Semester II

Course Code: IT-21
Course Name: Python Programming

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	**Practical**	**Tutorial**		
3 Hrs./Week	-	3	25	-	-	50	75

Course Description:

Prerequisite:

Object oriented Concepts.

Course Objectives:

1. To understand and use the basic of python.
2. To understand advance concepts of python and able to apply it for solving the complex problems.
3. To understand the reading and writing data through file handling.
4. To understand basic database concepts in python.
5. To develop the critical thinking and analytical approach by using python libraries.

Course Outcomes:

Student will be able to

CO1: Understand Demonstrate the concepts of python and modular programming. (Understand)

CO2: Apply the concepts of concurrency control in python (Apply)

CO3: Solve the real-life problems using object-oriented concepts and python libraries (Apply)

CO4: Demonstrate the concept of IO, Exception Handling, database (Apply)

CO5: Analyze the given dataset and apply the data analysis concepts and data visualization. (Analyze)

Course Structure:

Unit No.	Topics Details	Weightage in %	No of Sessions
1	1. Introduction & Components of Python 1.1. Understanding Python 1.2. Role of Python in AI and Data science 1.3. Installation and Working with Python 1.4. The default graphical development environment for Python - IDLE 1.5. Types and Operation	15	7

	1.6. Python Object Types-Number, Strings, Lists, Dictionaries, Tuples, Files, User Defined Classes 1.7. Understanding python blocks 1.8. Python Program Flow Control 1.9. Conditional blocks using if, else and elif 1.10. Simple for loops in python 1.11. For loop using ranges, string, list and dictionaries 1.12. Use of while loops in python 1.13. Loop manipulation using pass, continue, break and else 1.14. Programming using Python conditional and loops block Extra Reading: Python installation with windows, Linux and MAC OS, creating virtual environment, configuring python on EC2 instance, understanding python IDE –[VSCode, PyCharm, Spyder], Installing Anaconda and setting up environment for python		
2	2. Python Functions, Modules & Packages 2.1. Function Basics-Scope, nested function, non-local statements 2.2. built-in functions 2.3. Arguments Passing, Anonymous Function: lambda 2.4. Decorators and Generators 2.5. Module basic usage, namespaces, reloading modules. – math, random, datetime, etc. 2.6. Package: import basics 2.7. Python namespace packages 2.8. user defined modules and packages Extra Readings: GUI framework in python	15	7
3	3. Python Object Oriented Programming 3.1. Concept of class, object and instances, method call 3.2. Constructor, class attributes and destructors 3.3. Real time use of class in live projects 3.4. Inheritance, super class and overloading operators, 3.5. Static and class methods 3.6. Adding and retrieving dynamic attributes of classes 3.7. Programming using OOPS 3.8. Deligation and container Extra Readings: Integrating GUI framework with OOP	15	6
4	4. Python Regular Expression 4.1. Powerful pattern matching and searching 4.2. Power of pattern searching using regex in python 4.3. Real time parsing of data using regex 4.4. Password, email, URL validation using regular expression	10	4

	4.5. Pattern finding programs using regular expression Extra Readings: Web scrapping and pattern matching with regex		
5	5. Python Multithreading and Exception Handling 5.1. Exception Handling 5.2. Avoiding code break using exception handling 5.3. Safe guarding file operation using exception handling 5.4. Handling and helping developer with error code 5.5. Programming using Exception handling 5.6. Multithreading 5.7. Understanding threads 5.8. Synchronizing the threads 5.9. Programming using multithreading Extra Readings: Multiprocessing, deadlock, synchronization, monitors and messaging queue	10	5
6	6. Python File Operation 6.1. Reading config files in python 6.2. Writing log files in python 6.3. Understanding read functions, read(), readline() and readlines() 6.4. Understanding write 6.5. functions write() and writelines() 6.6. Manipulating file pointer using seek 6.7. Programming using file operations Extra Readings: Reading and writing the files on AWS S3 bucket	5	2
7	7. Python Database Interaction 7.1. Introduction to NoSQL database 7.2. Advantages of NoSQL database 7.3. SQL Vs NoSQL 7.4. Introduction to MongoDB with python 7.5. Exploring Collections and Documents 7.6. Performing basic CRUD operations with MongoDB and python Extra Readings: Graph database like Neo4j with python	10	5
8	8. Python for Data Analysis 8.1. NumPy: 8.2. Introduction to NumPy 8.3. Creating arrays, Using arrays and Scalars 8.4. Indexing Arrays, Array Transposition 8.5. Universal Array Function 8.6. Array Input and Output 8.7. Pandas: 8.8. What are pandas? Where it is used?	20	9

	8.9. Series in pandas, pandas DataFrames, Index objects, ReIndex 8.10. Drop Entry, Selecting Entries 8.11. Data Alignment, Rank and Sort 8.12. Summary Statics, Missing Data, Index Hierarchy 8.13. Matplotlib: 8.14. Python for Data Visualization 8.15. Introduction to Matplotlib 8.16. Visualization Tools Extra Readings: Text analytics with NLP and python		
	Total:	**100**	**45**

Course References:

Recommended Books:

Text Books:

Introduction to Python Programming, By Gowrishankar S, CRC Press

Reference Books:

1. Learning Python 5th ed. by Mark Lutz
2. Python: The Complete Reference by Martin C. Brown
3. Python Data Analytics: With Pandas, NumPy, and Matplotlib 2nd ed. Edition by Fabio Nelli
4. Core Python Programming by Wesley J. Chun Publisher: Prentice Hall
5. Python Programming: A modular approach by Taneja Sheetal, Kumar Naveen
6. Beginner's Guide to Python Programming: Learn Python 3 Fundamentals, Plotting and Tkinter GUI Development Easily by Serhan Yamacli
7. Programming Python, O'reilly, by Mark Lutz
8. Learning Python, O'reilly, Mark Lutz
9. Head First Python, O'reilly, By Paul Barry

Recommended Certifications:

1. Programming, Data Structures And Algorithms Using Python https://swayam.gov.in/nd1_noc19_cs40/preview
2. Data Analytics with Python https://swayam.gov.in/nd1_noc20_cs46/preview

Course Code: IT-22
Course Name: Software Project Management

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	**Practical**	**Tutorial**		
3 Hrs./Week	-	3	10	10	5	50	75

Course Description:

Prerequisite:

Basic Software Engineering process

Course Objectives:

4. To learn process of Software Project Management.
5. To Study role of Project Manager in Project Management.
6. To learn Agile Project Management Framework.
7. To study various role of Agile Team and Tools.
8. To understand project planning and tracking.

Course Outcomes:

Student will be able to

CO1: Understand the process of Software Project Management Framework and Apply estimation techniques. (Apply)
CO2: Learn the philosophy, principles and lifecycle of an agile project. (Understand)
CO3: Demonstrate Agile Teams and Tools and Apply agile project constraints and trade-offs for estimating project size and schedule (Apply)
CO4: Explain Project Tracking and Interpretation of Progress Report (Understand)
CO5: Analyze Problem statement and evaluate User Stories (Analyze)

Course Structure:

Sr. No.	Topics Details	Weightage in %	No of Sessions
1	1. Linear Project Management Framework 1.1 Overview of project Management 1.2 Project management life cycle-IEEE Life Cycle 1.3 Project Management Process 1.4 Role of Project Manager 1.5 Quality Metrics 1.6 Risk Management Process (Case Study Based) 1.6.1 Risk Identification 1.6.2 Risk Analysis 1.6.3 Risk Mitigation 1.6.4 RMMM	15	6

	1.7 Hands on MS Project Tool– Resource Allocation, Scheduling, Gannt chart Note: Case studies based on Risk Management, MS Project tool & Gannt Chart Extra Reading: Different software project management, Types of Risk, Risk Information sheet (RIS), CPM and PERT		
2	**2. Linear Software Project Estimation** 2.1 Different methods of Cost estimation 2.1.1 COCOMO-I & II model (Problem Statement) 2.1.2 Delphi cost estimation 2.2 Function Point Analysis (Problem Statement) 2.3 The SEI Capability Maturity Model CMM 2.4 Software Configuration management Note: Case studies/Numerical Problems based on COCOMO-I and FPA Extra Reading: KLOC, Rayleigh Curve, Change Management, Configuration management tool - SVN Tool or Redmine	20	8
3	**3. Agile Project Management Framework** 3.1 Introduction and Definition Agile, Agile Project Life Cycle 3.2 Agile Manifesto: History of Agile and Agile Principles 3.3 Key Agile Concepts: 3.3.1 User stories, Story points 3.3.2 Product Backlog 3.3.3 Sprint Backlog, 3.3.4 Sprint Velocity 3.3.5 Swim lanes 3.3.6 Minimum Viable Product (MVP) 3.3.7 Version and Release 3.4 Agile Project Management v/s Traditional Project Management Note: Case studies based on agile vs. traditional project Extra Reading: Study Scrum Agile Framework, Agile project management delivery & methodology framework, Software project team management and different team structures	15	10

4	**4 Agile Teams, Size and Schedule** 4.1 Dynamic System Development Method 4.2 Value-Driven Development 4.3 Team and roles of an Agile Team 4.3.1 Scrum Master 4.3.2 Product Owner 4.3.3 Development Team 4.4 Product Vision and Product Roadmap 4.5 Project Objective and Key Metrics 4.6 Introduction to User Stories 4.7 Estimate the Product Backlog 4.8 Techniques for estimating Story Points 4.9 Plan Product Releases 4.10 Product Prioritization Note: Case studies based on Estimation of Product backlog & Story points, design your team and Add screenshots with the caption, Design User stories, log efforts and task in detail Extra Reading: Personnel Management, Release & iteration planning, eXtreme Programming (XP), Values and Principles, Team Dynamics and Collaboration	15	10
5	**5.Tracking Agile Project and Reports** 5.1 Introduction 5.2 Plan and Execute Iteration 5.3 Facilitate Retrospective, Making Team Decisions and Closing out Retrospective 5.4 Agile Reports 5.4.1 Daily Reports 5.4.2 Sprint Burn down Chart and Reports 5.5 Benefits of Agile Project Management Note: Case studies based on No. of iterations and Project Report, Sprint Chart Extra Reading: Use of MS Project to track agile project, Agile project management tools, Feature-Driven Development, Agile Metrics	20	5
6	**6. Implementation with Agile Tools** 6.1 Introduction of Agile Tools 6.2 Hands on GitHub 6.2.1 Create Project using Kanban 6.2.2 Project Repositories 6.2.3 Continuous Integration 6.2.4 Project Backlog	15	6

	6.2.5 Team Management 6.2.6 Progress Tracking 6.2.7 Releases 6.3 Implementation of Problem statement with Agile Tools- GitHub 6.3.1Designing Product Vision, Product Backlog, 6.3.2 Sprint Backlog, Estimate Story Points 6.3.3 Iteration Release Note: Case study on design of product vision & backlog with features and user stories, Estimation of story points, Design Iteration Plan, Iteration progress and close iteration in detail Extra Reading: Agile modeling, Explore various Agile Tools		
	Total:	**100**	**45**

List of Practical's (if any)

1. Design Project Management plan template by using MS-Project tool. (Resource allocation, Scheduling, Cost Calculation and Gantt Chart)
2. Create project plan using agile methodologies for the development of web page of Library Management System as a minimum viable product using 3 resources as per sprint planning.
3. Calculate the effort to execute the task and prioritize the task to execute in the current sprint and keep rest of the task in backlog.
4. Demo of the task developed by the developer in the Sprint.
5. Retrospective to discuss about the short coming and improvement of the design and execution of the Sprint task.
6. Check in the developed code in the GitHub repository.

Course References:

Recommended Books:

Text Books:

1. Software engineering principles and practice, McGraw-Hill, Waman S. Javadekar
2. Software Engineering by Pressman
3. Agile Project Management For Dummies, 2nd Edition
4. Coaching Agile Teams: A Comparison for ScrumMasters, Agile Coaches, and Project Managers in Transition, Lyssa Adkins

5. Agile Project Management: Creating Innovative Products (2nd Edition) by Jim Highsmith, Addison-Wesley Professional

Reference Books:

1. Mark C. Layton, Steven J. Ostermiller
2. Agile Estimating and Planning by Mike Cohn Robert C Martin Series
3. Introduction to Software Project Management by By Adolfo Villafiorita, CRC Press
4. Agile Project Management with Scrumby Ken Schwaber, Microsoft Press © 2004
5. Agile Project Management QuickStart Guide : The Simplified Beginners Guide To Agile Project Management by ClydeBank Business
6. Agile Product Management with Scrum: Creating Products that Customers Love by Roman Pichler.
7. Scrum Mastery: From Good to Great Servant-Leadership by Geoff Watts
8. Agile Project Management for Dummies by Mark C. Layton
9. The Agile Enterprise: Building and Running Agile Organizations by Mario E. Moreira
10. Scrum: The Art of Doing Twice the Work in Half the Time by Jeff Sutherland
11. Essential Scrum: A Practical Guide to the Most Popular Agile Process by Kenneth S. Rubin
12. Agile Project Management with Kanban By Eric Brechner
13. Agile Constraints: Creating and Managing Successful Projects with Scrum, Multiple authors

Recommended Learning Material:

1. https://learning.tcsionhub.in/
2. https://www.agilealliance.org
3. http://www.pmi.org
4. https://github.com/topics/kanban
5. https://www.opensourcescrum.com/
6. https://www.scrum.org/resources
7. https://www.tutorialspoint.com/agile/index.htm
8. https://www.atlassian.com/agile
9. https://www.javatpoint.com/agile
10. https://www.guru99.com/agile-testing-course.html
11. https://www.visual-paradigm.com/tutorials/agile-tutorial/

Recommended Certifications:

1. Project Management Professional (PMP)
2. PMI-ACP(Agile Certified Practitioner)
3. Associate in Project Management

4. BVOP Certified Project Manager
5. Certified Associate in Project Management (CAPM)
6. Certified Project Director
7. Certified Project Management Practitioner (CPMP)
8. Certified Project Manager (CPM)
9. Certified ScrumMaster (CSM)
10. CompTIA Project+
11. Master Project Manager (MPM)
12. PRINCE2 Foundation/PRINCE2 Practitioner
13. Professional in Project Management (PPM)
14. Project Management in IT Security (PMITS)
15. APMG International
16. Strategyex Certificate (Associate or Master's) in Agile
17. International Consortium for Agile (ICAgile)
18. Agile Certification Institute
19. Scaled Agile Academy
20. Scrum Alliance
21. Certified Agile Project Manager (IAPM)

Course Code: MT-21
Course Name: Optimization Techniques

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	**Practical**	**Tutorial**		
3 Hrs./Week	-	3	10	10	5	50	75

Course Description:

Prerequisite:

Basic mathematical knowledge is essentials.

Course Objectives:

1. To understand the role and principles of optimization techniques in business world.
2. To understand the process of problem statement formulation of the business scenario.
3. To understand the implementation of various decision-making techniques in the process of decision making.
4. To gain the techniques and skills on how to use optimization techniques to support the decision making in business world.

Course Outcomes:

Student will be able to

CO1: Understand the role and principles of optimization techniques in business world (Understand)

CO2: Demonstrate specific optimization technique for effective decision making (Apply)

CO3: Apply the optimization techniques in business environments (Apply)

CO4: Illustrate and infer for the business scenario (Analyze)

CO5: Analyze the optimization techniques in strategic planning for optimal gain. (Analyze)

Course Structure:

Sr. No.	Topics Details	Weightage in %	No of Sessions
1	**1. Linear Programming** 1.1. Various definitions, statements of basic theorems and properties, Advantages and Limitations, 1.2. Application areas of Linear programming 1.3. Linear Programming – Concept 1.4. Simplex Method and Problems 1.5. Two Phase Simplex Method and problems,	20	10

	Note: Case study-based problems Extra Readings: Formulation of Linear programming, Solution of LPP using Graphical method		
2	**2. Markov Chains & Simulation Techniques:** 2.1 Markov chains: Applications related to technical functional areas, 2.2 Steady state Probabilities and its implications, 2.3 Decision making based on the inferences Monte Carlo Simulation. Extra Readings: Application of Markov chain in Queuing theory, Simulation techniques used in Machine learning and bioinformatics	15	7
3	**3. Sequential model and related Problems** 3.1 Processing n jobs through 2 machines 3.2 Processing n jobs through 3 machines 3.3 Processing n jobs through m machine Extra Readings: Processing of n jobs through m machines	15	6
4	**4. PERT & CPM** 4.1 Basic differences between PERT and CPM. 4.2 Network diagram 4.3 Time estimates (Forward Pass Computation, Backward Pass Computation 4.4 Critical Path 4.5 Probability of meeting scheduled date of completion, 4.6 Calculation on CPM network. 4.7 Various floats for activities 4.8 Event Slack 4.9 Calculation on PERT network. 4.10 Application of schedule based on cost analysis and crashing 4.11 Case study-based problems Extra Readings: Optimal Cost estimation by crashing the network, Explore the MS Project tool.	20	10
5	**5. Game Theory** 5.1 Introduction 5.2 n X m zero sum game with dominance 5.3 Solution using Algebraic, Arithmetic and	15	6

	Matrix strategy Extra Readings: Learn the difference between Sequential and Simultaneous game		
6	**6. Decision Analysis** 6.1 Introduction to Decision Analysis 6.2 Types of Decision-making environment 6.3 Decision making under uncertainty and under risk 6.4 Concept of Decision Tree Extra Readings: Decision models in Econometrics and computer science	15	6
	Total:	**100**	**45**

List of Practicals (if any)

Practicals to be conducted on the following topics. It is expected that, Applications to be covered using Python and /or R.

1. Linear Programming
2. Markov Chain and Simulation Techniques
3. Sequential models and related problems
4. CPM and PERT
5. Game Theory
6. Decision Analysis

(Separate Guidelines will be issued for the same)

Course References:

Recommended Books:

Text Books:

1. Operations Research by Pannerselvam
2. Operations Research Theory and Application by J. K. Sharma –Mac-Millan Publication
3. Statistical and Quantative Methods – Mr. Ranjit Chitale

Reference Books:

1. Statistical Methods – S.P.Gupta, Sultan Chand, New Delhi
2. Operation Research by V. k. Kapoor
3. Operations Research by Kanti Swaroop, P. K. Gupta and Man Mohan
4. Introduction to Operations Research by Hiller & Lieberman, Tata Mc Graw Hill

5. Operations Research by H. A. Taha
6. Operation Research by Hira & Gupta
7. What is Game Theory?, David K. Levine, Economics, UCLA
8. Recommended Learning Material:

Research Software:

1. MS Excel Solver
2. TORA
3. Python and / or R programming

Websites:

1. www.orsi.in
2. www.atozoperationalresearch.com

Websites for practical sessions:

1. https://towardsdatascience.com/linear-programming-and-discrete-optimization-with-python-using-pulp-449f3c5f6e99
2. https://github.com/topics/operations-research?l=python
3. https://github.com/Gabeqb/Linear-Programming-With-Python/commit/a61be0d5fc8e66dd38f3d094bb80cef6a9a04152

Journals:

1. International Journal of Operations Research and Management science
2. International Journal of Operations and Quantitative Management
3. Indian Journal of Advance Operations Management.

Recommended Certifications:

1. Data science with Python
2. Data science with R programing
3. Certification in Machine Learning
4. Certification in Tableau

Course Code: IT-23
Course Name: Advanced Internet Technologies

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	**Practical**	**Tutorial**		
3 Hrs./Week	-	3	25	-	-	50	75

Course Description:

Prerequisite:

Student must have hands-on working knowledge of HTML, CSS, JavaScript and Angular JS

Course Objectives:

1. To impart the design, development and implementation of Dynamic Web Pages.
2. To implement the Latest properties of CSS3
3. To implement the Concept of NodeJS.
4. To develop programs for Web using Angular and SPA.
5. To design and implement dynamic websites with good sense of designing and latest technical aspects.

Course Outcomes:

Student will be able to

CO1: Outline the basic concepts of Advance Internet Technologies (Understand)
CO2: Design appropriate user interfaces and implements webpage based on given problem Statement (Apply)
CO3: Implement concepts and methods of NodeJS (Apply)
CO4: Implement concepts and methods of Angular (Apply)
CO5: Build Dynamic web pages using server-side PHP programming with Database Connectivity (Apply)

Course Structure:

Sr. No.	Topics Details	Weightage in %	No of Sessions

1	**1. Introduction to HTML5** 1.1. Basics of HTML5 – Introduction, features, form new elements, attributes and semantics in HTML5 1.2. <canvas>, <video>, <audio>. 1.3. Introduction to Scalable Vector Graphics (SVG) 1.4. Introduction to Version compatibility 1.5. Installation of Apache Tomcat (Xampp/Lampp/MySQL) Extra Reading: Geo location, Drag, Drop, Web Storage	10	5
2	**2. Introduction to CSS3** 2.1. Architecture of CSS 2.2. CSS Modules 2.3. CSS Framework 2.4. Selectors and Pseudo Classes 2.5. Fonts and Text Effects 2.6. Colors, Background Images, and Masks Extra Reading: Transitions, Transforms and Animations Embedding Media, Gradients, Bootstrap	10	5
3	**3. Node JS** **3.1.** introduction and how it works 3.2. installation of node js 3.3. REPL 3.4. NPM 3.5. How modules work 3.6. Webserver Creation 3.7. Events Extra Reading: Node.js with MySQL	25	12
4	**4. Angular (Latest Stable Version)** 4.1. Introduction (Features and Advantage) 4.2. Type Script 4.3. Modules 4.4. Components 4.5. Directives, Expression, Filters 4.6. Dependency Injection 4.7. Services 4.8. Routing 4.9. SPA (Single Page Application) Extra Reading: Data binding, property binding, Event Binding, Two way data binding, String Interpolation.	25	12
5	**5. PHP**	30	11

	5.1. Installing and Configuring PHP 5.2. Introduction 5.2.1. PHP and the Web Server Architecture, PHP Capabilities 5.2.2. PHP and HTTP Environment Variables 5.2.3. Variables 5.2.4. Constants 5.2.5. Data Types 5.2.6. Operators 5.2.7. Working with Arrays 5.3. Decision Making, Flow Control and Loops 5.4. Introduction to Laravel 5.5. Creating a Dynamic HTML Form with PHP 5.6. Database Connectivity with MySQL 5.6.1. Performing basic database operations (CRUD) 5.7. Using GET, POST, REQUEST, SESSION, and COOKIE Variables Extra Reading: Sending Emails, PHP with AJAX and XML, Payment Gateway Integration		
Total:		**100**	**45**

Course References:

Recommended Books:

Text Books:

1. Complete reference HTML, TMH
2. HTML5 & CSS3, Castro Elizabeth 7th Edition
3. Beginning Node.js by Basarat Ali Syed
4. Angular: Up and Running- Learning Angular, Step by Step by Shyam Seshadri
5. Beginning PHP, Apache, MySQL web development

Reference Books

1. Introducing HTML5 - Bruce Lawson, Remy Sharp
2. Node.js in Action, 2ed by Alex Young, Bradley Meck
3. Mastering Node.js by Pasquali Sandro
4. Angular Essentials by Kumar Dhananjay
5. Complete Ref. PHP

Recommended Learning Material:

- MOOC Courses

1) **Introduction to HTML5 – University of Michigan**
   https://www.coursera.org/learn/html
2) **Introduction to Web Development – University of California**
   https://www.coursera.org/learn/web-development
3) **HTML, CSS and JavaScript for Web Developers – Johns Hopkins University**
   https://www.coursera.org/learn/html-css-javascript-for-web-developers
4) **Web Design for Everybody: Basics of Web Development & Coding Specialization – University of Michigan**
   https://www.coursera.org/specializations/web-design
5) **Introduction to CSS3 – University of Michigan**
   https://www.coursera.org/learn/introcss
6) **Server-side Development with NodeJS, Express and MongoDB – The Hong Kong University of Science and Technology**
   https://www.coursera.org/learn/server-side-nodejs
7) **Front-End Web UI Frameworks and Tools: Bootstrap 4 – The Hong Kong University of Science and Technology**
   https://www.coursera.org/learn/bootstrap-4
8) **Front-End JavaScript Frameworks: Angular – The Hong Kong University of Science and Technology**
   https://www.coursera.org/learn/angular
9) **Single Page Web Applications with AngularJS – John Hopkins University**
   https://www.coursera.org/learn/single-page-web-apps-with-angularjs
10) **Building Web Applications in PHP – University of Michigan**
    https://www.coursera.org/learn/web-applications-php
11) **Building Database Applications in PHP – University of Michigan**
    https://www.coursera.org/learn/database-applications-php
12) **Web Applications for Everybody Specialization**
    https://www.coursera.org/specializations/web-applications

- Other Learning Material

❖ **HTML 5, CSS3, JavaScript**
  - https://www.htmldog.com/
  - https://www.w3schools.com/
  - https://qhmit.com/
  - http://www.landofcode.com/
  - https://www.codecademy.com/
  - http://www.echoecho.com/html.htm
  - https://www.awwwards.com/

❖ **Bootstrap**
  - https://www.w3schools.com/bootstrap4/
  - https://getbootstrap.com/
  - https://www.freecodecamp.org/news/learn-bootstrap-4-in-30-minute-by-building-a-landing-page-website-guide-for-beginners-f64e03833f33/
  - https://www.freecodecamp.org/news/want-to-learn-bootstrap-4-heres-our-free-10-part-course-happy-easter-35c004dc45a4/

❖ **NodeJS**
  - https://nodejs.org/en/docs/guides/

- https://www.w3schools.com/nodejs/
- https://www.nodebeginner.org/
- http://visionmedia.github.io/masteringnode/

❖ **Angular**
- https://www.c-sharpcorner.com/topics/angular-8
- https://www.javatpoint.com/angular-8

❖ **PHP**
- https://www.php.net/manual/en/index.php
- https://phptherightway.com/
- https://www.tutorialspoint.com/php/php_useful_resources.htm
- https://www.w3schools.com/php/

Recommended Certifications:

1. Microsoft HTML5 and CSS3 (https://www.microsoft.com/en-us/learning/exam-70-480.aspx)
2. Certification available on Coursera and Udemy.

Course Code: IT-24
Course Name: Advanced DBMS

Credit Scheme			Evaluation Scheme				
Lecture	**Practical**	**Credit**	**Internal**			External	Total
			Written	**Practical**	**Tutorial**		
3 Hrs./Week	-	3	15	10	-	50	75

Course Description:

Prerequisite:

Basics of Database Concepts

Course Objectives:

1. To understand core concepts of database management system and its types
2. To provide database design approaches using E-R model and normalization
3. To discuss transaction management and concurrency control
4. To gain an awareness of the structure of object-oriented database and its applications
5. To gain familiarization of Database crash, recovery concepts and security issues
6. To Demonstrate SQL, XML schema and NO SQL database

Course Outcomes:

Student will be able to

CO1: Describe the core concepts of DBMS and various databases used in real applications (Understand)

CO2: Design relational database using E-R model and normalization (Apply)

CO3: Demonstrate XML database and nonprocedural structural query languages for data access (Apply)

CO4: Explain concepts of Parallel, Distributed and Object-Oriented Databases and their applications (Understand)

CO5: Apply transaction management, recovery management, backup and security – privacy concepts for database applications (Apply)

Course Structure:

Sr. No.	Topics Details	Weightage in %	No of Sessions
1	**1. Introduction DBMS – Concepts & Architectures** 1.1 Database and Need for DBMS, Characteristics of DBMS 1.2 Database 3-tier schema (ANSI/SPARC) and system architecture of DBMS 1.3 Views of data- Schemas and instances, Data Independence 1.4 Centralized, Client-Server system, Transaction servers, Data servers, Cloud based servers Extra Reading: Indexing and Hashing - Basic concepts of indexing, ordered index, B+ tree index, B+ tree extensions, Multiple key access, Hashing concepts, types of hashing, Bitmap indices	10	4
2	**2. Data Modelling and Relational Database Design** 2.1 Data Modelling using ER Diagram: Representation of Entities, Attributes, Relationships and their Type, Cardinality, Generalization, Specialization, Aggregation. 2.2 Relational data model: Structure of Relational Database Model, Types of keys, Referential Integrity Constraints 2.3 Codd's rules 2.4 Database Design using E-R, E-R to Relational 2.5 Normalization – Normal forms based on primary (1 NF, 2 NF, 3NF, BCNF) Note: Case studies based on E-R diagram & Normalization Extra Reading: Database languages - Relational Algebra, Relational database languages, Data definition in SQL, Views and Queries in SQL, Joins, specifying constraints and Indexes in SQL, Specifying constraints management systems Postgres/ SQL/MySQL	16	8
3	**3. Transaction and Concurrency control** 3.1. Concept of transaction, ACID properties, States of transaction 3.2. Concurrency control, Problems in concurrency controls 3.3. Scheduling of transactions, Serializability and testing of serilaizibity 3.4. Lock-based Protocol and Time stamp-based	13	6

	ordering protocols 3.5. Deadlock Handling Extra Readings: Semantic data controls & Multi-version concurrency control		
4	**4. Parallel Databases** 4.1. Introduction to Parallel Databases 4.2. Parallel Database Architectures 4.3. I/O parallelism 4.4. Inter-query and Intra-query parallelism 4.5. Inter-operational and Intra-operational parallelism 4.6. Key elements of parallel database processing: Speed-up, Scale-up Synchronization and Locking Extra Readings: Parallel handling and Load balancing	13	6
5	**5. Distributed Databases** 5.1. Introduction to Distributed Database System 5.2. Homogeneous and Heterogeneous Databases 5.3. Distributed data storage (Fragmentation and Replication) 5.4. Distributed transactions 5.5. Concurrency control schemes in DDBMS 5.6. Commit protocols 2 phase and 3 Phase Commit Protocol Extra Readings: Reliability issues in DDBMS and Web based interface of DDBMS	13	6
6	**6. Object Oriented Databases & Applications** 6.1. Overview of Object- Oriented Database concepts & characteristics 6.2. Database design for OODBMS – Objects, OIDs and reference type 6.3. Spatial data and Spatial indexing (Any two techniques) 6.4. Mobile Database: Need, Structure, Features, Limitations and Applications 6.5. Temporal databases, temporal aspects valid time, transaction time or decision time 6.6. Multimedia Database: Architecture, Type and Characteristics	10	4
7	**7. Crash Recovery and Backup** 7.1. Failure classifications 7.2. Recovery & Atomicity 7.3. Log based recovery 7.4. Checkpoint and Shadow Paging in Data recovery 7.5. Database backup and types of backups	10	5

	Extra Readings: Role and Functions of Database administrator		
8	**8. Security and Privacy** 8.1. Database security issues 8.2. Discretionary access control based on grant & revoking privilege 8.3. Mandatory access control and role-based access control for multilevel security 8.4. Encryption & public key infrastructures	10	4
9	**9. NO-SQL Database** Introduction, Types of NOSQL, Need of NoSQL databases, Use Cases	5	2
Total:		**100**	**45**

List of Practicals (if any)

1. To install and configure database software (ORACLE/MYSQL)
2. To design a database (logical & physical database)
3. To Perform all SQL operations and queries on designed physical database
4. To install and configure NO-SQL database and practice for core operations
5. To perform experiments on database crash and recovery
6. To perform experiments on database Backup – restoring operations on database server
7. To perform some operations on Object oriented databases

Course References:

Recommended Books:

Text Books:

1.
2. Introduction to database systems C.J. Date, Pearson.
3. Fundamentals of Database Systems by Elmasri Navathe
4. Principles of Database Management James Martin, PHI
5. Database System Concepts by Abraham Silberschatz, H. Korth, Sudarshan

Reference Books:

1. Database Management System by Raghu Ramakrishnan / Johannes Gherke
2. Database Management System (DBMS)A Practical Approach. By Rajiv Chopra
3. Database system practical approach to design, implementation & management by Connoly & Begg,
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence Martin Fowler