PROGRAM EDUCATIONAL OBJECTIVES (PEOs):
1. To enable graduates to excel professionally by adapting to the dynamic needs of the industry, academia and research in the field of Full Stack Development.
2. To enable graduates to practice and promote full stack development for societal needs.
3. To enable graduates to contribute to advancement of information technology by means of research and lifelong learning.

PROGRAM OUTCOMES (POs):
ENGINEERING GRADUATES WILL BE ABLE TO:
1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OBJECTIVES (PSOs)
1. To analyse, design and develop applications relevant to the industrial needs.
2. To apply software engineering principles and practices for developing quality software for scientific and business applications.
3. To develop programs related to full stack development based on open source technologies.

Provide mapping of 1) POs to PEOs and 2) PSOs to PEOs. Use the following marking:

Contribution 1: Reasonable 2: Significant 3: Strong

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES
A broad relation between the programme objective and the outcomes is given in the following table

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**TOTAL NO. OF CREDITS: 74**

### PROFESSIONAL ELECTIVES (PE)

#### SEMESTER II, ELECTIVE I

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### FOUNDATION COURSES (FC)

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OBJECTIVES:
This course is designed to provide the solid foundation on topics in applied probability and various statistical methods which form the basis for many other areas in the mathematical sciences including statistics, modern optimization methods and risk modeling. It is framed to address the issues and the principles of estimation theory, testing of hypothesis and multivariate analysis.

UNIT I PROBABILITY AND RANDOM VARIABLES

UNIT II TWO DIMENSIONAL RANDOM VARIABLES
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

UNIT III ESTIMATION THEORY

UNIT IV TESTING OF HYPOTHESIS
Sampling distributions – Type I and Type II errors –Small and large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS
Random vectors and matrices –Mean vectors and covariance matrices –Multivariate normal density and its properties –Principal components – Population principal components – Principal components from standardized variables

TOTAL: 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following topics:

- Basic probability axioms and rules and the moments of discrete and continuous random variables.
- Consistency, efficiency and unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

The students should have the ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.
REFERENCES:


CP5151 ADVANCED DATA STRUCTURES AND ALGORITHMS          L T P C
                                                              4 0 0 4

OBJECTIVES:

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To select and design data structures and algorithms that is appropriate for
  problems.
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING 12
Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing
Algorithms- Growth of Functions: Asymptotic Notation — Standard Notations and Common
Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

UNIT II HIERARCHICAL DATA STRUCTURES 12
Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-
Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree-
Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a
node-Bounding the maximum degree.

UNIT III GRAPHS 12
Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-
First Search – Topological Sort – Strongly Connected Components- Minimum Spanning
Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest
Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic
Graphs – Dijkstra’s Algorithm;  All-Pairs Shortest Paths: Shortest Paths and Matrix
Multiplication – The Floyd-Warshall Algorithm;
UNIT IV  ALGORITHM DESIGN TECHNIQUES  12

UNIT V  NP COMPLETE AND NP HARD  12

TOTAL: 60 PERIODS

OUTCOMES:
Upon the completion of the course the students should be able to:

- Design data structures and algorithms to solve computing problems
- Design algorithms using graph structure and various string matching algorithms to solve real-life problems
- Apply suitable design strategy for problem solving

REFERENCES:

CP5153 OPERATING SYSTEM INTERNALS  L T P C
3 0 0 3

OBJECTIVES:

- To be able to read and understand sample open source programs and header files.
- To learn how the processes are implemented in linux.
- To understand the implementation of the Linux file system.
- To study Linux memory management data structures and algorithms.
- To acquire the knowledge in the implementation of interprocess communication.
- To understand how program execution happens in Linux.

UNIT I  INTRODUCTION  9

UNIT II  PROCESSES  9

UNIT III FILE SYSTEM
The Virtual File System (VFS) - Role - File Model - System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Filesystems - Filesystem Type Registration - Filesystem Handling - Namespaces - Mounting - Unmounting - Implementation of VFS System Calls.

UNIT IV MEMORY MANAGEMENT
Page frame management - page descriptors - non-uniform memory access - memory zones - reserved page frames - zoned page frame allocator - kernel mappings - buddy system algorithm - page frame cache - zone allocator.

UNIT V PROCESS COMMUNICATION AND PROGRAM EXECUTION
Process Communication - Pipes - Usage - Data Structures - Creating and Destroying a Pipe - Reading From and Writing into a Pipe - Program Execution - Executable Files - Process Credentials - Command-Line Arguments and Shell Environment - Libraries - Program Segments and Process Memory Regions - Execution tracing - Executable Formats - Execution Domains - The exec Functions

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students should be able to:

- To explain the functionality of a large software system by reading its source.
- To revise any algorithm present in a system.
- To design a new algorithm to replace an existing one.
- To appropriately modify and use the data structures of the Linux kernel for a different software system.

REFERENCES:
FS5101 WEB APPLICATION DEVELOPMENT USING PYTHON L T P C
3 0 0 3

OBJECTIVES:
- To learn the core programming features of Python
- To understand the back end data model and accessing
- To understand Django fundamentals and use its concepts to build and deploy robust web applications and apps.
- Learn about Django URL patterns and views and deploy Django applications

UNIT I PYTHON BASICS 9
Python basics- Standard types -Flow Control – Exception handling – Files -Functions- Strings-
List- Tuples- Dictionaries

UNIT II PYTHON: OBJECT ORIENTED PROGRAMMING 9
Class Definitions – Instantiation - Sub Classing – Inner Classes – Regular Expressions - Inheriting from other classes- Class and Static Methods – Private Methods- Polymorphism - Importing python modules and libraries-Creating objects-Manipulating and working with objects.

UNIT III DJANGO 9

UNIT IV DJANGO ARCHITECTURE 9
Django and Python - DJango stake on MVC: Models - Views and Template – Overall Django Architecture - 3 Core Files: models.py- urls.py- views.py – URL’s – Modeling HTTP: Requests ; Responses and Middleware – Views / Logic

UNIT V DJANGO FORMS AND APIS 9

TOTAL : 45 PERIODS

OUTCOMES:
After completing this course- students will have a fundamental understanding of how to implementing Python based applications
- Safely model and store data in SQL databases
- Use MVC (Models- Views & Templates)
- Build and deploy robust Django web apps
- Integrate with RESTful web services
- Unit Testing and Debugging Django apps

REFERENCES:
1. Python Web Development with Django 1st Edition by Jeff Forcier ; Paul Bissex; Wesley Chun; Pearson Education; 2009
3. Django for Beginners: Build websites with Python and Django Paperback, William S Vincent, Independently Published, 2018
OBJECTIVES:
The students should be made to:
- Acquire the knowledge of different programming paradigms.
- Be able to understand the methods of specifying the syntax formally.
- Learn the different data types available in programming languages and understand how the language translators handle the type checking process.
- Study the semantics of the various control structures.
- Understand the design issues for subprograms.
- Learn the different methods of specifying concurrency.
- Acquire knowledge on how the events and exceptions are handled.

UNIT I  INTRODUCTION  9

UNIT II  DATA TYPES, EXPRESSIONS AND CONTROL STRUCTURES  9

UNIT III  SUBPROGRAMS AND OBJECT-ORIENTED PROGRAMMING  9

UNIT IV  CONCURRENCE AND HANDLING OF EXCEPTIONS AND EVENTS  9

UNIT V  FUNCTIONAL AND LOGIC PROGRAMMING  9

TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:

- To explain the concepts of programming languages.
- To compare the different programming paradigms.
- To identify appropriate programming paradigm for designing large software systems.
- To choose appropriately data types and control structures during the implementation of software systems.

REFERENCES:

FS5102 FRONT END TECHNOLOGIES
(HTML5; CSS3; Bootstrap; JavaScript; JQuery)

OBJECTIVES:
- Design and develop interactive, client-side, executable web applications.
- Demonstrate how Internet programming tasks are accomplished.
- Build tools that assist in automating data transfer over the Internet.

UNIT I HTML5 & CSS3

UNIT II BOOTSTRAP

UNIT III JAVASCRIPT
UNIT IV  JQUERY
JQuery - Introduction, Structure, Using jQuery and including .js file to HTML, Type of Selectors, Handling Events with jQuery, jQuery DOM Traversal, jQuery DOM Manipulation, jQuery Effects, APIs - Geo-location, Local Storage, Session Storage, History.

UNIT IV  AJAX & JQUERY
AJAX and JQuery - Introduction to AJAX 10.1 Asynchronous access to remote data, GET HTTP request, AJAX Load, Send Data, Callback Handlers, Change AJAX data type, Status Codes, JSON, Accessing and Consuming remote JSON Data. HTML5 Forms and JQuery UI - Understanding Forms, Adding Smarts to Your Forms, Form Validation, Validation Tutorial, Updating Database Table Values, Introduction to jQuery UI, Animation and Special Effects.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to:

- understand and describe the role of front-end development in modern web applications
- act like a professional front-end developer.
- Able to analyze problems, seek for needed information, apply a solution, verify it
- see the alternative ways for creating a front-end
- able to discuss and take into use more front-end technologies.

REFERENCES:

CP5161  DATA STRUCTURES LABORATORY  L T P C
0 0 4 2

OBJECTIVES:
- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.

LIST OF EXPERIMENTS
Each student has to work individually on assigned lab exercises. Lab sessions could be scheduled as one contiguous four-hour session per week or two two-hour sessions per week. There will be about 15 exercises in a semester. It is recommended that all implementations are carried out in Java. If C or C++ has to be used, then the threads library will be required for concurrency. Exercises should be designed to cover the following topics:
EXPERIMENTS:
1. Implementation of Merge Sort and Quick Sort - Analysis
2. Implementation of a Binary Search Tree
3. Red-Black Tree Implementation
4. Heap Implementation
5. Fibonacci Heap Implementation
6. Graph Traversals
7. Spanning Tree Implementation
8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
9. Implementation of Matrix Chain Multiplication
10. Activity Selection and Huffman Coding Implementation.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design and implement basic and advanced data structures extensively.
- Design algorithms using graph structures
- Design and develop efficient algorithms with minimum complexity using design techniques.

OBJECTIVES:
- Building strong expertise to develop front end application using HTML5, CSS3, JavaScript along with JQuery framework.

Lab Exercises:
1. Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist the following pages. Home page, Registration and user Login, User profile page, Bookscatalog, Shopping cart, Payment by credit card, order confirmation.
2. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient
3. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
4. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
5. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
   a. Parameter: A string Output: The position in the string of the left-most vowel
   b. Parameter: A number Output: The number with its digits in the reverse order
6. Design an XML document to store information about a student in an engineering college affiliated to Anna University. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
7. DOM Manipulation with jQuery.
8. Events in JQuery.
9. Animation in JQuery.
10. AJAX with JQuery.

**Web Application Development using Python laboratory**

1. Learn how to install Django in a Linux System
2. Use forms processing of Django for creating simple applications
3. Demonstrate creating views in Django
4. Create a public site that lets people view polls and vote in them
5. Create an administrative interface that lets you add, change and delete polls
6. Create a session in Django
7. Create an RSS Feed using Django
8. Demonstrate Cookies handling
9. Demonstrate E-mail sending
10. Demonstrate RESTful APIs
11. Mini-project

**TOTAL : 60 PERIODS**

**OUTCOMES:**
Upon completion of the course, the students should be able to:

- To develop elegant and responsive front-end by leveraging latest technologies
- Build strong foundations (ex: Design pattern) in entry level engineers thereby making them job ready as per industry requirements.
- To learn new technologies by applying foundation paradigms.
- Students will be become an industry-ready engineer who can be readily deployed in a project.

**IF5251**

**SOFTWARE INDUSTRIALIZATION**

**OBJECTIVES:**
The student should be able:

- To point out the need for industrialization in software development
- To understand the non functional requirements in software engineering
- To carry out performance analyses
- To study the various types of scalability
- To acquire the art of capacity planning
- To Understand the techniques for infrastructure management

**UNIT I**

**INDUSTRIALIZATION OF SOFTWARE DEVELOPMENT**

The Fragile Hand Weaving – Features Vs Robustness – Components and Services Based Development – Agile and DevOps - Software Factory – Automation
UNIT II  NON FUNCTIONAL REQUIREMENTS and ENGINEERING  9

UNIT III  PERFORMANCE and SCALABILITY ENGINEERING  9

UNIT IV  THE ART OF CAPACITY PLANNING  9

UNIT V  PRODUCTION SYSTEMS MANAGEMENT  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students will be able to:

- Understand SOA and DevOps
- Understand the non-functional requirements in software engineering
- Apply various performance analysis techniques
- Analyze software systems for scalability
- Apply capacity planning methods
- Apply infrastructure management techniques

REFERENCES:
IF5201 NETWORK ENGINEERING

OBJECTIVES:
- To provide an introduction to the principles and practices of Network Engineering.
- To understand the architecture of the network devices.
- To learn QoS related methodologies.
- To explore the emerging technologies in network engineering.

UNIT I FOUNDATIONS OF NETWORKING

UNIT II QUALITY OF SERVICE

UNIT III HIGH PERFORMANCE NETWORKS

UNIT IV NETWORK DEVICE ARCHITECTURE

UNIT V SOFTWARE DEFINED NETWORKING

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Explain the principles of network engineering.
- Knowledge of network engineering concepts and techniques.
- Recent development in network engineering.

REFERENCES:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS5201</td>
<td>BACK END TECHNOLOGIES</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

(Mongo DB; Express Framework; Angular JS; Node.js)

**OBJECTIVES:**
- To learn the basics of Angular JS
- To implement Forms, inputs and Services
- To implement Directives and Databases
- To understand basics of Nodejs and Express
- To understand the basics ofMongo DB and its data model

**UNIT I**

**INTRODUCTION TO ANGULAR JS**

Introduction – Features – Angular JSModel-View-Controller – Expression -Directives and Controllers -Angular JS Modules – Arrays –Working with ng-model – Working with Forms – Form Validation – Error Handling with Forms – Nested Forms with ng-form – Other Form Controls

**UNIT II**

**DIRECTIVES & BUILDING DATABASES**

Filters – Using Filters in Controllers and Services – Angular JS Services – Internal Angular JS Services – Custom Angular JS Services - Directives – Alternatives to Custom Directives – Understanding the Basic options – Interacting with Server –HTTP Services – Building Database, Front End and BackEnd

**UNIT III**

**NODE JS AND EXPRESS FRAMEWORK**


**UNIT IV**

**INTRODUCTION TO MONGODB**

JSON and MongoDB – Adopting a Non-relational Approach – Opting for Performance vs. Features-Running the Database Anywhere – Generating or Creating a Key – Using Keys and Values – Implementing Collections

**UNIT V**

**DATA MODELS**

Understanding Databases – Reviewing the Feature List - Designing the Database – Building Indexes – Inserting Data – Quering for Data – Updating Data – Removing Data – Referencing a Database – GRID FS

*TOTAL : 45 PERIODS*
OUTCOMES:
Students are able to:
- Implement Directives and Controllers
- Create Forms, validate and use Filters
- Understand the usage of Keys and Values
- Implement Datamodel

TEXT BOOKS:

REFERENCES:

FS5202 MICRO SERVICES, API AND DEVOPS

OBJECTIVES:
- To introduce service-oriented and micro-services architecture.
- To understand the technology underlying service design and micro-services applications.
- To be familiar with DevOps practices
- To integrate DevOps with Cloud

UNITI SOA AND MICROSERVICE ARCHITECTURE BASICS

UNITII MICROSERVICE BASED APPLICATIONS

UNITIII DEVOPS
UNIT IV CLOUD AND DEVOPS

Origin of DevOps - The developers versus operations dilemma - Key characteristics of a DevOps culture – Deploying a Web Application - Creating and configuring an account - Creating a web server - Managing infrastructure with Cloud Formation - Adding a configuration management system

UNIT V WORKING WITH APIs

Working with Third Party APIs: Overview of interconnectivity in cloud ecosystems. Working with Twitter API, Flickr API, Google Maps API. Advanced use of JSON and REST.

OUTCOMES:
At the end of this course, the students will be able to:
- Understand the advantages of DevOps practices
- Implement SOA with Micro Services applications
- Analyze a real world problem and develop a cloud based software solution.

REFERENCES:

CP5281 TERM PAPERWRITING AND SEMINAR L T P C

In this course, students will develop the scientific and technical reading and writing skills they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation
Please keep a file where the work carried out by you is maintained.

### Activities to be carried Out

<table>
<thead>
<tr>
<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection of area of interest and Topic</td>
<td>You are requested to select an area of interest, topic and state an objective</td>
<td>2nd week</td>
<td>3% Based on clarity of thought, current relevance and clarity in writing</td>
</tr>
<tr>
<td>Stating an Objective</td>
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</tr>
</tbody>
</table>
| Collecting Information about your area & topic| 1. List 1 Special Interest Groups or professional society  
2. List 2 journals  
3. List 2 conferences, symposia or workshops  
4. List 1 thesis title  
5. List 3 web presences (mailing lists, forums, news sites)  
6. List 3 authors who publish regularly in your area  
7. Attach a call for papers (CFP) from your area. | 3rd week        | 3% (the selected information must be area specific and of international and national standard) |
| Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter | • You have to provide a complete list of references you will be using. Based on your objective - Search various digital libraries and Google Scholar  
• When picking papers to read - try to:  
  - Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them,  
  - Favour papers from well-known journals and conferences,  
  - Favour “first” or “foundational” papers in the field (as indicated in other people’s survey paper),  
  - Favour more recent papers,  
  - Pick a recent survey of the field so you can quickly gain an overview,  
  - Find relationships with respect to each other and to your topic area (classification scheme/categorization)  
  - Mark in the hard copy of papers whether complete work or section/sections of the paper are being | 4th week        | 6% (the list of standard papers and reason for selection)                                       |

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<table>
<thead>
<tr>
<th>Reading and notes for first 5 papers</th>
<th>Reading Paper Process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For each paper form a Table answering the following questions:</strong></td>
<td><strong>5th week</strong></td>
</tr>
<tr>
<td>• What is the main topic of the article?</td>
<td><strong>8%</strong></td>
</tr>
<tr>
<td>• What was/were the main issue(s) the author said they want to discuss?</td>
<td>(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
</tr>
<tr>
<td>• Why did the author claim it was important?</td>
<td></td>
</tr>
<tr>
<td>• How does the work build on other’s work, in the author’s opinion?</td>
<td></td>
</tr>
<tr>
<td>• What simplifying assumptions does the author claim to be making?</td>
<td></td>
</tr>
<tr>
<td>• What did the author do?</td>
<td></td>
</tr>
<tr>
<td>• How did the author claim they were going to evaluate their work and compare it to others?</td>
<td></td>
</tr>
<tr>
<td>• What did the author say were the limitations of their research?</td>
<td></td>
</tr>
<tr>
<td>• What did the author say were the important directions for future research?</td>
<td></td>
</tr>
<tr>
<td>Conclude with limitations/issues not addressed by the paper (from the perspective of your survey)</td>
<td></td>
</tr>
<tr>
<td>Reading and notes for next 5 papers</td>
<td>Repeat Reading Paper Process</td>
</tr>
<tr>
<td><strong>6th week</strong></td>
<td><strong>8%</strong></td>
</tr>
<tr>
<td></td>
<td>(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
</tr>
<tr>
<td>Reading and notes for final 5 papers</td>
<td>Repeat Reading Paper Process</td>
</tr>
<tr>
<td><strong>7th week</strong></td>
<td><strong>8%</strong></td>
</tr>
<tr>
<td></td>
<td>(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
</tr>
<tr>
<td>Draft outline 1 and Linking papers</td>
<td>Prepare a draft Outline, your survey goals, along with a classification / categorization diagram</td>
</tr>
<tr>
<td>--------------------------------------</td>
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</tr>
<tr>
<td>Abstract</td>
<td>Prepare a draft abstract and give a presentation</td>
</tr>
<tr>
<td>Introduction Background</td>
<td>Write an introduction and background sections</td>
</tr>
<tr>
<td>Sections of the paper</td>
<td>Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey</td>
</tr>
<tr>
<td>Your conclusions</td>
<td>Write your conclusions and future work</td>
</tr>
<tr>
<td>Final Draft</td>
<td>Complete the final draft of your paper</td>
</tr>
<tr>
<td>Seminar</td>
<td>A brief 15 slides on your paper</td>
</tr>
</tbody>
</table>

TOTAL : 30 PERIODS

FS5211 FULL STACK ENGINEERING LABORATORY – II (BACK END, MICRO SERVICES AND API) L T P C

COURSE OBJECTIVES:
The students should be able :
- To implement Forms, inputs and Services using Angular JS
- To develop a simple web application using Nodejs; Angular JS and Express
- To implement data models using Mongo DB
LIST OF EXPERIMENTS:
1. Develop a Form and validate using Angular JS
2. Create and implement modules and controllers in Angular JS
3. Implement Error Handling in Angular JS
4. Create and implement Custom directives
5. Create a simple web application using Express, Node JS and Angular JS
6. Implement CRUD operations
7. Implement MongoDB data models

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course; the student should be able to:
- Design and Implement Forms, inputs and Services using Angular JS
- Develop a simple web application using Nodejs; Angular JS and Express
- Implement data models using Mongo DB

CP5092 CLOUD COMPUTING TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:
- To understand the concepts of virtualization and virtual machines
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions
- To gain knowledge on the concept of virtualization that is fundamental to cloud computing
- To understand the various issues in cloud computing
- To be able to set up a private cloud
- To understand the security issues in the grid and the cloud environment

UNIT I VIRTUALIZATION 9

UNIT II VIRTUALIZATION INFRASTRUCTURE 9

UNIT III CLOUD PLATFORM ARCHITECTURE 9
UNITIV PROGRAMMING MODEL

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus

UNITV CLOUD SECURITY

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Employ the concepts of storage virtualization, network virtualization and its management
- Apply the concept of virtualization in the cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Develop services using Cloud computing
- Apply the security models in the cloud environment

REFERENCES:

MU5252 DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION 

OBJECTIVES:

- To understand the basic concepts and algorithms of digital processing.
- To familiarize the student with the image processing environments like Matlab and its equivalent open source Image processing environments.
- To expose the students to a broad range of image processing techniques and issues and their applications, and to provide the student with practical experiences using them.
To appreciate the use of image processing in current technologies and to expose the students to real-world applications of the image processing.

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9

UNIT II  IMAGE ENHANCEMENT AND RESTORATION  9

UNIT III  IMAGE SEGMENTATION AND MORPHOLOGY  9

UNIT IV  INTRODUCTION TO PATTERN RECOGNITION  9

UNIT V  IMAGE PATTERN RECOGNITION CASE STUDIES  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course
- The students should be able to implement basic image processing algorithms using MATLAB tools
- Design an application that incorporates different concepts of Image processing
- Apply and explore new techniques in the areas of image enhancement, restoration, segmentation, compression, wavelet processing and image morphology
- critically analyze different approaches to implements mini projects
- Explore the possibility of Appling image processing concepts in various domains

REFERENCES:

CP5095  COMPUTER VISION  L T P C
3 0 0 3

OBJECTIVES:
- To review image processing techniques for computer vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional image analysis techniques
- To understand motion analysis
- To study some applications of computer vision algorithms

UNIT I  IMAGE PROCESSING FOUNDATIONS  9
Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II  SHAPES AND REGIONS  9

UNIT III  HOUGH TRANSFORM  9

UNIT IV  3D VISION AND MOTION  9

UNIT V  APPLICATIONS  9
Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:

1. Implement fundamental image processing techniques required for computer vision
2. Perform shape analysis
3. Implement boundary tracking techniques
4. Apply chain codes and other region descriptors
5. Apply Hough Transform for line, circle, and ellipse detections
6. Apply 3D vision techniques
7. Implement motion related techniques
8. Develop applications using computer vision techniques

REFERENCES:

CP5191  MACHINE LEARNING TECHNIQUES  L  T  P  C
3  0  0  3

OBJECTIVES:
1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques
3. To study the various probability based learning techniques
4. To understand graphical models of machine learning algorithms

UNIT I  INTRODUCTION
UNIT II  LINEAR MODELS  9
Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error –
Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving
Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT III  TREE AND PROBABILISTIC MODELS  9
Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and
Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to
Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics –
Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K
means Algorithms – Vector Quantization – Self Organizing Feature Map

UNIT IV  DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS  9
Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis –
Factor Analysis – Independent Component Analysis – Locally Linear Embedding –
Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms –
Learning – Overview – Getting Lost Example – Markov Decision Process

UNIT V  GRAPHICAL MODELS  9
Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain
Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden
Markov Models – Tracking Methods

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Distinguish between, supervised, unsupervised and semi-supervised learning.
- Apply the apt machine learning strategy for any given problem.
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any
given problem.
- Design systems that uses the appropriate graph models of machine learning.
- Modify existing machine learning algorithms to improve classification efficiency.

REFERENCES:
1. Ethem Alpaydin, “Introduction to Machine Learning 3e (Adaptive Computation and
OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I  INTRODUCTION: MOTIVATION  9

UNIT II  MODELING  9

UNIT III  INDEXING  9
Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations - Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV  CLASSIFICATION AND CLUSTERING  9
Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V  SEARCHING THE WEB  9

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to

- Build an Information Retrieval system using the available tools
- Identify and design the various components of an Information Retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Design an efficient search engine and analyze the Web content structure

REFERENCES:

CP5074 SOCIAL NETWORK ANALYSIS L T P C
3 0 0 3

OBJECTIVES:
- To understand the components of the social Network
- To model and visualize the social network
- To mine the users in the w4
- To understand the evolution of the social Network
- To know the applications in Real Time Systems

UNIT I INTRODUCTION

UNIT II MODELING AND VISUALIZATION

UNIT III MINING COMMUNITIES
Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV EVOLUTION

UNIT V APPLICATIONS
A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection
OUTCOMES:
Upon Completion of the course, the students will be able to

- Work on the internals components of the social network
- Model and visualize the social network
- Mine the behaviour of the users in the social network
- Predict the possible next outcome of the social network
- Apply social network in real time application.

REFERENCES:

CP5097 MOBILE APPLICATION DEVELOPMENT

| OBJECTIVES: |
| Understand system requirements for mobile applications |
| Generate suitable design using specific mobile development frameworks |
| Generate mobile application design |
| Implement the design using specific mobile development frameworks |
| Deploy the mobile applications in marketplace for distribution. |

UNIT I INTRODUCTION
Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications.

UNIT II BASIC DESIGN
Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.
UNIT III  ADVANCED DESIGN
Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV  ANDROID

UNIT V  IOS
Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TOTAL :45 PERIODS

OUTCOMES:
• Describe the requirements for mobile applications
• Explain the challenges in mobile application design and development
• Develop design for mobile applications for specific requirements
• Implement the design using Android SDK
• Implement the design using Objective C and iOS
• Deploy mobile applications in Android and iPhone marketplace for distribution

REFERENCES:

IF5092  VIDEO ANALYTICS

OBJECTIVES:
• To know the fundamental concepts of big data and analytics
• To learn various techniques for mining data streams
• To acquire the knowledge of extracting information from surveillance videos.
• To learn Event Modelling for different applications.
• To understand the models used for recognition of objects in videos.
UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS

UNIT II MINING DATA STREAMS

UNIT III VIDEO ANALYTICS

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of this course, students will be able to:
- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Work with surveillance videos for analytics.
- Design of optimization algorithms for better analysis and recognition of objects in a scene.
- Model a framework for Human Activity Recognition

REFERENCES:
OBJECTIVES:
This course covers the basics of machine learning, neural networks and deep learning. Model for deep learning technique and the various optimization and generalization mechanisms are included. Major topics in deep learning and dimensionality reduction techniques are covered. The objective of this course is:

- To present the mathematical, statistical and computational challenges of building neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

UNIT I INTRODUCTION
Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes-Training a network: loss functions, back propagation and stochastic gradient descent-Neural networks as universal function approximates

UNIT II DEEP NETWORKS

UNIT III DIMENTIONALITY REDUCTION
Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

UNIT IV OPTIMIZATION AND GENERALIZATION

UNIT V CASE STUDY AND APPLICATIONS
Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection- BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to

- Understand basics of deep learning
- Implement various deep learning models
- Realign high dimensional data using reduction techniques
- Analyze optimization and generalization in deep learning
- Explore the deep learning applications

REFERENCES:

FS5001 OPEN SOURCE TECHNOLOGIES

OBJECTIVES:
- To provide knowledge about Open Source Technologies and to help in understanding the programming aspects of Personal Home Page (PHP), Perl, C#; ASP.NET and MySQL.

UNIT I INTRODUCTION

UNIT II OPEN SOURCE DATABASE

UNIT III OPEN SOURCE PROGRAMMING LANGUAGES

UNIT IV C# AND .NET PLATFORM

UNIT V PERL
OUTCOMES:
Upon completion of the course, the students will be able to
- Understand the difference between open source software and commercial software.
- Identify, install and run Linux operating system.
- Install and manage applications.
- Identify, install open source web technologies Apache, MySQL, PHP.
- Write session control PHP code for a website

REFERENCES:
3. Rasmus Lerdorf & Levin Tatroe, — Programming PHP II, O'Reilly, 2002 (Unit III)
4. C# 6.0 and the .NET 4.6 Framework; by ANDREW TROELSEN; Philip Japikse; Apress; 2017

OPEN SOURCE TECHNOLOGIES LAB

OBJECTIVE:
- To provide practical experience in software development using open source tools like Perl, C#, ASP.NET, PHP and MySQL.

EXERCISES:

1. Program to Demonstrate String Functions using PHP.
2. Program to Demonstrate Session using PHP.
3. Program to Create a File and write the Data into it using PHP.
4. Application for Email Registration and Login using PHP and MySQL.
5. Create a login page using ASP.NET.
6. Write a program to display feedback form using ASP.NET.
7. Program to perform Functions in Lists.
8. Program to copy content of one file to another file Using Exception Handling.
9. Program to Detect the Web Browser using Perl.
10. Program to perform the String Operation using Perl.
12. Program to Perform read, write operations in Files using Perl.
OUTCOMES:
Upon completion of the course, the students will be able to
• Understand the difference between open source software and commercial software.
• Identify, install and run Linux operating system.
• Install and manage applications.
• Identify, install open source web technologies Apache, MySQL, PHP.
• Write session control PHP code for a website.

TOTAL: 45+30: 75 PERIODS

FS5002    AGILE TECHNOLOGIES

OBJECTIVES:
• To understand the basic concepts of Agile Software Process.
• To gain knowledge in the area of various Agile Methodologies.
• To develop Agile Software Process
• To know the principles of Agile Testing
• Assess product quality risks within an Agile project

UNIT I INTRODUCTION
Software is new product development – Iterative development – Risk (Driven and Client (Driven iterative planning – Time boxed iterative development – During the Iteration, No changes from external stakeholders – Evolutionary and adaptive Development (Evolutionary requirements analysis – Early “Top Ten” high (level requirements and skilful analysis Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

UNIT II AGILE AND ITS SIGNIFICANCE

UNIT III AGILE METHODOLOGY
UNITIV SCRUM

UNITY AGILE PRACTICING AND TESTING

OUTCOMES:
- Demonstrate a systematic understanding of current agile techniques and practices used in industry.
- Apply industry standard agile techniques in develop software in a team.
- Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
- Apply concepts of XP and EVE in develop a software
- Managing the changes applying different testing techniques

LAB CURRICULUM FOR AGILE TECHNOLOGIES:
1. Design, implement, and deliver a Partial software product
2. Exploring the tools related to Agile Development and approach.
4. Perform Scrum with multiple or distributed project teams.
5. Apply Extreme Programming for a real life problem.
6. Agile Transformation - A Case Study

REFERENCES:
OBJECTIVES
- Understand software architectural requirements and drivers
- Be exposed to architectural styles and views
- Be familiar with architectures for emerging technologies

UNIT I INTRODUCTION AND ARCHITECTURAL DRIVERS 9

UNIT II QUALITY ATTRIBUTE WORKSHOP 9
Quality Attribute Workshop – Documenting Quality Attributes – Six part scenarios – Case studies.

UNIT III ARCHITECTURAL VIEWS 9

UNIT IV ARCHITECTURAL STYLES 9
Introduction-Data flow styles-Call-return Styles-Shared Information styles - Event styles-Case Studies for each style.

UNIT V DOCUMENTING THE ARCHITECTURE 9

LAB EXPERIMENTS:
The course project is divided in 6 small components that will be performed during the different lab sessions; there are, in principle, 7 lab sessions. The project consists of the design and implementation of the software architecture of a Weather Mapping System (WMS). Implementation will take place both in Java and C++ (combination of both languages). Each lab assignment consists of a theoretical part and a practical part, which are defined in specific lab assignment statements that are posted at least one or two weeks before the session. Report and demo (if applicable) for each assignment is due for the following session.
1. Tool Presentation

This session is an introductory session; there is no lab assignment for this session. Introduction to working with an industrial strength software development environment, namely Rational Rose: how to write and maintain a UML specification; configuration management; architecture design; CORBA-IDL document generation; Java code generation from a UML model etc.

Presentation of the Project: Weather Mapping System.

2. Use Case View
   Design of the Use Case View. Risk Analysis.


4. Integrating Patterns in the Architecture
   Integration of selected architectural and design patterns in the logical view obtained previously.


6. Component and Interprocess Communication Design

Generation from the previous architecture design of CORBA Interfaces and Components Definitions.

7. Implementation of WMS Implementation of the Weather Mapping System (Java & C++), with a particular emphasis on the Interprocess communication mechanism and the software components identified.

Lab Reports:
Lab reports should include:
- The answers to the questions included in the assignment statement. The answers should motivate briefly your design choices.
- The printout of the diagrams and related documents (e.g. class, use cases, operations descriptions etc.) produced using Rational Rose.

TOTAL: 45+30: 75 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Explain influence of software architecture on business and technical activities
- Identify key architectural structures
- Use styles and views to specify architecture
- Design document for a given architecture

REFERENCES:

FS5004  FULL STACK SECURITY
        LT P C
        3 2 0 4

Course Objectives:
- To learn how to defend vulnerable web applications
- To understand Web application security and how it differs from other types of Internet security.
- To learn procedures and technologies that are essential to developing, penetration testing and releasing a secure Web application.
- To expose to the prolific methods hackers use to execute Web attacks
- To better equip to protect confidential.

UNIT I    INFORMATION SECURITY MANAGEMENT  9

UNIT II   HACKING METHODOLOGY  9

UNIT III  CODE AUDITING AND REVERSE ENGINEERING  9
Introduction – How to Effectively Trace through a Program – Auditing and Reviewing Selected Programming Languages – Looking for Vulnerabilities

UNIT IV   SECURING JAVA CODE  9

UNIT V    DEVELOPING SECURITY ENABLED APPLICATIONS  9

Course Outcomes:
At the end of the course, the students will be able to
1. Recognize various security measures needed to protect their application and data
2. Write creative codes that are inbuilt with security measures
3. Trace code effectively for security measures needed for the application
4. Handle security for the Java code
5. Test the secure application

References:

FULL STACK SECURITY LABORATORY

Course Objectives
- Learn the fundamentals of programming with React and building web apps
- Build web applications with security features
- Create real-world React web applications and related tools

List of Experiments
1. Build a simple Web Form for any application of interest to demonstrate authentication
2. Build a simple CAPTCHA application
3. Build a simple calculator application using React
4. Build a timer application using React
5. Build a weather forecasting application using React
6. Build a simple quiz application using React
7. Build a secure shopping cart counter application using React
8. Build a secure e-commerce application
9. Build a secure messaging application
10. Build a social media application and still protecting personalized data

TOTAL: 45+30: 75 PERIODS

Course Outcomes
Upon completion of this lab students will be able to
- Create web applications with security features
- Build web applications from scratch with React
- Build real-world React web applications
- Use React related tools appropriately

FS5005 DESIGN THINKING FOR INNOVATION L T P C
3 0 2 4

OBJECTIVES:
- Learn design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Learn the different phases of design thinking
- Apply various methods in design thinking to different problems
UNIT I  INTRODUCTION  9

UNIT II  UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM  9
Search field determination - Problem clarification - Understanding of the problem - Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.

UNIT III  IDEATION AND PROTOTYPING  9
Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

UNIT IV  TESTING AND IMPLEMENTATION  9
Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.

UNIT V  FUTURE  9

OUTCOMES:
- Define key concepts of design thinking
- Practice design thinking in all stages of problem solving
- Apply design thinking approach to real world problems

LAB CURRICULUM FOR DESIGN THINKING:
(i) 2030 Schools Challenge:
Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills.

(ii) THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL
Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to “redesign the gift-giving experience” for their partner.

(iii) THE WALLET PROJECT VIA STANFORD D-SCHOOL
Concept: Very similar to the Gift-Giving Project, the Wallet Project is 90-minute (plus
(iv) **INVENT A SPORT (WITH JUST THESE ITEMS)**

**Concept:** We’ve all played sports at some point in our life. Who came up with the rules? Who created the game? Who made the constraints? And who decided the objects to play with? Now, with limited time and resources, your group will create and invent a new sport, and a set of directions for people to actually play the game.

(v) **“BOOK IN AN HOUR” ACTIVITY (VIA ALL WHO WONDER)**

**Concept:** Give a group a book (fiction or non-fiction). Then you break them up into smaller groups (or individuals) to read different parts of the book. Each group (or person) has to read and then create an overview/trailer of their part of the book to share chronologically with the rest of the class. Here the design really starts with the creative process driving how you share the information, plot, characters etc. Perfect use for professional development when you want to introduce a topic in a fun, engaging way.

(vi) **CHILDREN’S STORY DESIGN ACTIVITIES**

**Concept:** The University of Arkansas created a series of STEM Challenges that work as great design activities with groups old and young! For example after reading “The Three Billy Goat’s Gruff” they set up a challenge like this:

You decide to help the billy goats reach the opposite side of the creek so they can eat. You must create a model structure to help the billy goats get from one side to the other while using the design loop and only the materials provided. Your teacher will also provide you with model billy goats, with specific weights, that your bridge must be able to withstand.

(vii) **New Product Development Activity:**

Student teams were given products ranging from toys to air fresheners. In 2 days, they had to create pitches on how to improve these products. The idea was to give them a clear sense of the scope of what they would do in a product development.

**REFERENCES:**

1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking. [Unit 1, 2, 3, 4]
2. Designing for Growth: a design thinking tool kit for managers By Jeanne Liedtka and Tim Ogilvie. [Unit 1]
3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown. [Unit 5]
4. [http://ajjuliani.com/design-thinking-activities/](http://ajjuliani.com/design-thinking-activities/)
   [https://venturewell.org/class-exercises/](https://venturewell.org/class-exercises/)

**FS5006 UI DESIGN**

L  T  P  C

3  0  2  4

**OBJECTIVES:**

- Explain the principles and process of UI design
- Illustrate the significance of various types of Interfaces and Emotions
- Describe Interaction design, Evaluation and testing process
- Explain about Mobile Information Architecture, Applications and Design elements
• Design the webpages by selecting appropriate Interaction methods

UNIT I PRINCIPLES AND PROCESS

UNIT II DESIGN PROCESS

UNIT III DESIGN AND TESTING

UNIT IV MOBILE HCI

UNIT V WEB HCI

OUTCOMES:
• Explain the principles and process of UI design for developing an interface.
• Illustrate the significance of various types of Interfaces and Emotions for designing an user interface.
• Describe Interaction design, Evaluation and testing process to solve real world problems.
• Explain about Mobile Information Architecture, Applications and Design elements for creating an application.
• Design the webpages by selecting appropriate Interaction methods for building an application.

LAB CURRICULUM FOR UI DESIGN:

1. Design a web page contains static pages
2. Design a web page contains dynamic pages
3. Design an UI includes navigation elements
4. Configure forms with focused inputs.
5. Design an UI with contextually obvious interactions.
6. Design an UI with all basic components of interface
7. Design a mobile app interface for Chatbox
8. Design a mobile app interface with all design elements
9. Develop a web application with various interaction methods and UI components
10. Develop a mobile application with all mobile interface design elements

REFERENCES:

TOTAL: 45+30: 75 PERIODS

FS5007 DATABASE TUNING L T P C 3 0 2 4

OBJECTIVES:
- To understand the basic principles of Database Tuning
- To analyze query level tuning and application interfaces
- To learn trouble shooting E-commerce applications
- To evaluate the performance of the database.
- To perform database I/O tuning

UNIT I BASIC PRINCIPLES 9

UNIT II TUNING RELATIONAL SYSTEMS AND COMMUNICATION 9
Table Schema and Normalization – Clustering Two Tables – Aggregate Maintenance – Query Tuning – Triggers – Client Server Mechanism – Application tools and Performance – Tuning Application Interface – Bulk Loading – Accessing Multiple Databases

UNIT III TROUBLE SHOOTING AND TUNING E – COMMERCE APPLICATIONS 9

UNIT IV PERFORMANCE MEASUREMENT

UNIT V TUNING DATABASE I/O

OUTCOMES:
- Understand the basic principles of Database Tuning
- Analyze query level tuning and application interfaces
- Learn trouble shooting E-commerce applications
- Evaluate the performance of the database.
- Perform database I/O tuning

LAB CURRICULUM FOR DATABASE TUNING:
1. SQL Server Basic Query Tuning Techniques
2. Gather system statistics needed to perform an database operation
3. Ad Hoc Query Optimization
4. Parameter Sniffing Optimization
5. Execute Auto trace Plan and examine the effects of column order in an index

TOTAL: 45+30: 75 PERIODS

REFERENCES:
1. Database Tuning-Principles, Experiments, and Trouble Shooting Techniques By Dennis Shasha and Philippe Bonnet; Morgan Kaufmann Publishers; 2003
2. Oracle Performance Troubleshooting With Dictionary Internals SQL & Tuning Scripts by Robin Schumacher, Rampant TechPress
3. Oracle Tuning: The Definitive Reference 3rd Edition; by Donald K. Burles; Rampant TechPress; 2014
OBJECTIVES:

- To outline the foundations of data visualization.
- To analyze the static and moving patterns.
- To judge the space perception in 3D space.
- To use visual and data objects for data visualization.
- To explore images for data visualization and to interpret the visualizations.

UNIT I  SCIENCE OF DATA VISUALIZATION  


UNIT II  STATIC AND MOVING PATTERNS  

UNIT III  SPACE PERCEPTION  

UNIT IV  VISUAL OBJECTS AND DATA OBJECTS  

UNIT V  DATA VISUALIZATION AND INTERPRETATION  

Interacting with Visualizations: Data Selection and Manipulation Loop – Exploration and Navigation Loop – Focus; Context and Scale in Non-metaphoric Interfaces.
LIST OF EXPERIMENTS:
Use python with Matplotlib; Pandas and Seaborn libraries for the following exercises:
1. Create basic plots for a dataset using Scatter plot; Line; multi-line chart; Histogram; and Bar Chart; pie chart; subplot; stack plot.
2. Create basic plots for a dataset using Scatter plot; Line; multi-line chart; Histogram; and Bar Chart; pie chart; subplot; stack plot.
3. Plotting 2D arrays
4. Waffle Charts; Word Clouds; Regression Plots
5. Creating Maps and Visualizing Geospatial Data

OUTCOMES:
- To outline the foundations of data visualization.
- To recognize the static and moving patterns.
- To judge the space perception in 3D space.
- To apply visual and data objects for data visualization.
- To interpret images for data visualization and to interpret the visualizations.

TOTAL: 45+30: 75 PERIODS

REFERENCES:
1. Information Visualization: Perception for Design (Interactive Technologies) 3rd Edition by Colin Ware; Morgan Kaufmann; 2013
2. Visualization Analysis and Design by Tamara Munzner; CRC Press; 2014