Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

W.E.F. Academic Session 2020-21

Bachelor of Design (B. Des.)

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Bachelor of Technology (B.Tech.) III Year

Curriculum

SEMESTER I

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1	BDS 111	INTRODUCTION TO	50	30	20	100	50	250	1	0	8	5
2	BDS 112	ELEMENTS OF DESIGN	50	30	20	50	50	200	1	0	6	4
3	BDS 113	MATERIAL STUDIES IN	50	30	20	30	20	150	1	0	4	3
4	BDS 114	COMMUNICATION	100	30	20			150	3	0	0	3
5	BDS 151	DESIGN SKETCHING				100	50	150	0	0	6	3
6	BDS 152	TECHNICAL DESIGN DRAWING				50	50	100	0	0	4	2
7	---	MOOCs (For B.Des. Hons										0
								1000				
								TOTAL CREDITS FOR SEMESTER I				**19**

SEMESTER II

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1	BDS 121	FUNDAMENTALS OF COMPUTING IN DESIGN	50	30	20	100	50	250	1	0	8	5
2	BDS 122	PRINCIPLES OF DESIGN	50	30	20	30	20	150	1	0	4	3
3	BDS 123	ELECTRICAL AND ELECTRONICS STUDIES	50	30	20	30	20	150	1	0	4	3
4	BDS 124	PHYSICAL ERGONOMICS	50	30	20	50	50	200	1	0	6	4
5	BDS 125	APPLIED MECHANICS FOR DESIGN	50	30	20	30	20	150	1	0	2	2
6	BDS 161	FORM STUDIES				30	20	50	0	0	4	2
7	BDS 162	RENDERING &				30	20	50	0	0	4	2
8	---	MOOCs (For B.Des. Hons										0
								1000				
								TOTAL CREDITS FOR SEMESTER II				**20**

SEMESTER III

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1	BDS 211	ARCHITECTURAL STUDIES IN DESIGN- I,	50	30	20	30	20	150	1	0	4	3
2	BDS 212	COMMUNICATION STUDIES IN DESIGN- II	100	30	20			150	2	0	0	2
3	BDS 213	MODEL MAKING AND HAND TOOLS WORKSHOP				30	20	50	0	0	4	2
4	BDS 214	SURFACE MODELLING IN COMPUTER AIDED	50	30	20	50	50	200	1	0	6	4
5	RVE 301	UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS	100	30	20			150	2	0	0	2
6	BDS 271	DESIGN				30	20	50	0	0	4	2
7	BDS 281	DESIGN PROJECT- I,				100	50	150	0	0	8	4
8	---	CYBER SECURITY	50	30	20			100	2	0	0	2
9	---	MOOCs (For B.Des. Hons							0	0	0	0
								1000				
TOTAL CREDITS FOR SEMESTER III												**21**

SEMESTER IV

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work &		L	T	P	
1	BDS	DESIGN MANAGEMENT- I,				30	20	200	2	0	2	3
2	BDS	DESIGN THINKING	50	30	20	50	50	200	1	0	6	4
3	BDS	SOLID MODELLING IN	50	30	20	30	20	50	1	0	4	3
4	---	ENGLISH LANGUAGE AND TECHNICAL WRITING	50	30	20	30	20	150	2	0	2	3
5	BDS	NATURE AND FORM				100	50	150	0	0	8	4
6	BDS	DESIGN PROJECT- II,				100	50	150	0	0	8	4
7	---	ENVIRONMENTAL SCIENCE	50	30	20			100	2	0	0	0
8	---	MOOCs (For B.Des. Hons										0
								1000				
TOTAL CREDITS FOR SEMESTER IV												**21**

SEMESTER V

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credi
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work		L	T	P	
1	BDS 311	CREATIVE NARRATION	50	30	20			100	2	0	0	2
2	BDS 312	HUMANITIES & SOCIAL STUDIES	50	30	20			100	2	0	0	2
3	BDS 313	DESIGN MANAGEMENT- II,	50	30	20			100	2	0	0	2
4	BDS 314	DESIGN RESEARCH	50	30	20			100	2	0	0	2
5	BDS 315	ARCHITECTURAL STUDIES – II,	50	30	20	30	20	150	1	0	2	2
6	BDS 331	ELECTIVE- I	50	30	20	30	20	150	1	0	2	2
7	BDS 332	ELECTIVE- II	50	30	20	30	20	150	1	0	2	2
8	BDS 351	DESIGN WORKSHOP				30	20	50	0	0	4	2
9	BDS 381	DESIGN PROJECT- III, SOFTWARE				50	50	100	0	0	8	4
10	---	CONSTITUTION OF INDIA	--	--	--			--	2	0	0	0
11	---	MOOCs (For B.Des. Hons Degree)*										0
								1000				
											TOTAL CREDITS FOR SEMESTER V	**20**

SEMESTER VI

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours per			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work		L	T	P	
1	BDS 321	PRODUCT BRANDING AND IDENTITY	50	30	20	30	20	150	2	0	2	3
2	BDS 322	DESIGN RESEARCH METHODOLOGY- II, APPLIED	100	30	20	30	20	200	3	0	2	4
3	BDS 323	MATERIAL AND PROCESSES IN DESIGN- I,	50	30	20	50	50	200	1	0	4	3
4	BDS 341	ELECTIVE- III	50	30	20			100	2	0	0	2
5	BDS 342	ELECTIVE- IV	50	30	20			100	2	0	0	2
6	BDS 361	CONTROL SYSTEM IN DESIGN				50	50	100	0	0	4	2
7	BDS 391	DESIGN PROJECT- IV,				100	50	150	0	0	8	4
8	---	ESSENCE OF INDIAN TRADITION KNOWLEDGE							0	0	0	0
9	---	MOOCs (For B.Des. Hons Degree)*										0
								1000				
											TOTAL CREDITS FOR SEMESTER VI	**20**

SEMESTER VII

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1	BDS 411	PROFESSIONAL PRACTICE IN DESIGN	50	30	20			100	2	0	0	2
2	BDS 412	FORM IN FOUR DIMENSION	100	30	20	50	50	250	2	0	6	5
3	BDS 413	MATERIAL AND PROCESSES IN	50	30	20	30	20	150	1	0	4	3
4	BDS 431	ELECTIVE- V	50	30	20	30	20	150	1	0	2	2
5	BDS 471	INDUSTRIAL TRAINING				--	100	100	0	0	6	3
6	BDS 472	DESIGN DOCUMENTATION-II	50	30	20			100	2	0	0	2
7	BDS 481	DESIGN PROJECT- V, SYSTEM THINKING IN DESIGN				100	50	150	0	0	8	4
8	---	MOOCs (For B.Des. Hons Degree)*										0
								1000				
TOTAL CREDITS FOR SEMESTER VII												**20**

SEMESTER VIII

S. No.	Course Code	Course Name	Maximum Marks Allotted					Total Marks	Contact Hours			Total Credit
			Theory			Practical						
			End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1	BDS 499	DESIGN DEGREE PROJECT				600	400	1000	0	0	40	20
2	---	MOOCs (For B.Des. Hons Degree)*										0
								1000				
TOTAL CREDITS FOR SEMESTER VIII												**20**

* List of MOOCs (NPTL) Based Recommended Courses for first year B. Des. Students:

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits

2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

* After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Design. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the

students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Des. degree program (not necessary one course in each semester). After successful completion of these MOOCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

PREFACE

Design is a profession of thinkers and visionaries, people who shape human experience of the future by learning from the past and the present. They're trained by education and practice to spot patterns, trends and gaps in people's day to day lives and gain insights from them. For these insights to be objective, meaningful and most importantly, actionable enough to evolve into ideas that improve human condition as well as the environment, a multidisciplinary field like design offers itself like a framework of effective problem solving.

This framework adopts practices from many other fields. The scientific method dictates the terms of collection and handling of information in the design practice. Technology drives the functional and engineering prudence of a design solution. Arts and humanities cover the characteristically emotional aspects of it. Hard economics dictates the terms of execution while culture and tradition influence the aesthetic and acceptability parts of a design solution.

With advances in engineering, designers strive to bring every technological breakthrough into the realm of human experience. They try to find new ways to use novel materials and processes to make incremental improvements in the quality of life in general. And now, they also continue to find effective ways to use the existing materials and processes in pursuit of averting further deterioration of the climate.

From the point of view of anthropology, as human behavior evolves and the society changes with it, designers try to gauge this evolution and offer tangible and non-tangible ways help people adapt to the changes induced by it.

Considering these and other aspects of the design profession, the process to train young designers becomes inherently multidisciplinary. It promotes lateral thinking and drives innovation on one hand, while providing tools to further accelerate the structured decision making process to streamline conventional problem solving on the other.

Design students are primed for being a part of the highly skilled talent pool for organizations. They are trained to become entrepreneurs, and they are taught to become scholars for various domains. Hence, an honorable Bachelor's of Design program must develop a set of skills and instill some virtues in its graduates to be able to contribute to the culture and economy at a level proportionate to their talent and training.

First, an **industry standard skill set** is an absolute requirement for employability in private or public sector in leading design positions. This skill set includes a certain degree of emotional intelligence to connect and

empathize with the end users, analytic skills to distill actionable insights from the market and industry for a timely initiation of a design project, visualization skills to see and present the problems and solutions as they should be, and communication skill to effectively articulate the design process to the stakeholders.

To develop this skill set, the curriculum must include a sufficient workload of skill development courses that includes topics like Representation Techniques, technical drawing and drafting, 3D modeling, model making, materials and process, workshop and manufacturing technologies, technical Studies (Applied Sciences, Mechanics, Electronics, Programming), prototyping, elements of visual design, elements of form, color and composition, ergonomics, research methodologies, design management and system thinking in design. Given the importance of these skills in the profession, the courses covering them constitute the Core of the curriculum.

Second, the qualifications for enrollment in recognized Master's programs worldwide in Design, Applied Sciences and Humanities are decided by the academic credentials earned by a student during his degree program. The design courses typically exceed the undergraduate and postgraduate norms from the perspective of most of the nationally as well as globally recognized evaluation systems as the number of topics covered and required contact hours to do so is significantly higher than a typical Technical or Engineering Degree program. However, it is not just the academic transcript that matters in a design degree, it is the quality and potential impact of the design projects and degree projects of the students which culminate in their portfolios and showcase their personal capacity to learn as well as the institution's capacity to teach and avail resources to visualize and materialize said projects. Students who pursue higher education are aiming to be specialists of a respective sub-domains of design, so their interests in a particular field of design are reflected in the courses they choose to build their theoretical foundation. Subjects offering the starting point for higher education programs form the compulsory and elective foundation part of the curriculum.

Third, the analytic skills are required for design students to be an active part of the Research and Development pool of academia as well as the economy. Courses like Design management and Research methodology offer such skills, hence should be included in the core of the curriculum.

Fourth is the entrepreneurship and management skills that the graduates require for starting their own innovation driven ventures. Since design as a profession transcends the boundaries of multiple domains of expertise, the true potential of some designers is realized when they capitalize upon their skills by offering them to a multitude of domains as entrepreneurs. Hence, they should have a basic level of awareness about starting up a business and its sustainable operation. This awareness also helps them in understanding the needs and limitations of the organizations they work for.

Fifth is the cultural sensibility that helps the designers judge the potential acceptability of their work in society. It is also essential so that solutions adopted from other cultures can be translated into more acceptable local versions.

Sixth, socio-economic sensibility is essential for building social ventures concerned with public affairs. It also helps the design practitioners in being aware of concepts like corporate social responsibility, grass root issues etc. Without being sensitive to customs, traditions and the local ecosystems, designers cannot produce truly inclusive solutions.

Courses like design and ethics, field study parts of the curriculum projects, workshops and short term modules prepared by experts in related fields, and periodic documentation filing assignments help the students develop this aspect of their professional persona.

Seventh, sensibility for environmental concerns encourage designers to contribute for the stabilization of rapidly declining climate quality of the planet. Introduction of basic environmental sciences sensitizes designers

towards the potential environmental impact their work may have. Given the impact on future generations, and the repercussions faced current generation due to disregard of natural cycles, this subject becomes crucial and mandatory part of the curriculum.

And eighth, a **global perspective** that helps the graduates in promoting India's design heritage in other parts of the world and bringing in the best practices of other economies and cultures into India's ecosystem. Academic exchanges across the universities and promotion of institutional publications like studies and other body of work of the students and the faculty helps in this regards.

With these considerations in mind, a model curriculum of Bachelor's degree in Design is offered in this document with an intention to prepare graduates who can successfully render their services to the society, industry and the environment for everyone's benefit and their personal growth in a profession that is challenging, emotionally and physically taxing yet exciting and fulfilling, philosophical yet pragmatic and emotional yet technology driven.

BDS111–INTRODUCTION TO DESIGN

Course Outcome

Discovery of design as a profession

Awareness about psychology of visual perception

Awareness about historical perspective of aesthetics

Understanding of materials an processes

Ability to define problems

Unit 1: Orientation

Definition and understanding of the design process. A brief history of design, evolution of industrial design as a profession; Exploring Creativity; Lateral thinking; visual explorations;

Unit 2: Visual Perception

Principles of visual perception (Gestalt). Laws of grouping (Prägnanz). Discussion and demonstration of the way humans make a greater sense out of combination of simple or complex curves and shapes.

Unit 3: Introduction to Product Design

Definitions of material, process and product. History and examples of product design. Fundamentals of product development cycle. Concept of end user. Defining user groups. Concept of market. Defining the market gap.

Unit 4: Problem Identification

Problem identification and definition. Scenario Building. Mind Maps and Metaphors. Definition of a solution. Ideation, conceptualization and representation of solutions.

Unit 5: System thinking in Design

Introduction to system Thinking; Definition of a system; Concepts of component, connection, transaction and transformation; Boundary and boundary conditions; Concepts of input, activity, response and output; Metaphors; Introduction to Static and dynamic maps;

References

T. Hauffe, Design: A Concise History, Laurence King Publishing, 1998
P.B. Meggs, A History of Graphic Design, Library of Congress Cataloging, 1998
Alan Pipes, Foundation of Art and Design, Lawrence King Publishing, 2008
Bryan Peterson, Design Basics for Creative Results, How Design Books, 2003
Don Norman, Emotional Design, Why We love (or Hate) Everyday Things, Basic Books, 2003
Don Norman, Design of Everyday Things, Basic Books, 2014

BDS112 – ELEMENTS OF DESIGN

Course Outcome

Ability of create simplified representations.

Ability to generate novel patterns and textures

Basic understanding of composition in graphic design

Unit 1: Pattern recognition and creation

Basic elements of visual design and its grammar. Pattern recognition, abstraction and construction.

Unit 2: Dot, Line and Curve

Characteristics of point/dot. Connotations, examples of use in arts, visual communication and industrial design. Characteristics of a line. Line quality. Curves, qualities and characteristics of curves. Visual and emotional interpretations.

Unit 3: 2 Dimensional Elements

Characteristics of a shape, concepts of positive and negative space, types of shapes. Developing patterns by repetition of points, dots, rectilinear elements, curvilinear elements, shapes. Regular and Irregular patterns. Fractals.

Unit 4: Gradation and texturing

Understanding of flat surface. Material and process based textures, construction based textures, pigmented textures.

Gradation on flat Surface, Introduction of highlights and shadows. Primer for elements of form course

Unit 5: Coloring Primer

Introduction to colours, pigment and light, additive and subtractive models. Shades of greys. Understanding warm and cold greys.

References

Samara Timothy, Design Elements, 2nd Edition: Understanding the rules and knowing when to break them, Rockport Publishers, 2014

Evans Poppy and Thomas Mark A., Exploring the Elements of Design, Delmar Cengage Learning, 2012

Beech R., Origami – The Complete Guide to the Art of Paper Folding, Lorenz Books, 2001

Wong W., Principles of Two Dimensional Design, John Wiley & Sons, 1972

White Alex W., The Elements of Graphic Design, Allworth Press, 2011

Gail Greet Hannah, Elements of Design, Princeton Architectural Press, 2002

BDS113–MATERIAL STUDIES IN DESIGN

Course Outcome

Knowledge of where most materials come from

Ability to identify which processes are used to make a product

Unit 1: Materials

Classification of materials, Elements; Origin of Elements in Periodic Table;
Metals and Alloys; Ceramics; Polymers; Semiconductors; Composites; Bio Materials; Salts; Fibber's; Liquids and Colloids;
History of significant materials, History of discovery of elements, history of biomaterials;

Unit 2: Metals and Alloys

Applications and properties of Steel, Brass, Bronze, Copper, Aluminium, Nickel, Tin, Lead, Zink and their Alloys, Phases and phase diagrams;

Unit 3: Properties

Mechanical, electrical, chemical, magnetic, thermal, optical and radiological properties of materials;

Unit 4: Processes

Material processing: Fabrication, additive and subtractive processes and their history;
Tools: General mechanics of subtractive processes;

Unit 5: Model Making Primer

Importance of model making in product design, making scale up and scale down models of objects; working with paper, expanded polystyrene, Styrofoam, Acrylic sheets, sunboard, and fiber board

References

William D. Callister Jr., Materials Science and Engineering, Wiley, 2015
S. K. Hajra Choudhary and A. K. Hajra Choudhary, Elements of Workshop Technology Vol. I, MPP, 2000
C. Baillie and L. Vanasupa, Navigating the Materials World, Academic Press, San Diego, CA, 2003

BDS114 –COMMUNICATION STUDIES IN DESIGN – I

Course Outcome

Ability to analyse communication with research subjects

Ability to gain actionable insights from day to day conversations

Unit 1: Perception

Reality, Experience, Subjective Constancy, Contrast Effect, Grouping;

Unit 2: Communication Theories

Concepts of Information and Data, Defining and investigating communication; Contextual Design; Models of communication;

Unit 3: Objectivist Theory & Application

Introduction to quantitative research, Uncertainty reduction theory, Expectancy violations theory, Social judgment theory, Elaboration likelihood model, Communication accommodation theory, Face negotiation theory;

Objectivist research/ practice: Creating hypotheses & testing relationships, Surveys/questionnaires;

Unit 4: Interpretive Theory & Application

Introduction to qualitative research, Symbolic convergence theory, Symbolic interactionism, Speech codes theory, Relational dialectics theory, and communication privacy management theory, Knowledge Gap Theory; Ethics;

Interpretive research/practice: Interviews and focus groups; Ethnography;

Unit 5: Field Work

Taking up a topic and collecting data from locations; Equivalent to 16 lecture hours;

References

Griffin, E. (2012). A first look at communication theory (8 th ed.). New York: McGraw-Hill.
Lewis, J. (2002). Cultural studies: The basics. London: SAGE Publications.
Watson, J. (1985). What is communication studies?. London: Edward Arnold.
Berko Roy (1989) Basically Communicating .Wm. C. Brown Publishers
Roloff, M. E., & Miller, G. R. (1987). Interpersonal processes: New directions in communication research. Newbury Park, Calif: Sage Publications
Carey, J. W. (1989). Communication as culture: Essays on media and society. Boston: Unwin Hyman

BDS151–DESIGN SKETCHING

Unit 1: Warm Up Exercises and Rapid Sketching

Representing the observed, representing concepts - Sketching for ideation; Lines; Geometric Shapes;

Unit 2: Drawing Techniques

One point, two point, and three-point Perspective;

Grid based drawing, analytical representation; Inside-out sketching; Construction Drawing;

Studies in light and shadow of 3-dimensional form representations;

Unit 3: Representing reality

Mimetic Imagery and Abstraction;

Unit 4: Representing Imagination

Memory and Imagination; Object representation;

Unit 5: Nature and life

Representing nature; Figure drawing;

Course Outcome

Ability to create compelling and detailed line drawings of real or imaginary objects in short time.

Ability to effectively explain an idea through visual language

References

Betty Edwards, New Drawing on the Right Side of the Brain, 2002
Dalley Terence ed.,The complete guide to illustration & design, Phaidon, Oxford, 1980
T. C. Wang, Pencil Sketching, John Wiley & Sons,1997
Wily Pogany, The Art of Drawing, Madison Books, 1996
R. Kasprin ,Design Media – Techniques for water colour, pen and ink, pastel and coloured markers, John Wiley & Sons,1999

BDS152–TECHNICAL DESIGN DRAWING

Course Outcome

Ability to create component level engineering drawings for production

Unit 1: Introduction

Importance of engineering drawing;
Conventions and standards: ISO; Scales;

Unit 2: Lines

Line types; Line Weights; Hatching Types;

Curves; Splines;

Unit 3: Orthography

Orthographic projections: points, lines, planes and solids;
Sections of solids; Intersection of solids.

Unit 4: Advanced Engineering Drawing

Isometric view;
Development of surfaces;
Trajectories and Loci of machine elements;
Assembly drawing;

Unit 5: Computer Aided Drafting

AutoCAD

References

A.J. Dhananjay, Engineering Drawing, TMH, 2008
N D Bhatt and V M Panchal, Engineering Drawing, 43rd Ed., Charator Publishing House,2001
M B Shah and B C Rana, Engineering Drawing, 2nd Ed., Pearson Education, 2009
T E French, C J Vierck and R J Foster, Graphic Science and Design, 4th Ed., McGraw Hill, 1984.
W J Luzadder and J M Duff, Fundamentals of Engineering Drawing, 11th Ed., PHI, 1995
K Venugopal, Engineering Drawing and Graphics, 3rd Ed., New Age International, 1998

BDS121– FUNDAMENTALS OF COMPUTING IN DESIGN

Course Outcome

Readiness for programing control systems

Readiness for building and testing software solutions

Unit 1: Understanding Computer System

The von Neumann architecture, machine language, assembly language, high level programming languages, compiler, interpreter, loader, linker, text editors, operating systems, flowchart;

Unit 2: Basic Programming

Basic features of programming (Using C): data types, variables, operators, expressions, statements, control structures, functions;

Unit 3: Advanced Programming

Advanced programming features: arrays and pointers, recursion, records (structures), memory management, files, input/output, standard library functions, programming tools, testing and debugging;

Unit 4: Data and Data Structures

Fundamental operations on data: insert, delete, search, traverse and modify;

Fundamental data structures: arrays, stacks, queues, linked lists;

Unit 5: Data handling

Searching and sorting: linear search, binary search, insertion-sort, bubble-sort, selection-sort, radix-sort, and counting-sort;

Unit 6: Object Oriented Programming

Introduction to object-oriented programming;

References

A Kelly and I Pohl, A Book on C, 4th Ed., Pearson Education, 1999
A M Tenenbaum, Y Langsam and M J Augenstein, Data Structures Using C, Prentice Hall India, 1996
H Schildt, C: The Complete Reference, 4th Ed., Tata Mcgraw Hill, 2000
B Kernighan and D Ritchie, The C Programming Language, 4th Ed., Prentice Hall of India, 1988

BDS122 –PRINCIPLES OF DESIGN

Unit 1: Principles of visual design

Principles of design, unity/harmony, balance, alignment, hierarchy, emphasis, similarity and contrast;

Unit 2: Morphology

Scale, proportions, movement, repetition, pattern, rhythm, variety, chaos;

Unit 3: Emotions and Colors

Perception of colors, emotion and colors;

Unit 4: Grays

Understanding the Grayscale, gradation methods;

Composition with grays, black and white;

Unit 5: Theory of Color mixing

The Science of Color Theories (Light & Pigment Theories); Primary colors and pure hues, Color Wheel; Tints, Tones and Shades, color charts; Color mixing models, color palettes;

Science of Color mixing, Subtractive & Additive color mixing principles;

Course Outcome

Ability to create compelling colour schemes for graphic design

Understanding the emotional impact of colours on people

Ability to handle different types of pigments for model making and prototyping

References

Itten J., The art of colour: the subjective experience and objective rationale of colour, John Wiley and Sons., 1974
Sherin, A., Design Elements, Color Fundamentals: A Graphic Style Manual for Understanding How Color Impacts Design, Beverly, Mass: Rockport Publishers, 2011
L. Hotzschue,Understanding Colour, VNR, 1995
R.M. Proctor, The principles of pattern, DoverPublications,1990
Elam, Kimberly; Geometry of Design: Studies in Proportion and Composition, Princeton Architectural Press, 2001Lauer

BDS123 –ELECTRICAL AND ELECTRONICS STUDIES IN DESIGN

Course outcome

Readiness to build control system hardware for products

Readiness to build powertrains in products

Unit 1: Circuit Analysis Techniques

Circuit elements, Simple RL and RC Circuits, Ohm's law, Kirchhoff's laws, Nodal Analysis, Mesh Analysis, Linearity and Superposition, Source Transformations, Thevnin's and Norton's Theorems, Sinusoidal Forcing Function, Complex Forcing Function, Phasor Relationship for R, L and C, Impedance and Admittance, Phasor Diagrams.

Unit 2: Diodes and Transistors

Semiconductor Diode, Zener Diodes, Rectifier Circuits, Wave Shaping Circuits, Bipolar Junction Transistors, Field-Effect Transistors.

Unit 3: Operational Amplifiers

Op-amp Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing, Voltage Buffer, Controlled Sources.

Unit 4: Logic Gates and Combinational Circuits

Number Systems and Codes, Logic Gates, Boolean Theorems, DeMogan's Theorems, Sum-of Product Form, Algebraic Simplification, Karnaugh Map Method.

Unit 5: Transformers and AC Machines

Ideal Transformer, Circuit Model of Transformer, Determination of Parameters of Circuit Model of Transformer, Voltage Regulation, Efficiency, Induced Voltage, Electromagnetic Torque, Torque Speed Characteristic.

Single Phase Induction Motors, Characteristics and Typical Applications, Stepper Motors, Construction Features, Methods of Operations, DC Generator and DC Motor Analysis.

References

W.H. Hayt and J.E. Kemmerly, Engineering Circuit Analysis; McGraw-Hill, 1993
R.J. Smith and R.C. Dorf, Circuits, Devices and Systems; John Wiley & Sons, 1992
R.L. Boylestad and L. Nasheisky, Electronic Devices and Circuit Theory; PHI, 6e, 2001
R.J. Tocci, Digital Systems; PHI, 6e, 2001
V. Del Toro, Electrical Engineering Fundamentals; PHI, 1994.
D.P. Kothari and I.J. Nagrath, Basic Electronics; McGraw-Hill, 1993
D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering; McGraw-Hill, 1991

BDS124–PHYSICAL ERGONOMICS

Unit 1: Man-Machine Interaction

Definition of Ergonomics and its application and overview, Concept of Man Machine Environment System;

Unit 2: Biomechanics of human Body

Overview of Human body and it's sub systems, Understanding musculoskeletal system and its function in terms of manual activities, Understanding nervous system, human sensory organs and their limitations; Basic Bio mechanics and its application in design;
Concept of Usability, Usability by Form, usability by feature, usability by function, usability by material;

Unit 3: Anthropometrics

Anthropometrics. Understanding and applications of anthropometry; Posture, reach, grip and movement. Quantification of comfort levels; Access, Reach, Posture and movement;
Product Ergonomics: Object handling, Macro and Micro Reach, Object handling effort and posture;

Course Outcome

First Experience of a design project

Understanding how humans physically interact with products

Understanding how people are affected by their habits

Understanding of how people use handheld objects

Understanding how vehicle interiors are designed

Ability to predict mistakes people make while using machines

Ability to predict how component or feature failure may injure users

Understanding how people get injured

Unit 4: Effort

Static and Dynamic effort. Quantification of effort; Endurance, Strength, Physical environment and its impact on human performance;
Cognition, perception and performance, Task Analysis;

Unit 5: Safety

Injury prevention, Safety, Vibration, Shock, Fatigue and occupational hazards; Error Handling: Human Errors; Forgiveness; Allowance for Errors; Component resilience; desirable use scenarios and user manual construction; safety against human error; safety against feature malfunction; troubleshooting manual;

References

R. S. Bridger, Introduction to Ergonomics, 2nd Edition, Taylor &Francis, 2003
J. Dul, and B. Weerdmeester, Ergonomics for beginners, a quick reference guide, Taylor & Francis, 1993
C. D. Wicknes, S. E. Gordon, and Y. Liu, An Introduction to Human Factors Engineering, Longman, New York, 1997
E. Grandjean, Fitting the task to the man, Taylor & Francis Ltd.1980
P.W. Jordan and W.S.Green, Human Factors in Product Design: current practice and future trends, Taylor & Francis, London, 1999
Dr. Debkumar Chakraborty, Indian Anthropometric Dimensions For Ergonomic Design Practice, National Institute of Design, 1997

BDS125–APPLIED MECHANICS FOR DESIGN

Unit 1: Basic principles of mechanics

Equivalent force system; Equations of equilibrium; free body diagram; Reaction; Static indeterminacy. Difference between trusses, frames and beams, Assumptions followed in the analysis of structures; 2D truss; Method of joints; Method of section; Frame; Simple beam; types of loading and supports; Shear Force and bending Moment diagram in beams; Relation among load, shear force and bending moment.

Course outcome

Theoretical understanding of how mechanisms and mechanical forces behave

Ability to create simplified versions of complex mechanisms

Ability to rapidly test mechanical solutions

Unit 2: Virtual work and Energy method

Virtual Displacement; Principle of virtual work; Applications of virtual work principle to machines; Mechanical efficiency; Work of a force/couple (springs etc.); Potential energy and equilibrium; stability;

Unit 3: Centre of Gravity and Moment of Inertia

First and second moment of area; Radius of gyration; Parallel axis theorem; Product of inertia, Rotation of axes and principal moment of inertia; Moment of inertia of simple and composite bodies. Mass moment of inertia.

Unit 4: Kinematics and Kinetics

Kinematics of Particles; Rectilinear motion; Curvilinear motion; Use of Cartesian, polar and spherical coordinate system; Relative and constrained motion; Space curvilinear motion; Kinetics of Particles; Force, mass and acceleration; Work and energy; Impulse and momentum; Impact problems; System of particles;

Unit 5: Practical Mechanics

Exploring mechanical properties of model making materials through experiments; Introduction to DIY culture; Building mechanisms using workable materials; Exploring degrees of freedom, joints and links through experiments. 4 Bar Mechanisms, Grashof Criterion, Crank-Rocker, Double Crank, Double Rocker, and Slider-Crank mechanisms;

Introduction to Control Systems; Introduction to mechanical switches, power trains and experimentation with actuators and motors;

References

I.H. Shames, Engineering Mechanics: Statics and Dynamics, 4th Ed., PHI, 2002

F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II – Dynamics, 3rd Ed., Tata McGraw Hill, 2000

J. L. Meriam and L. G. Kraige, Engineering Mechanics, Vol I – Statics, Vol II – Dynamics, 5th Ed., John Wiley, 2002

R. C. Hibbler, Engineering Mechanics, Vols. I and II, Pearson Press, 2002

S. Timoshenko and D. H. Young, Engineering Mechanics, McGraw Hill, 1956

J. Garratt, Design and Technology, Cambridge University Press, 1996

BDS161 – FORM STUDIES

Course Outcome

Ability to control surfaces of objects created from imagination

Function oriented look at product aesthetics

Applying Logic and mathematics to generate volumes

Unit 1: Thinking in three dimensions

Concepts of space and Volume, Evolution of a flat shape into a volume;

Creating compositions using rectilinear and curvilinear surfaces; Regular and irregular Solids, geometric shapes and their compositions; Regular and irregular Organics shapes;

Unit 2: Structure and Order

Form, Feature and Content, Dominant, subdominant and subordinate elements, transition elements; Creating a family of forms;

Abstraction, Expression and Meaning in Product Form; Generative algorithms; Generated Forms;

Unit 3: Transformation and Movement

Addition, subtraction, conformation, Transition, Morphing; Radii Manipulation; creating volumes through imaginary movements;

Unit 5: Identities and relationships

Ambiguity of "Form follows function"; examples from nature; Forms of Machine elements;

Skeletons of life forms; Exoskeletons; Plant Structures

Components of Built Spaces; Visualization through surface modeling software;

Material Explorations using Papier Mache, wood, Threads, Ropes, Plaster of Paris and Polystyrene; Introduction to 3D Printing;

References

Gyorgy Kepes, Language of Vision, Dover Publications, 1995
Kimberly Elam, Geometry of Design: Studies in Proportion and Composition, Princeton Architectural Press, 2001
Gaston Bachelard and Maria Jolas (Translator),The Poetics of Space, Beacon Press; Reprint edition, 1994
Gail GreetHannah, Elements of Design, Princeton Architectural Press, 2002
H. G. Greet and R. R. Kostellow, Elements of Design and the Structure of Visual Relationships, Architectural Press, NY, 2002
Mario Livio, the Golden Ratio: The Story of PHI, the World's Most Astonishing Number, Broadway, 2003

BDS162 –RENDERING & ILLUSTRATION

Course Outcome

Ability to quickly visualize ideas

Ability to do visual design explorations

Ability to create compelling visuals of ideas before they come to reality for every stakeholder's proper understanding

Unit 1: Interaction with Light

Highlights, shadow and reflection study of objects;

Direct and indirect illumination;

Unit 2: Photorealistic Visualization

Rendering objects by observation, Rapid sketching techniques;

Visual compositions of objects;

Unit 3: Photography Basics and Digital Imaging

Introduction to Photography: Subject, Background and foreground relationships. Photography techniques; Introduction to Image processing software, color correction, exposure correction, frame correction;

Expression and Imagery, Time and space in Image;

Unit 4: Image Processing

Migration of forms and Image manipulation, Metamorphosis through form, color and structure;

Unit 5: Digital Illustration Techniques

Exposure and demonstration of Illustration and Image making software;

Digital sketching; Vector illustrations; Procedural Illustrations;

References

Rober McKim, Experiences in Visual Thinking, Brooks/Cole Publishing Company, 1980
Stephen Missal, Exploring Drawing for Animation (Design Exploration Series), Thomson Delmar Learning, 2003
D. K. Francis Ching, Design Drawing, John Wiley & Sons,1998
Tom Porter ,Design Drawing techniques for architects, graphic designers and artists, Oxford Architectural Press,1991
Terence ed .Dalley, The complete guide to illustration & design, Phaidon, Oxford, 1980
T. C. Wang, Pencil Sketching, John Wiley & Sons,1997

BDS211–ARCHITECTURAL STUDIES IN DESIGN–I, SPACE AND HABITAT

Course Outcome

Understanding the concept of space and Place from a designer's point of view

Ability to differentiate between qualities of built and natural spaces

Understanding human behaviour in isolated and shared spaces

Understanding the need to utilize spaces for gratification

Unit 1: Space

Concept of Occupation; occupied spaces; unoccupied spaces; Built Spaces; natural Spaces; Landscapes; Arenas; Concept of boundary; Physical Boundaries; Imaginary boundaries; Interior Space; Lighting and illumination, Climatology;
Concept of Play; Recreation; Comfort and Safety parameters; Activity Oriented Spaces;

Unit 3: Evolution of Spaces

Visual concepts of Area and Volume, history of built spaces, history of settlements;
Concept of Home; Shelters; Dwellings; Settlements; Solitary living; Co Habitation; Cooperative living; Adaption; Structure and Dynamics of Built Spaces; Residential; Commercial and Industrial Spaces;
Evolution of agrarian society; prehistoric settlements; Evolution of rituals and customs; Rural Sanitation; Rural connectivity; Migration patterns;

Unit 4: Visual Design in Spaces

History of Aesthetics in architecture; Hedonistic Vs Ascetic design of spaces; Design movements (-isms e.g., Modernism, post modernism, Memphis, art deco)

Unit 5: Utilitarian Spaces

Origin of commerce; commercial spaces; High density habitats; industrialization; post industrialization; Urban Housing;
Fundamentals of interior design and exhibitions; Public Spaces, Mobility oriented spaces;

References

Various, A Dictionary of Color Combination (Sanzo Wada's works), Seigensha Art Publishing, 2011
Charles Correa, A Place in the Shade, Penguin India, 2010
Setha M. Low, Denise Lawrence-Zúñiga, Anthropology of Space and Place: Locating Culture (Wiley Blackwell Readers in Anthropology) , Wiley-Blackwell , 2003
Nick Dunn, Architectural Model making 2nd Edition, Thames & Hudson, 2014
Katherine S. Willis, Net spaces: Space and Place in a Networked World, Routledge, 2017
Meg Boulton, Jane hawkes, Place and Space in the Medieval World, Routledge, 2017

BDS212–COMMUNICATION STUDIES IN DESIGN – II

Course Outcome

Understanding the mechanisms of human conversation

Understanding persuasive dialogue

Using persuasion in visual language

Unit 1: Information

Processing information – Coding & Decoding; Sender, Channel and Receiver; Signs and their meanings in Indian cultures

Unit 2: Communication

Study of relationships between Signifier, Signified and context, Denotation and Connotation; Communicating through gestures, voice, type and visuals; Designing visual messages to send meanings

Unit 3: Introduction to Semiotic Perspective

Goals of Semiotic Analysis; Sign: Concept and Types; Codes: Concepts, Types and Sharing; Process of Signification: Connotation and Denotation

Unit 4: Semiotic Interpretations and Culture

Metaphors; Myths: Concept and Debates; Communication as Text / Discourse; Ideology: Link to Meaning Making

Unit 5: Introduction to Rhetoric Perspective

Origin and Evolution; Functions of Rhetoric; Key Elements of Rhetoric; Introduction to Indian Thoughts on Rhetoric

Unit 6: Rhetoric Presentation and Effects

Rhetorical Schemes and Devices; Elements of Rhetoric Presentation; Analyzing Rhetorical Presentation; Making Rhetorical Presentation

References

Ronald H. Forgus, Perception, The basic process in cognitive development, USA, McGraw-Hill 1996
Arthaya, Seminar on Visual semantics, IDC, IIT Bombay 1992
Carey, J. W. (1989). Communication as culture: Essays on media and society. Boston: Unwin Hyman Ghanekar, A (1998) Communication skill for effective management. Everest Publishing House. Gilligan, Pune Fiske, J. (1982). Introduction to communication studies. London, Angleterre: Methuen
Schlenker, B. R. (1980). Impression management: The self-concept, social identity, and interpersonal relations. Monterey, Calif: Brooks/Cole Pub. Co.

BDS213 – MODEL MAKING AND HAND TOOLS WORKSHOP

Course Outcome

Understanding of the behaviour and properties of plastic components

Understanding of deformable materials

Finding out biodegradable replacements of polluting materials

Unit 1: Introducing Plastic Polymers

Properties and usage of thermoplastics and thermosetting plastics.

Unit 2: Plastics

Process of selection and applications of plastics for engineering and consumer products.

Design limitations and specific advantages of plastic molding processes. Property change on recycled plastics.

Environmental impact of disposable plastic products, recycling methods of different types of synthetic polymers, biodegradation, UV degradation

Unit 3: Elastomers

Properties, processing and use of natural and synthetic Rubber

Unit 4: Ceramics

Properties, Processing and use of ceramics and glass.

Unit 5: Natural materials

Properties of natural materials like wood, bamboo, cane, leather, cloth, jute and paper and their use at craft and industry. Workshop practice of woodworking and wood carving.

Preferences

J. Garratt, Design and Technology, Cambridge University Press, UK, 20004
R. Thompson, Manufacturing processes for design professionals, Thames & Hudson, London 2007
Michael Ashby and Kara Johnson, Materials and Design: The Art and Science of Material Selection in Product Design, Butterworth Heinemann, 2002

BDS214–SURFACE MODELLING IN COMPUTER AIDED DESIGN

Course Outcome

Ability to create Engineering CAD ready Surface models

Ability to conduct design iterations in CAD software

Unit 1: Points

Point Cloud data Handling; Fitting curves and surfaces through point Clouds; Interpolation basics

Unit 2: Curves

Scanning and tracing Sketches; Curve hierarchy, ISO-Curves; End Tangents; Multi Span Bezier Curves;

Unit 3: Surface Construction

Tolerances; open and closed surfaces; trimmed and untrimmed surfaces;

Unit 4: Freeform surface modeling

Sculpting with Control vertices; Sculpting with ISO-Curves

Unit 5: Parametric surface modeling

Parent-Child Relationships, Nesting; Feature Arrays; Nesting; Design Variations;

Unit 6: Fundamentals of Class A surface modeling

G0, G1, G2, G3 Continuity, Optical Analysis of Multi-span surfaces, Curvature Analysis

References

Christoph M. Hoffmann, Geometric and Solid Modelling: An Introduction
William Howard and Joseph Musto. Introduction to Solid Modeling Using solid works. McGraw Hills
Alejandro Reyes, Beginners Guide to SolidWorks, SDC Publications

BDS271 –DESIGN DOCUMENTATION - I

A craft/cottage Industry

Understanding of the current and past scenario of craft and cottage industries of Uttar Pradesh or any other state of India.

Field study of selected craft and cottage industry and pinpoint lacuna in their process/artifacts etc.

Course Outcome

Comprehensive understanding of the history and present state of one cottage industry/craft of Uttar Pradesh or India

Aptitude to conduct thorough field research and collect qualitative and quantitative information which may be useful for other industries and people

BDS281 –DESIGN PROJECT–I, SIMPLE PRODUCT DESIGN

Lectures on simplicity; Complex nature of simple products; Single Function Products; Material Property as function; Form as function.

Course Outcome

Ability to create innovative single component single feature solutions

BDS221–DESIGN MANAGEMENT–I, CONSUMER PSYCHOLOGY

Course Outcome

Understating of why people buy things

Ability to offer relevant products which people need

Awareness about Design Rights and their enforcement by law

Unit 1: Consumer Motivations

Identification of user needs and Driving Factors;

Emotional Design, Sensibility, Social Ethics and Concerns;

Unit 2: Market

Consumer Vs Buyer, Consumer Groups, Buyer Groups, Periodic Trends, Market Gaps, Market Oriented Innovation;

Unit 3: Business Evolution

Product Planning for the future, Disruptive Innovation;

Unit 4: Product Lifecycle Management

Procurement, Process monitoring, Quality Assurance, Guarantee Statement, Warrantee Statement, Buybacks, refurbishing;

Component interchangeability, Process Homogenization, Material Homogenization, Feature Standardization;

Unit 5: Intellectual Property

Product differentiation and identity;

Patent laws, History, Budapest Treaty, Current State of Enforcement; Structure of a Patent Application;

Design Rights, Trademarks, and intellectual property, India Design Act;

Global and local frameworks of securing Intellectual Property Rights; indigenous intellectual property;

Indian laws and their enforcement mechanisms. International laws and their enforcement mechanism;

References

Kathryn Best, The Fundamentals of Design Management, AVA Publishing, 2010

Brigitte Borja De Mozota, Design Management: Using Design to Build Brand Value and Corporate Innovation, Allworth Press, 2004

Kenneth B Khan, Product Planning Essentials, M E Sharpe Inc, 2011

John Stark, Product Lifecycle Management: 21st Century Paradigm for Product Realisation, Springer, 2011

Craig M. Vogel and Jonathan Cagan, Creating Breakthrough Products: Innovation from Product Planning Program Approval, FT Press, 2001

David L. Rainey, Product Innovation: Leading Change through Integrated Product Development, Cambridge University Press, 2011

BDS222–DESIGN THINKING

Course Outcome

Ability to comprehend large scale problems.

Ability to come up with radical solutions in relatively short time.

Unit 1: Intention

Understanding Empathy; User stories; interpretive research;

Unit 2: Problem Definition

Visual representation of problem statements; contextualization and validation of a problem set; Heat maps; polar maps; Data visualization methods;

Unit 3: Scenario Building

Mapping solutions; partial solutions; incremental solutions

Unit 4: Ideation

Brainstorming; Differential Discussion; group methods to generate ideas; solitary methods to generate ideas; Lateral Thinking

Unit 5: Concept Detailing

User Journey maps; User stories; activity mapping; feature matrix

References

John Thackara, In the Bubble: Designing in a Complex World, The MIT Press, 2005
Bruce Hanington, Bella Martin, Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions, Rockport Publishers, 2012
Donald A. Norman, Living with Complexity, MIT Press, 2010
Jeffrey Whitten and Lonnie Bentley, Systems Analysis and Design Methods, McGraw-Hill/Irwin, 2005
Gerald M. Weinberg and Daniela Weinberg, General Principles of Systems Design, Dorset House, 1988

BDS223–SOLID MODELING IN COMPUTER AIDED DESIGN

Unit 1: Solid Modeling basics
Linear Extrusion; Boolean operations;

Unit 2: Parametric Solid modeling
Surface handling; Curvature handling; thickness handling

Unit 3: Assembly
Skeleton modeling; DOF restriction; reference matching; tolerances;

Unit 4: Product integration in CAD
Bottom-Up Modeling; Top-Down Modeling; Fasteners;

Unit 5: Variation
Design explorations

Unit 6: Drafting
Drafting and generating 2D drawings from 3D models

Generation of Bill of materials

References

Christoph M. Hoffmann, Geometric and Solid Modelling: An Introduction
William Howard and Joseph Musto. Introduction to Solid Modeling Using solid works. McGraw Hills
Alejandro Reyes, Beginners Guide to SolidWorks, SDC Publications

Course Outcome

Ability to finalize component level design

Ability to improvise a design before making physical model

Ability to simulate and analyse a solution

Ability to furnish production details

BDS261 –NATURE AND FORM

Course Outcome

Ability to take inspiration from nature to solve product design trials

Form and metaphors

Inspirations from nature, Utility, Evolution

Biomimicry, Biosimilar shapes and volumes, Exoskeletons, Structures

Bionics, Biosimilar components of mechanisms

Applications in product Design

3D modeling

References

Maggie Macnab, Design by Nature: Using Universal Forms and Principles in Design, New Riders, 2011
Rudolf Finster walder, Form Follows Nature: A History of Nature as Model for Design in Engineering, Architecture and Art, Springer Vienna Architecture, 2011
Alan Powers, Nature in Design: The Shapes, Colors and Forms that Have Inspired Visual Invention, Conran, 2002
Ellen Lupton, Jennifer Tobias, Alicia Imperiale, Grace Jeffers and Randi Mates, Skin: Surface, Substance, and Design, Princeton Architectural Press, 2002

BDS291 –DESIGN PROJECT–II, DISPLAY AND CONTROL DESIGN

Course Outcome

Practical Application of Cognitive and Physical Ergonomics

Understanding Mental models

Understanding how people react with digital devices

Orientation: Cognitive Ergonomics

Unit 1: Morphology

Morphology of Interactive media; Data; Consumer; Input Channels; Response mechanisms; gratification models; Activity mapping; Stim ulus-Response; Action-Reward;

Unit 2: Narrative

Storytelling and narratives in Interactive media

Unit 3: User Experience

Experience design and interactive media

Unit 4: Information Architecture

Information Structuring, time and space for Interactive Medias

Unit 5: User Interface Design

Design of multi-modal interfaces for text, graphics, animation, video, audio, games, etc.

Project Work

Designing interactive media for public use - installations, Museums and community facilities

References

Lev Manovich, The Language of New Media, Cambridge, MIT Press, 2001
Joe Lambert, Digital Storytelling: Capturing Lives, Creating Community, Life on the Water Inc, 2008
Noah Wardrip- Fruin (Editor) and Nick Montfort, The New Media Reader, MIT Press, 2003
Bryan Alexander, The New Digital Storytelling: Creating Narratives with New Media, Praeger, 2011
Robert Klanten, Interactive Installations and Experiences, Die Gestalten Verlag, 2011

BDS311 –CREATIVE NARRATION

Course Outcome

Ability to comprehend and draft user stories.

Ability to document user experience in a retainable form.

Unit 1: Story

Story, narrative and meaning making, metaphors

Unit 2: Objective

Premise and problem statement, Context

Unit 3: Protagonist

Characters and personas, examples of Don Quixote, Karna

Unit 4: Chain of Events

Plot and Scenarios

Unit 5: Dynamics

Relationship between problems, need and conflict, rationalization of need, rationalization of conflict

Unit 6: Closure

Conflict, Action and Resolution

References

Mike Korolenko and Bruce Wolcott, Storytelling and Design: Media Literacy for the Digital Age, Pearson Learning Solutions, 2005
Marie-Laure Ryan (editor), Narrative across Media: The Languages of Storytelling, University of Nebraska Press, 2004
Kristin M. Langellier and Eric E. Peterson, Storytelling In Daily Life: Performing Narrative, Temple University Press, 2004

BDS312–HUMANITIES & SOCIAL STUDIES

Unit 1: Artistic Creation

Complete understanding of Perception, Communication, Imagination, Expression, and Creativity for artistic creation.

Unit 2: Art & Design Movements

To understand the thoughts and techniques involved in important art movements - Impressionism, Cubism, Constructivism, Optical Art, Kinetic Art etc. Students are expected to express their ideas through Posters, Murals, Building Art, Collage, Graffiti, 3D-Installations.

Unit 3: Ethnography and Anthropology

Observations/Analysis; Community---Based Ethnographic Research; Activity Theory; Empathy in Design; Value Sensitive Design; Historical development of fieldwork; relations between field methods and dominant theoretical orientations; varieties of fieldwork at present; the implications; Ethnographic research design as a continuous process; the formulation of research problems.

Unit 4: Introductory Sociology & Psychology

Sociology as a Science of Human Society: Introduction: - Basic concepts (Roles, Norms, Values, Groups and Institutions), Social Structure, Culture, Perspectives (Functionalist, Conflict & Interactionist), Psychological Perspectives and Approaches;

References

Geraldine Gay and Helene Hembrooke, 2004, Activity-Centered Design, An Ecological Approach to Designing Smart Tools and Usable Systems.
Amy. E. Aniston, Graphic Design Basics (IInd Edition)
Lydia Darbyshire, Practical Graphic Design Technique
Batya Friedman and Alan Borning, Value Sensitive Design and Information Systems
Julian Murchison, Ethnography Essentials: Designing, Conducting, and Presenting Your Research

Course outcome

Develop visual awareness of the present day environment.

Recognize and relate design forms to historical precedents and possible future developments.

Have a greatly increased general knowledge, including source material which he/she can draw on for future student and development in the field of design

Producing reliable information about human, social life and culture.

BDS313–DESIGN MANAGEMENT–II, BUSINESS COMMUNICATION

Course Outcome

Ability to communicate novel ideas to general stake holders

Unit 1: Explaining Ideas
Briefs, Detailed Briefs and Concept Notes

Unit 2: Scale of Work
Approximation, Cost Estimation

Unit 3: Discussion
Knowledge Management, Feedbacks, Information loops, Updates

Unit 4: Record Keeping
Activity Documentation and Reporting

Unit 5: Scope of Work
Induction, Work distribution, Task Assignments

Time management, Scheduling

Unit 6: Presentation
Informal and Formal Communication; Top-Down, Bottom-Up, Diagonal and Lateral Communication; Pitch Presentations.

References

Best, K. (2006). Design management: managing design strategy, process and implementation. AVA publishing
Cooper, R., Junginger, S., & Lockwood, T. (Eds.). (2013). The handbook of design management. A&C Black
Martin, R. L. (2009). The design of business: Why design thinking is the next competitive advantage. Harvard Business Press.

BDS314–DESIGN RESEARCH METHODOLOGY–I, QUANTITATIVE RESEARCH

Course Outcome

Ability conduct objectivist research

Ability to understand large scale data

Ability to understand collective behaviour

Unit 1: Elements of Research

Data; Variables and constants; Concepts and constructs; Theories and observations;

Unit 2: Logic

Inductive; Deductive;

Unit 3: Sampling

Basic concept; Representativeness; Probability and non-probability sample- concepts; Types of probability and non-probability samples; Practical guidelines for sampling

Unit 4: Quantitative Methods and Statistics

Surveys: importance, types, uses, guidelines for framing questionnaire; Content Analysis- basic concepts, Characteristics and uses; Distribution;

Unit 5: Statistics in media research

Measures of Central tendency; Descriptive statistics, Correlations, Inferential statistics- chi square, t – test

Unit 6: Field Work

Taking up a topic and collecting data from locations; Equivalent to 8 lecture hours;

References

Brenda Laurel, Design Research: Methods and Perspectives, The MIT Press, US, 2003

R. D. Wimmer & J. R. Dominick, Mass media research: An introduction. Belmont, California, Wadsworth Pub. Co., 2000

A. Hansen, Mass communication research methods. New Delhi: Log Angeles, 2009

E. R. Babbie, The practice of social research. Belmont, California, Wadsworth Pub. Co., 1992

C. R. Kothari, Research methodology: Methods & techniques. New Delhi: New Age International (P) Ltd., 2004

BDS315 –ARCHITECTURAL STUDIES–II, CONNECTIVITY AND MOBILITY

Course Outcome

Understanding of how humans address their need to interact with others as social animals

Unit 1: Connectivity

Communication channels; interpersonal communication; mass communication; Public Information systems; Information Services;

Information Consumption patterns; Internet of Things;

Unit 2: Movement

Movement of Goods; Movement of People; Modes of Transportation; Individual Movement; Mass movement; Transportation as service; Transit Systems; Commuter centric Design;

Public Vs Individual information systems; Mobile navigation; mental maps; Traffic Management;

Unit 3: Engagement

Public gatherings; Public events; Event management and planning; Crowd Management;

Unit 4: Infrastructure

Resources sharing and management; Delivery systems; Consumption patterns; Occupancy patterns;

Remote Area Connectivity; Rural Transportation; Rural Road networks;

Urban Connectivity; High Density Transportation; Transit Oriented Development; Public Safety;

Accessible Design; Universal Design in Public Transportation; Universal Design in Communication technologies;

Unit 5: Sustainable Transportation

Structure and design flaws of Public Transportation; Alternative Energy resources for transportation; Anatomy of Electric Vehicles;

References

Caspers, Mar, Designing Motion, Automotive Designers 1890 to 1990, Birkhäuser, 2017
Brandes, Uta / Stich, Sonja / Wender, Mir, Design by Use, The Everyday Metamorphosis of Things, Birkhäuser, 2009
Alice Foxley, Distance and Engagement: Walking, Thinking and Making Landscape, Lars Müller, 2001
Kevin Thwaites. Sergio Porta, Urban Sustainability Through Environmental Design: Approaches to Time-People-Place Responsive Urban Spaces, Taylor & Francis, 2007
Herwig, Oli, Universal Design, Solutions for Barrier-free Living, Birkhäuser, 2008

BDS351 – DESIGN WORKSHOP

Course Outcome

Hands on experience …

Emphasis on the skill of workshop methods. Hands on techniques to manipulate the basic materials according their understanding. Exposure to the students on some of the software on Product Design and Visual Design. The focus of the course is teaching the students about design intent and how software can be utilized for the maximum benefit of the designer. The student project involves making products out of concepts in virtual environment.

References

Williams, R., & Sheldon, C. Robin Williams Handmade Design Workshop: Create Handmade Elements for Digital Design. Peachpit Press., 2009

Cuffaro, D., & Zaksenberg, I. The Industrial Design Reference & Specification Book: Everything Industrial Designers Need to Know Every Day. Rockport Publishers.2010

Sherwin, D.Creative workshop: 80 challenges to sharpen your design skills. How Books.2013

Fullerton, T., Swain, C., & Hoffman, S. Game design workshop: Designing, prototyping, & playtesting games. CRC Press. 2004

BDS381 –DESIGN PROJECT – III, SOFTWARE USER INTERFACE DESIGN

Course Outcome

Ability to design compelling interfaces of software products

Orientation

Unit 1: Theory

Use of HCI methods (Contextual Enquiry, Focus Groups, Interviews, etc.) for understanding the user and his requirement.

Unit 2: Research

Understanding the factors that define user experience.

Unit 3: Design

Design of multi-modal interfaces, expressive interfaces, audio interfaces, tangible interfaces and gestural interfaces.

Design of interactive systems, products for future use, Collaborative products to be used in groups, devices for rural applications and devices for use in public places

References

Donald A. Norman, Invisible Computer: Why Good Products Can Fail, the Personal Computer Is so Complex and Information Appliances Are the Solution, MIT Press, 1998
Brenda Laurel, Computer as Theater, Addison-Wesley Pub Co, 1993
Jef Raskin, The Humane Interface: New Directions for Designing Interactive Systems, Pearson Education,2000

BDS321 –PRODUCT BRANDING AND IDENTITY

Course Outcome

Understanding of why organizations invest in maintaining their identity

Knowledge of Branding and Identity design process

Unit 1: Principles of Visual Design Refresher

Understanding visual culture; Visual Theories; Visual Design; Symbolism, Time, Sound; Point of View

Unit 2: Visual Art

Visual art History; Painting; Architecture and Sculpture; Artistic Styles;

Unit 3: Aesthetic Experience

Modes of Aesthetic Experience; Basics of Aesthetic values; Aesthetics of Thinking and Creativity; Taste and Aesthetes; Aesthetics of Symbols and Language;

Unit 4: Visual Experience

Photography and Moving Images; Historical, Technical and Cultural Perspective; Ethical and Critical Perspective; Motion Pictures; Television and Video; Reality Shows;

Unit 5: Branding and Identity

History of branding; structure of a Brand; Brand language; Logos; Copywriting; Typeface; Brand Placement; Brand Guidelines;

Structure of Identity; Visual Abstraction; Metaphors; Communication; Representativeness; Evolution;

References

Paul M., Visual Communication: Images with Messages, 2006
Ralf E. Wileman, Visual Communication
David Sless, Learning & Visual Communication
Friedrich O. Huck and Carl L. Fales, The Digital Evolution: Visual Communication in the electronic age
Zia-Ur-Rehman, Visual Communication an Information Theory Approach
Margaret Mark, Carol Pearson, the Hero and the Outlaw: Building Extraordinary Brands through the Power of Archetypes, McGraw Hill, 2001

BDS322–DESIGN RESEARCH METHODOLOGY–II, APPLIED STATISTICS AND INFOGRAPHICS

Course Outcome

Ability to understand and communicate complex information in a consumable way

Ability to find relationships between statistical data accumulated from large scale surveys

Unit 1: Regression models

Linear regression, Simple regression, Ordinary least squares, Polynomial regression, General linear model;
Generalized linear model, discrete choice, Logistic regression, Multinomial logit, mixed logit, Probit, Multinomial probit, Ordered logit, Ordered probit, Poisson;
Multilevel model, fixed effects, Random effects, Mixed model;

Unit 2: Nonlinear Regression

Nonlinear regression, Nonparametric, Semiparametric, Robust, Quantile Isotonic, Principal components, Least angle, Local, Segmented, Errors-in-variables;

Unit 3: Statistical Extrapolation

Probability Distribution; Linear extrapolation; Polynomial extrapolation; Conic Extrapolation; French Curves;
Least squares, Ordinary least squares, Linear, Partial, Total, Generalized, Weighted, Non-linear, Non-negative, Iteratively reweighted, Ridge regression, Least absolute deviations, Bayesian, and Bayesian multivariate Linear Regression.
Statistical Forecasting; Average, Naïve, and seasonal Naïve approaches, Drift method;
Qualitative forecasting methods, informed opinion and judgment, Delphi method, market research, and historical life-cycle analogy;

Quantitative Forecasting methods, Time Series methods, last period demand, simple and weighted N-Period moving averages, simple exponential smoothing, poisson process model based forecasting, and multiplicative seasonal indexes; Extreme Value Theory

Interpretive approach: Cool hunting; Dead Reckoning;

Unit 4: Data Visualization

Data Point, Bar, Stack, Pie, Donut, and Dot charts; Histograms;

Unit 5: Graphic Design and Data Visualization

Infographics Design project

References

Brenda Laurel, Design Research: Methods and Perspectives, The MIT Press, US, 2003
R. D. Wimmer & J. R. Dominick, Mass media research: An introduction. Belmont, California, Wadsworth Pub. Co., 2000
A. Hansen, Mass communication research methods. New Delhi: Log Angeles, 2009
E. R. Babbie, The practice of social research. Belmont, California, Wadsworth Pub. Co., 1992
C. R. Kothari, Research methodology: Methods & techniques. New Delhi: New Age International (P) Ltd., 2004

BDS323–MATERIAL AND PROCESSES IN DESIGN–I, UNCONVENTIONAL MANUFACTURING

Course Outcome

Ability to design products which are seemingly impossible to manufacture using conventional processes

Unit 1: Material Deposition Processes

Laser Deposition, Micro-Plasma Powder Deposition, Chemical vapor Deposition, Micro Welding, Powder Casting

Metal 3D Printing, Powder Deposition 3D printing;

Unit 2: Subtractive Processes

Electrochemical machining, Electro-Discharge machining, Ultrasonic Machining, Laser Beam Machining, Water jet machining, Abrasive Jet Machining, Plasma Arc machining

Unit 3: Cutting and Removal

Water Jet Cutting, Plasma Cutting, Laser Cutting, Electro-Discharge Wire Cutting; Abrasive Jet Cutting

Unit 4: Additive Extrusion Processes

Extruded Filament 3D printing, Clay 3D printing, Stereo lithography

Unit 5: Special Purpose Manufacturing processes

Rot molding, Layer Compression, Sheet contouring, Friction Welding

Unit 6: Surface Treatment Processes

Laser Etching, Acid/Base Etching, Electro Chemical Etching, Sand Blast Etching, Ultraviolet Etching, Photochemical Machining

Electro Chemical Polishing

References

Vijay K. Jain, Advanced Machining Processes. Allied Publishers, New Delhi, 2007
P. C. Pandey and H.S. Shan, Modern Machining Processes, Tata McGraw-Hill, New Delhi, 2007
G.F. Benedict, Nontraditional Manufacturing Processes, Marcel Dekker Inc., New York, 1987
McGeough, Advanced Methods of Machining, Chapman and Hall, London, 1998
Paul De Garmo, J.T. Black, and Ronald A. Kohser, Material and Processes in Manufacturing, Prentice Hall India, 2001.

BDS361 –CONTROL SYSTEMS IN DESIGN

Course Outcome

Theoretical awareness of how control systems of products work

Unit 1: Sensing

Feedback systems, mathematical modelling of physical systems;

Unit 2: Signals

Laplace transforms, block diagrams, signal flow graphs, state-space models;

Unit 3: Data

Time domain analysis: performance specifications, steady state error, transient response of first and second order systems;

Unit 4: Processing

Stability analysis: Routh-Hurwitz stability criterion, relative stability; proportional integral, PI, PD, and PID controllers;

Lead, lag, and lag-lead compensators;

Unit 5: Analysis

Root-locus method: analysis, design;

Frequency response method: Bode diagrams, Nyquist stability criterion, performance specifications, design; State space methods: analysis, design; Physical realizations of controllers: hydraulic, pneumatic, and electronic controllers.

References

K Ogata, Modern Control Engineering, 4th Ed., Pearson Education Asia, 2002
B C Kuo and F. Golnaraghi, Automatic Control Systems, 8th Ed., John Wiley (students ed.), 2002
M Gopal, Control Systems: Principles and Design, 2nd Ed., TMH, 2002
M Gopal, Modern Control System Theory, 2nd Ed., New Age International, 1993
R. C. Dorf and R. H. Bishop, Modern Control Systems, 8th Ed., Addison Wesley, 1998
P. Belanger, Control Engineering: A modern approach, Saunders College Publishing, 1995

BDS391 –DESIGN PROJECT–IV, TECHNICALLY COMPLEX PRODUCT DESIGN

Course Outcome

Ability to break down complex product ideas into smallest components

Ability to build functional prototypes

Orientation

Product Integration; Forward Integration; Backward integration;

Top – Down Design Approach; Bottom-Up Design Approach;

Reverse Engineering; Proof Of concept;

BDS411–PROFESSIONAL PRACTICE IN DESIGN

Course Outcome

Understanding of how modern businesses start and run.

Ability to supervise and manage live design projects

Basic skillset of a design business owner

Unit 1: Entrepreneurship

Social Entrepreneurship, Business Entrepreneurship, Trading Entrepreneurship, Corporate Entrepreneurship, and Agricultural Entrepreneurship;

Unit 2: Business Foundation

Timmons Model of Entrepreneurship, Investment Models, Startup Business Models, Business Plans, Pitch presentations, Small Business models;

Unit 3: Legal aspects of business

Contracts and Agreements, Conflict Resolution, Arbitration;

Unit 4: Running a Design Business

Set up of an independent design business, Hiring processes, Project Scheduling and work delegation, Cost Estimation;

Unit 5: Intellectual Property

Registration process of Intellectual property Rights, Design Registration, and Brand/Trademark Registration;

Unit 6: Accounting

Billing, salaries and taxation;

References

Ted Crawford, AIGA Professional Practices in Graphic Design, Allworth Press, 2008
Shan Preddy, How to Run a Successful Design Business: The New Professional Practice, Gower Publishing, Ltd., 2011

BDS412 – FORM IN FOUR DIMENSIONS

Course Outcome

Understanding of evolution of shapes and forms with time

Unit 1: Projection and Transition

Movement of Light around a Form, Movement in time and space. Movement of Space around a Form

Kinematic Structures, Mechanisms, spontaneous, automatic and reactive dynamic forms

Unit 2: Transformation

Fluid Forms, Semi Fluid Forms, Semi Solid Forms

Unit 4: Evolution

Feature based evolution; Content based evolution; Environment Based Evolution

Unit 5: Union and Separation

Merger, Conformity, Subtraction, Division

Unit 6: Decay

Concept of Decay, Examples from nature, examples of manmade objects

References

Ellen Lupton, Jennifer Tobias, Alicia Imperiale, Grace Jeffers and Randi Mates, Skin: Surface, Substance, and Design, Princeton Architectural Press, 2002
Li: Dynamic Form in Nature, Wooden Books, 2007
Lung-Wen Tsai, Mechanism Design: Enumeration of Kinematic Structures According to Function, CRC Press, 2001
Sibel Deren Guler, Madeline Gannon, KateSicchio, Crafting Wearables: Blending Technology with Fashion, 2016

BDS413–MATERIALS AND PROCESSES IN DESIGN–II, PRODUCTION PLANNING

Course Outcome

Understanding manufacturing and mass production

Understanding a designer's role to facilitate manufacturing

Ability to innovate for cost and carbon footprint reduction of mass produced goods

Unit 1: Fundamentals of Mass Production

Introduction, Production Planning and Control, Value analysis and value engineering

Unit 2: Structure of Mass Production

Plant location and layout, Equipment selection, Maintenance planning

Job, batch, and flow production methods

Group technology, Work study, Time and motion study, Incentive schemes, Work/job evaluation, Inventory control,

Unit 3: Manufacturing planning

MRP, MRP-II, JIT, CIM, Quality control, Statistical process control, Acceptance sampling, Total quality management, Taguchi's Quality engineering.

Forecasting, Scheduling and loading, Line balancing, Break-even analysis.

Unit 4: Operations

Introduction to operations research, linear programming, Graphical method, Simplex method, Dual problem, dual simplex method, Concept of unit worth of resource, sensitivity analysis, Transportation problems, Assignment problems

Network models: CPM and PERT, Queuing theory

Unit 5: Alternatives of Mass production

Studio hours to be committed to explore 3D printing and additive manufacturing

References

S. L. Narasimhan, D. W. McLeavey, and P. J. Billington, Production, Planning and Inventory Control, Prentice Hall, 1997
J. L. Riggs, Production Systems: Planning, Analysis and Control, 3rd Ed., Wiley, 1981
Muhlemann, J. Oakland and K. Lockyer, Productions and Operations Management, Macmillan, 1992
H. A. Taha, Operations Research - An Introduction, Prentice Hall of India, 1997
J. K. Sharma, Operations Research, Macmillan, 1997.

BDS471 –INDUSTRIAL TRAINING

At a sponsor business

Students in this semester would avail opportunity to work with design firm under the guidance of practice professional for 6-8 weeks.

Course Outcome

Work Experience under the guidance of in practice professionals

BDS472 –DESIGN DOCUMENTATION - II

Location and Industry/Craft

Understanding of the history and present state of one cottage and craft industry of UP. To understand the conventional processes, materials and prepare a product catalog, Design Insights and proposals for survival and advancement of the subject industry/craft

Course Outcome

Comprehensive understanding of the history and present state of one cottage industry/craft of Uttar Pradesh or India

Design inputs for the benefit of the targeted craft/cottage industry

Aptitude to conduct thorough field research and collect qualitative and quantitative information which may be useful for other industries and people

BDS481 – DESIGN PROJECT – V, SYSTEM THINKING IN DESIGN

Unit 1: System Thinking

Lectures on Design Thinking and System Thinking from Design perspective. The Fifth Discipline approach. Scenario Maps and Metaphors

Unit 2: Problem Solving

Design of system level solutions so that design can be thought of modularly as suited for different combinations and applications.

Unit 3: Complex Systems

Understanding, strategizing, conceptualizing and designing for complex systems.

Unit 4: System Design

Designing complex artefacts. Design solutions that are suitable for transportation, education, publishing, retailing, etc.

Course Outcome

Ability of comprehend large scale problems

Skillset to work in the collaborative dynamic of a design team

Development of systemic approach to solve ill-defined problem

Social/environmental awareness

References

John Thackara, In the Bubble: Designing in a Complex World, The MIT Press, 2005
Bruce Hanington, Bella Martin, Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions, Rockport Publishers, 2012
Donald A. Norman, Living with Complexity, MIT Press, 2010
Jeffrey Whitten and Lonnie Bentley, Systems Analysis and Design Methods, McGraw-Hill/Irwin, 2005
Gerald M. Weinberg and Daniela Weinberg, General Principles of Systems Design, Dorset House,1988

BDS499 –DESIGN DEGREE PROJECT

Sponsored/Self Sponsored full time Project

Students in this semester would take sponsored /self-sponsored fulltime project (technically complex project). The students can do design degree project in house but it would be advisable for them to go to industry/ design firm and do the design degree project

ELECTIVES

BDS331- Elective I

BDS331a Sustainable Design

BDS331b Furniture & Interior Design

BDS331c Frugal Innovation

BDS332- Elective II

BDS332a Design of Medical Equipment

BDS332b Mobility and Vehicle Design

BDS332c Aerospace Design

BDS341- Elective III

BDS341a Videography and Film Making

BDS341b Graphics and Animation

BDS341c Typography

BDS342- Elective IV

BDS342a Interaction Design

BDS342b Universal Design

BDS342c Toy and Games Design

BDS431- Elective V

BDS431a Photography and Image Processing

BDS431b FEM and Optimization Tools

BDS431c Mechatronics

Course Outcome

To make students specialized in particular domains

EVALUATION SCHEME

SEMESTER I

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 111	Introduction to Design	1	0	8	30	70	100	0	100	200	3
2	BDS 112	Elements of Design	1	0	6	30	70	100	0	100	200	4
3	BDS 113	Material Studies in Design	1	0	4	30	70	100	0	50	150	3
4	BDS 114	Communication Studies in Design- I	3	0	0	30	70	100	50	0	150	3
5	BDS 151	Design Sketching	0	0	12	30	70	100	0	100	200	3
6	BDS 152	Technical Design Drawing	0	0	4	15	35	50	50	0	100	2
		Total	**6**	**0**	**34**						**1000**	**18**

SEMESTER II

Sl. No.	Course Code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 121	Fundamentals of Computing in Design	1	0	8	15	35	100	30	20	150	3
2	BDS 122	Principles of Design	1	0	4	30	70	100	0	100	200	3
3	BDS 123	Electrical and electronics in Design	1	0	4	30	70	100	30	20	150	3
4	BDS 124	Physical Ergonomics	1	0	6	30	70	100	0	100	200	4
5	BDS 125	Applied Mechanics for Design	1	0	2	15	35	50	0	50	100	2
6	BDS 161	Form Studies	0	0	4	15	35	50	0	50	100	2
7	BDS 162	Rendering & Illustration	0	0	4	15	35	50	0	50	100	2
		Total	**5**	**0**	**32**						**1000**	**19**

SEMESTER III

Sl. No.	Course Code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 211	Architectural Studies in Design - I	2	0	4	30	70	100	0	100	200	4
2	BDS 212	Communication Studies in Design- II	3	0	0	30	70	100	0	50	150	3
3	BDS 213	Model Making and Hand Tools Workshop	1	0	4	30	70	100	0	50	150	3
4	BDS 214	Surface Modelling in CAD	1	0	8	30	70	100	0	50	150	3
6	RVE 301	Universal Human Values and Professional Ethics	3	0	0	15	35	50	50	0	100	3
7	BDS 271	Design Documentation – I	0	0	0	0	0	0	0	50	50	2
8	BDS 281	Design Project – I	0	0	8	0	100	100	0	100	200	4
9	---	Cyber Security	2	0	0							0
		Total	**12**	**0**	**24**						**1000**	**22**

SEMESTER IV

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 221	Design Management - I	2	0	2	30	70	100	0	50	150	3
2	BDS 222	Design Thinking	1	0	6	30	70	100	0	100	200	4
3	BDS 223	Solid Modelling in CAD	1	0	4	30	70	100	0	50	150	3
5	---	English Language and Technical Writing	2	0	2	15	35	50	50	0	100	3
6	BDS 261	Nature and Form	0	0	8	30	70	100	0	100	200	4
7	BDS 291	Design Project – II	0	0	8	0	100	100	0	100	200	4
8	---	Environmental Science	2	0	0							0
		Total	8	0	30						1000	21

SEMESTER V

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 311	Creative Narration	2	0	0	15	35	50	0	50	100	2
2	BDS 312	Humanities and Social Studies	2	0	0	15	35	50	50	0	100	2
3	BDS 313	Design Management – II	2	0	0	15	35	50	0	50	100	2
4	BDS 314	Design Research methodology - I	2	0	0	15	35	50	50	0	100	2
5	BDS 315	Architectural Studies in Design – II	1	0	2	15	35	50	0	50	100	2
6	BDS 331	Elective – I	1	0	2	15	35	50	0	50	100	2
7	BDS 332	Elective – II	1	0	2	15	35	50	0	50	100	2
8	BDS 351	Design Workshop	0	0	4	15	35	50	0	50	100	2
9	BDS 381	Design Project - III	0	0	16	0	100	100	0	100	200	4
10	---	Constitution of India	2	0	0							0
		Total	13	0	26						1000	20

SEMESTER VI

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 321	Product Branding and Identity	2	0	2	30	70	100	0	50	150	3
2	BDS 322	Design Research methodology - II	3	0	2	30	70	100	0	100	200	4
3	BDS 323	Materials and Processes in Design - I	1	0	4	30	70	100	0	50	150	3
6	BDS 341	Elective - III	1	0	2	15	35	50	0	50	100	2
7	BDS 342	Elective - IV	1	0	2	15	35	50	0	50	100	2
8	BDS 361	Control system in Design	0	0	4	15	35	50	0	50	100	2
9	BDS 391	Design Project – IV	0	0	16	0	100	100	0	100	200	4
10	---	Essence of Indian Traditional Knowledge	2	0	0							0
		Total	10	0	32						1000	20

SEMESTER VII

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 411	Professional Practice in Design	2	0	0	30	70	100	0	50	100	2
2	BDS 412	Form in Four Dimensions	2	0	8	30	70	100	0	100	200	4
3	BDS 413	Materials and Processes in Design - II	1	0	4	30	70	100	0	50	150	3
4	BDS 431	Elective - V	1	0	2	15	35	50	0	50	100	2
6	BDS 471	Industrial Training	0	0	0	0	0	0	0	150	150	3
7	BDS 472	Design Documentation-II	0	0	0	0	0	0	0	100	100	2
8	BDS 481	Design Project - V	0	0	16	0	100	100	0	100	200	4
		Total	6	0	30						1000	20

SEMESTER VIII

Sl. No.	Course code	Subject	Periods			Internals			End Semester		Total	Credit
			L	T	P	CT	TA	Total	TE	PE		
1	BDS 499	Design Degree Project	0	0	40	0	500	500	0	500	1000	20
		Total	0	0	40						1000	20