions and three dimensions
- Observe and represent observation with different lines.
- Develop line quality with rigorous sketching.

COURSE CONTENTS

- ### Drawing basics:

  Types of pencils and their characteristics, how to hold a pencil, importance of wrist and elbow movements, how to draw lines and circles, importance of drawing in single strokes, disadvantages of broken wrist movement, gain control over eye and hand coordination.

➢ Nature Drawing :

Importance of pressure while drawing a line. Impact of variation in pressure on the quality of drawing. Understand basic units, (e.g. a leaf) their proportions and relationship with the whole. Draw simple units, without details.

➢ Human Drawing:

Understand the proportions of body. Different parts of human body, their proportional relationship within and without, learn to draw parts without details.

➢ Object Drawing:

Basic dimensions, how three dimensions build up volumes, representation of three axes in 2 D, principles of isometric and perspective drawing, simple isometric and perspective drawing in one, and two point perspectives.

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

- Develop observation skills and understanding of tools to draw (CO1)
- Understand proportions of human body and objects and their relationship to the environment (CO2)

Skills and Attributes:

- Apply observational skills to draw nature, human and object drawings (CO3)
- Sketch forms and figures with an understanding of proportions, light and shade, angles and perspective (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	1	3	2	3	3	0	0	0	0	3	3
CO 2	2	2	3	2	3	2	0	0	0	1	1	3
CO 3	3	2	3	3	3	2	0	0	0	2	2	3
CO4	3	1	3	3	3	2	0	0	2	2	2	3

PREREQUSITES AND METERIAL

1. Basic drawing skill
2. Pencil (2B , 4 B, 6B) Paper (cartridge paper, color , and other types of paper)
3. Require few object and human models for Live sketching

REFERENCE BOOKS

1. Sketching: Drawing Techniques for Product Designers by Koos Eissen(Author), Roselien Steur(Author), BIS Publishers
2. Drawing for Product Designers (Portfolio Skills: Product Design) by Kevin Henry, Laurence King Publishing
3. Perspective and Sketching for Designers by Jessica Newman, Jessica Newman and Jack Beduhn, Prentice Hall
4. Freehand Drawing For Architects and Interior Designers by Magali Delgado Yanes, Magali Delgado Yanes (Author), Ernest Redondo Dominguez and Maria Fleming Alvarez, W. W. Norton & Company
5. Design Drawing by Francis D. K. Ching and Steven P. Juroszek, Wiley
6. How to Draw: drawing and sketching objects and environments from your imagination by Scott Robertson and Thomas Bertling, Design Studio Press
7. Sketching: The Basics by Roselien Steur an Koos Eissen, BIS Publishers
8. Anatomy and Drawing by Victor Perard, Dover Publications
9. Illustration With Markers/Time-Saving Techniques for Design Professionals by John A. Gleason, Whitney Library of Design
10. Rendering with Pen and Ink by Robert W. Gill, W Norton & Co Inc

URL

- https://www.creativebloq.com/features/how-to-draw-animals-people-landscapes
- https://design.tutsplus.com/tutorials/how-to-draw-a-rose--cms-26864
- https://www.thegreatcourses.com/courses/how-to-draw.html
- http://www.floobynooby.com/pdfs/Perspective_Drawing_Handbook-JosephDAmelio.pdf
- https://www.pdfdrive.com/human-figure-drawing-books.html

ELEMENTS OF DESIGN

Foundation @ SOD

L	T	P	C

1	1	2	3

COURSE BRIEF

The elements of design are the basic components used as part of any composition. They are the objects to be arranged, the constituent parts used to create the composition itself. In most situations the elements of design build upon one another, the former element helping to create the latter. The module focuses on ways of thinking and seeing with focus on the elements like a dot, a line, color, shape, form, texture, pattern etc.

LEARNING OBJECTIVE

The module introduces the students to

- Understand fundamentals related to elements of design and develop sensitivity towards Visual Perception.
- The various characteristics of each element and their applicability.
- Explore according to aptitude and thought process. Such explorations imbibe sensitivity towards the various characters of each element and the variations that can be created by appropriate utilization of these characteristics.

COURSE CONTENT

- **Dot**

What is a dot? Arrangement of dots, image creation with dots, density of dots, impact of varying densities of dots, relationship of density with clarity of pictures/images,

- **Line**

Line as extension of dots, straight and curved lines, various attributes of line, (width, thickness, weight, length, direction) combination of various types of lines, effect of line orientations

- **Texture and pattern**

What is texture? Texture and pattern in nature and man-made environment, analysis of texture and patterns, exploration with different media

- **Shape**

Definition/ identification of shape, (through lines, value, color, texture etc.) Geometric and organic shapes. Linear and complex shapes. Interaction of shapes

- **Size/scale**

Basic understanding of scale and size. How sizes play a role in gaining/losing dominance over other elements in a given format.

- **Form and space**

Definition of negative and positive spaces. Relationship between positive and negative spaces. Transition from space to form and vice versa.

COURSE OUTCOME

Knowledge & Understanding:

After completing this course, you will be able to:

- Develop creative conceptual ability and sensitivity to visual perception (CO1)
- Understand fundamentals of visual interactions that exist between two or more elements (CO2)

Skills and Attributes:

- Apply understanding of elements to create effective compositions (CO3)
- Demonstrate an ability to present creative ideas using design language (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	1	3	2	2	2	0	0	2	2	2	3
CO 2	2	1	3	2	2	2	0	0	0	1	2	3
CO 3	3	1	3	2	2	2	0	0	3	2	2	3
CO4	3	2	3	3	2	2	0	0	2	2	2	3

PREREQUSITES AND METERIAL

1. Poster color, Black Ink, Scale, Markers and Geometry Box.
2. Brush(0,2, 4 ,8,) Paper (cartridge paper, color , and other types of paper)
3. Acrylic or water and oil-based color require to explore student in bigger surface.

REFERENCE BOOKS

1. Design Basics by David A. Lauer Learning.
2. Design Elements: Understanding the rules and knowing when to break them by Timothy Samara, Rockport Publishers.
3. Design Elements, Form & Space: A Graphic Style Manual for Understanding Structure and Design by Dennis Puhalla, Rockport Publishers.

COLOUR

Foundation @ SOD

L	T	P	C
1	2	2	4

COURSE BRIEF

Colour, or color, is the characteristic of human visual perception described through with names such as red, orange, yellow, green, blue, or purple. The module explores an understanding of three basic elements that are required for an appreciation of color: a light source, an object, and a viewer. It also helps to explore the psychological and cultural factors involved in perception. The importance of color design stems from the significance of color to the human mind and this module shall help in creating ideas, expresses messages, spark interest, and generate certain emotions through compositions.

LEARNING OBJECTIVES

One of the most important elements of design, color, is being treated as a separate subject, to learn and explore more in the same. This subject exposes the student to the basic characteristics of color, and the additive and subtractive color theories and its application.

COURSE CONTENTS

- Color terminologies – hue, value, tint, shade, intensity, Chroma, etc.
- Primary colors
- Secondary colors

- Color wheel
- Intermediate colors
- Complimentary colors
- Split complimentary colors
- Grey scale
- Color schemes: monochromatic, warm, cool, complimentary, split complimentary, triadic, analogous,
- Color interaction

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

- Demonstrate an understanding of color theories and color interaction in your work (CO1)
- Explain and translate the understanding of color terminology in compositions (CO2)

Skills and Attributes:

- Generate practical application and understanding of colors (CO3)
- Demonstrate an ability to present creative contextual compositions (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	2	3	0	2	1	0	0	2	0	3	3
CO 2	2	1	3	0	2	1	0	0	3	1	2	3
CO 3	3	1	3	1	1	1	0	0	3	2	2	3
CO4	3	1	3	0	3	1	0	0	3	2	2	3

2023-27

PREREQUSITES AND METERIAL

1. Poster color, mostly camel
2. Brush(0,2, 4 ,8,) Paper (cartridge paper, color , and other types of paper)
3. Pastel, and acrylic or water and oil-based color require to explore student in bigger surface.

REFERENCE BOOKS

1. Color influencing form : a color coursebook by Roy Osborne. Publication - Boca Raton, FL: Universal Publishers, 2007
2. Color, form and space by Birren, Faber, Publication- New York. : Reinhold., 1960
3. Colour Interaction with a Three Dimensional Form by Vyas, H. K. 1968
4. Elements of Design: (Advanced) Form & ColourVyas, H. K.
   Design I: The Elements Videotape; Color, Line, Shape & Form, Pattern by Texture Atexinc.
5. The Forms of Color by Gerstner, Karl, Publication -Cambridge : The MIT Press, 1990
6. Colour for Survival by Ward, Peter, Publication - London : Orbis pub, 1980
7. Playing with color: 50 graphic experiments for exploring color design principles by Richard Mehl, Publication - Beverly: Rockport Publishers, 2013
8. Color management : a comprehensive guide for graphic designers (2005 ed.)by John T Drew and Sarah A Meyer, Publication - Switzerland : Roto Vision, 2005
9. Colour: Art & Science edited by Trevor Lamb, Janine Bourriau. Publication - Cambridge University Press.
10. Goethe's Theory of Colours By Johann Wolfgang von Goethe .
11. Colour: A Workshop for Artists and Designers by David Hornung.

REFERENCE URL's

https://www.pantone.com/what-is-color

https://www.quora.com/What-are-designer-colours

https://www.crayola.com/for-educators/resources-landing/articles/color-what-is-color.aspx

GEOMETRY

Foundation @ SODS

L	T	P	C
2	2	2	5

COURSE BRIEF

The course introduces the students to the basic fundamentals of Construction, Visual Perception and Spatial Positioning of Figures/ Objects in 2 Dimensions and 3 Dimensions. The students are empowered with the knowledge and skills to interpret and represent development of 2D and 3D geometry in the form of drafted sheets

and study models. The module covers the practical nuances of drafted drawing as an effective communication tool in a cross functional production scheme.

LEARNING OBJECTIVE

Learn axes, planes of projection and types of graphical representations.

Learn standard guidelines of drafting in 2d and 3D representations.

Learn basic geometric shapes and properties, construction of 3d form.

COURSE CONTENTS

UNIT 1 (Fundamentals of Drafting)

Guidelines and Nomenclatures, Lettering, Scales (Engineer's scale, Graphical Scale, Representative Fraction), Two Dimensional Geometrical Constructions (Line and Angle Bisection, Division of lines and circle, Centre point of arc, Calculation of Arc length, Reverse Curves, Evolution and construction of Polygons), Conics and Curvilinear Objects, Representation of 3 Dimensional objects, Principles of Projections, Projections of Points.

UNIT 2 (Principles of Geometry)

Geometry in natural and Man-made environments, Relationship of Pentagon and natural objects, Vitruvian man, Fibonacci series and Golden Ratio, Fractals.

UNIT 3 (Projections of Lines and Solids)

Guidelines and Nomenclatures, Lettering, Scales (Engineer's scale, Graphical Scale, Representative Fraction), Two Dimensional Geometrical Constructions (Line and Angle Bisection, Division of lines and circle, Centre point of arc, Calculation of Arc length, Reverse Curves, Evolution and construction of Polygons), Conics and Curvilinear Objects, Representation of 3 Dimensional objects, Principles of Projections, Orthographic Projections- Isometric and Axonometric projection of of regular solids and combination of solids.

UNIT 4 (3D geometry and Development of solids)

Solids (Generation of Volumes, Basic Solids, Additive and Subtractive nature of solids, Development of Surfaces of regular and sectional solids), **Platonic and Archimedean solids** (Identities and differences, Importance and application, Duals of Platonic solids, Truncation of solids)

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

- Demonstrate an understanding of geometric principles in nature (CO1)
- Develop an understanding of terminology used to explain projections and fundamentals of drafting (CO2)

Skills and Attributes:

- Create platonic solids reflecting an understanding construction of the same (CO3)

- Demonstrate and explain the construction of 2D and 3D objects (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	2	2	2	2	1	0	0	0	3	2	3
CO 2	2	2	2	2	2	1	0	0	3	1	2	3
CO 3	2	1	2	2	1	1	0	0	3	1	2	3
CO4	3	1	3	1	2	1	0	0	2	1	1	3

PREREQUSITES AND METERIAL

1. Drawing Board, T square, Set Square, Geometry Box, Brush and Glue
2. Paper (cartridge paper, color , and other types of paper)
3. Acrylic or water and oil-based color require to explore student in bigger surface.

REFERENCE BOOKS

- Engineering Drawing, P.S. Gill, S. K. Kataria & Sons
- Elementary Engineering Drawing (Plane and Solid Geometry), by N.D. Bhatt, Charotar Publishing House
- Geometry of Design: Studies in Proportion and Composition, Kimberly Elam, 2001
- Alt.fractals: A Visual Guide to Fractal Geometry and Design by Eric Baird, 2011
- The Aesthetics of Geometry in Design, Suzanne Greischel, 1983
- Shell foundations: geometry, analysis, design and construction, N. P. Kurian 2006

- Geometry of construction, T.B. Nichols and Norman Keep. Nichols, Trafalgar Bertram. Publication - London : Cleaver-Hume Press, 1947
- Ruler and Compass, Andrew Sutton, 2009
- Geometric constructions with 112 figures, George Edward Martin,1998

SCIENCE & LIBERAL ARTS

Foundation @ SODS

L	T	P	C
1	1	0	2

COURSE BRIEF

The subject aims to introduce design students to Indian Visual culture, history and Society through a Liberal Arts perspective. It aims to sensitize students to the visual aesthetics, cultural practices, viewed against the backdrop of various regional, social, and historical contexts.

LEARNING OBJECTIVE

- To sensitize design students to social, cultural, and historical contexts surrounding design.
- To enable students to discover values, belief systems, and philosophies that underly various cultural, and aesthetic expressions.
- To introduce and expose students to Indian and global art, design, and craft movements.
- To introduce design students to basic methods of inquiry, research, and documentation.
- To enable students to contextualize basic design principles to plural Indian aesthetic identities.
- To enable students to develop visual, written, and oral communication skills.

COURSE CONTENTS

Here's an indicative list of trigger topics based on broad themes. Each theme shall look at how design, function, aesthetics, materials, processes, and techniques have influenced or been influenced by the diversity of place, climate, culture, history, values, and philosophies:

1. **Food**: Philosophy, production, processing, cooking, serving, consumption, waste disposal.
2. **Clothing and accessories**: Everyday, ceremonial, royal, gender, age, body, comfort, identity.
3. **Shelter**: Settlement patterns, form, comfort, services, tribal, vernacular, classical architecture.
4. **Communication**: Language, signs and symbols, text, script, music, dance, theater.
5. **Transport**: Means and methods, every day, royal, ceremonial, accessories, individual, group, mass.

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

CO 1: Research and document cultural/ethnic backgrounds, and to discover underlying beliefs, philosophies, and value systems.

CO 2: Contextualize cultural heritage with the historical backdrop of Indian and global art, design, and craft.

Skills and Attributes:

CO 3: Corelate basic design principles such as elements, colour, geometry, materials and techniques with historical and contemporary design, and craft.

CO 4: Organize, articulate, and present information, and ideas through visual, textual, and oral presentations.

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	3	1	3	1	1	0	1	2	1	2	3
CO 2	3	2	2	2	2	1	0	1	3	1	2	3
CO 3	3	1	3	2	2	3	0	1	2	1	2	3
CO4	3	2	3	3	2	2	0	1	3	2	2	3

PREREQUSITES AND METERIAL

1. Basic drawing skill ,

2. Pencil (2B , 4 B, 6B) Paper (cartridge paper, color , and other types of paper)
3. Color- poster, acrylic, and other
4. Laptop and Camera

REFERENCE BOOKS

Liberal Arts and Sciences: Thinking Critically, Creatively, and Ethically by Christopher A. Ulloa Chaves ED.D.

MATERIAL EXPLORATION-I

Foundation @ SOD

L	T	P	C
0	1	2	2

COURSE BRIEF

The module introduces students to material and technical exploration. This semester the students will explore planar and granular material and understand the possibilities of form exploration with the same while understanding the properties and characteristics of the same. The module is designed to allow each student to pursue a personal direction in their work that may be traditional or non-traditional. With focus on ideation and exploration, the module aims at exposing the basic properties, simple techniques and methods to add/remove material, and how to evolve new forms using the properties. Through a series of lectures, discussions, exercises, and assignments, students will acquire the fundamental knowledge and skills required for entry into the professional world.

LEARNING OBJECTIVE

Student will learn about the property and characteristics of materials and gain knowledge and skills to work on it by using basic tools and techniques.

COURSE CONTENT

This is entirely a manual process-based module, and only hand tools will be used for carrying out all the exercises. The students will be exposed to:

Planar Material (paper, fabric, etc.)

Granular Material (clay, pop, etc.)

TOOLS

Use of basic hand tools -

- Cutter
- Scissors
- Saw
- Chisel
- File
- Tri angle
- Hammer
- Holders Etc.

TECHNIQUES

- Demo of properties of Materials
- Sample manipulations
- Explanation of each property
- Various methods of addition and removal
- Assignments based on explorations of properties

COURSE OUTCOMES

After completing this course, you will be able to:

Knowledge & Understanding:

- Explain properties of material through manipulation technique. (CO1)

Skills and Attributes:

- Apply knowledge and understanding of material behavior and techniques to create design expression (CO2)
- Demonstrate skillset of working with material and related tools via exploration and manipulation (CO3)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	0	3	2	2	1	0	0	1	3	2	3
CO 2	3	2	3	3	3	2	0	0	3	2	2	3
CO 3	3	2	3	3	3	2	0	0	2	2	2	3

PREREQUSITES AND MATERIAL

1. Basic drawing skill
2. Material as specified by the faculty
3. Pencil (2B, 4 B, 6B) Paper (cartridge paper, color , and other types of paper)
4. Mask and Apron

REFERENCE BOOKS

1. The Backyard Blacksmith Hardcover - by **Lorelei Sims** , publisher : Crestline book
2. Learners World Clay Moulding Book Clay Tools, AC 073 ASIN B00HJ2VNNA
3. Clay Modeling Books, by **Gurinder**, young learner publications
4. BETWEEN CLAY AND DUST-by : **MUSHARRAF ALI FAROOQI**, publisher : Aleph book company pvt. Ltd.
5. The Potter's Complete Book of Clay and Glazes: A Comprehensive Guide to Formulating, Mixing, Applying, and Firing Clay Bodies and Glazes. by **James Chappell**.
6. The Incredible Clay Book. Publishr : Klutz Press by Sherri Haab (Editor), Laura Torres
7. On the Effects of Gypsum, or Plaster of Paris, as a Manure; Chiefly Extracted from Papers and Letters on Agriculture, by the Agricultural Society in Canada, by **Multiple Contributors**

8. Plaster of Paris and How to Use It, by **Martin Wiener Ware**
9. Plaster of Paris: Techniques from Scratch, by **Reid Harvey**
10. Create Anything With Clay, by Sherri Haab , Laura Torres publisher : Kultz press
11. Plaster of Paris: Techniques from Scratch Paperback – by **Reid Harvey publisher**: Gentle breeze publication

2023-27

Year 1

Semester 2

2023-27

SKETCHING AND DRAWING-II

Foundation @ SOD

L	T	P	C
0	4	2	5

COURSE BRIEF

Increasing the level of complexity from previous semester the sketching and drawing- 2, this semester will focus more on learning to gain control over hand movement to achieve the desired result with different mediums on different surfaces. The students shall also work with creativity and imagination to explore and create detailed drawings with play of light and shadow for a context.

LEARNING OBJECTIVES

- Enhances on student's previous learnings of Visual Perception and Spatial Positioning of Figures/ Objects in two dimensions and three dimensions.
- Empower students with the knowledge and skills to observe, explore, experiment and represent their observation while playing with different mediums.
- Display rigor and experimentation while looking at details of light and shadows along with expressions and techniques.

COURSE CONTENTS

This subject is an extension of learning gained in semester I. Having gained the basic skills, the student is now prompted to move ahead, with complex cases, and make complete drawing with details.

- **Nature Drawing:**
  Importance of light and shade and drawing. Impact of changing the surface and medium. Looking at details and bringing aesthetically pleasing compositions
- **Human Drawing:**
  Understand the proportions of body. Looking at human form with details and precision. Looking at human form in relation to another subject/ object.
- **Object Drawing:**
  Form in perspective and in context. Creating images that communicate and ways and means to say it.

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

- Reflect an understanding of form and proportions (CO1)

Skills and Attributes:

- Experiment and explore drawing techniques to create aesthetically pleasing compositions. (CO2)
- Illustrate ideas with details and sensitivity. (CO3)
- Communicate ideas effectively through visual representations (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	0	3	3	3	3	0	0	1	0	1	3
CO 2	3	2	3	3	3	2	0	0	3	0	1	3
CO 3	3	0	3	3	3	2	0	0	2	2	2	3
CO4	3	1	3	3	3	1	0	0	3	2	1	3

PREREQUSITES AND METERIAL

- Basic drawing skill
- Pencil (2B, 4B, 6B) Paper (cartridge paper, color , and other types of paper)
- Require few objects and human models for Live sketching

REFERENCE BOOKS

1. Sketching: Drawing Techniques for Product Designers by Koos Eissen(Author), Roselien Steur(Author), BIS Publishers
2. Drawing for Product Designers (Portfolio Skills: Product Design) by Kevin Henry, Laurence King Publishing
3. Perspective and Sketching for Designers by Jessica Newman

4. Jessica Newman and Jack Beduhn, Prentice Hall
5. Freehand Drawing For Architects and Interior Designers by Magali Delgado Yanes
6. Magali Delgado Yanes (Author), Ernest Redondo Dominguez and Maria Fleming Alvarez,
7. Design Drawing by Francis D. K. Ching and Steven P. Juroszek, Wiley
8. How to Draw: drawing and sketching objects and environments from your imagination by Scott Robertson and Thomas Bertling, Design Studio Press
9. Sketching: The Basics by Roselien Steur an Koos Eissen, BIS Publishers
10. Anatomy and Drawing by Victor Perard, Dover Publications
11. Illustration With Markers/Time-Saving Techniques for Design Professionals by John A. Gleason, Whitney Library of Design
12. Rendering with Pen and Ink by Robert W. Gill, W Norton & Co Inc

URL

- https://www.creativebloq.com/features/how-to-draw-animals-people-landscapes
- https://design.tutsplus.com/tutorials/how-to-draw-a-rose--cms-26864
- https://www.thegreatcourses.com/courses/how-to-draw.html
- http://www.floobynooby.com/pdfs/Perspective_Drawing_HandbookJosephDAmelio.pdf
- https://www.pdfdrive.com/human-figure-drawing-books.html

PRINCIPLES OF DESIGN

Foundation @ SOD

L	T	P	C
1	1	2	3

COURSE BRIEF

In this course, which is an extension of design basics learnt in the earlier semester, thrust is given on understanding and learning of principles for visualization. Human eyes follow certain unwritten yet universally true principles. Once understood, these principles are to be thoroughly explored, to create visuals and aesthetically pleasing compositions demonstrating the application of principles.

LEARNING OBJECTIVE

The module introduces the students to

- Create communicative compositions, applying knowledge and understanding of elements and principles of design.
- Gestalt laws and its application.
- Creative thought process, self-exploration, and deriving a final on comparative basis.

COURSE CONTENT

Gestalt Law

Introduction to Gestalt psychology. Gestalt's principles of visualization, these principles in nature, application in creative work of prominent artists/designers

Harmony and Rhythm

Few of the basic principles, underlying the pleasantness of a visual. What is visual harmony and what is visual disharmony? what is the impact of rhythm on a visual? These questions will be answered by a detailed and elaborate demonstration to the students, followed by exploratory assignments to be done by the students.

Emphasis

"Center of Interest." It is about dominance and influence. Most artists put it a bit off center and balance it with some minor themes to maintain our interest. Some artists avoid emphasis on purpose. They want all parts of the work to be equally interesting.

Contrast

Uses contrasting visual concepts. That same Western Kansas "big sky" landscape becomes very dramatic and expressive when a storm builds in the southwest. Principles can grow out of any artistic device that is used to produce an effect on the viewer.

Balance

This is perhaps the most subjective principles of design. A visual looks good if it is well balanced, and if it is not, the eyes tend to reject it as unpleasant. However, it is not the physical balance but the visual balance – the interaction between the positive and negative spaces in a given format. Learning this principle involves going through and analyzing substantial examples.

What is symmetry? What are the different types of symmetry? The discussion would involve examples of symmetry in nature and man-made environment. The exercises will also involve relation between symmetry, asymmetry and balance.

COURSE OUTCOME

Knowledge & Understanding:

After completing this course, you will be able to:

- Understand fundamentals of principles of design. (CO1)

Skills and Attributes:

- Employ visual, material, hand-skills and digital techniques to generate original forms. (CO2)
- Implement fundamentals by developing conceptual ability and the necessary skills of creating communicative compositions (CO3)
- Observe and explore visual language as a tool of communication (CO4)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	0	3	2	2	2	0	0	0	2	2	3
CO 2	3	0	3	2	3	2	0	0	0	2	2	3
CO 3	3	0	3	2	2	2	0	0	1	1	2	3
CO4	3	2	3	3	3	2	0	0	3	2	2	3

PREREQUSITES AND METERIAL

- Poster color, Black Ink, Black pen, Scale, Markers and Geometry Box.
- Brush(0,2, 4 ,8,) Paper (cartridge paper, color , and other types of paper)
- Laptop or personal computer

REFERENCE BOOKS

1. Design Basics by David A. Lauer Learning.
2. Logic and Design: In Art, Science and Mathematics by Krome Barratt, Green Editorial.
3. Illustrated Elements of Art and Principles of Design by consultant: Gerald F. Brommer, Crystal Productions.
4. Design Elements: Understanding the rules and knowing when to break them by Timothy Samara, Rockport Publishers.
5. Design Elements, Form & Space: A Graphic Style Manual for Understanding Structure and Design by Dennis Puhalla, Rockport Publishers.
6. Universal Principles of Design by William Lidwell, Kritina Holden and Jill Butler, Rockport Publishers.

DESIGN PROCESS

Foundation @ SOD

L	T	P	C
3	2	2	6

COURSE BRIEF

Design is a process. Anyone who wants to get into the field of design, irrespective of the discipline of specialization, needs to get conversant with the basic steps, their relevance, methods and approaches involved in the process of designing. Besides looking at creating visual and design vocabulary, this course will also introduce the methods and give students an overview of the process of design which is essential to understand and appreciate the design development through observation, study, exploration, ideation and perception.

LEARNING OBJECTIVE

- To introduce students to the different stages in the design process – from perception of a problem to generating a solution to the problem through investigation, analysis and synthesis.
- To understand the methodology of the problem solving process.

COURSE CONTENTS

- Analysis and mapping of the design process.
- The morphology of the problem solving process
- Case studies
- Role of creativity in design

COURSE OUTCOMES

Knowledge & Understanding:

After completing this course, you will be able to:

- Understand the steps invoved in design process. (CO1)
- Interpret and analyze visual and textual information to develop perception and ideas for expression.(CO2)

Skills and Attributes:

- Design a thoughtful tangible outcome using skill, knowledge and understanding explored in other modules. (CO3)
- Document the entire learning process, exploration, progression of design understanding and sequence of design development. (CO4)
- Demonstrate engagement with content via reading, researching and participating in classroom discussions and activities. (CO5)

Co-relation Course Outcomes (COs) and Program Outcomes

(POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	3	3	3	3	1	1	1	1	1	3	3
CO 2	3	3	3	3	3	2	1	2	2	2	2	3
CO 3	3	2	3	2	2	2	1	2	1	2	2	3
CO4	3	3	3	3	3	2	1	2	3	2	2	3
CO5	1	3	2	2	1	2	1	3	2	1	2	3

PREREQUSITES AND METERIAL

1. Basic drawing skill ,
2. Pencil (2B , 4 B, 6B) Paper (cartridge paper, color , and other types of paper)
3. Color poster acrylic, and other
4. Laptop and Camera

REFERENCE BOOKS

1. Thinking Design by S Balaram
2. The Design Process by Karl Aspelund
3. Thoughts on Design by Paul Rand
4. The Design of Everyday Things by Don Norman
5. Change by Design by Tim Brown
6. Designing for Growth by Jeanne Liedtke

2023-27

MATERIAL EXPLORATION-II

Foundation @ SOD

L	T	P	C
0	1	2	2

COURSE BRIEF

Material Exploration for this semester will focus on the creating design expression through manipulating and modifying porous and fibrous material like wood to strong, hard and shiny material like metal. With emphasis placed on ideation, and exploration this subject will promote curiosity and an atmosphere conducive to material and technical exploration. Material Exploration aims at exposing the basic properties, simple techniques and methods to add/remove material, and how to evolve new forms using the properties. Through a series of lectures, discussions, exercises, and assignments, students will acquire the fundamental knowledge and skills required for understanding and playing with material.

LEARNING OBJECTIVE

Student will learn about the property and characteristics of materials and also gain knowledge and skills to work on it by using basic tools and techniques.

COURSE CONTENT

This is entirely a manual process-based module, and only hand tools will be used for carrying out all the exercises. The students will be exposed to:

- WOOD (deodar, golden teak, sesame, Sal, rosewood) etc.
- METAL (aluminum, steel,) etc.

TOOLS

Use of basic hand tools -

- saw
- chisel

- file
- drill
- tri angle
- hammer
- planer
- holders
- jointer
- Sander machine Etc.

TECHNIQUES

- Demo of properties of Materials
- Sample manipulations
- Explanation of each property
- Various methods of addition and removal
- Assignments based on explorations of properties

COURSE OUTCOMES

After completing this course, you will be able to:

Knowledge & Understanding:

- Demonstrate an understanding of material properties through manipulation technique. (CO1)

Skills and Attributes:

- Demonstrate skillset of working with material and related tools via exploration and manipulation (CO2)
- Apply knowledge and understanding of material behavior and techniques to create design expression. (CO3)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	0	3	2	2	1	0	0	0	3	2	3
CO 2	3	0	3	3	3	1	0	0	0	2	2	3
CO 3	3	2	3	3	3	2	0	0	2	2	2	3

PREREQUSITES AND MATERIAL

- Basic drawing skill
- Material as specified by the faculty
- Pencil (2B, 4 B, 6B) Paper (cartridge paper, color , and other types of paper)
- Mask and Apron

REFERENCE BOOKS

1. What Wood Is That? A Manual of Wood Identification by Herbert L. Edlin (Author) publisher : Viking adult
2. Understanding Wood: A Craftsman's Guide to Wood Technology by R. Bruce Hoadley publisher: Taunton press
3. Wood: Materials for Inspirational Design, by Chris Lefteri
4. Solid Wood: Case Studies in Mass Timber Architecture, Technology and Design 1st Edition , by Joseph Mayo
5. Wood: Identification and Use, by Terry Potter, Publisher : guild of master craftsmen Nature & Art of Workmanship, by David Pye
6. Creative Metal Forming – by Betty Helen Longhi (Author), Cynthia Eid (Author), publisher :Brynmorgen press
7. The Backyard Blacksmith Hardcover – by Lorelei Sims , publisher : Crestline book

COMPUTER APPLICATIONS

Foundation @ SOD

L	T	P	C
0	1	2	2

COURSE BRIEF

This subject gives an exposure to basic design softwares used in design disciplines. The tools are used extensively in varied industries as well. It is very important to understand how to design graphics as well as how to handle the tools effectively. Through a series of lectures, discussions, exercises, and assignments, students will acquire the fundamental knowledge and skills required for entry into the professional world.

LEARNING OBJECTIVE

Develop necessary digital tools and techniques.

Enhance the techniques of execution of form and content relevant to the field in both digital and print mediums.

Create and manipulate images to use in various contexts.

The learnings will also help in understanding of form - product, spaces, and layouts for print and web.

COURSE CONTENT

Adobe Photoshop

Basic exposures and learning to experiment with various possibilities. Application oriented exercises with actual photographs/images.

- Images in Photoshop and Image Ready (Default images)
- Intro to Tools Selections & Color Models
- Working with Layers
- Transforming & Retouching
- Color & Tonal Adjustments
- Working with Typography

Adobe Illustrator

Basic exposures and learning to experiment with various possibilities. Application oriented exercises to create graphics and sketches for a purpose.

- Graphics creation
- Intro to Tools Selections & Color Models
- Working with Layers
- Transforming & Manipulating
- Grids and layouts
- Working with Typography

COURSE OUTCOME

After completing this course, you will be able to:

Knowledge & Understanding:

- Demonstrate an understanding of tools and techniques used to create effective compositions. (CO1)

Skills and Attributes:

- Create graphics and images using tools and techniques of divergent thinking (CO2)
- Apply basic design concepts – light, color, texture etc to create aesthetically pleasing graphics/images (CO3)

Co-relation Course Outcomes (COs) and Program Outcomes (POs)

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	Develop a creative mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Teamwork	Professional Ethics	Sustainable Solution	Local and Global Context	Lifelong Learning

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	0	3	2	2	0	0	0	1	1	2	3
CO 2	3	0	3	3	3	1	0	0	1	1	2	3
CO 3	3	0	3	3	3	1	0	0	1	1	2	3

PREREQUSITES AND METERIAL

- Basic drawing skill
- Laptop, or personal computer

REFERENCE BOOKS

1. The Adobe Photoshop CS6 Book for Digital Photographers (English) by Scott Kelby
2. Adobe Photoshop CS6 for Photographers: A professional image editor's guide to the relative use of Photoshop for the Macintosh and PC by Martin Evening.
3. Adobe Illustrator for beginners 2021, Hector Grant

2023-27

Year 2

Semester 3

Automotive Sketching and Illustration -I SDTD 2011 **C: L: T:P** :: 3:0:1:4

1. Course Description :

Sketching is the fundamental tool of a Designer. A student communicates his idea to the world by this medium. This course introduces the essential background and basics in Sketching needed for a Designer.

2. Learning Objective:

1. To learn how to draw perfect straight lines, with varying line Intensity.
2. How to use your shoulder and not wrist, and learn to draw long dynamic lines.
3. Learn to Draw Cubes in three different Perspectives using Vanishing Points.
4. Understanding the Use of Auxiliary Vanishing Points.
5. Drawing Cubes at different angles while rotating the Horizon line.
6. Drawing Products using Construction of Cubes as a guideline.

3. Course Contents

- Introduction
  - History
  - Materials and Mediums
- Sketching and Design Phases
- Drawing Approach
- Types of Perspective
  - Blocks
  - Perspective in Lines
  - The View point
  - Shading and Cast Shadow
- Ellipses, Cylinders, Planes and Sections, Sphere
- View point
  - The Informative View point
  - Side view
  - Ellipses and Viewpoints
  - Eye level perspective

- Birds Eye Perspective
- Horizon and Eye level perspective
- Ground level Perspective

- Singular and Multiple Rounding.
- Tubes, Planes and Sections.

4. Course Outcomes

CO1: Students learn basics of drawings by using different kinds of drawing stationary.
CO2: Students understand concept of perspective theory and its implications in representing objects and drawings. They practice to learn hand movement control and pressure control for strokes with required tonal value.
CO3: Students apply perspective principle to draw objects and environments both existing and new.
CO4: Students analyze dimensions, sizes and scales to represent and judge spatial measurements.
CO5: Students are able to evaluate the right proportions, aesthetics and ratios for creations of forms.
CO6: Students are able to create new forms of Automotive Designs in right proportions and scale. They are able to draw zoom in and zoom out views and along with human figures. They can imagine automotive forms and draw different views in different angle.

5. Prerequisites and Materials

- Students should have basic understanding of elements and principles of design.

Reference Books:-

- Sketching the Basics by Koos Eissen & Roselien Steur
- Drawing for Product Designers (Portfolio Skills: Product Design) by Kevin Henry, Laurence King Publishing
- Perspective and Sketching for Designers by Jessica Newman Jessica Newman and Jack Beduhn, Prentice Hall
- Design Rendering Techniques by Dick Powell.

Table: Correlation of POs & PSOs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	1	1	0	0	0	1	1	1	1	1	1	1	1
CO2	2	0	3	1	0	1	1	1	1	1	1	1	1	1	1

Form and Aesthetics SDTD 2012 **C: L: T: P :: 3:0:1:4**

1. Course Description

An extension to principles of design and elements of design, the subject dwells more on application of design principles on physical entities, also studying inter relationships between participating entities. The experiments deal with creating compositions using rectilinear, curvilinear volumes, planes in space, and curves in space, concavity and convexity in forms etc. This has significance when applied to form generation methods with a keyword/emotion as inspirations.

2. Learning Objective

a. To learn elements of visual design in space and physical entities.
b. To apply the elements of design and design principles to design spaces and compositions aiming for a visual meaning, expressions.

3. Course Contents

A. Theoretical

- Basic principles of design
- Elements of Design
- Revisit Gestalts
- Types of curves
- Types of planes
- Rectilinear and curvilinear volumes

B. Practical/Tutorial

A student has to perform small assignments to learn applications of Elements of Visual Design and Principles of Visual Design. They do this through dominant/subdominant rectilinear form composition, curve composition in space, composition of planes in space.

4. Course Outcomes

CO1: Students learn basic principles of Design, lines, curves in 3D space.

CO2: Students practice scope of applications of the visual design principles in space and physical entities.

CO3: Students also learn to apply proportions on compositions to create inter relationships between participating entities.

CO4: Students able to create forms based on themes and characters.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Effective Articulation	Discovery to Realization	Design for Future	Multidisciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Principals of Vehicle Research	Vehicle Packaging	Workshops and Clay Modelling

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of elements and principles of design.

Reference Books:-

1. Elements of Design: Rowena Reed Kostellow and the Structure of Visual Relationships
2. Book by Gail Greet Hannah.
3. Design Elements: Understanding the rules and knowing when to break them by Timothy Samara, Rockport Publishers
4. Design Elements, Form & Space: A Graphic Style Manual for Understanding Structure and Design by Dennis Puhalla, Rockport Publishers
5. Universal Principles of Design by William Lidwell, Kritina Holden and Jill Butler, Rockport Publishers

URL:-

- http://rowenafund.org/history/history-intro.html
- https://amyherlee.wordpress.com/2016/03/16/studio-mass/
- https://vanseodesign.com/web-design/dominance/

Design Research SDTD 2013 C: L: T: P :: 2:1:1:0

1. Course Description

Every design, whether product, industrial or automotive begins with a research. Research includes the end customer, the market or the context for which the product needs to be designed. Design research enables the designer to understand the basic purpose of the product and that further helps in creating a better design. Since this course is about automotive, it becomes yet more important to make sure that the design is the best in its class. Design research also creates awareness about the competition and the direction in which the market is heading.

2. Learning Objective

a. Students will acquire and strengthen skills involved in process of design for any new vehicle design.
b. Students will also use different tools for doing research to know trend analysis & data analysis which can be used as a base for a project.

3. Course Contents

A. Theoretical

- Ethnographic Data Collection & Analysis
- User Needs-Explicit & Latent
- Trend Analysis

- User and Market Research

B. Practical/Tutorial

- A student has to learn about different design research methodologies.
- Students has to apply different tools to practice design research for class room exercises.

4. Course Outcomes

CO1: Students learn different methodologies to do user research, tools & techniques.

CO2: Students are able to apply knowledge of design process to identify and analyze problems involved in products, process or society.

CO3: Students are able to arrive at better solutions by applying design process and design research.

CO4: Students will be able to do trend analysis for futuristic solutions

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of vehicle design and automotive products.
- Students should have basic understanding of design process.

Reference Books:-

- *Design Research: Methods and Perspectives by Brenda Laurel, Peter Lunenfeld*
- *The Little Book of Design Research Ethics by IDEO*
- *Drm, a design research methodology by Lucienne T.M. Blessing, Amaresh Chakrabarti*
- *Design Research Through Practice: Ilpo Koskinen, John Zimmerman, Thomas Binder*

URL:-

- https://cardesignresearch.com/
- https://link.springer.com/chapter/10.1007/978-3-319-07863-2_19
- https://www.researchgate.net/publication/317092583_Automotive_User_Experience_Design_Patterns_An_Approach_and_Pattern_Examples

Project 1: Simple Mobility product design SDPJ 2106 C: L: T: P :: 5:1:2:4

1. Course Description

An interesting approach is HPV Challenge, which is focused on Human Powered Vehicles. This class of vehicles allows not only to set-up a classical competition in terms of design, innovation, presentation, manufacturing and racing, but also to grow the bring awareness about speed-energy relation. It provides better understanding of the sustainable mobility problem, awareness about the potential and the limits of human muscular power, development of technical skills about design and engineering of lightweight and efficient vehicles.

2. Learning Objective

- Better understanding of the sustainable mobility problem,
- Potential and the limits of human muscular power.
- Lightweight and efficient vehicles

3. Course Contents

A. Theoretical

- Lifestyle centered on freedom of movement
- Feasibility study
- Basic Context Data and System Metrics
- Human powered or pedal electric assisted vehicle

B. Practical/Tutorial

- A student has to learn about different constraints involved in environment friendly vehicle.
- Students learn about different types of environment friendly vehicle. They apply principle for new design or find out a new methods/combinations.

4. Course Outcomes

CO1: students learn concept of Human powered vehicle and sustainable vehicle.

CO2: Students apply knowledge for feasibility of concepts.

CO3: Students will gain hands on knowledge about design of eco- friendly vehicle.

CO4: Students will be able to apply knowledge and create designs using the principles of eco design.

CO5: Students create design knowledge to come out with innovative solutions.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	3	3	2	1	2	1	1	1	1	1	2	2
CO2	1	2	2	1	2	3	0	2	0	0	0	0	2	0	3
CO3	2	1	2	3	1	1	1	1	1	2	2	1	2	1	3
CO4	1	2	1	2	3	2	1	2	1	3	2	0	2	1	2
CO5															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of vehicle systems and fuels.
- Students should have basic understanding of environment friendly products.

Reference Books:-

- *Design of Human-Powered Vehicles:by C mark Archibald*
- *Faster, Smarter, Greener, the future of car and mobility by Venkat Sumantran, Charles Fine and David Gonsalvez.*
- *Design of Human-Powered Vehicles by Mark Archibald*
- *The Car in 2035: Mobility Planning for the near future by Kati Rubinyi*

URL:-

- https://www.itdp.org/wp-content/uploads/2014/07/ITDP_Bike_Share_Planning_Guide.pdf
- https://www.theguardian.com/sustainable-business/2014/sep/04/auto-industry-transportation-design-art-center-driverless-car
- https://www.youtube.com/watch?v=nZ7sStkNAu8

Materials & Manufacturing Processes SDTD 2018 **C: L: T: P :: 3:1:2:**

1. Course Description

Design industry is largely supported and influenced by the materials and processes used in the manufacturing of the automotive products. The kind of material used in a particular product changes the process used for manufacturing and vice versa.

With advances in technology and availability of various types of new materials & technology, the design and style industry has risen to great extent. Also, the creative value of the products has taken a huge leap. It

is, thence, of an utmost importance that a designer should have the basic understanding of various materials and the way they are processed to suit the end product. This course will lay the foundation in the arena.

2. Learning Objective

- Manufacturing processes and assembly techniques for Ferrous and non – ferrous metals in mobility applications.
- Properties and usage of thermoplastics, thermosetting plastics. Process of selection and applications of plastics for Mobility Products.
- Design limitations in application of Plastics in Mobility.
- Assembly Processes and Decorative techniques for Automotive Trims. Design, Limitations and Selection of materials.

3. Course Contents

A. Theoretical

- Introduction to Material Science
  - Ceramics and Glass
  - Natural Materials
  - Finishing & Coating Technologies
  - Metals-Ferrous and Non-Ferrous
- Thermoplastics, Thermosetting Plastics, Composites, and Elastomers
  - Manufacturing processes of vehicle interior components
  - Tyre manufacturing process
  - Seating systems
  - Door Trims
  - Dashboard
  - Lights
  - Upholstery
  - Knobs & meters
- Manufacturing Process & Applications of Metal parts for mobility products
  - Frame/chassis
  - Body Panels
  - Engine, Transmissions, axles etc.

B. Practical/Tutorial

- A student has to learn about materials & manufacturing processes involved in manufacturing mobility products.
- Apply knowledge in short assignments in proposing vehicle configurations.

4. Course Outcomes

CO1: Students will gain knowledge about materials & manufacturing processes of vehicle systems and sub systems.

CO2: Students analyses the appropriate selection of materials in improving design thereby resulting better service and life of product.

CO3: Students will be able to apply materials and processes knowledge for futuristic vehicle applications.

CO4: Students are able to find new applications of materials & processes.

5. Prerequisites and Materials

- Students should have basic understanding of engineering and automotive working principles.
- Students should have basic understanding of physics.

Reference Books:-

- *Manufacturing Processes for Design Professionals by Rob Thompson*
- *Manufacturing Processes for Advanced Composites*
- *Materials and Process Selection for Engineering Design, Second Edition by Mahmoud M. Farag*
- *Industrial Design: Materials and Manufacturing by Jim Lesko*
- *Advances In Material Science by R.K.Dogra*
- *The Automotive body manufacturing systems and processes by Mohammed A Omar, Publisher: Wiley*
- *Ceramic Materials: Science and Engineering by C. Barry Carter and M. Grant Norton*
- *Surface Coatings by Mario Rizzo and Giuseppe Bruno*
- *Mortimer, J., ed. Advanced Manufacturing in the Automotive Industry. Springer-Verlag New York, Inc., 1987*

URL:-

- https://dspace.mit.edu/bitstream/handle/1721.1/50428/41494729-MIT.pdf;sequence=2
- https://www.slideshare.net/TalVagman/automotive-manufacturing-process-overview?from_action=save
- http://www.toyota-ej.co.jp/english/process/index.html

Table: Correlation of POs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	3	3	1	2	1	1	1	1	1	2	2
CO2	1	0	1	3	2	3	2	2	1	1	3	1	3	2	1
CO3	1	0	1	2	3	3	2	1	1	3	3	1	3	3	1
CO4	1	1	0	3	2	3	2	2	2	3	2	1	2	3	1
/G	1.0	0.5	0.8	2.5	2.5	3.0	1.8	1.8	1.3	2.0	2.3	1.0	2.3	2.5	1.3

History of Transportation Design SDTD 2015 **C: L: T: P :: 3:1:2:0**

1. Course Description

The topic talks about the journey of design, of Automobile and architecture. From the first car to the current scenario, students will take the road to the ever-changing ever-evolving automobile design history. The course is also an essential topic to be discussed in design education, since it enables a student to see the transformation of design with respect to the engineering demands of its time. Student will get to know how the prevalent advances in other fields influenced automotive design.

2. Learning Objective

- To learn history of automotive design.
- Understand American, Italian and Japanese styling languages.
- To learn on the emergence of electric vehicles.

3. Course Contents

A. Theoretical

- Industrial revolution and rise of modern design.
- Introduction to modern design, major themes and 'styles' in modernism; Art Nouveau and Art Deco, Bauhaus, System Design, Post-modern culture and design.
- Developments in United States, British, Italian, European and Japanese in terms of style and genres.
- The key players in automobile, world wars and effects on automotive industry, Harley Earl and automotive design, development of unique automotive form, early body styles, automotive design and car racing, cultural meaning of earlier automobile.

- Impact of world wars on design, aircrafts and automotive design, fins and wings in automotive design, market segments and related designs, study of various design languages.
- Mass production, standardization of production, assembly line, the rise of industrial design, emergence of art & color, triumph of style.
- Who killed the electric cars and reemergence into market.

B. Practical/Tutorial

- A student has to perform a small assignment to redesign a concept as a homage to one of the iconic cars before 1980 or similar. Also to select an international brand with strong Styling DNA and study its journey to come up with an infographic.

4. Course Outcomes

CO1: Students will gain knowledge about history of Automobile design.

CO2: Student understand the trend of design in particular context.

CO3: Students link cultural and social trend with automotive design. Students learn American, Italian and Japanese evolution of styling.

CO4: Understand technology disruptions leading to styling changes.

Reference Books:-

- Design History: Understanding Theory and Method by KjetilFallan.
- Indian Textiles by John Gillow and Nicholas Barnard
- India by Design: Colonial History and Cultural Display by SaloniMathur
- History of Modern Design by David Raizman
- Scandinavian Design: Alternative Histories by KjetilFallan
- Art Deco and British Car Design: The Airline Cars of the 1930s by Barrie Down.
- A Century of Automotive Style: 100 Years of American Car Design by Michael Lamm and Dave Holls.
- The People's Car: A Global History of the Volkswagen Beetle by Bernhard Rieger.
- A Century of Car Design by Penny Sparke.
- The Car in 2035: Mobility Planning for the near Futureby Kati Rubinyi.

- The Art Nouveau Style Book of Alphonse Mucha (Dover Fine Art, History of Art) by Alphonse Mucha
- Car: The Definitive Visual History of the Automobile Hardcover – May 2, 2011 by DK (Author)

5. Prerequisites and Materials

- None

Table: Correlation of POs & PSOs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling

Year 2

Semester 4

Automotive Sketching and Illustration -II SDTD 2016 **C: L: T: P** :: 3:0:1:4

1. Course Description

In Continuation with Sketching Course in the Previous Semester, This Module focuses on bringing Value to the Objects we are intending to Sketch. It introduces the concept of Shading, Highlights, Shadows, and Color etc. It also introduces how the Light Interacts with Objects.

The students are further taught to Render Objects using Markers and Dry Pastels.

2. Learning Objective

- Learn to use shading and Understand Different Surface Interaction and Flow in Objects.
- Learn to cast shadows of Objects w.r.t Light Source.
- Understand Color Interaction with Objects and render using Markers.

3. Course Contents

- Depth
  - Focal point
  - Silhouette line Weight
  - Direction of shading
  - Cast Shadow
  - Highlights and Shadows
  - Transparency
- Marker Rendering
  - Basic Techniques
  - Infilling Flat Areas
  - Marker Streaking
  - Masking
  - Working to a line
  - Toning and Blending
  - Over coating
  - Highlights and Borders.
  - Reflections w.r.t Materials

- Ground tones and sky tones
- Using Dry Pastels
- Descriptive Drawing

4. Course Outcomes

CO1: Students learn to understand effect of light on products and create it in drawing with different media.

CO2: Apply Reflections In different Objects with respect to Materials and be able to Render Objects using Markers.

CO3: Students learn digital software like Photoshop, and render automotive drawings & renderings.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	2	2	1	2	1	1	1	1	1	2	2
CO2	2	1	3	1	2	2	0	2	1	1	1	1	0	2	1
CO3	3	1	3	2	1	1	1	1	1	0	0	1	0	1	1
AVG	1.8	0.8	2.3	1.3	1.3	1.3	0.5	1.3	0.8	0.5	0.5	0.8	0.3	1.3	1.0

B.

Th
Pr

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Perspective and Proportion Basics
- Good line Quality and Intensity.
- Basics of Ellipse orientation in various Perspectives/ Angles.

Reference Books:-

· Sketching the Basics by Koos Eissen & Roselien Steur
· Sketching : Drawing Techniques for Product Designers by Koos Eissen and Roselien Steur
· Drawing for Product Designers (Portfolio Skills: Product Design) by Kevin Henry, Laurence King Publishing
· Perspective and Sketching for Designers by Jessica Newman Jessica Newman and Jack Beduhn, Prentice Hall.

Clay Modeling SDTD 2019 **C: L: T: P** :: 3:1:2:0

1. Course Description

Clay modeling is one of the traditional practices followed till date in order to visualize a design from a idea represented on Two dimensional medium. It helps to realize the details and proportion in real and compare with the planned or perceived one. The Industrial clay has properties, which allow the designer to tweak the design as per requirements during iterations. Despite the luring threat from Virtual reality the current designer, believe that clay modeling is to stay for long. This - tools, clay properties, method of creating the core and base, application of clay and refining the form to proportions and detailing.

2. Learning Objective

- Understand output quality, properties of industrial clay
- Learn clay basic modeling tools and application
- Learn to extract feature lines, creases of a simple Product or selected speed form.

3. Course Contents

A. Theoretical

- Understand output quality, properties of industrial clay
- Learn clay basic modeling tools and application
- Learn to extract feature lines and creases of a simple Product or selected speed form.

B. Practical/Tutorial

A student has to perform assignments to applications of Industrial Clay.

Tentative assignments are as follows-

- Core or Armature preparation
- Grid and Surface plate preparation, fixing armature
- Product feature line replication
- Drawings and template preparation

4. Course Outcomes

CO1: Students learn handling automotive clay and tools.

CO2: Students will gain knowledge about making automotive forms in Clay .

CO3: students are able to develop a sense of aesthetics in 3D forms, understand aesthetics on automotive surfaces.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of Orthographic and Isometric projection.

Reference Books:-

· Clay Modeling : Techniques for giving Three Dimensional Form to Idea by San El Mook, 1993

URL:-

- http://www.kolb-technology.com/en/products/classic/clay.html
- https://lucianobove.com/2016/03/reasons-clay-modelling-is-important-in.html/
- https://www.themakersfieldguide.com/blog/2018/8/28/clay-modeling-in-automotive-design-and-industrial-design

Digital Sculpting -I SDTD 2014 **C: L: T: P** :: 3:0:2:2

1. Course Description

Ideas are generated in minds, quickly transferred to 2D medium. However, in a short-term project the process needs to be iterated quickly. This subject mainly focuses on making this possible - converting ideas quickly into digital 3D forms. The sketches are converted to orthographic views, suitable planes are selected as the starting reference points. And then we have two approaches - the spline or the polygon mesh methods to generate the forms. This allows for quick realization of ideas into perceivable digital volumes of the concepts.

2. Learning Objective

- To learn quick idea generation on two-dimensional medium, convert it to digital volumes.
- Orthographic sketches and Canvas to be placed on suitable planes.
- Use digital tools to make surfaces between the curve network/canvas reference sketches to build the whole volume.

3. Course Contents

A. Theoretical

- Understanding modes –sculpt, sketch and user interface
- Planes, axis and perspective, isometric view
- Setting preference, units, grid size
- Primitive shapes, dimensioning and fully constraint sketches
- Basic operations – extrude, sweep, loft, shell etc
- refining tools –fillets, chamfer and variable edges
- Digital rendering softwares- setting parameters -light, camera, studio light, material, environment etc.

B. Practical/Tutorial

A student has to perform small assignments to applications of tentative assignments are as follows-

- Icon/Logo Design
- Keyfoab concept generation
- Toy car concept with environment

4. Course Outcomes

CO1: Students learn hands on command in 3d digital software like Fusion 360, Rhino, solidworks etc.

CO2: Students are able to create existing 2D drawings in to 3D forms.

CO3: Students are able to represent 3D solids into 2D drawing by using orthographic views and isometric views.

CO4: Students are able to think of new designs and create 3D digital mock up

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	0	3	1	2	1	1	1	1	1	1	1	2	3
CO2	1	0	0	3	2	0	0	0	0	0	0	0	1	0	3
CO3	1	1	1	3	1	1	0	1	1	0	0	0	1	1	3
CO4	1	1	1	2	1	2	0	1	1	0	0	0	1	1	3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic knowledge of Sketching and visualizing ideas on 2 dimension
- Should have knowledge of Engineering. Graphics - Orthographic, Isometric views.
- Students should install above-mentioned software in their PC/Laptop.

Reference Books:-

- Autodesk Fusion 360 Basics Tutorial Paperback – Import, 15 Aug 2018 by Tutorial Books
- Autodesk Fusion 360: A Power Guide for Beginners and Intermediate Users Paperback – Import, 6 Jun 2018 by John Willis (Author), Sandeep Dogra (Author), Cadartifex (Author)
- Blender Basics: Classroom Tutorial Book by Jim Chronister Publication date 2017
- Product Design Modeling using CAD/CAE: The Computer Aided Engineering Design By Kuang-Hua Chang

Reference URL:-

- https://www.blender.org/support/tutorials/
- https://www.autodesk.com/products/fusion-360/get-started
- http://web.mit.edu/2.972/www/solid_modeling.html
- http://docs.mcneel.com/rhino/5/usersguide/en-us/html/ch-14_headphones.htm
- https://forums.autodesk.com/t5/autocad-forum/extrude-v-s-sweep-vs-loft/td-p/1925203

Trends in Automotive Technology C: L: T: P :: 3:1:2:0

1. Course Description

This course intends to give a vision of the near and long-term future of selected automotive areas from the viewpoint of the automotive industry.

-Future scenarios based on technical background and actual facts and figures.

- Global future car and traffic scenarios taking into account cultural, regional, social and demographic factors.
- Development trends in car electronics.
- Trends in design, body structure and modules as well as the use of virtual methods in development and production,
- Future developments in the area of power train, wheels and about the CO2 challenge.
- Improvement of driving safety through technologies such as Dynamic Drive, X-by-Wire, AFS etc.
- Safety and accident prevention: driver assist and car-to-car communication,
- Environmental effects of producing, using and recycling of cars, current improvements and future optimizations.

2. Learning Objective

- To learn top technological changes that are prevalent in automotive industry.
- To understand the challenges and trends in future automotives.

3. Course Contents

A. Theoretical

- Technology Trends
    - Autonomous Vehicles (AV) concepts
    - Connectivity
    - Electrification
    - Shared Mobility
    - Artificial Intelligence (AI)
    - Big Data & Data Analytics
    - Human-Machine Interface
    - Block chain

B. Practical/Tutorial

A student will research in to above areas of automotive technology and make presentations.

4. Course Outcomes

CO1: Students will gain knowledge about future trends in automotive design and technology.

CO2: Students understand technology of how the Automobile works.

CO3: Students learn trends in automobile production methods & processes.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	2	1	2	1	1	2	2	1	2	3
CO2	1	1	1	2	1	2	1	2	1	1	1	1	1	2	3
CO3	1	1	1	2	1	3	1	1	1	1	2	1	1	1	3
VG	0.8	0.8	0.8	1.5	0.8	1.8	0.8	1.3	0.8	0.8	1.3	1.0	0.8	1.3	2.3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. **Prerequisites and Materials**
   - Students should have basic understanding of engineering and automotive working principles.
   - Students should have basic understanding of physics.

Reference Books:-

- *Automotive Mechanics by William H. Crouse, Publisher: McGraw Hill*
- *Heinz Heisler: Advanced Vehicle Technology, Publisher: Butterworth - Heinemann, 2002*
- *Seth Leitman, Bob Brant, Leitman Seth: Build your Own Electric Vehicle: Publisher: McGraw-Hill Companies. 2008*

URL:-

- https://www.kopykitab.com/ebooks/2017/03/10369/sample/sample_10369.pdf
- https://booksite.elsevier.com/samplechapters/9780750675994/9780750675994.PDF
- http://160592857366.free.fr/joe/ebooks/Automative%20engineering%20books/Automotive%20Engineering%20Powertrain,%20Chassis%20System%20and%20Vehicle%20Body.pdf

Automotive Engineering and Technology SDTD 2021 **C: L: T: P :: 3:1:2:0**

1. Course Description

Automotive Engineering Fundamental is to acquaint the students with the basic engineering aspects of an automobile. Since the designers need to deal with automotive products throughout their career, it is very important for them to know how the product works. The topic here gives the idea of the major components and their working in an automotive product.

2. Learning Objective

- To learn about various sub systems in a Vehicle and their working principles.
- Be able to form technical specifications of a vehicle and select various aggregates based on that.

3. Course Contents

C. Theoretical

- Vehicle Power System
  - Prime Movers & Energy Sources
  - Components of vehicle
  - Layout of Conventional Type Vehicle
  - Vehicle Dimensions
- Vehicle Transmission and Suspension System
  - Gear Box

- Clutch
- Braking Systems
- Suspension Systems
- Wheels
- Tyres
- Final Drive
- Front Axle Steering System

- Vehicle Structure & Materials
  - Frame
  - Body
  - Materials

D. Practical/Tutorial

A student has to learn about forming suitable specification of a new vehicle and learn to specify aggregates based on that.

- Vehicle Integration
- Type of Prime mover
- Vehicle Propelling & control system

4. Course Outcomes

CO1: Students will gain knowledge about vehicle systems and sub systems.

CO2: Students understand technology of how the Automobile works.

CO3: Students learn trends in automobile production methods & processes.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. **Prerequisites and Materials**
    - Students should have basic understanding of engineering and automotive working principles.
    - Students should have basic understanding of physics.

Reference Books:-

- *Automotive Mechanics by William H. Crouse, Publisher: McGraw Hill*
- *Heinz Heisler: Advanced Vehicle Technology, Publisher: Butterworth - Heinemann, 2002*
- *Seth Leitman, Bob Brant, Leitman Seth: Build your Own Electric Vehicle: Publisher: McGraw-Hill Companies. 2008*

URL:-

- https://www.kopykitab.com/ebooks/2017/03/10369/sample/sample_10369.pdf
- https://booksite.elsevier.com/samplechapters/9780750675994/9780750675994.PDF
- http://160592857366.free.fr/joe/ebooks/Automative%20engineering%20books/Automotive%20Engineering%20Powertrain,%20Chassis%20System%20and%20Vehicle%20Body.pdf

Project 2: 2 Wheel Mobility product design SDPJ 2111 C: L: T: P :: 5:1:2:4

1. Course Description

This is a Project based Exploration of Design Solutions, to predict the mode of Transport in the Coming Future, through Creative Sketching and Ideation.

This Course will Include Development of Exterior and Interior of a Vehicle Concept. This course will also introduce the use of simple Digital Sketching software to help illustrate student ideas.

2. Learning Objective

- Explore Forms in 3 Dimensional Space.
- Visualize and Draw Objects from Mind.
- Understand Design Process.
- Push the Boundaries in Creativity through simple but effective form translation into tangible Design Solutions.

3. Course Contents

- Analyzing Brief
- Verbalize, Ideate
- Explore visual DNA of Vehicle
- Select Key directions and Identify Themes
- Develop, Select, Synthesize
- Deliver Final Solution

4. Course Outcomes

CO1: Students will be able to define a Mood board, Apply Keywords and Develop Forms with Expression.

CO2: Students will be able to Develop an Innovative Package based on the Architecture of the Vehicle.

CO3: Students will be able to translate the Essene of the form to a Tangible Transport Solution and Implement Design Process.

CO4: Develop Final Renders of Concepts.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	3	1	2	1	3	2	2	2	2	2
CO2	1	2	3	3	3	2	1	2	1	2	2	2	2	2	3
CO3	1	2	3	3	3	3	1	1	1	2	2	1	1	1	3
CO4	1	2	3	3	3	3	1	1	1	2	2	1	1	1	3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Sketching Fundamentals and Basics.
- Basic of Computers, Alias sketchbook
- Visualization of Geometrical Forms and Understanding Proportion, Scale.

Reference Books:-

- Sketching the Basics by Koos Eissen & Roselien Steur
- Vehicle Design: Aesthetic Principles in Transportation Design by Jordan Meadows.
- How to Draw: Drawing and Sketching Objects and Environments from Your Imagination by Scott Robertson.
- Cosmic Motors: Spaceships, Cars and Pilots of Another Galaxy by Daniel Simon

Year 3

Semester 5

Ergonomics & Vehicle Packaging SDTD 3014 C: L: T: P :: 3:1:1:4

1. Course Description

Ergonomics inputs are required right from the concept stage of design reducing the likelihood of expensive or unfeasible modifications being necessary at downstream stages. The combination of product concepts populated with human manikin provides a platform to consider human factors. Vehicle packaging deals with the overall envelop in which occupants of a vehicle are placed while using a vehicle, along with the basic dimensions needed to be kept static while designing any vehicle. Vehicle packaging aims at achieving excellent spatial and ergonomic efficiency while meeting legislative requirements and performance objectives.

2. Learning Objective

- Role of Ergonomics in Vehicle safety, comfort of occupant, ease of use, better performance and aesthetics.
- Properties and usage of thermoplastics, thermosetting plastics. Process of selection and applications of plastics for Mobility Products.
- Design limitations in application of Plastics in Mobility.
- Assembly Processes and Decorative techniques for Automotive Trims. Design, Limitations and Selection of materials,

3. Course Contents

A. Theoretical

- Occupant Packaging
- Anthropometry- static & dynamic
- Functional task oriented measurements
    - Steering system
    - Brake pedal system
    - Road & surround visibility
- Automotive Seat design for Seating comfort
    - Comfort and usability of Seat Belt
    - Seat design for driver's size & shape
    - Occupant fatigue for extended period
    - Occupant safety in case of a crash
- Design of Symbols for Automotive Display and control
    - Information Graphics
    - Advanced recreational systems
    - Digital Meters
- Vehicle Package & Layouts
    - Factors influencing vehicle Package

- Front end package, Rear end package, underbody.
- Regulatory requirements

B. Practical/Tutorial

- A student has to learn about ergonomics in vehicle design process. Justify and apply in practical cases.
- Students learn about Vehicle packaging parameters. Apply knowledge for new vehicle design.

4. Course Outcomes

CO1: Students learn about vehicle shapes and dimensions of different types of vehicle. They become aware of different components in exterior and interiors of a vehicle.

CO2: Students become aware of different regulatory factors in deciding vehicle dimensions.

CO3: Students use different human body templates to design interiors and exteriors. Learn about other different spaces human performances.

CO4: Students are able to apply knowledge of human factors & packaging for new vehicle design.

5. Prerequisites and Materials

- Students should have basic understanding of automotive working principles.
- Students should have basic understanding of automotive controls.

Reference Books:-

- *Automotive Ergonomics by Brayan Peacock & Waldemar Karowski*

- *H-point: The Fundamentals of Car Design & Packaging by Geoff Wardle, Ralph Gilles, and Stuart Macey*
- *Automotive Ergonomics by Brian Peacock and Waldemar Karwowski*
- *Automotive Ergonomics: Driver-Vehicle Interaction by Nikolaos Gkikas*
- *Anthropometry in India by John Beddoe*

URL:-

- https://www.slideshare.net/vins049/ergonomics-automotive-presentation
- https://www.slideshare.net/sudhavel/basic-ergonomics-in-automotive-design
- https://www.slideshare.net/sudhavel/occupant-packaging-in-car-body-design

Table: Correlation of POs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	1	2	2	2	1	1	1	2	2	1	1	2	1

PE 3 Vehicle Graphics SDTD 3015 **C: L: T: P :: 3:1:1:2**

1. Course Description

This is an industry, which caters to bespoke vehicle decal designs, which reflects the dreams of a potential aspiring customer. A way of ornamentation to your car, this demands in depth persona study and aspirations of the client, translating it to decal design on the vehicle.

2. Learning Objective

- To learn methods of persona study, pitching themes.
- To apply the elements of design and design principles to design logo/icons, layout and compositions

3. Course Contents

A. Theoretical

- Extracting user persona and themes to mood board and theme board.
- Extracting themes to decals identify areas on the vehicle enhancing feature lines, surfaces and creases.
- Conversion of raster images to vector, for to scale production
- Vinyl printing and final application to vehicles.

Practical/Tutorial

A student has to perform assignments to be delivered on vinyl sheets. Tentative assignments are as follows -

- Icon/Logo Design
- Decal design on different makes of vehicles

4. Course Outcomes

CO1: Students will learn to generate themes from different persona study, convert to and generate visual themes, create concepts.

CO2: Students will learn techniques to transfer ideas and themes to physical decals at real life scales on vehicle

CO3: Students are able to judge the importance of vehicle graphics in totality in contributing to vehicle design.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	2	1	1	1	1	1	2	1	1	2
CO2	3	1	3	1	1	2	1	1	1	1	1	2	2	1	2
CO3	3	1	3	1	1	1	1	1	1	2	1	1	1	1	2

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding sketching, illustration and colors, Vinyl
- Soft skill on Adobe Illustrator, Adobe Photoshop will be required for this course.

- Students should install above-mentioned software in their PC/Laptop.

Reference Books:-

· Vehicle Wrapping by Craig Campbell (Author)
· Vehicle Graphics 101: An Instructional Guide to the Vinyl Vehicle Graphics Industry Perfect Paperback – February 14, 2008 by Kirsten Hudson (Author), Todd LaBrie (Author)
· The Graphic Installers Handbook 1st Edition, by Rob Ivers (Author)

URL:-

- https://99designs.com/blog/design-tutorials/vehicle-wrap-design-tips/
- https://www.rolanddga.com/blog/2016/06/01/21/49/top-10-vehicle-wrap-design-tips
- https://blog.signwarehouse.com/basic-guide-vinyl-vehicle-graphics/
- https://www.kickcharge.com/outdoor-advertising/top-5-rules-for-effective-vehicle-wrap-design/

PE 3 Advanced Digital Rendering SDTD 3016 C: L: T: P :: 3:1:1:2

1. Course Description

This course introduces advanced tools and techniques for the development of Photorealistic Render of Sketches and Forms, to blend with the Natural Environment of the Product. It helps the Student to convey or communicate his idea to the End User in Real World Scenario.

2. Learning Objective

- Learn to Use Blend Modes, quick Selection tools.
- Learn to apply Details like Parting line, add Radius, Reflections w.r.t Material.
- Apply transparency In Glass.
- Use of Filters and effects.

3. Course Contents

- Rendering Process
- Line Drawing
- Paths
- Layer Building
- Value to Communicate Form
- Colorized Layers
- Final Composite Image.

4. Course Outcomes

CO1: Students learn advanced commands and special effects in Photoshop.

CO 2: Students will be able to Create Professional High Quality Renders.

CO 3: Students are able to demonstrate their Ideas with much better effect.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	2	1	1	1	1	1	2	1	1	3
CO2	3	1	3	1	1	2	1	1	1	1	1	2	2	1	3
CO3	3	1	3	1	1	1	1	1	1	1	1	1	1	1	3
G															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Basic of Computers
- Basics of Adobe Photoshop.

Reference Books:-

- How to Render: The Fundamentals of Light, Shadow and Reflectivity by Scott Robertson with Thomas Bertling.
- Design Rendering Techniques by Dick Powell.
- Photoshop CS6 in easy steps by Robert Shufflebotham

Project 3: Vehicle Styling Project (Exterior Design) C: L: T: P :: 5:1:1:6

1. Course Description

The emotional impression a car imprints on a potential buyer is as equally important for its commercial success as fulfilling functional requirements. Hence, to create a positive emotional impression of a vehicle, great effort is put into a car's styling process. One of the key aspects during the early stages of the automotive design process is the convergence of styling and engineering design. While requirements stemming from engineering design are usually characterized by quantitative values, styling requirements are rather qualitative in nature. Converging these two requirement types is laborious.

Learning Objective

- Different measures for the vehicular structures design and styling.

- Theme based vehicle form and expressions. Balance between functionality and aesthetics.
- Hands on practice and development from scratch, vehicle styling project.

2. Course Contents

A. Theoretical

- Automotive Design- Scope and Directions
- New Vehicle Product Design and Development
- Vehicle Design Trends- Historical Perspective
- Vehicle Styling Process- from Sketch to Vehicle
- Studios, Resources, Skills and Tools
- Vehicle Package
- Sessions by design experts on-
- Cars
- Two wheelers
- Commercial Vehicles
- Concept vehicles, show cars, futuristic vehicles

B. Practical/Tutorial

- A student has to learn about appearance of various types of automotive products like cars, motorcycles, trucks, buses etc. They apply principle for new design or find out a new methods/combinations.

3. Course Outcomes

CO1: Students learn appearance of various types of automotive products like cars, motorcycles, trucks, buses etc..

CO2: Students understand vehicle design trends, journey from sketch to vehicle,

CO 3: Students gets hands on skills in using resources and tools. Students produce sketching-rendering, Computer Aided Styling (CAS), Clay model.

CO 4: Students present detail of exterior-interior, Instrument Panel, Color-Material-Finish and experience design.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2	3	3	2	1	3	2	2	2	1	2	2	2
CO2	2	2	2	1	3	3	3	2	0	2	0	2	2	2	3
CO3	2	2	2	1	3	3	3	2	0	2	0	2	2	2	3
CO4	2	2	2	1	3	3	3	2	0	2	0	2	2	2	3
AVG	2.0	1.8	2.5	2.5	2.0	2.5	2.0	2.3	1.5	2.3	1.7	1.3	2.0	2.2	2.5

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

4. Prerequisites and Materials

- Students should have basic understanding of vehicle systems and fuels.
- Students should have basic understanding of environment friendly products.

Reference Books:-

- *Future Drive: Electric Vehicles And Sustainable Transportation by Daniel Sparling*
- *Faster, Smarter, Greener, the future of car and mobility by Venkat Sumantran, Charles Fine and David Gonsalvez.*
- *Design of Human-Powered Vehicles by Mark Archibald*
- *The Car in 2035: Mobility Planning for the near future by Kati Rubinyi*

URL:-

- https://www.google.com/search?q=sustainable+vehicle+design&safe=active&rlz=1C1GCEU_enIN820IN820&tbm=vid&source=lnms&sa=X&ved=0ahUKEwii7Z-x2rrgAhVJfX0KHSp5D3QQ_AUIDCgD&biw=1348&bih=604&dpr=1
- https://www.theguardian.com/sustainable-business/2014/sep/04/auto-industry-transportation-design-art-center-driverless-car
- https://www.youtube.com/watch?v=nZ7sStkNAu8

PE 4 3D Printing C: L: T: P :: 3:1:1:2

1. Course Description

Additive manufacturing- namely rapid prototyping and 3D printing are advancing by leaps and bounds as the world witnesses new innovations in the fields every day. Due to the cost reduction and time saving rapid prototyping has become such a coveted technology among automotive and aerospace engineers, scientists, medical researchers and even independent hobbyists. To the layman, automotive prototypes can represent only a single step of the validation process which lies between the initial design phase of the product and the final run of production.

2. Learning Objective

- Students learn about prototyping.
- Students use different prototype methods
- Apply knowledge to make prototype of their designs

3. Course Contents

A. Theoretical

- Digital prototyping
- FE Analysis
- Scale down prototype models
- Rapid prototyping
- Materials used in RPT
- Different types of RPT

B. Practical/Tutorial

- A student has to learn RPT and prototyping
- Students understand importance of prototyping.

- Students create prototype for their designs

4. Course Outcomes

CO1: Students will gain knowledge about RPT material and process.

CO2: Students understand importance of prototyping in new designs.

CO3: Students will be able to apply knowledge on design of automotive parts.

CO4: Students will create new designs and make prototypes using RPT

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	3	2	3	3	1	1	2	2	2	2	2	1
CO2	1	1	2	3	1	3	1	2	1	1	2	1	2	1	1
CO3	1	1	2	3	2	3	1	1	1	1	2	1	2	1	1
CO	1	2	2	3	2	3	1	2	1	2	1	1	1	1	1

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of mass transport vehicle.
- Students should have basic understanding of existing Mass Transport System.

Reference Books:-

- *Rapid Prototyping by Andreas Gebhardt*
- *Kar Kraft by Charlie Henry*
- *101 Design Methods by Vijay Kumar*
- *Automotive Product Development: A Systems Engineering Implementation by Vivek D. Bhise*

URL:-

- https://www.youtube.com/watch?v=NkC8TNts4B4
- https://www.youtube.com/watch?v=l6qzQLJobqU
- https://www.mindtheproduct.com/2016/05/concept-sketch-production-nissan-creates-cars/

PE 4 FRP Manufacturing C: L: T: P :: 3:1:1:2

1. Course Description

Fiber Reinforced Plastic or FRP is a composite material consisting of reinforcing fibers thermosetting resins and other materials such as fillers

and pigments may also be present. Glass fiber is generally used as a reinforcing material and polyester resins are usually used as bending agent.

Hand layup process. This is the most popular method for manufacture of large and complex items. It requires minimum equipment and inexpensive molds. Molds are made of reinforced plastics, plaster of Paris, wood, etc. only one mold, male or female is used and the articles produced have finish on the side that comes in contact with the mold. Resins used are of polyester and epoxy. The molding operation is as follows.

- Application of release agent.
- Gel coat
- The layup operation.
- Curing and releasing the mold.
- Trimming.
- Painting

2. Learning Objective

- Students learn about prototyping by using FRP method.
- Students gets hands on experience different stages of FRP methods
- Apply knowledge to make prototype of their designs

3. Course Contents

C. Theoretical

- FRP processes
- Die making
- Hand Lay up
- Spray up method
- Filament winding
- Match die molding
- Pultrusion
- Resin transfer molding
- Reaction injection molding

D. Practical/Tutorial

- A student learn and do hand molding of small component.
- Students understand processes of prototyping.
- Students create prototype for their designs

4. Course Outcomes

CO1: Students will gain knowledge about FRP material and process.

CO2: Students understand molding processes of FRP plastics begins by placing the fiber preform on or in the mold.

CO3: Students will be able to apply knowledge on design of automotive parts.

CO4: Students will create new designs and make prototypes using FRP

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
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CO2	1	1	2	3	1	3	1	2	1	1	2	1	2	1	1
CO3	1	1	2	3	2	3	1	1	1	1	2	1	2	1	1
CO4	1	2	2	3	2	3	1	2	1	2	1	1	1	1	1

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of mass transport vehicle.
- Students should have basic understanding of existing Mass Transport System.

Reference Books:-

- *Rapid Prototyping by Andreas Gebhardt*
- *Kar Kraft by Charlie Henry*
- *101 Design Methods by Vijay Kumar*
- *Automotive Product Development: A Systems Engineering Implementation by Vivek D. Bhise*

URL:-

- https://www.youtube.com/watch?v=NkC8TNts4B4
- https://www.youtube.com/watch?v=l6qzQLJobqU
- https://www.mindtheproduct.com/2016/05/concept-sketch-production-nissan-creates-cars/

Year 3

Semester 6

1. Course Description

This course introduces advanced tools and techniques for the development of Photorealistic Render of Sketches and Forms, to blend with the Natural Environment of the Product. It helps the Student to convey or communicate his idea to the End User in Real World Scenario.

2. Learning Objective

- Learn to Use Blend Modes, quick Selection tools.
- Learn to apply Details like Parting line, add Radius, Reflections w.r.t Material.
- Apply transparency In Glass.
- Use of Filters and effects.

3. Course Contents

- Rendering Process
- Line Drawing
- Paths
- Layer Building
- Value to Communicate Form
- Colorized Layers
- Final Composite Image.

4. Course Outcomes

CO1: Students learn advanced commands and special effects in Photoshop.

CO 2: Students will be able to Create Professional High Quality Renders.

CO 3: Students are able to demonstrate their Ideas with much better effect.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Creative Mind-set	Empathy	Articulation	Realization	Future	Approach	Spirit	Work	Ethics	Solutions	Context	Learning	Research	Packaging	Modelling
CO1															
CO2															
CO3															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Basic of Computers
- Basics of Adobe Photoshop.

Reference Books:-

- How to Render: The Fundamentals of Light, Shadow and Reflectivity by Scott Robertson with Thomas Bertling.
- Design Rendering Techniques by Dick Powell. Photoshop CS6 in easy steps by Robert Shufflebotham

2023-27

Visual Communication and Portfolio Creation SDTD 3018 C: L: T: P :: 2:1:1::0

1. Course Description

Presentation of work, of a designer is the most important part of a Professional Designer. A portfolio aims at presenting and exhibiting the capabilities, innovative thinking and design sensibility of a designer. A Proper Understanding of Graphic Design Rules is required to plan the Layout of the Pages and arrange Projects in their Digital Portfolio. This Module is an exercise based on repeated feedbacks by the teachers/instructors in creating a refined portfolio.

2. Learning Objective

- Learn How to Layout and structure, Use a Theme, Understand Placement of Images and Text in the Portfolio.
- Design a graphical Cover Page and CV
- Understand the Importance of Quality over Quantity

3. Course Contents

- Layout Importance.
- Logo Placement
- Alignment
- Typography Rules
- Composition
- Negative space and Positive Space
- Foreground and Background Slide design
- Develop a theme for his/her Portfolio.
- Hierarchy of Projects
- Selection of projects
- Cover page and Index
- Final Slide Design

4. Course Outcomes

CO 1: the ability to create visual representations through applying basic visual communication principles in layout and typography to better organize and visually structure the information

CO 2: Apply his learning to Organize and structure the portfolio in a clean yet efficient way and show his Individual thought process, demonstrate skills and Creativity.

CO 3: Student able to judge graphical aesthetics and apply to use.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	3	1	1	3	3	1	1	0	3	1	0	0	1
CO2	2	1	2	1	1	2	1	2	1	1	1	1	1	1	1
CO3	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Photoshop Skills
- Project works done during the whole Course.

Reference Books:-

- How to be a Graphic Designer, Without Losing Your Soul by Adrian Shaughnessy
- The Elements of Typographic Style by Robert Bringhurst
- Design Portfolios by Sara Eisenman

Advanced Digital Sculpting 2 : ALIAS **C: L: T: P** :: 3:0:1:4

1. Course Description

Continuing with teaching of 3D software's, as done in the previous semesters, Digital Sculpting and 3D Rendering teaches advanced usage of Digital Sculpting Software using complex projects.

The attempt it to create designers who are ready to work in the industry and display the extraordinary skills with various software. Even though the software taught are same as previous semester, but the level of difficulty is higher.

Included here are software like Keyshot/V-ray Showcase to create photo realistic renderings of the project.

2. Learning Objective

- Learn to use shading and Understand Different Surface Interaction and Flow in Objects.
- Learn to cast shadows of Objects w.r.t Light Source.
- Understand Color Interaction with Objects and render using Markers.

3. Course Contents

- Key Shot Workflow
- Model Import
- Applying Materials
- Editing Materials
- Adding Labels
- Lighting
- Composition and Camera Setup
- Render Settings and Output
- NURBS Fundamentals, Projecting, Intersecting and Trim, Building with Curves & Surface tools, Aligning and Matching Surfaces and Curves

4. Course Outcomes

CO1: Student will be able to create and manipulate simple Geometrical volumes and transform the Objects.

CO2: Students will be able to create 3d Curves and merge surface of a car.

CO3: Students will be able to create class A surfaces and it's applications.

CO4: Students are able to apply Class A surface in automotive applications.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Basic of Computers
- Alias Studio Tools software and Keyshot
- Visualization of Geometrical Forms and Understanding Proportion, Scale.

Reference Books:-

· Sketching the Basics by Koos Eissen & Roselien Steur
· Learning Design with Alias Studio Tools by Fridolin T. Beisert
· Learning Autodesk Alias Design 2016 by Prof. Sham Tickoo Purdue Univ.

URL:-

- https://knowledge.autodesk.com/support/alias-products/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Alias-Tutorials/files/GUID-358AC713-21D6-40B5-9C43-74D26334B3F0-htm.html
- https://luxion.atlassian.net/wiki/spaces/K7M/overview

Ui/Ux in Transportation Design **C:L:T:P** :: 3:2:1:0

1. Course Description

The fast changing automotive designs are more becoming incorporation of information Technology and artificial intelligence. UX and UI is an ever-growing sector and pivotal point for the automotive industry. Self-driving car and modern car is an example of that. The dashboard is data center where many human machine interaction happens. Application of App for operation of car control is also an example of Ui/Ux application in modern car.

Here students will be introduced to user experience and user interface concepts through HMI. They will also be introduced to Introduction to Figma and after Effects of automotive design.

2. Learning Objective

- To learn elements of Ui/Ux design and application in automotive domain
- To apply the elements of Ui/Ux design for automotive HMI problem solving.

3. Course Contents

A. Theoretical

- Introduction
- Account & permissions
- Working with Frames
- Hierarchy and nesting
- Auto layouts and constraints
- Creating components and styles
- Basic prototyping
- Import and Export of files

B. Practical/Tutorial

- Introduction
- Setting up project and compositions
- Importing assets
- Workflow and key frames
- Layers and Text animations
- Masks and effects
- Animating and graph editors
- Rendering

4. Course Outcomes

CO1: Here students will get hands-on experience with the faculty, learning common practices and workflows, while building up own design, taking their UI designs for transportation design and services in to consideration.

CO2: Students will come to know HMI methodology and get acquainted to key HMI theories.

CO3: Students learn applications in automotive industry, learnings can be applied to any UX/UI related field.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															
CO7															
CO8															
CO9															
CO10															
CO11															
CO12															
PSO1															
PSO2															
PSO3															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Soft skill on Adobe Illustrator, Adobe Photoshop and Adobe XD will be required for this course.
- Rendering and sketching skills.
- Students should install above-mentioned software in their PC/Laptop.

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

6. Prerequisites and Materials

- Basic knowledge of design and user survey,
- Rendering and sketching skills.
- Students should install above-mentioned software in their PC/Laptop.
- Adobe XD, Figma, In vision, proto io etc

Reference Books:-

- The Elements of User Experience — By Jesse James Garret
- A Project Guide to UX Design: For user experience designers in the field or in the making (2nd Edition) — By Russ Unger & Carolyn Chandler
- Communicating Design: Developing Web Site Documentation for Design and Planning (2nd Edition) — By Dan M. Brown

Service Design in Transportation **C: L: T: P** :: 3:2:1:0

1. Course Description

Service Design in Transportation is a vibrant area of study where mobility services are used by millions around in the world and is improving every day — integrating with new players like Ola, Uber, and others, allowing more people to travel in comfort while reducing the number of cars on the road. This includes user friendly urban intelligent transportation system in to consideration. It also analyses travel routes, user behavior, habits and schedule in to consideration. Developing user friendly, efficient and intelligent system for major travel needs are the goal.

2. Learning Objective

- To learn elements of service design and use suitable tools like Ui/Ux to design a better transport service for Indian cities and villages.

- To apply the elements of service design and use Ui/Ux to demonstrate new solutions in Transport service design.

3. Course Contents

C. Theoretical

- Introduction
- Indian socio economic background
- Identifying various travel needs
- Method and experiences
- Idea generation for better travel services
- Use of Ui/Ux in plan
- Working with Frames
- Hierarchy and nesting
- Auto layouts and constraints
- Creating components and styles
- Basic prototyping

D. Practical/Tutorial

- Introduction
- Working with software like adobe XD figma etc
- Present ideas using Ux concepts
- Workflow and key frames

4. Course Outcomes

CO 1: Here students will get hands-on experience with the faculty, learning

Service design principles.

CO 2: Students will do project on service design for transportation domain.

CO 3: Students learn applications of Ui/Ux in design transport services

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	2	2	3	2	2	1	3	3	2	3	2	3
CO2	2	1	1	2	2	3	1	2	1	3	1	1	1	2	3
CO3	2	1	2	2	2	2	1	1	1	2	3	1	2	1	3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Soft skill on Adobe Illustrator, Adobe Photoshop and Adobe XD will be required for this course.
- Rendering and sketching skills.
- Students should install above-mentioned software in their PC/Laptop.

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

6. Prerequisites and Materials

- Basic knowledge of design and user survey,
- Rendering and sketching skills.
- Students should install above-mentioned software in their PC/Laptop.
- Adobe XD, Figma, In vision, proto io etc

Reference Books:-

- The Elements of User Experience — By Jesse James Garret
- This is Service Design Thinking: Basics, Tools, Cases Paperback – 9 March 2012 by Marc Stickdorn (Author), Jakob Schneider (Author)
- Service Design: 250 Essential Methods Paperback – Import, 1 November 2013 by Robert A. Curedale (Author)
- A Project Guide to UX Design: For user experience designers in the field or in the making (2nd Edition) — By Russ Unger & Carolyn Chandler
- Communicating Design: Developing Web Site Documentation for Design and Planning (2nd Edition) — By Dan M. Brown

Self-driving Vehicle Technology C: L: T: P :: 3:2:1:0

1. Course Description

To qualify as fully autonomous, a vehicle must be able to navigate without human intervention to a predetermined destination over roads that have not been adapted for its use. Companies developing and/or testing autonomous cars include Audi, BMW, Ford, Google, General Motors, Tesla, Volkswagen and Volvo.

One of the key current issues in creating designs for fully autonomous vehicles is how to deal with the cameras, radar, lidar, sensors, cellular connectivity, and other technologies that allow the car to see, process, and respond to roads, humans, infrastructure, and other obstacles.

Students learn to know about realistic vehicle physics, complete sensor suite: camera, LIDAR, GPS/INS, wheel odometry, depth map, semantic segmentation, object bounding boxes

2. Learning Objective

- To learn about principles of development of autonomous vehicle.
- To learn methods for static and dynamic object detection, localization and mapping, behavior and maneuver planning, and vehicle controls

3. Course Contents

E. Theoretical

- Technology Trends
    - Broad idea of vehicle control via internet
    - Connectivity
    - 5 ways of automation
    - Artificial Intelligence (AI) uses in automotive
    - Learn about Tesla's 4 level autonomy
    - design considerations and safety assessment of self-driving cars

F. Practical/Tutorial

A student will research in to above areas of automotive technology and make presentations.

4. Course Outcomes

CO1: Students will gain knowledge about autonomous vehicle design and considerations.

CO2: Students understand technology of how the Autonomous vehicle works.

CO3: Students learn Tesla's production model methods & processes.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	2	1	2	1	1	2	2	1	2	3
CO2	1	1	1	2	1	2	1	2	1	1	1	1	1	2	3
CO3	1	1	1	2	1	3	1	1	1	1	2	1	1	1	3
CO4															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. **Prerequisites and Materials**
   - Students should have basic understanding of engineering and automotive working principles.
   - Students should have basic understanding of physics.

Reference Books:-

- *Automotive Mechanics by William H. Crouse, Publisher: McGraw Hill*
- *Heinz Heisler: Advanced Vehicle Technology, Publisher: Butterworth - Heinemann, 2002*
- *Seth Leitman, Bob Brant, Leitman Seth: Build your Own Electric Vehicle: Publisher: McGraw-Hill Companies. 2008*

URL:-

- https://www.kopykitab.com/ebooks/2017/03/10369/sample/sample_10369.pdf
- https://booksite.elsevier.com/samplechapters/9780750675994/9780750675994.PDF
- http://160592857366.free.fr/joe/ebooks/Automative%20engineering%20books/Automotive%20Engineering%20Powertrain,%20Chassis%20System%20and%20Vehicle%20Body.pdf

Project 4: Public Transport/Commercial Transport (Exterior, Interior etc)

C: L: T: P :: 5:1:2:4

1. Course Description

Automotive design is a creative process used to define the physical appearance of motor vehicles such as cars, trucks, motorcycles etc. To ensure a vehicle is aerodynamic, its exterior design has to include several essential shapes: curves, the shoulder, a wedge, etc. The design student is responsible for the exterior of the vehicle- develops the proportions, shape, and surface details of the vehicle. Exterior design is first done by a series of manual sketches and digital drawings. The design process is an integral part of the development process. The designers collaborate closely with research, development and production areas, coordinating and fine-tuning vehicle dimensions, material concepts and production processes, also ensuring producibility in the process.

2. Learning Objective

The task of the design student is usually split into three main aspects: exterior design, interior design, and color and trim design. Graphic design is also an aspect of automotive design. Students learn to work on these aspects and identify and address the needs of specific user groups.

3. Course Contents

A. Theoretical

- The design of the body must incorporate standards of safety, size and weight, aerodynamics or ways to reduce the friction of airflow, and appearance. Intelligent Transportation system etc.
- Layouts can roughly be divided into three categories: front-wheel drive, rear-wheel drive and four-wheel drive. Many different combinations of engine location and driven wheels are found in practice, and the location of each is dependent on the application for which the vehicle will be used. Traffic Calming ,Technique to Promote Active Communities
- Aesthetics is a core design principle that defines a design's pleasing qualities. In visual terms, aesthetics includes factors such as balance, color, movement, pattern, scale, shape and visual weight. Use of aesthetics to complement their designs' usability, and so enhance functionality with attractive layouts. Context-Sensitive Vehicular Facility

B. Practical/Tutorial

- A student learn about visual design aspects in transportation design and apply psychological methods to include expressions and character in exterior and interior design.
- Students has to produce project documents and observational records to demonstrate vehicle design solutions.

4. Course Outcomes

CO1: Students will gain knowledge about trends and challenges in vehicle design and mobility.

CO2: Students also understand the vehicular aesthetic impacts and different types of mobility systems and their interactions.

CO3: Students are be able to apply knowledge to solve mobility issues in a particular context.

CO4: Students are able to use creativity for the built environment and set goals to improve quality of transit.

CO5: Students can judge visual characteristics of better transportation design.

CO6: Students can conceive new ideas for future for better transportation system.

5. Prerequisites and Materials

- Students should have basic understanding of mobility issues at system level.
- Students should have basic understanding of sustainable mobility - ecology/environment, culture, technology, legislation, safety, Mass transportation, Urban, Semi-urban, rural transport systems & mobility needs.

Reference Books:-

- *Railway Transportation Systems: Design, Construction and Operation by Christos N. Pyrgidis*
- *Intelligent Transportation Systems: Smart and Green Infrastructure Design by Sumit Ghosh , Tony S. Lee*
- *Sustainable Transportation Systems Engineering: Evaluation & Implementation by Francis Vanek, Largus Angenent, James H. Banks, Ricardo A. Daziano , Mark A. Turnquist*
- *Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Our Lives by Jarrett Walker*

URL:-

1. http://www.transalt.com/transportation-system-design/
2. https://ops.fhwa.dot.gov/publications/fhwahop13013/fhwahop13013.pdf
3. https://www.youtube.com/watch?v=tSeGPO0TVHM

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Multi-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Global & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Mockups and Clay Modelling

Industrial Visit **INDT 3101** **C: L: T: P** :: 1:0:1::0

1. Course Description

Academics has to play a role hand to hand with Industry. Industry orientation and recognition of actual scenario is equally important. Students are taken to few relevant industries for a trip to quickly have an experience of industry scenarios.

2. Learning Objective

- To have experience and feel of relevant industry

3. Course Contents

- Visit to product and transportation design firms
- Visit to manufacturing industries

4. Course Outcomes

CO1: Student get a feel of industry.

CO2: Students will be able to relate academics with industry.

CO3: Students are able to identify their strength and match with industry requirements.

CO4: Students can get a broader picture of concept to product application.

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of design and prototyping

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	3	3	3	1	1	2	2	1	1
CO2	1	1	1	2	1	2	3	2	1	1	1	1	1	2	1
CO3	0	2	1	2	2	2	1	1	1	1	1	1	1	1	1
CO4	0	2	1	2	2	1	1	2	1	1	1	1	1	1	1
CO5															

B.D

Thi
Pro

Year 4

Semester 7

Design Management & IPR **SDTD 4006** **C: L: T: P** :: 2:1:1:0

1. Course Description

Design management is a field of inquiry that uses project management, design, strategy, and supply chain techniques to control a creative process, support a culture of creativity, and build a structure and organization for design.

Intellectual property rights are the rights given to persons over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

2. Learning Objective

- Exposes students to creative management, design thinking, and business strategy.
- Brings together marketing management, operations management, and strategic management.
- Learns about Design thinking and Design Leadership.
- The objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.

3. Course Contents

A. Theoretical

- Design Management
  - Managing organizational management and corporate design
  - Managing design systematically
  - Managing design as a strategic asset
  - Managing design for innovation
  - Design Policy
  - Promotion & research
- Introduction to Intellectual Property Rights
  - Patent Law
  - Trademarks
  - Enforcement of Intellectual Property Rights
  - Copyright, Neighboring Rights, and Industrial Designs

B. Practical/Tutorial

- A student has to learn about managing design rights and protecting intellectual property.
- Students learn about structure and organization for design.

4. Course Outcomes

CO1: Students will gain knowledge about structure, policy and techniques to run a design organization.

CO2: Students will gain knowledge intellectual property rights and laws related to that.

CO3: Students learn about design policies

CO4: Student learn to protect design and design rights

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	0	1	2	2	1	3	3	2	3	3	3	2	1	1	1
CO2	0	1	1	2	1	3	3	2	1	3	1	1	1	2	1
CO3	0	2	2	2	2	2	1	1	1	2	3	1	1	1	1
CO4	0	2	1	2	2	2	1	2	1	2	1	1	1	1	1
G															

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of design profession and design thinking.
- Students should have basic understanding of economics.

Reference Books:-

- *Design Management: Managing Design Strategy, Process and Implementation by Kathryn Best*
- *The Fundamentals of Design Management by Kathryn Best*
- *Design Management: The Essential Handbook by David Hands*
- *Intellectual property rights by Khushdeep Dharni and Neeraj Pandey*

URL:-

- https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf
- https://www.prv.se/en/prv-for-entrepreneurs/glossary/intellectual-property-rights2/
- https://www.esa.int/About_Us/Law_at_ESA/Intellectual_Property_Rights/What_is_intellectual_property
- http://www.legalservicesindia.com/article/1742/Intellectual-Property-Rights-in-India.html

Advanced Materials in Automotive C: L: T: P :: 3:1:2:0

1. Course Description

The main materials used for making cars, parts and components, along with future trends, are steel, aluminum, magnesium, copper, plastics and carbon fibers. The prime reason for using steel in the body structure is its inherent capability to absorb impact energy in a crash situation.

The advanced materials include advanced high strength steels, non-ferrous alloys, such as aluminum, magnesium and titanium alloys, and a variety of composites, including carbon fiber composites, metal matrix composites and nanocomposites. Carbon fiber and aluminum has a tendency to be a lighter material when contrasted with different metals like steel and has a more extensive scope of utilization in the automotive field. High quality steel materials can be recyclable which makes the material to be financially productive. Carbon fiber has high obstruction against destructiveness when contrasted and the ongoing materials utilized in the automotive industry. High quality steel materials are cost effective. The consistently developing enthusiasm for carbon fiber in vehicles is associated with the one of a kind arrangement of their properties. The utilization of carbon fiber in the structure of vehicles is

impeded by two components, to be specific, the expense of fiber materials, or, in other words than that of different steels utilized in the car business, and the troubles in assembling auto bodies under the states of present day huge scale creation.

2. Learning Objective

- Manufacturing processes and assembly techniques for Ferrous and non – ferrous metals in mobility applications.
- Properties and usage of thermoplastics, thermosetting plastics. Process of selection and applications of plastics for Mobility Products.
- Design limitations in application of Plastics in Mobility.
- Assembly Processes and Decorative techniques for Automotive Trims. Design, Limitations and Selection of materials.

3. Course Contents

C. Theoretical

- Introduction to Material Science
  - Advanced materials include advanced high strength steels
  - Non-ferrous alloys
  - Composites
  - Carbon fiber

D. Practical/Tutorial

- A student has to learn about materials & manufacturing processes involved in manufacturing mobility products.
- Apply knowledge in short assignments in proposing vehicle configurations.

4. Course Outcomes

CO1: Students will gain knowledge about materials & manufacturing processes of vehicle systems and sub systems.

CO2: Students analyses the appropriate selection of materials in improving design thereby resulting better service and life of product.

CO3: Students will be able to apply materials and processes knowledge for futuristic vehicle applications.

CO4: Students are able to find new applications of materials & processes.

5. Prerequisites and Materials

- Students should have basic understanding of engineering and automotive working principles.
- Students should have basic understanding of physics.

Reference Books:-

- *Manufacturing Processes for Design Professionals by Rob Thompson*
- *Manufacturing Processes for Advanced Composites*
- *Materials and Process Selection for Engineering Design, Second Edition by Mahmoud M. Farag*
- *Industrial Design: Materials and Manufacturing by Jim Lesko*
- *Advances In Material Science by R.K.Dogra*
- *The Automotive body manufacturing systems and processes by Mohammed A Omar, Publisher: Wiley*
- *Ceramic Materials: Science and Engineering by C. Barry Carter and M. Grant Norton*
- *Surface Coatings by Mario Rizzo and Giuseppe Bruno*
- *Mortimer, J., ed. Advanced Manufacturing in the Automotive Industry. Springer-Verlag New York, Inc., 1987*

URL:-

- https://dspace.mit.edu/bitstream/handle/1721.1/50428/41494729-MIT.pdf;sequence=2
- https://www.slideshare.net/TalVagman/automotive-manufacturing-process-overview?from_action=save
- http://www.toyota-ej.co.jp/english/process/index.html

Table: Correlation of POs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	3	3	1	2	1	1	1	1	1	2	2
CO2	1	0	1	3	2	3	2	2	1	1	3	1	3	2	1
CO3	1	0	1	2	3	3	2	1	1	3	3	1	3	3	1
CO4	1	1	0	3	2	3	2	2	2	3	2	1	2	3	1
/G	1.0	0.5	0.8	2.5	2.5	3.0	1.8	1.8	1.3	2.0	2.3	1.0	2.3	2.5	1.3

Aerodynamics C: L: T: P :: 3:1:2:0

1. Course Description

Aerodynamics is the study of forces and the resulting motion of objects through the air. Studying the motion of air around an object allows us to measure the forces of lift, which allows an aircraft to overcome gravity, and drag, which is the resistance an aircraft "feels" as it moves through the air.

Therefore, to build the best possible car we need to understand and optimize how the air flows around and through the body, its openings and its aerodynamic devices.

To enable the comparison of the drag produced by one vehicle versus another, a dimensionless value called the Coefficient of Drag or Cd is created. Every vehicle has a Cd which can be measured using wind tunnel data. The Cd can be used in drag equations to determine the drag force at various speeds.

Learning Objective

- Students learn about Aerodynamics and its applications in vehicle design.

2. Course Contents

A. Theoretical

- Vehicle Design Process
- Vehicle Development Process
- Aerodynamics forms generations

B. Practical/Tutorial

Students may need to display their understanding of vehicle design process by small exercises.

3. Course Outcomes

CO1: Students will gain knowledge about Aerodynamics followed in Vehicle form design.

CO2: Students will understand scope of aerodynamics in vehicle design.

CO3: Students will create vehicle aerodynamic applications.

CO4: Students can relate different vehicle forms and its aerodynamic characteristics.

Table: Correlation of POs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	2	2	3	2	2	1	3	3	2	3	1	1
CO2	2	1	1	2	2	3	1	2	1	3	1	1	1	2	2
CO3	2	1	2	2	2	2	1	1	1	2	3	1	2	1	1
CO4	2	1	1	2	2	2	1	2	1	2	1	1	1	1	2

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

4. Prerequisites and Materials

- Students should have basic understanding of vehicle design and engineering involved in vehicle manufacturing.

Reference Books:-

- *Julian Happian-Smith, Transport Research Laboratory (TRL) Introduction to Modern Vehicle Design, Publisher: Elsevier, 2001.*
- *Heinz Heisler: Advanced Vehicle Technology, Publisher: Butterworth - Heinemann, 2002*
- *Seth Leitman, Bob Brant, Leitman Seth: Build your Own Electric Vehicle: Publisher: McGraw-Hill Companies. 2008*

URL:-

- https://www.araiindia.com/Draft_AIS_Standards.asphttps://www.canva.com/learn/design-elements-principles/
- http://www.siamindia.com/
- http://www.mitrasias.com/bharat-stage-emission-standards/

CMF & Vehicle Interiors C: L: T: P :: 3:1:2:0

1. Course Description

The CMF (Color Material and Finish) Design is a branch of Vehicle design yet one of the most important pieces of the puzzle in producing and selling a successful product. This module dissects and expands to a great depth the importance of this discipline. The subject helps improve the quality of designs according to trend strategies by applying color material and finish with innovation.

Vehicle interior has seen a lot of concentration in terms of design and market as interiors are facing dramatic improvement in terms of changing drivetrains and increased digital technology and human computer interactions

2. Learning Objective

- To learn elements of visual design and aesthetics design principles
- To apply the elements of design and design principles to design vehicle interiors and components like seats, dashboard, steering , instrument panels etc.

3. Course Contents

E. Theoretical

- Vehicle interior - guidelines to sketch and render.
- Color - Pantone Matching System (PMS) as an effective way to communicate color. RAL color chart.
- Color - Pantone system - opaque and transparent plastics.
- Material – Metals as alloys (E.g. Al 6061, Al 7075, SS 304) with mechanical properties and related applications.
- Material – Plastics as type of resin (Eg. UV-resistant ABS, food-safe HDPE) and understanding data sheets.
- Finishes - finish designators are SPI (Society of Plastic Industry) standards – B1 and C1 surface finishes, A class surface, in mold textures.
- Learn to make CMF document - capturing the decorative qualities of designed product – on CAD.

F. Practical/Tutorial

- Work on Vehicle interiors – Sketching and Rendering, interior component design.
- Case studies of benchmarked interior concept designs Volvo X90 and luxury line of brands - Genesis, Infinity etc.
- In CMF, the student has to perform small assignments to learn applications CMF. Tentative assignments are as follows-
    - Icon/Logo Design
    - Designing the next generation dashboard/seat

4. Course Outcomes

CO1: Students learn about different materials used in interiors of automotive.

CO2: Students learn to create automotive interior drawings in right perspective.

CO3: Students learn to recreate existing and new interior design concepts in two and three dimensions including digital medium.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	2	3	3	1	1	0	3	2	0	0	1
CO2	3	1	2	2	2	2	1	2	1	1	1	2	2	1	3
CO3	3	1	3	1	2	1	1	1	1	1	1	1	1	1	3
VG	3.0	1.5	2.8	1.5	2.0	2.0	1.8	1.5	1.0	0.8	1.8	1.8	1.3	1.0	2.3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Soft skill on Adobe Illustrator, Adobe Photoshop and Adobe XD will be required for this course.
- Rendering and sketching skills.
- Students should install above-mentioned software in their PC/Laptop.

Reference Books:-

· CMF Design: The Fundamental Principles of Colour, Material and Finish Design Paperback – April 26, 2016 by Liliana Becerra (Author)

URL:-

- https://www.fictiv.com/hwg/plan/how-to-communicate-color-material-and-finish-effectively
- https://colormarketing.org/2018/05/18/cmf-design-what-is-it/
- https://www.fictiv.com/hwg/
- https://www.theseus.fi/bitstream/handle/10024/108568/thesis_Isoaho-1.pdf?sequence=1
- https://cardesignnews.com/articles/interior-motives/2018/autumn/2018/11/interior-motives-autumn-2018
- https://www.carbodydesign.com/gallery/2013/05/volkswagen-previews-design-vision-gti-concept/6/

Summer Internship **SIIB 4101** **C: L: T: P** :: 2:0:0:4

1. Course Description

This is a 6 weeks Industry internship where students be a part of industry and learn different processes. They also do small projects along with relevant departments.

2. Learning Objective

- To have trial experience of working for industry and understand realistic constraints.

3. Course Contents

- Get appointed in selected firm for industrial internship
- Complete 6 weeks internship work and get a certificate of completion

4. Course Outcomes

CO1: Student get a feel of working for industry.

CO2: Students will be able to relate academics with industry.

CO3: Students are able to contribute for industry.

CO4: Students learn a lot about technology.

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Students should have basic understanding of design and prototyping

Table: Correlation of POs & PSOs v/s COs

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

6. Prerequisites and Materials

- Students should have basic understanding of design and prototyping

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	3	1	3	1	2	3	1	1	2	2	1	1
CO2	1	1	1	3	1	3	3	2	1	1	1	1	1	2	1

Project 5: Futuristic Transportation/ Concept Design/System Design

C: L: T: P :: 5:0:0:10

1. Course Description

This is a Project based Exploration of Design Solutions, to predict the mode of Transport in the Coming Future, through Creative Sketching and Ideation.

This Course will Include Development of Exterior and Interior of a Vehicle Concept. This course will also introduce the use of simple Digital Sketching software to help illustrate student ideas.

2. Learning Objective

- Explore Forms in 3 Dimensional Space.
- Visualize and Draw Objects from Mind.
- Understand Design Process.
- Push the Boundaries in Creativity through simple but effective form translation into tangible Design Solutions.

3. Course Contents

- Analyzing Brief
- Verbalize, Ideate
- Explore visual DNA of Vehicle
- Select Key directions and Identify Themes
- Develop, Select, Synthesize
- Deliver Final Solution

4. Course Outcomes

CO1: Students will be able to define a Mood board, Apply Keywords and Develop Forms with Expression.

CO2: Students will be able to Develop an Innovative Package based on the Architecture of the Vehicle.

CO3: Students will be able to translate the Essene of the form to a Tangible Transport Solution and Implement Design Process.

CO4: Develop Final Renders of Concepts.

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	3	1	2	1	3	2	2	2	2	2
CO2	1	2	3	3	3	2	1	2	1	2	2	2	2	2	3
CO3	1	2	3	3	3	3	1	1	1	2	2	1	1	1	3
CO4	1	2	3	3	3	3	1	1	1	2	2	1	1	1	3

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. Prerequisites and Materials

- Sketching Fundamentals and Basics.
- Basic of Computers, Alias sketchbook
- Visualization of Geometrical Forms and Understanding Proportion, Scale.

Reference Books:-

- Sketching the Basics by Koos Eissen & Roselien Steur
- Vehicle Design: Aesthetic Principles in Transportation Design by Jordan Meadows.
- How to Draw: Drawing and Sketching Objects and Environments from Your Imagination by Scott Robertson.
- Cosmic Motors: Spaceships, Cars and Pilots of Another Galaxy by Daniel Simon

2023-27

Semester 8

Year 4

B.Des_Transportation & Mobility Design

Graduation Project: Transportation & Mobility Design Project with Industry
C: L: T: P :: 15:0:0:30

1. Course Description

During this final Semester, Students will be working on the Final Project which would exhibit their understanding and learning throughout the previous seven semesters.
The Final Project topic will be decided during the course of time. This project will be of higher complexity and the most important part of the whole course since it will give the final touch to the design learning of the student. Students shall be working individually to give shape to the designing of the product under the given topic.
Progress on project shall be evaluated periodically through presentation at various stages, by the jury. The deliverables of the project shall be project report, sketches, final and mock-up models, design drawings, photographs and the final presentation including techno-commercial viability of the proposed new/improved designs.

It is expected that the students take this project as industry sponsored project. This period of a semester is also treated as internship as student can actually report to the organization which they choose to do the internship with.

All systems and procedures as applicable to the internship shall be followed. Student will have the external guide (at the place of internship) and also an internal mentor.

Those students not able to find or not willing to work with a sponsor, is free to complete the project on the campus under the guidance of an internal guide.

2. Learning Objective

- To learn to work for industry under industry mentor.
- To apply academic knowledge in practice for industry scenario.

3. Course Contents

A. Theoretical

.

B. Practical/Tutorial

Students learn organizational norms and behavior. Students learn industry and business perspectives.

- Design and manufacture of 2 wheelers
- Design and manufacture of 4 wheelers
- Design and manufacture of electric vehicle
- Design consultancies
- Any other kind of business related to Transportation & Mobility

4. Course Outcomes

CO1: Students send portfolio of work to industries so as to exhibit clearly the strengths of projects

CO2: Students search for companies who are in the area of vehicle design, manufacturing & consulting and get a project.

CO3: Students attend interview/evaluation process if any by the company for doing a industry project

CO4: Students are able to independently walk in to industry with academic knowledge and confidence.

CO5: Students learn about different processes related to organizational behavior and culture.

CO6: Students learn business perspective and technological knowledge about implementations.

CO7: Students are able to relate academics with industry.

CO8: Students are able to analyze broader perspective of eco system

CO9: Students execute knowledge and professionalism

CO10: Students are able to create solutions for new problem scenarios

CO11: Students are able to explain new concepts through professional models, cad and renderings.

CO12: Students learn to document professionally the work executed by him/her

Table: Correlation of POs & PSOs v/s COs

PO & PSO Vs CO	Develop Creative Mind-set	Empathy	Creative Articulation	Discovery to Realization	Design for Future	Inter-Disciplinary Approach	Entrepreneurial Spirit	Team Work	Professional Ethics	Sustainable Solutions	Local & Global Context	Lifelong Learning	Fundamentals of Vehicle Research	Vehicle Packaging	Digital Mockups and Clay Modelling
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	3	3	3	2	1	3	2	2	3	1	3	2	2
CO2	1	2	2	1	3	3	3	2	0	3	3	2	3	2	3
CO3	1	1	3	3	1	3	1	1	2	2	2	1	3	1	3
CO4	1	2	3	2	3	2	1	2	2	3	3	2	2	3	2
CO5	2	2	3	3	1	3	3	3	2	3	3	1	2	3	3
CO6	2	2	3	3	2	2	3	2	3	3	3	1	2	2	2
CO7	2	2	2	3	2	2	3	2	3	2	2	1	2	2	2
CO8	2	1	2	3	3	1	3	2	3	2	2	2	3	3	2
CO9	3	1	2	3	3	1	3	2	2	2	2	2	3	3	3

CO10	3	3	2	3	2	1	3	2	2	2	2	2	3	3	3
CO11	3	3	2	2	2	2	3	2	2	3	2	2	2	3	3
CO12	3	2	3	2	2	2	3	3	2	2	2	1	2	3	2
AVG	2.0	1.9	2.5	2.6	2.3	2.0	2.5	2.2	2.1	2.4	2.4	1.5	2.5	2.5	2.5

0: No Relation 1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

5. Prerequisites and Materials

- Student should be attached to a relevant industry and work on industry brief.
- Student should have an industry guide and academic guide to do the project.
- Student should have full understanding of vehicle design process and skills to do the project.
- Student should have project documentation skill and knowledge.
- Student should have presentation skill both verbal & written.

Reference Books:-

- The Multi Material Lightweight Vehicle (MMLV) Project by David Wagner, Matthew Zaluzec , Timothy W. Skszek, Jeff L. Conklin
- Modern Electric, Hybrid Electric, and Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao, Stefano Longo, Kambiz Ebrahimi
- Electric Vehicle Sharing Services for Smarter Cities: The Green Move project for Milan: from service design to technology deployment (Research for Development) by Daniele Fabrizio Bignami, Alberto Colorni Vitale, Alessandro Lué, Roberto Nocerino, Matteo Rossi, Sergio Matteo Savaresi .

URL:-

- https://www.sciencedirect.com/science/article/pii/S2212827116302979
- https://academic.oup.com/icc/article-abstract/24/3/635/791239?redirectedFrom=fulltext
- https://www.horiba-mira.com/our-services/vehicle-engineering/design-development