# Project Work Book
## (Guidelines and Log)
## Course Code: 410248 & 410256
### (2015 Course)
## Fourth Year of Computer Engineering

Year 2021 - 2022

Group/Project ID:  A10

Team Members:    1.    Suraj Adsul

2.    Amit Dighe

3.    Saurabh Wankhede

4.

Project Title:    Sign Language Recognition Using
Python and OpenCV

Project Guide  :   Mrs. S. B. Borhade

Area of the Project: AI and Machine Learning



## Department of Computer Engineering

**Sinhgad Technical Education Society's**
**Sinhgad Institute of Technology and Science, Pune**

**Savitribai Phule Pune University**

# Preamble

Project work is one of the most important components of the curriculum for an Engineering Graduate. Right from conceiving the idea to its materialization, is a journey that has to be systematized, well defined and well documented to enjoy the full benefits of the efforts undertaken.

Every activity of the project development has its own importance. Team formation, conceiving the idea, preparing the hypothesis, reporting the progress and development to the guide(/mentor), Interactions, suggestions and improvements, relevant documentations in proper format, schedule plans and visit logs are some of the typical activities involved in project development.

Every institute is following their own best methods and techniques as per the guidelines and curriculum of the affiliated university. To bring uniformity for the project work there is a need to come together and prepare comprehensive guidelines and to standardize the process.

This project work book will serve the purpose and facilitate the job of students, guide and project coordinator. This document will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

This document will definitely support the work undertaken.

Dr. Varsha H. Patil
Coordinator, Board of Studies, Computer Engineering
Savitribai Phule Pune University
June 2018

# General Instructions

1. Students should enter correct information in the work book.

2. Get all entries verified by respective project guide. No changes are to be made without project guide's permission.

3. Students should report to their respective guides as per the schedule and its log is to be maintained in the work book.

4. Follow all deadlines and submit all documents strictly as per prescribed formats.

5. The work book should be produced at the time of all discussions, presentations and examinations.

6. The work book must be submitted to project coordinator/ guide/ department / College after successful examination at the end of year.

7. All documents and reports are to be prepared in Latex only (All the formats specifications provided adheres to MS Word but consequently applicable to finalized project report published using Latex)

8. Submit hard as well as soft copy and maintain copy with each member.

This booklet is supportive document to rules and regulations enforced by affiliated university. This booklet provides recommendations, guidelines and is record of all related activities associated with project work. This booklet is provided with a genuine intent to bring uniformity, to systematize the project work and to keep audit of work undergone by team members.

## Work Book Development Project

| | |
|---|---|
| Project Institution | Department of Computer Engineering<br>Matoshri College of Engineering and Research Centre, Nashik |
| Support & Guidance | Dr. Gajanan K. Kharate,<br>Principal, Matoshri College of Engineering and Research Centre, Nashik |
| Concept and Design | Dr. Varsha. H. Patil<br>BoS Coordinator Computer Engineering , SPPU, Pune<br>Vice Principal, Matoshri College of Engineering and Research Centre, Nashik |
| Project coordinator | Mrs. Swati A. Bhavsar<br>Assistant Professor,<br>Matoshri College of Engineering and Research Centre, Nashik |
| Technical Committee Members | 1. Dr. Goraksh V. Garje<br>2. Dr. Parikshit Mahalle<br>3. Mr. Niranjan L. Bhale<br>4. Dr. Sunil R. Dhore<br>5. Dr. Nuzhat Shaikh<br>6. Dr. Sudeep Thepade<br>7. Dr. Mangesh Bedekar<br>8. Ms. Swapnaja Hiray<br>9. Mr. Ranjeet Gawande |
| Date | 5th January 2017 |
| Version No. & Revision Date | 3.0 (Revised on 10th June 2018) |
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# Savitribai Phule Pune University
# Computer Engineering

## Program Educational Objectives

**PEO1.** To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.

**PEO2.** To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.

**PEO3.** To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.

**PEO4.** To prepare the graduates with strong managerial and communication skills to work effectively as an individual as well as in teams.

## Program Outcomes

**Students are expected to know and be able –**

**PO1.** To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis and mathematical modeling to the solution of complex engineering problems.

**PO2.** To analyze the problem by finding its domain and applying domain specific skills

**PO3.** To understand the design issues of the product/software and develop effective solutions with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

**PO4.** To find solutions of complex problems by conducting investigations applying suitable techniques.

**PO5.** To adapt the usage of modern tools and recent software.

**PO6.** To contribute towards the society by understanding the impact of Engineering on global aspect.

**PO7.** To understand environment issues and design a sustainable system.

**PO8.** To understand and follow professional ethics.

**PO9.** To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.

**PO10.** To demonstrate effective communication at various levels.

**PO11.** To apply the knowledge of Computer Engineering for development of projects, and its finance and management.

**PO12.** To keep in touch with current technologies and inculcate the practice of lifelong learning.

## Program Specific Outcomes (PSO)

A graduate of the Computer Engineering Program will demonstrate-

**PSO1:** Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

**PSO2:** Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

**PSO3:** Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

# Table of Contents

# 1. Project Work

The word *project* comes from the Latin word *projectum* from the Latin verb *proicere*, "to throw something forwards" which in turn comes from *pro-*, which denotes something that precedes the action of the next part of the word in time (paralleling the Greek ðñü) and *iacere*, "to throw". The word "project" thus actually originally meant" something that comes before anything else happens".

(Curtsey Ref- http://en.wikipedia.org/)

The intention of Project work is to conceive an idea and to implement it systematically by using knowledge derived during the course of education mainly to innovate or facilitate.

A group of Under Graduate students at Final Year will undertake project over academic year. Work involves study of feasibility of the project, planning of project, studying existing systems, tools available to implement the project and state of art software testing procedures and technology with use of case tools, design is to be implemented into a working model (software or hardware or both) with necessary software interface as an executable package.

## 1.1 Project Audit Committee (PAC):

It is recommended to form a departmental "Project Audit Committee" to monitor project activities comprising of Head, Project Coordinator, Industry Expert(s), External Expert(s), Department Academic Coordinator and few senior guides.

## 1.2. Course Objectives:

- To Apply the knowledge for solving realistic problem
- To develop problem solving ability
- To Organize, sustain and report on a substantial piece of team work over a period of several months
- To Evaluate alternative approaches, justify the use of selected tools and methods
- To Reflect upon the experience gained and lessons learned
- To Consider relevant social, ethical and legal issues,
- To find information for yourself from appropriate sources such as manuals, books, research journals and from other sources, and in turn increase analytical skills.
- To Work in TEAM and learn professionalism.

## 1.2 Course Outcomes:

Students are expected to know and be able to-

**CO1. Knowledge Application & Independent Learning:** Solve real life problems by applying knowledge and skills keeping eye on current technologies and inculcating the practice of lifelong learning

**CO2. Problem Solving Skills:** Analyze alternative approaches, apply and use most appropriate one for feasible solution exhibiting project management skills

**CO3. Communication:** Demonstrate effective communication at various levels and write precise reports and technical documents in a nutshell

**CO4. Collaboration:** Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality

**CO5. Ethics:** Provide solution to problems considering social, safety, environmental, ethical and legal issues

## 1.3 Mapping of Course Outcomes (CO) of Project Work and Program Outcomes (PO):

The proper assessment of the COs and POs is one of the most important processes and it is to be done with precision and planning. It is recommended to assess the students continuously as they progress through the program. It is collectively one or more processes that define, collect, and prepare data to evaluate the achievement of Program Outcomes. Every COs are to be mapped to different POs based on their influence of COs on them. Sample mapping of PO and CO for project work is given in table 1.

**Table 1: Mapping of CO and PO**

|       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| **CO1** | √ | √ | √ |   | √ | √ |   |   |   |      |      | √ |
| **CO2** | √ | √ | √ | √ |   |   |   |   |   |      | √    |   |
| **CO3** |   |   |   |   |   |   |   |   |   |      | √    |   |
| **CO4** |   |   |   |   |   |   |   |   | √ | √    |      |   |
| **CO5** |   |   |   |   |   | √ | √ | √ |   |      |      |   |

## 1.4 Guidelines for Project Work Selection, Finalization and Guide Allotment:

Project is one of the significant contributory team works that has to be completed with distinct impression. It is necessary to explore the domain of interest / research/ thirst area/ society needs. In Toto one cannot figuratively define best project but still there are certain parameters on which we can gauge the quality of project work done. It will be better suited to go for well-defined and relatively safe projects that provide scope for demonstrating proficiency with a low risk of failure especially at Under Graduate level.

**Process in General:**
1. Project teams and their areas of interest is to be registered with project Coordinator preferably in second semester of third year.
2. Students are provided with list of guides & their domain of expertise, list of earlier three years projects, constitution of PAC and copy of logbook giving all guidelines.

3. Considering registered teams area of interest/domain and expertise of guide, the Project coordinator in consultation with PAC tentatively allots Project guides.
4. Team may come up with sponsored project (Title suggestion and associated guidance by external institute/Company).
5. Teams in consultation with guide prepare project proposal(s)
6. Project Proposal must include project title, group members, sponsorship details (if any), detailed problem definition, area, Type of Project [Sponsored/Non Sponsored, AND viz- 1. Framework, 2. System as - Application/ Systems Software with or without Hardware 3. Research, 4. Survey], abstract, details of existing similar systems if any, scope of the project and software-hardware requirements. [Sponsorship details include name of sponsoring authority, address, name of guide, sponsorship terms and conditions and respective documents certifying the same from authorities].
7. A Panel of experts will approve the project group and title. Discussion / presentation may be arranged covering topics listed in the proposal.
8. Once project titles are finalized by PAC, guides are reallocated/ changed, if required.
9. It is recommended to seek guidance from PG students and/or alumini and assistance from third year students.
10. It is recommended to maintain record of all meetings, discussions, suggestions, contributions and roles played by each member of the team.

**Dos and Don'ts:**

- Project work is expected to involve a combination of study (literature study/ line of investigation), and methodical implementation.

- Instead of fancied and driven behind the gaudy and ostentatious ideas, utility needs to be emphasized. It is also acceptable to identify the discrepancies/ flaws an existing system and work accordingly to rectify or improve.

- It is irrational to select the IDE and the software/ tools before the idea is not yet finalized.

- Identify domain, feasibility and usability of work.

- Understand the way project will materialize and progress is of at most importance.

## 1.5 General Project Evaluation Parameters:

Project work is to be evaluated jointly by both Internal and External examiners, unanimously agreeing upon the following parameters amongst many others.
1. Problem definition and scope of the project.
2. Thorough literature survey done.
3. Exhaustive and rational requirement analysis.
4. Appropriate software engineering approach followed.
5. Use of project management tools.
6. Comprehensive implementation

7. Optimization considerations (memory, time, resources, costing).
8. Use of parallel/multi-core, embedded, distributed computing approach.
9. Thorough testing of all modules and integration of modules done.
10. Project presentation and demonstration.
11. User interface, ease of use, usability and GUI.
12.  Understanding individual capacity, role and involvement in the project.
13. Team work (roles defined, distribution of work, intra-team communication and togetherness).
14. Participation in various contests, publications and IPR.
15. Presentation of work in the form of project report(s). Documents /manuals
   - project report, quick reference, system, installation guide etc
16. Outcomes / usability/ commercial value/ product conversion of work
17. Consideration of social, safety, environmental, ethical and legal issues

## 1.8. Publications Guidelines:

The work undertaken is to be appreciated and recognized by the significant publications and/or IPR. The quality of the publications reflects the efforts and recognition of the work. So, it is highly recommended to publish work in consultation with the guide in referred national and international Journals of repute, with high Impact Factor and also in recognized conferences. There are some journals operating in different regions which use 'International' word, but in true sense are not International.  Refer

1. http://www.fi.dk/viden-og-politik/tal-og-analyser/den-bibliometriske-forskningsindikator/autoritetslister-for-tidsskrifterog-forlag/bfi-publishers-2011.pdf
2. http://www.fi.dk/viden-og-politik/tal-og-analyser/den-bibliometriske-ingsindikator/autoritetslister-for-tidsskrifter-og-forlag/Autoritetslisten%20for%20tidsskrifter%202011%20-20med%20niveauer.pdf

## 1.9. IPR Guidelines:

The first legislation in India for protection of Industrial Designs was The Patents & Designs Protection Act, 1872. It supplemented the 1859 Act passed by Governor General of India for granting exclusive privileges to inventors and added protection for Industrial Design. The 1872 Act included the term ¯any new and original pattern or design, or the application of such pattern or design to any substance or article of manufacture '.
Hence it is recommended that students should know about Copyright
and Patents. Refer-
1.  http://www.ipindia.nic.in
2.  http://www.ipindia.nic.in/writereaddata/Portal/IPOGuidelinesManuals/1_30_1_manual-designs-practice-and-procedure.pdf

# 2. University Syllabus (semester I)

## Project Work Stage I

**Course Objectives:**
- To Apply the knowledge for solving realistic problem
- To develop problem solving ability
- To Organize, sustain and report on a substantial piece of team work over a period of several months
- To Evaluate alternative approaches, and justify the use of selected tools and methods,
- To Reflect upon the experience gained and lessons learned,
- To Consider relevant social, ethical and legal issues,
- To find information for yourself from appropriate sources such as manuals, books, research journals and from other sources, and in turn increase analytical skills.
- To Work in TEAM and learn professionalism

**Course Outcomes:**

**On completion of the course, student will be able to-**
- Solve real life problems by applying knowledge.
- Analyze alternative approaches, apply and use most appropriate one for feasible solution.
- Write precise reports and technical documents in a nutshell.
- Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality

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**Guidelines-**

Project work Stage – I is an integral part of the Project work. In this, the student shall complete the partial work of the Project which will consist of problem statement, literature review, design, scheme of implementation (Mathematical Model/SRS/UML/ERD/block diagram/ PERT chart, etc.) and Layout & Design of the Set-up. The student is expected to complete the project up to the design phase. As a part of the progress report of Dissertation work Stage-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected project topic. The student shall submit the duly certified progress report of Project work Stage-I in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

The examiner will be assessed by a panel of examiners of which one is necessarily an external examiner. The assessment will be broadly based on work undergone, content delivery, presentation skills, documentation and report.

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**Project Work Stage II**

## Course Objectives:
- To follow SDLC meticulously and meet the objectives of proposed work
- To test rigorously before deployment of system
- To validate the work undertaken
- To consolidate the work as furnished report.

## Course Outcomes:
On completion of the course, student will be able to–
- Show evidence of independent investigation
- Critically analyze the results and their interpretation.
- Report and present the original results in an orderly way and placing the open questions in the right perspective.
- Link techniques and results from literature as well as actual research and future research lines with the research.
- Appreciate practical implications and constraints of the specialist subject

**Guidelines-**

In Project Work Stage-II, the student shall complete the remaining project work which consists of Selection of Technology and Tools, Installations, UML implementations, testing, Results, performance discussions using data tables per parameter considered for the improvement with existing/known algorithms/systems and comparative analysis and validation of results and conclusions. The student shall prepare and submit the report of Project work in standard format for satisfactory completion of the work that is the duly certified by the concerned guide and head of the Department/Institute

## 3. Undertaking by Students

# Sinhgad Institute of Technology and Science, Pune

With reference to circular (ref-project/2009/3369) regarding malpractices in project work from DTE, Pune following undertaking is to be submitted.

## UNDERTAKING BY STUDENT

We, the students of B.E. Computer hereby assure that we will follow all the rules and regulations related to project activity for the academic year 20 -20 . The Project titled-

### Sign Language Recognition Using Python and OpenCV

will be fully designed/ developed by us and every part of the project will be original work and will not be copied/ purchased from any source.

| Name of the student | Signature |
|---|---|
| 1. Suraj Adsul | _____ |
| 2. Amit Dighe | _____ |
| 3. Saurabh Wankhede | _____ |
| | _____ |

## 4. Schedule of Project Work

## Semester I

| Sr. No. | Activity Scheduled | Date (Tentative) |
|---|---|---|
| 1. | Registration of Project Teams | Third Year Semester II/ Mid of June |
| 2. | Submission of Project Proposal | Last Week of June |
| 3. | Project presentations | First week of July |
| 4. | Finalization of projects & allotment of guide | Second week of July |
| 5. | Submission of final Proposal | Third week of July |
| 6. | Review meeting/ presentation for progress of project work- I | Last week of July |
| 7. | Review meeting/ presentation for progress of project work- II | Third week of August |
| 8. | Review meeting/ presentation for progress of project work- III | Second week of Sept |
| 9. | Review meeting/ presentation for progress of project work- IV | Last week of Sept |
| 10. | Submission of partial project report | $1^{st}$ Week Oct |
| 11. | Project work (Stage I) Examination | As per SPPU Notification |
| | | |

## Semester II

| Sr. No. | Activity Scheduled | Date(Tentative) |
|---|---|---|
| 1. | Review meeting/ presentation for progress of project work -V | Second week of Jan |
| 2. | Review meeting/ presentation for progress of project work -VI | Second week of Feb |
| 3. | Review meeting/ presentation for progress of project work- VII | Last week of March |
| 4. | Submission of final project report and Project Work book to the project Coordinator | First week of April |
| 5. | Project Examination | As per SPPU Notification |

## Schedule of Project Work – Semester –I

| Sr. | Project Activity | Date |
|---|---|---|
| 1. | Commencement of Teaching | 15.06.2021 |
| 2. | Domain Identification | 25.06.2021 |
| 3. | Submission of Project Proposal | 30.06.2021 |
| 4. | Project Idea Presentation | 06.07.2021 to 07.07.2021 |
| 5. | Finalization of Projects & Allotment of Guide | 12.07.2021 |
| 6. | Submission of Final Proposal | 19.07.2021 |
| 7. | Project Review- I - Problem Statement, Motivation, Objectives and Literature Review | 26.07.2021 to 30.07.2021 |
| 8. | Corrections if any of PR-I & Preparation of Review II | 02.08.2021 |
| 9. | Preparation of Review II & Latex Environment and Report Templates | 09.08.2021 |
| 10. | Project Review- II - Feasibility and Scope | 12.08.2021 to 13.08.2021 |
| 11. | Corrections if any of PR-II & Preparation of Review III | 16.08.2021 |
| 12. | Documentation of PR-I & PR-II in Latex, Paper Writing | 23.08.2021 |
| 13. | Documentation of PR-I & PR-II in Latex, Paper Writing | 30.08.2021 |
| 14. | Preparation of Review III | 06.09.2021 |
| 15. | Project Review- III – Requirement Analysis | 08.09.2021 & 10.09.2021 |
| 16. | Corrections if any of PR-III & Preparation of Review IV, Paper Writing | 13.09.2021 |
| 17. | Documentation of PR-III in Latex & Preparation of Review IV, Paper Writing | 20.09.2021 |
| 18. | Final Project Review - Design | 27.09.2021 to 28.09.2021 |
| 19. | Abstract & Conclusion of Paper | 04.10.2021 |
| 20. | Submission of Partial Project Report | 07.10.2021 |
| 21. | Term End | 30.10.2021 |
| 22. | Project work Examination | As per SPPU Notification |

# 5. Project Review (Semester I)

The group members are expected to present their work undertaken during the semester. Journey of development has to be rationally presented with thorough literature survey in review meeting.

## 5.1 Project Review-I: Problem Statement, Motivation, objectives and Literature Review

Student is expected to deliver presentation covering Problem Statement, Motivation, objectives and Literature Review.

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Do Research gap identified lead to find motivation of project? | |
| 2. | Does the statement give clear identification about what your project will accomplish? | |
| 3. | Is the statement short and concise? | |
| 4. | Does similar type of methodology / model exist? | |
| 5. | Is the studied literature sufficient to decide scope of the project? | |
| 6. | Are the objectives clearly and unambiguously listed? | |
| 7. | Can a person who is not familiar with the project understand scope of the project by reading the project problem statement? | |
| 8. | Are project objectives of study (what product, process, resource etc.) clearly defined? | |
| 9. | Are the objectives set helpful to achieve goal of the project? | |
| 10. | Does the project contribute to our Society by any means? | |

**Sign of Guide:**　　　　　　　　　　　　　　　**Date:**

**Remark and Suggestions:**




**Name and Sign of Reviewers:**

**1.**

**2.**

## 5.2 Project Review-II: Feasibility and Scope

Student is expected to deliver presentation covering Feasibility and Scope

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Is the project's view point understood? | |
| 2. | Is the project goal statement in alignment with the sponsoring organization's business goal and mission? | |
| 3. | Who is the project's end user? | |
| 4. | What is the projected cost of producing a product? | |
| 5. | Is project achievable in specified (Time & Cost Budget)? | |
| 6. | Are the requirements within the scope of the project? | |
| 7. | Is the scope properly defined? | |
| 8. | Does the problem statement clearly define scope of the project? | |
| 9. | Do the project requirements fit into available software and hardware? | |
| 10. | Whether the milestones are stated completely and project timeline is given? | |
| 11. | Whether risks like technical risks, Operational risks, schedule risks, business risks are identified correctly or not? | |
| 12. | Whether Risk prioritization is done properly and any back up plan is decided? | |

**Sign of Guide:**                                     **Date:**

**Remark and Suggestions:**

**Name and Sign of Reviewers:**

**1.**

**2.**

## 5.3 Project Review-III: Requirement Analysis
Student is expected to deliver presentation covering Requirement Analysis

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Is information domain analysis complete, consistent and accurate? | |
| 2. | Is problem statement categorized in identified area and targeted towards specific area there in? | |
| 3. | Is external and internal interfacing defined? | |
| 4. | Are requirements consistent with schedule, resources and budget? | |
| 5. | Are all requirements traceable to system level? | |
| 6. | What is needed to make the product? | |
| 7. | Is there demand for the product? | |
| 8. | Is identification of stakeholders done properly? | |
| 9. | Whether all requirements are captured and documented in line with scope? | |
| 10. | Whether all type of analysis classes are identified? | |
| 11. | Whether the Acceptance criteria are decided? | |
| 12. | Is SRS document as per IEEE format complete and correct? | |

**Sign of Guide:**                                     **Date:**

**Remark and Suggestions:**

**Name and Sign of Reviewers:**

**1.**

**2.**

## 5.4 Project Review-IV: Design

Student is expected to deliver presentation covering Design

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Are requirements reflected in the system architecture? | |
| 2. | Does the design support both project (product) and project goals? | |
| 3. | Does the design address all the issues from the requirement? | |
| 4. | Does the design address all the issues from the requirement? | |
| 5. | Is effective modularity achieved and modules are functionally independent? | |
| 6. | Are structural diagrams (class, Object, etc) well defined? | |
| 7. | Are all class associations clearly defined and understood?(Is it cleat which classes provide which services)? | |
| 8. | Are the classes in the class diagram clear? (What they represent in the architecture design document?) | |
| 9. | Is inheritance appropriately used? | |
| 10. | Are the multiplicities in the use case diagram depicted in the class diagram? | |
| 11. | Are all objects used in sequence diagram? | |
| 12. | Are the symbols used in all diagrams corresponding to UML standards? | |
| 13. | Are behavioral diagrams (use case, sequence, activity, etc.) well defined and understood? | |
| 14. | Does each case have clearly defined actors and input/ output? | |
| 15. | Does the sequence diagram match with class diagram? | |
| 16. | Is aggregation/ containment (used) clearly defined and understood? | |
| 17. | Whether State charts are capturing system's dynamic behavior correctly? | |

**Sign of Guide:**                                    **Date:**

**Remark and Suggestions:**




**Name and Sign of Reviewers:**

**1.**

**2.**

## 6. Internal Evaluation Sheet (Semester I)

| Sr. No. | Names of Team Members | Problem Statement / Motivation / Objectives / Scope/ Feasibility Requirement (05) | Literature Survey (05) | Requirement Analysis (05), Modeling & Designing (10) | Planning & Prototyping (05) | Presentation & Question - Answer (10) | Partial Project Report (10) | Total (50) |
|---|---|---|---|---|---|---|---|---|
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |
| 4. | | | | | | | | |

**Name and Signature of Evaluation Committee:**

      1.  **Prof.**

      2.  **Prof.**

**Examiners Feedback and Suggestions:**




**Signature of Guide**      **PAC**      **Signature of Head**
[Name of Guide]      [Name of HoD]
      **Head of Department**

## 7. Project Review: (Semester II)

The group members are expected to present their work undertaken during the semester. Journey of development has to be rationally presented.

### 7.1 Project Review-I: Modeling (Model Refinement and Algorithm development)

Student is expected to deliver presentation covering Modeling

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Which software Development Process model is used? (Water fall, Incremental, RAD) How? (? at this level?) | |
| 2. | Are data objects, their attributes and relationships clearly identified? (All constraints for SRS are captured or not?) | |
| 3. | Have the objects and respective classes and their responsibilities? | |
| 4. | Have you analyzed the requirements been analyzed and represented into respective models? | |
| 5. | Have the different system states been differentiated and depicted them in the form of state transition diagram? | |
| 6. | Does the mathematical model clearly imply design of the project? | |
| 7. | Does the mathematical model clearly states goal of project? | |
| 8. | Is the interface between the modules properly identified? | |
| 9. | Are any functional dependencies identified and described? | |
| 10. | Which architectural model does the system support? | |
| 11. | Whether Deployment diagram is in line with selected architecture? | |
| 12. | Whether all components are designed properly and represented in component diagram? | |
| 13. | Whether NP-completeness of algorithms is checked? | |

**Sign of Guide:**                                               **Date:**

**Remark and Suggestions:**




**Name and Sign of Reviewers:**

**1.**

**2.**

## 7.2 Project Review-II: Coding / Implementation

Student is expected to deliver presentation covering Coding / Implementation

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Does the code completely and correctly implement the design? | |
| 2. | Does the code comply with the coding standard? | |
| 3. | Is the code well structured, consistent in style, and consistently formatted? | |
| 4. | Are all functions in the design coded? | |
| 5. | Does the code make use of object oriented concepts? | |
| 6. | Does the code support granularity? | |
| 7. | Is the language used for coding correctly chosen as per the project need? | |
| 8. | If any off-the-shelf components are used, Have you understood the functionalities of using it? | |
| 9. | Are all comments consistent with the code? | |
| 10. | Whether code optimization is done properly?(By using language features) | |

**Sign of Guide:**                                    **Date:**

**Remark and Suggestions:**



**Name and Sign of Reviewers:**

**1.**

**2.**

## 7.3 Project Review-III: Validation and Testing
Student is expected to deliver presentation covering Validation and Testing

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Has alpha testing been done? | |
| 2. | Has beta testing been done? | |
| 3. | Have been validated the requirements, design and code as per standard? | |
| 4. | Has GUI testing of project been performed? How? | |
| 5. | Does the system comply with basic usability norms? | |
| 6. | Has the code been tested using standard datasets available in your area of project? | |
| 7. | Has the code been tested in real time environment? | |
| 8. | After integration of all components whether total performance of system is checked? | |
| 9. | Whether repository of all components along with versions is documented? | |
| 10. | Have social, safety, environmental, ethical and legal issues been considered while providing solution to problem? | |

**Sign of Guide:**                                      **Date:**

**Remark and Suggestions:**

**Name and Sign of Reviewers:**

**1.**

**2.**

## 7.4 Project Review-IV: Report Writing

Student is expected to deliver presentation covering Report Writing

| Sr. | Question | Remark / Grade |
|---|---|---|
| 1. | Is the report written as per the prescribed format? | |
| 2. | Is the report timely prepared? | |
| 3. | Is the report properly organized, spelled, grammatically correct? | |
| 4. | Is the report plagiarism free? | |
| 5. | Is the report precise and written to the point? | |
| 6. | Does the report contain complete results and comparative graphs? | |
| 7. | Are all figures and tables properly numbered and labeled? | |
| 8. | Are all figures and tables properly cited? | |
| 9. | Whether references are properly cited? | |

**Sign of Guide:**                                        **Date:**

**Remark and Suggestions:**

**Name and Sign of Reviewers:**

**1.**

**2.**

## 8. Internal Evaluation Sheet (Semester II)

| Sr. No. | Names of Team Members | Modeling (10) | Coding and Implementation (40) | Testing (10) | Understanding, Individual Involvement / Contribution in the project (10) | Team Work (10) | Demonstration cum Presentation (10) | Documents & Report (10) | Total (100) |
|---------|----------------------|---------------|-------------------------------|--------------|---------------------------------------------------------------------------|----------------|-------------------------------------|-------------------------|-------------|
| 1. | | | | | | | | | |
| 2. | | | | | | | | | |
| 3. | | | | | | | | | |
| 4. | | | | | | | | | |

**Name and Signature of Evaluation Committee:**

1. **Prof.**
2. **Prof.**

**Examiners Feedback and Suggestions:**



**Signature of Guide**          PAC                    **Signature of Head**
[Name of Guide]                                        [Name of HoD]
                                                       **Head of Department**

## 9. Contest Participation Details

### 9.1. Participation in Project Competition

| Sr. No. | Name and Place of Project Competition and Exhibition | Date | Certificates / prizes won, if any |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

Attach attested copy of certificate(s)

### 9.2. Paper Publication/ Presentation/IPR

| Sr. No. | Name of Organizer | Date | Certificates/ Prizes won, if any |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

Attach attested copy of certificate(s)

# 10. Rubrics

### A. Idea Inception

| Grade (Grade Point) \ Parameter | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| Problem Definition and Scope of the Project | | | | |
| Literature Survey | | | | |
| Software Engineering Approach | | | | |
| Requirement Analysis | | | | |

### B. Implementation

| Grade (Grade Point) \ Parameter | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| Implementation- Design, platform, coding, | | | | |
| Optimization considerations(Memory, time, Resources, Costing) | | | | |
| Thorough Testing of all modules | | | | |
| Integration of modules and project as whole | | | | |

### C. Documentation

| Grade (Grade Point) \ Parameter | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| Proposal | | | | |
| Project Report | | | | |
| Quick references | | | | |
| System manual | | | | |
| Installation Guide | | | | |
| Work Book | | | | |

### D. Demonstration

| Grade (Grade Point) | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| **Parameter** | | | | |
| Project Presentation and Demonstration(User Interface, ease of use, usability) | | | | |
| Understanding individual capacity & involvement in the project | | | | |
| Team Work (Distribution of work, intra-team communication and togetherness) | | | | |
| Outcomes / Usability | | | | |

### E. Contest Participation / Awards, Publications and IPR

| Grade (Grade Point) | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| **Parameter** | | | | |
| Participation in various contests | | | | |
| Appreciation and Awards | | | | |
| Publications | | | | |
| Copyright | | | | |
| Patent | | | | |
| Commercial value /product conversion of Work | | | | |

### F.  Environment & Ethics (solution to problems considering)

| Grade (Grade Point) | Excellent (10-9) | Very Good (6-8) | Fair (3-5) | Poor (1-2) |
|---|---|---|---|---|
| **Parameter** | | | | |
| **social** | | | | |
| **safety** | | | | |
| **environmental** | | | | |
| **ethical** | | | | |
| **Legal issues** | | | | |

### Annexure I: Format for Final Proposal

**Title Page**
- Project Group ID
- Title of the project
- Domain such as Databases, Data Mining, Image processing, WSN, Web technology etc.
- Team Member (PRN, Roll No, Name, Role/Task assigned, email, mobile & sign)
- Sponsorship details, if any (Name, External Guide name and Designation with Signature, e- Mail ID)
- Internal Guide(with signature of approval)
- Type of Project
- Mentor(PG Student/Alumni/other)
- TE students associated with:(Roll No, Name)

**Inner Pages:**
- Keywords (ACM Keywords)
- Problem Definition
- Abstract
- Process Diagram, System architecture, List of modules, and functionalities
- Literature survey (Study, Current market survey: similar systems/products available, their pros and cons.
- Objectives
- Scope of the project
- Software and hardware requirements
- Expected Outcomes
- Probable date of completion
- References (This should include the list of books, magazines, research papers, web links etc. referred by the students)

## Annexure II: System Requirement Specification

Software requirement Specification is a detailed write-up indicating the requirements that the project demands. It contains actual detailed problem definition. The definition should include all that is to be done and is to be developed in the final software and / or Hardware (product) that has to be generated form the years work (User's point of view). The entries under this section are to be categorized as,

1. Necessary functions,
2. Desirable functions, and others

Requirement may not be final and provision should be available to add features dynamically without affecting the actual flow and design of the document. Modified requirements (after doing feasibility study) are to be prepared under all the 3 categories listed above form the developer's point of view. The requirements listed herein should be feasible technically form the software/ Hardware point of view.

It should include following important requirements.

**1. Detailed Problem Definition**

**2. External Interface Requirements**
- User interfaces
- Hardware Interfaces
- Software Interfaces
- Communication Interfaces

**3. System Features**
- Feature 1
- Feature 2 etc.

**4. Other Non- functional requirements.**
- Performance requirements
- Safety requirements
- Software Quality attributes

A preliminary report of project work (Partial Project Report) is to be prepared as per the guideline given below using **Latex** and is to be submitted at the end of semester I.

**Title Page**

First page containing Name, Topic Name, Guide Name, Year, Branch, and College Name etc.

**Certificate**

- Certificate
- Project approval sheet
- Certificate by the sponsoring authority, if any.

**Acknowledgements (if any)**

Thanking any person / staff member / friend if to be done so.

**Abstract**

A minimum of 100 words briefing the topic in consideration.

**Keywords**

A minimum of 5 and maximum of 10

**Introduction**

Introduction includes briefing of the details to follow, details of project work, objectives, scope of the project, motivation and organization of report.

**Literature Survey**

The purpose of the literature survey is to identify information relevant to project work and the potential and known impacts of it within the project area. This section should include a comprehensive report of current market survey done with respect to problem. Include study of similar systems available, if any along with their pros and cons. identify those areas where there is an absence or scarcity.

**Design Details (Phase I to IV)**

Phase I: Requirements Analysis
The Group is to submit a detailed write – up indicating the requirements that the project demands, viz.

- Actual detailed problem definition.
- The definition is to include all that is to be done and is to be put up in the final software and / or
- Hardware (product) that is to be generated from the years work (User's point of view).

Requirement may not be final and provision should be available to add features dynamically without affecting the actual flow and design of the document.

Modified Requirements (After doing feasibility study) are to be prepared under all the 3 categories listed above from the developer's point of view. The requirement listed herein should be feasible technically from the software / Hardware point of view.

**Follow the standard format of SRS.**

**Phase II: Analysis Phase**

The group (based on Phase I) is to suggest the paradigm followed by them in the project. The paradigm should be justifiable from Phase I. The various stages and work to be completed under them is to be indicted in detail.

**Phase III: Design Phase**

ERDs (Optional, decide in consultation with guide)

- The group is to draw the ERD (Entity Relationship Diagram) for the project. (This should be justifiable with regard to Phase I & II)
- The ERD after getting evaluated (by dry running) is to be analyzed for incompleteness from any point of view.
- The ERD thus validated should be made fair in a presentable fashion.
  - This ERD is to be included in the Report.

**IF**

**The project group is to follow an "Object Oriented" Approach for their Project.**
**THEN**

- The group should all UML (Unified Modeling Language) diagrams for the project.
- These diagrams are to be refined in every aspect for this report(as per requirements finalized in phase I)
- Proper notations are to be used in all the figures drawn.
- Proper Color-coding if required is to be used.
- Extensions to diagrams / customizations may be done and represented ( if the project demands it)

**ELSE (groups following Structured Approach)**

- The group should draw the DFD-s (Data Flow Diagrams) for the Project. (These should be justifiable with respect to Phase I, II and the ERD)
- DFD Level 0, Level 1, Level 2 should be drawn in an evolutionary fashion ( No entries to appear in Level 2 unless they are in Level 1, which in turn are in Level 0)
- The DFD's are to be validated and made final in a presentable fashion.
- Proper Color- coding is expected
- Extensions to DFD-s may be represented (if the project demands it)

**Phase – IV: Planning Phase**

- The group should finalize the Front End/ Back End required for the project as per the demands of the project( Software and / or hardware)
- The Front End/ Back End should be justifiable depending on the complexity of the project.
- The structure of the database should be finalized depending on the complexity of the project.
- Any Normalization required on the database is done so as to ensure correctness for the future phase.
- Coding Language / Methodology should be finalized/
- Time requirement to be finalized and indicated
- Actual project plan including major milestones should be decide and finalized
- Rough estimates of lines of code / functions / routines to be made.
- Rough estimates of lines of code / Objects / Classes to be made ( for Groups following OO Paradigm)

- Software Reuse /Re – Engineering possibilities are to be expected and indicated
- Software and Hardware requirement.
- Probable date of completion.
   Scope of the project.

- A prototype is expected which basically includes all the MAJOR features in the project.
- The GUI/ Front end should be prepared.
- The structure of the database / back end (if any) to be indicated.
- The prototype is built basically to give a feel of the actual software and / or hardware (Product) that is expected
   Major routines / Functions are expected.

**Conclusions**

Write conclusions drawn from the work done with atleast 50 words.

**References**

List out Books, Magazines, Thesis, Journals, Web links etc referred in IEEE format

**Plagiarism Check Report**

## Annexure IV:  Format for Project Report (Semester II)

A report of project work has to be prepared as per the guidelines given below using Latex and should be submitted at the end of semester II along with CD containing (copy of Partial Project Report, Final Project Report along with .tex files, Power point presentation, copy of base paper and reference papers, executable Project Code, supportive software platform for the project execution).

- **First page as per standard college reports**
  First page containing Name, Topic Name, Guide Name, Year, Branch, and
College Name etc. (see format displayed herewith)
- **Certificate** (will be provided by college)
  Dissertation approval sheet (see format displayed herewith) Also attach certificate certifying the project work done approved by the sponsoring authority, if any.
- **Abstract**
  A minimum of 100 words briefing the topic in consideration.
- **Keywords**
  A minimum of 5 and maximum of 10
- **Index**
  Details of various Topics, Sub-Topics, with Page No. Figure Index, giving details
of page number, figure number and figure caption Table Index, giving details of page number, table number and table caption (If any) Index of Pseudo-code / Sample code (If any)

**I) Introduction**
Minimum of 200 words, giving some briefing of the details to follow.

- · Detailed problem definition

- · Justification of problem

- · Need for the new system

- · Advances/additions/updating the previous system

- · Presently available systems for the same

- · Purpose of your system

- · Organization of the report

This section should be relevant to the Literature Survey done and reported in the partial project report. The purpose of the literature survey is to identify information relevant to project work and the potential and known impacts of it within the project area. This section should include a comprehensive report of current market survey done with respect to problem. Include study of similar systems available, if any along with their pros and cons. identify those areas where there is an absence or scarcity.

**II) Analysis**
- · Project plan
- · Requirement analysis
- · Team structure

The Group has to submit a detailed write-up indicating the requirements that the project demands-

**Actual detailed problem definition**

The definition should include all that has to be done and developed in the final software and / or Hardware (product) that will be generated from the years work (User's point of view).

The entries under this section are to be categorized as-
1. Necessary functions,
2. Desirable functions,
3. Others

Requirement may not be final and provision should be available to add features dynamically without affecting the actual flow and design of the document. Modified Requirements (after doing feasibility study) are to be prepared under all the 3 categories listed above from the developer's point of view. The requirements listed herein should be feasible technically from the Software / Hardware point of view. The new list should be categorized in the 3 categories listed above. (Follow the IEEE format of SRS)

The group is to suggest the Paradigm followed by them in the Project. The Paradigm should be justifiable from Phase I. The various stages and work to be completed under them has to be indicted in detail.

**III) Design**

· Software Requirement Specification(SRS) format is as given below.

· Risk assessment

· Brief discussion on Project plan submitted in semester I including major milestones

and the work done as per it.

**IV) Modeling**

· UML diagrams (all 9)

· ERD & Normalization (NF) for database (if any)

· The group should draw the ERD (Entity Relationship Diagram) for the Project. (This should be justifiable with regard to Phase I & II)

· The ERD after getting evaluated (by dry running) should be analyzed for incompleteness     from any point of view

· The ERD thus validated should be made fair in a presentable fashion

· This ERD is to be included in the Report

**IF**

The project group is to follow an "Object Oriented "Approach for their Project.

**THEN**

· The group should prepare all UML (Unified Modeling Language) diagrams for the project

· These diagrams are to be refined in every aspect for this report (as per requirements

finalized in phase I)

· Proper notations are to be used in all the figures drawn

· Proper Color-coding if required is to be used

· Extensions to diagrams / customizations may be done and represented (if the project demands it)

---

**ELSE (groups following Structured Approach)**
       · The group is to draw the DFD-s (Data Flow Diagrams) for the Project.
(These should be justifiable with respect to Phase I, II and the ERD)
       · DFD Level 0, Level 1, Level 2 should be drawn in an evolutionary fashion
(No entries to appear in Level 2 unless they are in Level 1, which in turn are in Level 0)
       · The DFD-s are to be validated and made final in a presentable fashion.
       · Proper notations are to be used in all the figures drawn
       · Proper Color-coding is expected
       · Extensions to DFD-s may be represented (if the project demands it)

## V) Coding

- Software used
- Hardware specification
- Programming language
- Platform
- Components
- Tools
- Coding Style Format

## V) Test data Sets, Result and Analysis

## VI) Testing
       · Format technical reviews
       · Test plan
       · Test cases
       · Test results
       (Unit, integration, regression, system,á,â)

## VII) Configuration Management Plan

## VIII) Software Quality Assurance Plan
       * Costing (Time, Money and Resources)
       (Do not include costing in the project report; submit to the guide)

## Conclusion
Conclusions in atleast 50 words based on work done

## References
List out Books, Magazines, Thesis, Journals, Web links etc referred in IEEE format

## Glossary
In Keyword Alphabetical Order Ascending along with Page numbers

## Plagiarism Check Report

**Annexure V: Project Report Formatting Guidelines**

1) **Report Size:** Limit your Project report to preferably 25- 40 pages for partial project report. Limit your Project report to preferably 80-100 pages for final project report.

2) **Footer:** The footer "Department of Computer Engineering, SITS, Pune" should be included. It should be TIMES NEW ROMAN 10 pt and centrally justified.

3) **Header:** Project Title centered and page nos. on right should be included. **Start numbering from introduction.**

4) **Paper Size:** A4 Size, bond paper.

5) **Margins: Mirrored.**
   1. **Top          : 1 inch**
   2. **Bottom      : 1 inch**
   3. **Inside :1.25 inch**
   4. **Outside       :1 inch**

6) **Line Spacing:** 1. 5 lines

7) **Title of Chapter:**
   1. **Font  : Arial (Bold face, Capital, )**
   2. **Size :16 pt, Alignment:** centered

8) **All Topics heading:**
   i. First order Heading: (for example -**1. Introduction**)
      1. Font  : Times New  Roman(Bold Face)
      2. Size   : 14 pt
   ii. Second order Heading: (for example -**1.1 Evolution)**
      1. Font  : Times New  Roman(Bold Face)
      2. Size : 12 pt

   iii. Third order Heading:  for example -1.1.1 Image  Processing

      **2.** Size : 12 pt
      **3.**

9) **Text:**
   1. Font      : Times New Roman(Bold Face)
   2. Size      : 12 pt

10) **Figures and Tables:**
   1.**Caption:**(for figures below the figure and for tables above the table)
   **2.** Font: Garamond(Bold)
   **3.** Size:11 pt
   **4.** Alignment: Center

11) **References :**
   **. Book**
   Author name(s), Book Title, Publisher, Copyright Year, page nos. if any.
   **. Journal/ Magazine/ Periodical**
   Author name(s), paper name, Journal/ Magazine/ Periodical name, issue no., page nos.
   **.Web Resources**
   Complete URL including  File name.
   **Plagiarism Check Report**

(Partial) Project Report
On

# " SIGN LANGUAGE RECOGNITION USING PYTHON AND OPENCV "

*by*

Suraj Adsul          (71916618H)
Amit Dighe          (71833047B)
Saurabh Wankhede   (71719807D)

*Under the guidance of*

Prof. S. B. Borhade



**Sinhgad Institutes**

Department of Computer Engineering
Sinhgad Institute of Technology and Science, Pune-4110141

**SAVITRIBAI PHULE PUNE UNIVERSITY**
**2021 -2022**

**Format for Project Approval sheet**

PROJECT APPROVAL SHEET

A

**Project**

on

(" SIGN LANGUAGE RECOGNITION USING PYTHON AND OPENCV ")

Is successfully  completed by

Suraj Adsul              (71916618H)
Amit Dighe              (71833047B)
Saurabh Wankhede    (71719807D)

at



**Department of Computer Engineering**
**Sinhgad Institute of Technology and Science,**
**Pune -4110141**
**Savitribai Phule Pune  University 2021-2022**

**Name : Prof. Mrs.S. B.  Borhade**                                          **Dr. Geeta S. Navale**
**Project Guide**                                                                         **Name of Head**
**Department of Computer Engg.**

# Report Documentation

Report Code: CS-BE-Project    2018-2019    **Report Number: < >**

Report Title:

**Address (Details):**
**Sinhgad Institute of Technology and Science, Pune**
**Pin – 411 041, M.S. INDIA.**

| **Author 1 [with Address, phone, E-mail]:** Address  **E-mail :** **Roll:** <Roll Number> > **Cell No** | **Author 2 [with Address, phone, E -mail]:** **Address**  **E-mail :** **Roll:** <Roll Number> **Cell No** | **Author 3 [with Address, phone, E -mail]:** **Address**  **E-mail :** **Roll:** <Roll Number> **Cell No** | **Author 4 [with Address, phone, E -mail]:** **Address**  **E-mail :** **Roll:** <Roll Number> **Cell No** |
|---|---|---|---|

**Year:** 2018 – 2019
**Branch:** Computer Engineering

*Key Words*: <Keywords in the Report>

| Type of Report: FINAL | Report Checked By: | Report Checked Date: | **Guides Complete Name:**  <Guide's Complete Name> | Total Copies  N+2 |
|---|---|---|---|---|

**Abstract: <A Brief Abstract of the Seminar>**

**NOTE –**
This table should not go beyond this page.
Scale down the Abstract if it does not fit in one page.
Take guide's Signature in the **"Report Checked By**:" Cell and Date of Signature in the "**Report Checked Date:**" Cell.
This page is the last page of the projects report and is NOT to be included in the **"Page Count"**

## Annexure VIII: Software Engineering Code of Ethics and Professional Practices

(Courtesy / Reference- http://www.acm.org/about/code-of-ethics )

Computers have a central and growing role in commerce, industry, government, medicine, education, entertainment and society at large. Software engineers are those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.

The Code contains eight Principles related to the behavior of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession. The Principles identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer's humanity, in special care owed to people affected by the work of software engineers, and the unique elements of the practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

1. PUBLIC - Software engineers shall act consistently with the public interest.
2. CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
3. PRODUCT - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
4. JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgment.
5. MANAGEMENT - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
6. PROFESSION - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. COLLEAGUES - Software engineers shall be fair to and supportive of their colleagues.
8. SELF - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

### Environment and Computing-

Information and communication technologies (ICTs ) have been contributing to environmental problems: computers, electronic devices and ICT infrastructure consume significant amounts of electricity, placing a heavy burden on our electric grids and contributing to greenhouse gas emissions. In 2007, the total footprint of the ICT sector –

including personal computers (PCs) and peripherals, telecoms networks and devices and data centers – was 830 Mt CO2 emission, about 2% of the estimated total emissions from human activity released that year (a figure equivalent to aviation ). ICT hardware poses severe environmental problems both during its production and its disposal. Each stage of a computer's life, from its production, throughout its use, and into its disposal, presents environmental problems. Manufacturing computers and their various electronic and non - electronic components consumes electricity, raw materials, chemicals, and water , and generates hazardous waste. All these directly or indirectly increase carbon dioxide emissions and impact the environment and the trend is to increase in the BAU ( Business As Usual ) scenario.

## Green Computing-

Hence you all our students are requested to follow green computing practices. Green computing is the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems — such as monitors, printers, storage devices, and networking and communications systems —efficiently and effectively with minimal or no impact on the environment. Green computing includes the dimensions of environmental sustainability, the economics of energy efficiency, and the total cost of ownership, which includes the cost of disposal and recycling. Green computing benefits the environment by improving energy efficiency, lowering greenhouse gas emissions, using less harmful materials, and encouraging reuse and recycling . Green design, Green manufacturing, Green use, Green disposal are complementary paths of green ICT. Only focusing on these four fronts we can achieve total environmental sustainability from the IT side and make IT greener throughout its entire lifecycle.

## Social Life and Computing-

Each IT professional must keep in mind the three key components of a corporate Green IT best practices policy -Environment, Economy and Social aspect. The invention of the computer has completely changed the way we live our lives. Nearly everything is controlled by a computer; cars, satellites, phones, etc. Computers have made our lives easier. Computers can also have positive effects on a person's social life when their power to connect over great distances is harnessed fully. Computers have both positive and negative impact in our society. While technology is a wonderful thing it is almost likely that it can be used in an immoral or wrong way. There is a price to pay for everything even if it appears it's making life easier on people.

While proper lifecycle management can greatly boost a IT company's ecological and environmental sustainability position, it can also contribute to achieving goals on the social front. Hardware retirement practices are the primary concern in this regard. In addition to seeking carbon neutrality, a proper asset retirement strategy should seek sustainability in the communities where companies operate.

**The following social objectives should be considered:**

1. To optimize sustainability in their IT infrastructure, companies should focus on each state of the IT lifecycle
2. Setting the Appropriate Corporate Sustainability Policy
3. Avoiding unethical labor practices and Controlling unethical exports
4. Accountability in the Recycling e-waste and Sustainability Metrics and Reporting
5. Greater Transparency Regarding Material Analysis and Extraction
6. Compliance with stringent, evolving security regulations