ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

MINOR

Subject: DESIGN THINKING

w.e.f. AY 2023-24 onwards

COURSE STRUCTURE

Semester	Course Number	Course Name	No. of Hrs/Week	No. of Credits
II	1	Introduction to design thinking	4	4
III	2	User experience design	4	4
IV	3	Integrated Design Research	4	4
	4	Introduction to Web Design	4	4
V	5	Sustainable Product Design	4	4
	6	Human Computer Interaction	4	4

COURSE 1: INTRODUCTION TO DESIGN THINKING

Theory   Credits: 4   4 hrs/week

UNIT I : FUNDAMENTALS OF DESIGN THINKING

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, the need of design thinking; An approach to design thinking, Design thinking Process model, Design thinking tools.

Case Studies: General, Engineering and Service applications

Activities: Identify an Opportunity and Scope of the Project

Explore the possibilities and prepare a design brief

UNIT II: EMPATHIZE AND DEFINE

Design thinking phases, how to empathize, Role of empathy in design thinking, the purpose of empathymaps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas.

Define- Methods of Define Phase: Storytelling, Critical items diagrams, Define success

Activities: Apply the methods of empathizing and Define Phases Finalize the problem statement

UNIT III: IDEATION

Challenges in idea generation, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method,

Create Thinking, Generating Design Ideas, Lateral Thinking, Analogies, Brainstorming, Mind mapping, National Group Technique, Synectic's, Development of work, Analytical Thinking, Group Activities. Ideation Tools: How Might We? (HMW), Storyboard, Brainstorming. What is design innovation? A mindset for innovation, and asking "What if?" asking "What wows?" and "What works?"

Activities- Apply the methods of Ideate Phase: Generate Lots of Ideas

UNIT I V: PROTOTYPING

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype.

Activities: Apply the Methods of the Prototype Phase: Create prototypes for selected ideas

UNIT V: TESTING PROTOTYPES

Prototyping for digital products: What's unique for digital products, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users. Create a Pitch-Plan for scaling up-Road map for Implementation, Fine-tuning and Submission of the project report

Activities: Collect feedback; iterate and improve the ideas

Present your solution using the Storytelling method

Text Books:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

COURSE 2: USER EXPERIENCE DESIGN

Theory   Credits: 4   4 hrs/week

Course Objectives: To learn User Experience of any Product, Application and its Service.

Course Outcome: Will be knowing the experiential practices of product and services

Unit -I: Experiments to learn how users interact with product

Unit -II: Research method tools

Unit-III: Data visualization and wire framing

Unit -IV: Usability testing technique

Unit -V: Communicating and implementing UX deliverable

Text Books:

William Buxton, "Sketching User Experiences: Getting the Design Right and the Right Design", Morgan Kaufmann Publishers, 2007

References:

1. A Project Guide to UX Design: For user experience designers in the field or in the making by Russ Unger, Carolyn Chandler.
2. The Elements of User Experience: User-Centered Design for the Web and Beyond by Jesse James Garrett.

COURSE 3: INTEGRATED DESIGN RESEARCH

Theory   Credits: 4   4 hrs/week

Course Objectives:

Putting the research areas together into one framework, a generic design research methodology that links the research questions together and provides support to address these in a systematic way.

Broad overview of the generic concepts of design, design research and the need for a design research methodology.

Course Outcomes:

Upon completion of this course, the student's research into design helps to;

1. Develop a holistic understanding of the area of design research

2. Carry out design research effectively and efficiently.

Unit I

Introduction to Design: Design Research, Main Issues, Lack of Overview of Existing Research, Lack of Use of Results in Practice, Need for a Design Research Methodology.

Unit II

Introduction, Methodological Framework, Types of Research Within the DRM Framework, Representing Existing and Desired Situations, Graphical Representation, From Reference Model to Impact Model, Success Criteria and Measurable Success Criteria.

Unit III

Identifying Overall Topic of Interest, Clarifying Current Understanding and Expectations; Clarifying Criteria, Main Questions and Hypotheses, Criteria, Research Questions and Hypotheses; Selecting Type of Research, Formulating Overall Research Plan, Overall Research Plan

Unit IV

Understanding Design, Schools of Thought, Types of DS-I ,DS-I Process Steps; Reviewing Literature, Identifying Literature, Summarizing Literature; Determining Research Focus, Identifying and Defining Factors and Links of Interest, Formulating Research Questions and Hypotheses, Techniques for Refining Research Questions and Hypotheses, Developing Research Plan for DS-I.

Developing Design Support; Types of Design Support; Types of PS; A Systematic PS Process; Task Clarification; Conceptualization; Determining Main Functions, Generating and Selecting Support Concepts, Introduction Plan; Elaboration.

Unit V:

Evaluating Design Support Evaluation, Importance of Evaluation ,Types of Evaluation in DRM, Synthesis Example, DS-I Versus DS-II,Existing Evaluation Approaches; Types of DS-II , Initial DS-II, Comprehensive DS-II, Systematic DS-II Process

Publishing Results; Various Forms of Publication and Their Intent, Overall Structure of a Thesis; Approaches to Help Structure a Thesis, Table of Content Approach , Presentation Approach, Methodical Design Approach, Question and Answer Approach

Text Books

1. Blessing, LTM, Chakrabarti, A. DRM A Design Research Methodology, Springer-Verlag, London, 2009.
2. Brenda Laurel, "Design Research Methods and Perspectives", MIT Press,Cambridge, 2004

COURSE 4: INTRODUCTION TO WEB DESIGN

Theory   Credits: 4   4 hrs/week

Course Objectives:

From the course, the student will learn

- Translate user requirements into the overall architecture and implementation of
- new systems and Manage Projects and coordinate with the Client.
- Write backend code in PHP language and Write optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to
- validate the applications against client requirements.
- Monitor the performance of web applications & infrastructure and
- Troubleshooting web applications with a fast and accurate resolution.

UNIT-I:

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, I frames Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3.

UNIT-II:

Java script - Introduction to Java script, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Fundamentals of Angular JS and NODE JS

Angular Java Script- Introduction to Angular JS Expressions: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

Node.js- Introduction, Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events.

UNIT-III:

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX.

AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, AJAX UI tags, Integrating PHP and AJAX.

UNIT-IV:

PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, and Operators.

Controlling program flow: Conditional statements, Control statements, Arrays, functions.

UNIT-V:

Web Servers- IIS (XAMPP, LAMP) and Tomcat Servers. Java Web Technologies Introduction to Servlet, Life cycle of Servlet, Servlet methods, Java Server Pages.

Database connectivity – Servlets, JSP, PHP, Practice of SQL Queries.

Introduction to Mongo DB and JQuery.

Web development frameworks – Introduction to Ruby, Ruby Scripting, Ruby on rails –

Design, Implementation and Maintenance aspects.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013

2. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

3. Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016

4. Java Script & jQuery the missing manual, 2nd Edition, David sawyer mcfarland, O'Reilly, 2011

5. Web Hosting for Dummies, 1st Edition, Peter Pollock, John Wiley & Sons, 2013

6. RESTful web services, 1st Edition, Leonard Richardson, Ruby, O'Reilly, 2007

Reference Books:

1. Ruby on Rails Up and Running, Lightning fast Web development, 1st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006

2. Programming Perl, 4th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly,2012

3. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009

4. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003

COURSE 5: SUSTAINABLE PRODUCT DESIGN

Theory   Credits: 4   4 hrs/week

Course Objectives:

- Design guidelines that help prolong the life of a product and minimize its environmental impact.
- Enable product design for end-of-life (EoL) objectives such as reuse, recycling and remanufacturing.
- Determine the cost of designing sustainable products.
- To address all three pillars of sustainability—environmental conservation, social sustainability, and economic sustainability.

Unit I:

Introduction, Definition of Sustainability, Definition of Design and the Engineering, Design Process, Selection of Materials, Selection of Machining Processes, What is Design Review?, Designing a Product for Functionality, Designing a Product for Usability, Golden Rules of Sustainable Product Design, Environmental Legislations, Introduction, Examples of Some Environmental Legislations around the World, Key Takeaways from State Laws Dealing with Disposal of Electronic Waste

Unit II:

Design for Disassembly, Importance and Definition of Design for Disassembly, Disassembly Process Planning, Design for Disassembly Guidelines, Product Modularization for Disassembly: Design, Approach to Disassembly, Disassembly Algorithms and Sequence Plans: Reactive, Approach to Disassembly Using Predetermined Motion Time Systems (PMTS) to Evaluate Ease of Disassembly: Proactive Approach, Framework of an Interactive System for Design for Disassembly

Unit III:

Designing for Assembly, Definition and Importance of the Assembly Process, Definition of Design for Assembly, Types of Assembly Methods, Different Modes of Assembly and Design Guidelines to Facilitate Them, Methodologies for Evaluating DfA,

Unit IV:

Designing for Maintenance, what is Maintenance? What Are the Factors That Affect Maintainability? Elements of the Maintenance Operation, Types of Maintenance Procedures, Planning for Maintenance and Its Management through Design Review, Models Used to Facilitate Equipment Design for Ease of Predictive Maintenance, Design Recommendations for Ease of Maintenance of Air Force Weapon Systems

Unit V:

Consideration of Reuse, Recycling and Remanufacturing, What is Product Reuse?, Product Modularization for Ease of Reuse, What is Recycling?, Types of Recycling, Components of a Recycling System, Design for Recycling, Assessing Recyclability, Manual Material Separation versus Mechanical

Separation, Design Guidelines for Material Separation, Applying Material Selection Guidelines to

Different Scenarios, what is Re-manufacturing? Comparing Products that Have Been Remanufactured, Recycled, Reconditioned and Repaired, What Type of Products Can be Remanufactured?, Conditions Necessary for Remanufacturing to be Profitable, Types of Remanufacturers, Guidelines for DfRem, Benefits of Remanufacturing, Metric Development for Assessing Re-Manufacturability, Case Study to Evaluate Product Re-manufacturability

Text Book:

1. Sustainable Product Design and Development ByAnoop Desai, Anil Mital, 1st edition, CRC Press

COURSE 6: HUMAN COMPUTER INTERACTION

Theory   Credits: 4   4 hrs/week

UNIT - I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT - II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT- III

Windows – New and Navigation schemes selection of windows, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT- IV

HCI in the software process, the software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

UNIT- V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3 2. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

REFERENCE BOOKS:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia. 2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech. 3. User Interface Design, Soren Lauesen , Pearson Education. 4. Human –Computer Interaction, D. R. Olsen, Cengage Learning. 5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.