

Guidelines for Student Projects , Lecture notes, slides 1- 8

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Guidelines for Student Projects

Project Title, Introduction, Requirements, Feasibility study, Scope/ Objectives, Requirement Analysis , Activity Time Schedule, Detail Design, Implementation and Testing , Project Completion Report.

Here students are in final year of B.Tech course in Computer Science & Engineering. The projects are of 20 to 30 credits. The duration for the project is one year. It is preferred that a project is implemented by team of two students, but if necessary it may be implemented by one or three students, that depends on its scope, varied technology and the volume of work.

1. Title of the project [Start time $T_0 + 1$ week]

This should be carefully decided by the student after discussing with the project supervisor or the guide.

- The student and guide are assumed to be aware about general requirements for the academic need, the current technological pursuits and the customers/market need or the requirements.
- This title may slightly change during or after the completion of the project feasibility study (section-6).

2. Introduction [Start of $T_0 + 2$ week]

Explain the relevance and importance of the project :

- Write a brief (1 or 2 pages) introduction of the project explaining its relevance and importance.
- Briefly mention why this project, what exists now, what is required and what would be realized as end product.
- Mention briefly about : technology, models, processes, testing, expected performance and limitations.
- Write about the usages and the benefits.

3. Requirements [Start of T_0 + 3 week]

The requirements come or taken or generated from users. Here it is from academic need.

Based on the academic needs, the current technological pursuits and finding or knowing what the customers/markets need or require, write in steps the project requirements.

- The requirements are expressed in simple language, understandable by one and all people and certainly not only by subject specialists.
- Avoid using any technical jargons that make sense to only few individuals.
- Write about 10 or 15 important requirements and put them in order according to their importance or preference based on some criteria.
- Mention how well the end product would be matured, realized and usable.
- Remember that each of these requirements are to be later analyzed so as to generate general design inputs. From these general design inputs, the designers would generated detail technical design specifications at system / subsystem level.

4. Feasibility study [Start of $T_0 + 5$ week]

The general requirements were listed in section-3 and therefore the feasibility study may start.

The feasibility study of project must be completed within 4 weeks, considering all aspects of the project mentioned below.

(a) Preliminary work done : Write if any related laboratory experiment performed in previous semesters? Write if any related courses/study done in the previous or current semester?

(b) Resources available (**RA**) : Indicate the desired resources within or in other laboratories within the institute in terms of inputs, hardware systems, software tools, test data, test facility, integration and demonstration facility.

(c) Confidence Factor (**CF**): Mention your confidence in exploiting the above mentioned resources.

(d) Capability Index (**CI**) : Mention your capability to synergies the resources necessary but not available at your work place.

(e) Relative Significance Factor (**RSF**) : Mention about the analysis performed in finding relative importance of a particular technology for a specific subsystem. Similarly do for all major subsystems.

(f) Viability Index (**VI**): Derive or explain for each technology the Viability Index from **CI** and **RSF**.

(g) Relative Importance Factor (**RIF**) : Assign to indicate or explain that some subsystem are important compare to others.

(h) System Integration factor (**SIF**) : Assign or explain your ability to integrate subsystem for realizing system.

(i) System Realizeability Index (**SRI**) : Finally calculate or explain System Realizeability Index which is a measure of successful completion of system development.

(j) Inadequacy parameter (**IP**) : The word inadequacy means insufficiency, lack or shortfall. For a technology $IP = (1 - CI) * RSF_{av}$.

The satisfactory completion of a project requires :

- Resources Available (RA) : High
- Capability Index (CI) : High
- Confidence Factor (CF): High
- Inadequacy Parameter (IP) : Low

5. Scope / Objectives: [Start of T₀ + 9 week]

By doing the project feasibility, the uncertainties and ambiguities are reduced. The team is now definite about Resources, Confidence, Viability, Realizeability, Inadequacy and many such factors.

Set clearly the project objectives considering the following :

- the project start and completion date : time two semesters,
- the number of personnel/work force : one, two or three students,
- the number of credits allocated : say 20 credits,
- the quality or standard : 7th and 8th semesters of B.Tech. course.

Write very clearly in 1, 2, 3 or more steps the scope/objectives set for the project. The objectives must reflect or address to what exactly is proposed to implement.

(While writing the scope , use technical terms like : input and outputs, simulation, models, techniques, processes, algorithms, hardware systems, software tools, coding, languages, operating systems and platforms, fabrications, implementation, integration, test methods, test standards, accuracy, reliability, installation etc.)

At this stage the Title of the project and its Scope/Objectives are usually agreed and frozen and will not change under normal situation.

6. Requirement Analysis [Start of T_0 + 10 week]

The general requirements were listed in section-3. To meet these requirements the feasibility study of project was completed in section-4. The scope/objective of the project have been frozen in section-5.

Now analyze these requirements one by one so as to generate general design inputs. Within 4 weeks, the requirement analysis must evolve and culminate into :

- The understanding of over system functioning.
- The Identification of all standalone or separable functions that may be accomplished as subsystem level task.
- Identify technologies and group them in to tasks they are to perform.
- Identify the critical technologies if any ?
- **Conceptualize, an over all system level block schematic** indicating all identified subsystems and their input/output need.
- Indicate of over all system functionality considering the subsystems level tasks.
- Prepare a list of hardware systems, peripheral devices, interfaces, displays, computing and network environment.
- Prepare a list of software, operating systems, compilers, assemblers, interpreters, loaders, drivers, language support
- Prepare a list of application software, case tools, simulators, GUI, databases, visualization and graphics support.
- Listing of buyer's specifications of the hardware including peripheral devices, interfaces even if they are not required to buy but used.
- Listing of I/O specification of the software packages even if they are not required to buy but used.
- Listing of test data at the inputs, type of tests to be performed during development and the making of the subsystems, and tests required during runtime or execution.

Conclude the requirements : Highlight what is already available and what will be newly created or required for the timely completion of the project. Formulate general design inputs.

7. Activity Time Schedule [Start of $T_0 + 14$ weeks]

The way, method or the manner in which the project will be executed.

Draw a suitable representation indicating the manner in which the project would be executed - from the start to the completion date.

- The representation is usually a PERT chart; the X- axis shows time (from start to completion) and the Y- axis shows all project activities.
- The time resolution of the X-axis can be monthly but for a small duration (about one year) project the time resolution can be weekly.
- The activities listed on Y-axis includes all important activities of the project.
- The body of the chart illustrates the start and completion date of each activity. It should clearly indicate the spread of each activity, their relative start and completion time, and how many tasks would run in parallel.

The project activities include

- Project start date, deciding the project : Title
- Relevance and importance of the project : writing Introduction
- Framing of project : Requirements
- Study about Project : Feasibility study
- Freezing of Project : Scope/Objectives
- General design inputs : Requirements Analysis
- System and subsystem level working : design
- Convert all designs into programs : Implementation
- Performance evaluation at system/subsystem level : Testing
- Documentation of all above activities : Project report

The activity time schedule must reflect all such things.

By this time, about one quarter of the project duration (14 weeks) is over. The remaining time is for detail design, implementation, testing and completion of project report. The documentation is a continuous process from day one, the start of the project.

8. Detail Design [Start of T_0 + 15 weeks]

Start of system and subsystem level detail design that continues for 6 weeks.

Typically a detail design includes :

- Design from the conceptual level block schematic (in section-6), a detail architectural layout, indicate every subsystem and within them identify every small entity their input/output and design.
- Draw functional block schematics, data flow diagrams for every small entity, subsystem, overall system and other considerations if any.
- Write the algorithms, the pseudo code for every function calls, the subroutines, and the recursions.

End of 20 weeks. Here comes the semester break.

9. Implementation and Testing [Start of $T_0 + 21$ week]

The programming tools and languages were decided in section-6. The next 18 weeks are for the implementation of the detail design done in section-8 so as to realize the end product, the Scope/Objectives of the project stated in section-5.

Start of software coding.

- Convert all above designs (at the entity, subsystems, system levels) into programs
- Execute or Run the programs step by step for each module, subsystem or any other entity considered necessary for the purpose of debugging and performance evaluation and design validation.
- Finally integrate all subsystems so as to realize the over system.
- Perform all system level test, evaluate the results and compare with the project scope/objects (section-5) and the requirements (section-6).

10. Project Completion Report [Start of $T_0 + 39$ week]

The time left for the completion of the project is 2 weeks.

- Complete all documentation.
- Make the Project Report ready for submission.

Note : The time allocations for completing different activity may vary by few weeks from one project to another, but the total time remains same.