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| **Savitribai Phule Pune University**  **Fourth Year of Computer Engineering (2015 Course) 410247:Laboratory Practice II** | | |
| **Teaching Scheme: Practical : 04 Hours/Week** | **Credit 02** | **Examination Scheme:**  **Term Work: 50 Marks Presentation: 50 Marks** |
| **Companion Courses: 410244 and 410245** | | |
| **Course Objectives and Outcomes:** Practical hands on is the absolute necessity as far as employability of the learner is concerned. The presented course is solely intended to enhance the competency by undertaking the laboratory assignments of the core courses. Enough choice is provided to the learner to choose an elective of one‟s interest. | | |
| Laboratory Practice II is companion lab for elective course I and elective course II. | | |
| **Guidelines for Laboratory Conduction**   * **List of recommended programming assignments and sample mini-projects is provided for reference.** * Referring these, Course Teacher or Lab Instructor may frame the assignments/mini-project by understanding the prerequisites, technological aspects, utility and recent trends related to the respective courses. * Preferably there should be multiple sets of assignments/mini-project and distribute among batches of students. * Real world problems/application based assignments/mini-projects create interest among learners serving as foundation for future research or startup of business projects. * Mini-project can be completed in group of 2 to 3 students. * Software Engineering approach with proper documentation is to be strictly followed. * Use of open source software is to be encouraged. * Instructor may also set one assignment or mini-project that is suitable to respective course beyond the scope of syllabus.   Operating System recommended :- 64-bit Open source Linux or its derivative Programming Languages: C++/JAVA/PYTHON/R  Programming tools recommended: Front End: Java/Perl/PHP/Python/Ruby/.net, Backend: MongoDB/MYSQL/Oracle, Database Connectivity : ODBC/JDBC, Additional Tools: Octave,  Matlab, WEKA**.** | | |
| **Guidelines for Student Journal**  The laboratory assignments are to be submitted by student in the form of journal. Journal may consists of prologue, Certificate, table of contents, and **handwritten write-up** of each assignment (Title, Objectives, Problem Statement, Outcomes, software and Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept in brief, Algorithm/Database design, test cases, conclusion/analysis). **Program codes with sample output of all performed assignments are to be submitted as softcopy.**  As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of digital storage media/DVD containing students programs maintained by lab In-charge is highly encouraged.  For reference one or two journals may be maintained with program prints at Laboratory. | | |
| **Guidelines for Assessment** | | |

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| Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness **reserving weightage for successful mini-project completion and**  **related documentation.** | |
| **Guidelines for Practical Examination** | |
| * **It is recommended to conduct examination based on Mini-Project(s) Demonstration and related skill learned.** Team of 2 to 3 students may work on mini-project. During the assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation and software engineering approach followed. * The supplementary and relevant questions may be asked at the time of evaluation to test the student‟s for advanced learning, understanding, effective and efficient implementation and demonstration skills. * Encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will   consummate our team efforts to the promising start of the student's academics. | |
| **Guidelines for Instructor's Manual** | |
| The instructor‟s manual is to be developed as a hands-on resource and as ready reference. The instructor's manual need to include prologue (about University/program/ institute/ department/foreword/ preface etc), University syllabus, conduction and Assessment guidelines, topics under consideration-concept, objectives, outcomes, set of typical applications/assignments/  guidelines, references among others. | |
| **Suggested List of Laboratory Assignments& Mini Projects**  **Recommended / Sample set of assignments and mini projects for reference for all four courses offered for Elective I and for all four courses offered for Elective II. Respective Student have to complete laboratory work for elective I and II that he/she has opted.** | |
| **410244: Elective I** | |
| **410244(A) : Digital Signal Processing** | |
| **1.** | Develop a program to generate samples of sine, Cosine and exponential signals at specified sampling frequency and signal parameters. (Test the results for different analog frequency (F)  and sampling frequency (Fs) ). |
| **2.** | Find the output of a system described by given difference equation and initial conditions for given input sequence. (Solution of difference equation) (Obtain the response for different systems by changing Degree of difference equation (N) and coefficients and also for different  input sequence x(n). Observe the response by considering system as FIR and IIR system). |
| **3.** | Write a program to plot the magnitude and phase response of a Fourier Transform (FT).  (Observe the spectrum for different inputs. Observe the Periodicity). |
| **4.** | Find the N point DFT / IDFT of the given sequence x (n). Plot the magnitude spectrum |X(K)|  Vs K. (Analyze the output for different N and the same input sequence x(n). Also observe the periodicity and symmetry property). |
| **5.** | Find the N point circular convolution of given two sequences. Test it for Linear convolution. Compute the circular convolution of given two sequences using DFT and IDFT. |
| **6.** | Develop a program to plot the magnitude and phase response of a given system ( given: h(n):  impulse response of system S) (Observe the frequency response for different systems. |

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|  | Compare the frequency response of a system (filter) for different length h(n) i.e filter  coefficients). |
| **7.** | **Mini-Project 1:** Design and Develop the N-point radix-2 DIT or DIF FFT algorithm to find  DFT or IDFT of given sequence x (n). (Analyze the output for different N. Program should work for any value of N and output should be generated for all intermediate stages.) |
| **8.** | **Mini-Project 2:** Obtain the Fourier transform of different window functions to plot the magnitude and phase spectrums. (Window functions: Rectangular, Triangular, Bartlett, Hamming, Henning, Kaiser. Observe and compare the desirable features of window sequences  for different length. Observe the main and side lobes). |
| **9.** | **Mini-Project 3:** Design an FIR filter from given specifications using windowing method. (Application should work for different types of filter specifications i.e. LPF, HPF, BPF etc and all window sequences. Plot the frequency response for different frequency terms i.e. analog  and DT frequency). |
| **10.** | **Mini-Project 4:** Design of IIR filter for given specifications using Bilinear Transformation. (Generalized code to accept any filter length for a transfer function H(Z). Application should work for different types of filter specifications that is LPF, HPF, BPF etc. and for different  transfer functions of an analog filter). |
| **410244(B): Software Architecture and Design Patterns** | |
| **1.** | **Mini-Project 1**: Narrate concise System Requirements Specification and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Identify and categorize the target system services with detailed service specifications modeled with component diagram incorporating appropriate architectural style and coupling. Design the service layers and tiers modeled with deployment diagram accommodating abstraction, autonomy, statelessness and reuse. Map the service levels and primitives to appropriate  Strategies for data processing using Client-Server Technologies as applicable. |
| **2.** | **Mini-Project 2:** Select a moderately complex system and narrate concise requirement specification for the same. Design the system indicating system elements organizations using applicable architectural styles and design patterns with the help of a detailed Class diagram depicting logical architecture. Specify and document the architecture and design pattern with the help of templates. Implement the system features and judge the benefits of the design  patterns accommodated. |
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| **410244(C): Pervasive and Ubiquitous Computing** | |
| Mini-Projects are to be designed so as to use,   * No / minimal extra hardware, * uses open source software's, * need hardly any subscription / telephony / data charges. | |
| **1.** | Design and build a sensing system using micro-controllers like - Arduino / Raspberry Pi / Intel  Galileo to sense the environment around them and act accordingly. |
| **2.** | Design and build a mobile application with context awareness to determine the remaining  battery level depending on the users current usage patterns. |
| **3.** | Design and build a music streaming system and a smart mobile application to use the speakers or headphones of the smart phone of multiple phones to stream stored / live music during a  party (instead of using large speakers). |
| **4.** | Smart Mobile Application with orientation sensing for users to put the phone in meeting / silent mode- OR- outdoor/ loud mode based on the orientation of the device.  -OR-  Smart Mobile Application with ambient sound / noise sensing to adjust the volume of the phone automatically. -OR-  Smart Mobile Application with ambient light sensing to adjust the screen brightness automatically. |

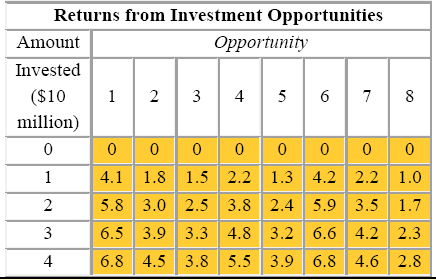
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| **5.** | **Mini-Project 1:** Smart Mobile Application for Location-Based Messaging  Design and build a Location-Based Messaging system where users have commented on various eating joints in the area you currently are. The mobile application should give you inputs / recommendations / suggestions on which eating joints are preferred by whom and for  what eating items, with their ratings etc. |
| **6.** | **Mini-Project 2:** Smart Mobile Application as a Museum Guide  Build a Mobile Application as a museum guide, the device scans the QR codes on the artifacts and gives an interactive detailed explanation using Audio / Text / Video about the museum artifact. using location of the user and the list of previously seen artifacts, the mobile application can suggest / recommend which next artifacts to be seen be the user |
| **7.** | **Mini-Project 3:** Smart Mobile Application as a Travel / Route Guide, Scenario -  You are visiting an ancient monument. There is no local guide available. The previous users have commented on various locations where artifacts can be seen, photo are uploaded.  The smart mobile application will give you directions / recommendations / suggestions on what to see and where, including narratives on the same. |
| **8.** | **Mini-Project 4:** Design and build a „Multifunctional Application‟ in the Mobile and Pervasive domain. The choice of application is to be determined so as to leverage the capabilities of typical smart devices.  These include such characteristics as,   * Location awareness and GPS systems * Accelerometers * Messaging * Sensor detection capability * Microphone and Camera * Media Player * Touch screen * Mapping Technology * Mobile Web Services |
| **410244(D): Data Mining and Warehousing** | |
| **1.** | For an organization of your choice, choose a set of business processes. Design star / snow flake schemas for analyzing these processes. Create a fact constellation schema by combining them. Extract data from different data sources, apply suitable transformations and load into destination tables using an ETL tool. **For Example:** Business Origination: Sales, Order,  Marketing Process. |
| **2.** | Consider a suitable dataset. For clustering of data instances in different groups, apply different  clustering techniques (minimum 2). Visualize the clusters using suitable tool. |
| **3.** | Apply a-priori algorithm to find frequently occurring items from given data and generate strong association rules using support and confidence thresholds.  **For Example:** Market Basket Analysis |
| **4.** | Consider a suitable text dataset. Remove stop words, apply stemming and feature selection techniques to represent documents as vectors. Classify documents and evaluate precision,  recall. |
| **5.** | **Mini project on classification:**  Consider a labeled dataset belonging to an application domain. Apply suitable data preprocessing steps such as handling of null values, data reduction, discretization. For prediction of class labels of given data instances, build classifier models using different techniques (minimum 3), analyze the confusion matrix and compare these models. Also apply  cross validation while preparing the training and testing datasets. |

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|  | **For Example:** Health Care Domain for predicting disease. |
| **410245: Elective II** | |
| **410245(A): Distributed Systems** | |
| **1.** | Design and develop a basic prototype distributed system (e.g. a DFS). |
| **2.** | Design and implement client server application using RPC/ RMI mechanism (Java) |
| **3.** | Design and implement a clock synchronization algorithm for prototype DS |
| **4.** | Implement Ring or Bully election algorithm for prototype DS. |
| **5.** | Implement Ricart Agrawala‟s distributed algorithm for mutual exclusion. |
| **6.** | Problem solving of Wait-die and Wait –wound scheme for deadlock prevention. |
| **7.** | Simulate Wait for Graph based Centralized or Hierarchical or Distributed algorithm for  deadlock detection. |
| **8.** | Implementation of 2PC / Byzantine Generals Problem |
| **Mini-Projects** | |
| Important properties your system should have:   * The system must support multiple, autonomous agents (either human or automated) contending for shared resources and performing real-time updates to some form of shared state. * The state of the system should be distributed across multiple client or server nodes.   The only centralized service should be one that supports users logging on, adding or removing clients or servers, and other housekeeping tasks.  •The system should be robust  The system should be able to continue operation even if one of the participant nodes crashes.  It should be possible to recover the state of a node following a crash, so that it can resume operation. We will let you choose your own application, and we will give you wide latitude in the overall and  the detailed design of your implementation. | |
| Design, implement, and thoroughly test a distributed system, implementing - Shared document editing, in the style of Google docs. The system should support real-time editing and viewing by multiple participants. Multiple replicas would be maintained for fault tolerance. Caching and/or copy  migration would be useful to minimize application response time. | |
| Design, implement, and thoroughly test a distributed system, implementing - A low-latency notification system. E.g., watch a whole bunch of RSS feeds and send all subscribers an email when one is updated. Interface with both the raw RSS feeds and Google‟s update notification service.  Replicate and partition the state of the monitoring system so that it can scale and survive node failures. | |
| Design, implement, and thoroughly test a distributed system, implementing - An airline reservation system. Each airline would maintain its own collection of servers, with enough state replication to  enable automatic fail-over. It would be possible to book travel that involves multiple airlines. | |
| Design, implement, and thoroughly test a distributed system, implementing - Implement a distributed file system that does something interesting. Maybe you want one for storing your MP3s  or movies. Or perhaps for something entirely different. | |
| **410245(B): Software Testing and Quality Assurance** | |
| **1.** | **Mini-Project 1:** Create a small application by selecting relevant system environment / platform and programming languages. Narrate concise Test Plan consisting features to be tested and bug taxonomy. Prepare Test Cases inclusive of Test Procedures for identified Test Scenarios. Perform selective Black-box and White-box testing covering Unit and Integration  test by using suitable Testing tools. Prepare Test Reports based on Test Pass/Fail Criteria and judge the acceptance of application developed. |

**2. Mini-Project 2:** Create a small web-based application by selecting relevant system environment / platform and programming languages. Narrate concise Test Plan consisting features to be tested and bug taxonomy. Narrate scripts in order to perform regression tests. Identify the bugs using Selenium WebDriver and IDEand generate test reports encompassing exploratory testing.



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## 410245(C):: Operations Research

1. **The Transportation Problem:**

Milk in a milk shed area is collected on three routes A, B and C. There are four chilling centers P, Q, R and S where milk is kept before transporting it to a milk plant. Each route is able to supply on an average one thousand liters of milk per day. The supply of milk on routes A, B and C are 150, 160 and 90 thousand liters respectively. Daily capacity in thousand liters of chilling centers is 140, 120, 90 and 50 respectively. The cost of transporting 1000 liters of milk from each route (source) to each chilling center (destination) differs according to the distance. These costs (in Rs.) are shown in the following table

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| Routes | Chilling Centers | | | |
| P | Q | R | S |
| A | 16 | 18 | 21 | 12 |
| B | 17 | 19 | 14 | 13 |
| C | 32 | 11 | 15 | 10 |

The problem is to determine how many thousand liters of milk is to be transported from each route on daily basis in order to minimize the total cost of transportation.

1. **Investment Problem:**

A portfolio manager with a fixed budget of $100 million is considering the eight investment opportunities shown in Table 1. The manager must choose an investment level for each alternative ranging from $0 to $40 million. Although an acceptable investment may assume any value within the range, we discretize the permissible allocations to intervals of $10 million to facilitate the modeling. This restriction is important to what follows. For convenience we define a unit of investment to be $10 million. In these terms, the budget is 10 and the amounts to invest are the integers in the range from 0 to 4. Following table provides the net annual returns from the investment opportunities expressed in millions of dollars. A ninth opportunity, not shown in the table, is available for funds left over from the first eight investments. The return is 5% per year for the amount invested, or equivalently, $0.5 million for each $10 million invested. The manager's goal is to maximize the total annual return without exceeding the budget

## 410245(D):: Mobile Communication

1. Design simple GUI application with activity and intents e.g. Design an android Application for Phone Call or Calculator
2. Design an android application for media player.
3. Design an android Application for SMS Manager

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| **4.** | Design an android Application using Google Map To Trace The Location of Device |
| **5.** | Design an android Application for Frame Animation |
| **6.** | **Mini-Project 1:** Design mobile app to perform the task of creating the splash screen for the application using timer, camera options and integrate Google map API on the first page of the application. Make sure map has following features:   * Zoom and View change * Navigation to specific locations * Marker and getting location with touch * Monitoring of location |
| **7.** | **Mini-Project 2:** Create an app to add of a product to SQLite database and make sure to add following features   * SMS messaging and email provision * Bluetooth options * Accessing Web services * Asynchronous remote method call * Use Alert box for user notification |
| **8.** | **Mini-Project 3:** Create the module for collecting cellular mobile network performance parameters using telephony API Manager   * Nearest Base Station * Signal Strengths * SIM Module Details * Mobility Management Information |
| **9.** | **Mini-Project 4:** Create an application for Bank using spinner, intent   * Form 1: Create a new account for customer, Form 2: Deposit money in customer account. Link both forms, after completing of first form the user should be directed to   the second form. Provide different menu options |
| **10.** | **Mini-Project 5:** Create the module for payment of fees for College by demonstrating the following methods.   * Fees Method()- for calculation of fees, Use customized Toast for successful payment of fees, Implement an alarm in case someone misses out on the fee submission deadline * Demonstrate the online payment gateway. |