UNDERGRADUATE COURSE

BACHELOR OF DESIGN

BATCH 2018-2019

Dr. A. P. J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow
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.
Curriculum (2018-19 Batch)

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**Total Credits for Semester VIII**: 20

**Total Credits**: 160
* 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.
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.
NavaRasa and associated Bhavas according to the Natyashastra by Bharat Muni and their modern interpretations

Unit 3: Introduction to Product Design

Unit 4: Problem Identification

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
Don Norman, Emotional Design, Why We love (or Hate) Everyday Things, Basic Books, 2003
BDS112 – ELEMENTS OF 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

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
Wong W., Principles of Two Dimensional Design, John Wiley & Sons, 1972
White Alex W., The Elements of Graphic Design, Allworth Press, 2011

Course Outcome
Ability of create simplified representations.
Ability to generate novel patterns and textures
Basic understanding of composition in graphic design
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
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
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;

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
R. Kasprin, Design Media – Techniques for water colour, pen and ink, pastel and coloured markers, John Wiley & Sons, 1999

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
BDS152—TECHNICAL DESIGN DRAWING

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
M B Shah and B C Rana, Engineering Drawing, 2nd Ed., Pearson Education, 2009
BDS121– FUNDAMENTALS OF COMPUTING IN DESIGN

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

Course Outcome
Readiness for programing control systems
Readiness for building and testing software solutions
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;

References
Itten J., The art of colour: the subjective experience and objective rationale of colour, John Wiley and Sons., 1974
L. Hotzschue, Understanding Colour, VNR, 1995
Lauer

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
BDS123 — ELECTRICAL AND ELECTRONICS STUDIES
IN DESIGN

Unit 1: Circuit Analysis Techniques

Unit 2: Diodes and Transistors

Unit 3: Operational Amplifiers
Op-amp Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing, Voltage Buffer, Controlled Sources, Instrumentation Circuits, Active Filters and Oscillators.

Unit 4: Logic Gates and Combinational Circuits
Number Systems and Codes, Logic Gates, Boolean Theorems, DeMorgan’s Theorems, Sum-of-Product Form, Algebraic Simplification, Karnaugh Map Method, Parity Generator and Checker, Inhibit Circuits. Sequential Circuits and Arithmetic Circuits; NAND and NOR gate Latches, S-C Flip-Flop, JK Flip-Flop, D Flip-Flop, Data Storage, Serial Data Transfer, Frequency Division and Counting, Binary Addition, 2’s Complement System, Full Adder, BCD Adder.

Unit 5: Transformers and AC Machines
Ideal Transformer, Circuit Model of Transformer, Determination of Parameters of Circuit Model of Transformer, Voltage Regulation, Efficiency, Three Phase Induction Motor, Three Phase Synchronous Generator, Induced Voltage, Electromagnetic Torque, Equivalent Circuit of Three Phase Induction Motor, Torque Speed Characteristic.

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

References
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

Course outcome
Readiness to build control system hardware for products
Readiness to build powertrains in products
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;

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
J. Dul, and B. Weerdmeester, Ergonomics for beginners, a quick reference guide, Taylor & Francis, 1993
E. Grandjean, Fitting the task to the man, Taylor & Francis Ltd.1980
Dr. Debkumar Chakraborty, Indian Anthropometric Dimensions For Ergonomic Design Practice, National Institute of Design, 1997

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
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. Dry friction; Description and applications of friction in wedges, thrust bearing (disk friction), belt, screw, journal bearing (Axle friction); rolling resistance.

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;

Kinematics and Kinetics of Rigid Bodies; Translation; Fixed axis rotational; General plane motion; Coriolis acceleration; Work energy; Power; Potential energy; Impulse-momentum and associated conservation principles; Euler equations of motion and its application.

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; Bio Mechanics; Introduction to the mechanical aspect of bio-mimicry, skeletal mechanisms of animal limbs, skeletal mechanisms of human limbs, structural characteristics of plants, structural characteristics of exoskeletons;

Introduction to Control Systems; Introduction to mechanical switches, power trains and experimentation with actuators and motors; Introductions to Arduino and Raspberry Pie;

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

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
BDS161 – FORM STUDIES

Unit 1: Thinking in three dimensions
Concepts of space and Volume, Evolution of a flat shape into a volume;
History of utilitarianism; Stone Age Tools; Evolution of farming equipment; native artisanal tools;
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;
Skeletions 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
Gaston Bachelard and Maria Jolas (Translator), The Poetics of Space, Beacon Press; Reprint edition, 1994
Mario Livio, the Golden Ratio: The Story of PHI, the World’s Most Astonishing Number, Broadway, 2003

Course Outcome
Ability to control surfaces of objects created from imagination
Function oriented look at product aesthetics
Applying Logic and mathematics to generate volumes
**BDS162 – RENDERING & ILLUSTRATION**

**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**
Stephen Missal, Exploring Drawing for Animation (Design Exploration Series), Thomson Delmar Learning, 2003
T. C. Wang, Pencil Sketching, John Wiley & Sons, 1997

**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
BDS211—ARCHITECTURAL STUDIES IN DESIGN—I, SPACE AND HABITAT

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
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

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
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

Arthaya, Seminar on Visual semantics, IDC, IIT Bombay 1992
BDS213 – MODEL MAKING AND HAND TOOLS

WORKSHOP

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

Course Outcome
Understanding of the behaviour and properties of plastic components
Understanding of deformable materials
Finding out biodegradable replacements of polluting materials
BDS214–SURFACE MODELLING IN COMPUTER AIDED DESIGN

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

Course Outcome
Ability to create Engineering CAD ready Surface models
Ability to conduct design iterations in CAD software

References
Christoph M. Hoffmann, Geometric and Solid Modelling: An Introduction
Alejandro Reyes, Beginners Guide to SolidWorks, SDC Publications
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
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

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;
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
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

Course Outcome
Understanding of why people buy things
Ability to offer relevant products which people need
Awareness about Design Rights and their enforcement by law
BDS222—DESIGN THINKING

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

Course Outcome
Ability to comprehend large scale problems.
Ability to come up with radical solutions in relatively short time.
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
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

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

Alan Powers, Nature in Design: The Shapes, Colors and Forms that Have Inspired Visual Invention, Conran, 2002

Course Outcome

Ability to take inspiration from nature to solve product design trials
Orientation: Cognitive Ergonomics

Unit 1: Morphology
Morphology of Interactive media; Data; Consumer; Input Channels; Response mechanisms; gratification models; Activity mapping; Stimulus-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

Noah Wardrip-Fruin (Editor) and Nick Montfort, The New Media Reader, MIT Press, 2003
Robert Klanten, Interactive Installations and Experiences, Die Gestalten Verlag, 2011
BDS311 – CREATIVE NARRATION

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

Course Outcome
Ability to comprehend and draft user stories.
Ability to document user experience in a retainable form.
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
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

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

BDS314–DESIGN RESEARCH
METHODOLOGY–I, QUANTITATIVE RESEARCH

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

Course Outcome
Ability conduct objectivist research
Ability to understand large scale data
Ability to understand collective behaviour
BDS315 –ARCHITECTURAL STUDIES–II,
CONNECTIVITY AND MOBILITY

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;

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;

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
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
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

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
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
BDS321 – PRODUCT BRANDING AND IDENTITY

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
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

Course Outcome
Understanding of why organizations invest in maintaining their identity
Knowledge of Branding and Identity design process
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
A. Hansen, Mass communication research methods. New Delhi: Log Angeles, 2009
BDS323–MATERIAL AND PROCESSES IN DESIGN–I, UNCONVENTIONAL MANUFACTURING

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

Course Outcome
Ability to design products which are seemingly impossible to manufacture using conventional processes
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
M Gopal, Modern Control System Theory, 2nd Ed., New Age International, 1993
BDS391 – DESIGN PROJECT – IV, TECHNICALLY COMPLEX PRODUCT DESIGN

Orientation

Product Integration; Forward Integration; Backward integration;
Top – Down Design Approach; Bottom-Up Design Approach;
Reverse Engineering; Proof Of concept;

Course Outcome

Ability to break down complex product ideas into smallest components
Ability to build functional prototypes
BDS411—PROFESSIONAL PRACTICE IN DESIGN

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

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
BDS412 – FORM IN FOUR DIMENSIONS

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
Lung-Wen Tsai, Mechanism Design: Enumeration of Kinematic Structures According to Function, CRC Press, 2001
Sibel Deren Guler, Madeline Gannon, Kate Sicchio, Crafting Wearables: Blending Technology with Fashion, 2016

Course Outcome
Understanding of evolution of shapes and forms with time
BDS413–MATERIALS AND PROCESSES IN DESIGN–II, PRODUCTION PLANNING

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
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 practice professionals
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.

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

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
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

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**SEMESTER VIII**

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