



Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran,
Nigdi, Pune – 411 044



B.Tech. Mechanical Engineering Project Guidelines

Scheme : B
Students registering for project work in VII Semester

This document provides guidelines for the B. Tech. students in carrying out their Final Year Project work in an effective way and to bring uniformity in the conduction of project work. A **B.Tech. Project (BTP)** can be started in the seventh or eighth semester. However, in case of an academic gap due to semester leave, the student will be allowed to continue the BTP with the consent of the project guide and the project coordinators. The BTP is broadly classified as experimental, numerical simulation, or product development. The **Departmental Project Assessment Committee (DPAC)** has been formed to ensure uniformity in project activities, and dissertation reports and to coordinate all project groups. This committee will be responsible for monitoring and evaluating the timely progress of the projects and communicating the progress report to the students. The committee is chaired by the Head of the Department along with the Project Coordinators as the conveners, and SIG in-charges as the committee members. The BTP is a partial requirement for the award of the degree of Bachelor of Technology (B.Tech.) in Mechanical Engineering.

The CO-PO and PSO mapping are as follows:

CO Statements for Project work	PO mapped	PSO mapped
Students will be able to		
1) Demonstrate sound academic fundamentals to formulate and analyze complex Mechanical engineering problems.	1,2,3,4,5	1,2,3
2) Provide creative/ innovative solutions for complex engineering problems.	1,2,3,4,5,10,11,12	1,2,3
3) Design Mechanical systems/products/processes for providing solutions to environmental issues/ needs of society/Industry/ safety issues.	1,2,3,4,8,10	1,2,3
4) Apply modern modeling and simulation techniques/ computing tools.	4,5,12	1,2,3

5) Work effectively as a team member / Leader in order to manage the project work and finance.	6,7,9,11,12	3
6) Write a report on the research work and present it effectively.	6,7,9,11,12	3

The BTP evaluation process will be carried out in four steps, i.e., Review 1, Review 2, and Review 3, followed by a final examination.

Roles and responsibilities of Project coordinator:

1. The Head of the Department and the Project coordinators will be responsible for forming the DPAC.
2. Project coordinators shall conduct the special session for the students in the mid of the sixth semester to create awareness among students related to final year project work. This special session includes information related to group formation, selection of project, and activities involved in completing the project work.
3. At the end of the sixth semester, the DPAC shall circulate the list of projects to be offered by the faculty member or department along with the concerned guide's name.
4. Project coordinators shall invite the project domain interest/problem definitions from the students and compile the received data.
5. Project coordinators shall appoint project guides by considering the area of interest of both the guides and students.
6. Project coordinators will be responsible for scheduling all project group reviews and compiling the evaluation report received from DPAC for further processing.
7. The project coordinators shall arrange the reviews as follows:
 - a. Review 1: Starting of the semester (within a month) [Presentation and proposed project summary report]
 - b. Review 2: After 1 month of review 1 [Presentation]
 - c. Review 3: After 1 month of review 2 [Presentation and Report]
 - d. Final Examination: At the end of the semester
8. To maintain uniformity in the documents/reports, project coordinators shall provide the templates of all the documents required to be prepared by the students. The documents may

include Templates of the proposed project summary reports, Project Reports, Presentations, posters (preferably A3 Size), etc.

Roles and responsibilities of DPAC:

1. DPAC will be responsible for the smooth and uniform conduction of the reviews of B.Tech. projects.
2. The DPAC shall monitor the progress of project work on a continuous basis by scheduling and conducting the project review presentations. The review panel should be formed for each project group to evaluate the progress. The DPAC should provide the evaluation sheet to the review panels based on suitable rubrics for each project review to ensure the quality of the projects.
3. The detailed review schedule shall be communicated to the students 07 days in advance.
4. The project reviews shall be conducted as per the schedule. The assessment and evaluation of each student should be carried out based on their individual participation, knowledge, content, and skills. For each review, the panel members shall recommend suitable suggestions. For subsequent reviews, the recommendations should be implemented and can be verified by the review panel. After each review, the panel shall submit the evaluation sheet to the project coordinators.
5. During this process, if any project group is not performing satisfactorily, the DPAC shall provide counseling or guidance to improve their performance. The DPAC can take appropriate action based on the timely progress of the project work.
6. The DPAC shall submit the names of 2 external examiners for conducting the final examination.

Roles and responsibilities of the Project Guide:

1. The project guide shall send detailed information about the proposed project to be offered to the B.Tech. students by him/her to the DPAC in the mid of the sixth semester. These project titles/areas shall be communicated to the students at the end of the sixth semester.
2. Project guide shall help students to identify the problem definition and suggest the objectives/methodology through brainstorming.

3. The Project guides must monitor the weekly progress being carried out by the project groups. In case it is found that progress is unsatisfactory, it should be reported to the DPAC for necessary action.
4. In the case of industry-sponsored projects, guides are expected to visit the industry on a regular basis along with students.
5. The project guide shall ensure the completion of all the project-related activities as per the requirement of review.
6. Project guide shall motivate the students to write a patent, copyright, research funding proposal, and paper publications for the overall development of the student.

Guidelines for Students:

1. Project work shall be based on any of the following:
 - a. Fabrication of product/ testing setup of an experimentation unit/ apparatus/ small equipment in a group.
 - b. Experimental verification of principles used in Mechanical Engineering Applications.
 - c. Projects having a valid database, data flow, algorithm, and output reports, preferably software based.
 - d. Indian Knowledge System [IKS]: Students are motivated to work on intra-disciplinary and transdisciplinary projects facilitated by IKS. Kindly refer to the link <https://iksindia.org/about.php> for further details.
2. It is mandatory for all students to undergo the project work as a part of their final year of the B.Tech. program.
3. It is the responsibility of the students to complete their project work in the given time frame.
4. The Project group shall have a minimum of 2 students and a maximum of 4 students from any division.
5. Students shall start working on the selection of problem statements for the project at the end of the VI semester. It is recommended that students should prefer interdisciplinary projects.
6. Students shall select the project and the project guide in their area of interest.
7. Following are the recommended areas in which students can select the project topics from:

- a. Robotics & Automation
 - b. Renewable & Sustainable Energy
 - c. Composites
 - d. NVH & Stress Analysis
 - e. Thermal & Fluidic Engineering
 - f. Automobile Engineering
8. The possible problem statements for the project can be availed from
 - a. Industries
 - b. Research labs or organization
 - c. Collegiate clubs
 - d. In-house research projects
 9. Each group will be assigned a faculty mentor as a Project Guide for necessary guidance and monitoring of the project work.
 10. Students shall meet their assigned project guide at least once a week and report the progress of the project work.
 11. Students shall maintain a record of all the meetings, remarks given by DPAC, and progress of the work in the project diary. The project diary must be presented during each review presentation to the DPAC.
 12. The project sponsorship can be of the following three categories:
 - a. **Self-sponsored project:** The students will bear the expenses incurred towards the completion of the project work.
 - b. **Industry / Research institutes sponsored project:** The expenses incurred towards the completion of the project work will be supported by the sponsoring industry or research institute. Students shall submit the sponsorship letter or relevant document mentioning all the necessary details like the student's name, guide name, problem definition, work to be carried out, sponsorship details, etc.
 - c. **Institute-sponsored project:** Any of the institutes or organizations will support the expenses incurred towards the completion of the project work. Students shall submit the sponsorship letter or relevant document mentioning the sponsorship in monetary support from the institutes or organizations. A particular review will be

carried out in the department to select the project group eligible for college sponsorship.

13. Following types of work will not be considered project work:

- a. Projects based on only Surveying
- b. Projects based on only Case study
- c. Computer simulation-based projects without validation of output
- d. Only Jigs & Fixture Manufacturing
- e. Assembly of ready-made components
- f. Only Mobile App development.

14. The project work assessment will be done in the following stages:

- a. Review 1: Within 1 month of the semester starting [Presentation & synopsis]
- b. Review 2: After 1 month of review 1 [Presentation]
- c. Review 3: After 1 month of review 2 [Presentation and Report]
- d. Final Examination: At the end of the semester

15. Expected work to be completed in the review:

- a. Review 1: Problem definition identification and feasibility
- b. Review 2: Design and Analysis of the Work
- c. Review 3: Manufacturing, Testing, and Report Writing

16. It is mandatory for students to remain present for all the reviews and examinations well before the scheduled time.

17. For the final examination, the student shall complete the project report in all aspects, including formatting. Each Student shall prepare the report duly signed by the project guide, the Head of the department, the Director, and the external examiner. Students should prepare three copies of the dissertation report.

18. Students shall submit all the data related to project work in soft copy to their guides, including project report, A3 size poster, Presentation, CAD, and CAE files.

19. Students shall write a research article/paper, funding proposal, patent, and copyright on their respective project work.

20. Students who are members of the various teams like **BAJA, Supra, Robocon, Tifan, etc**, are allowed to opt the projects related to the respective competitions or teams. Non-members of the teams are strictly not allowed.

Evaluation Procedure:

For the smooth conduction of each project, the progress shall be monitored continuously by the DPAC and the project guide. For this Project, the coordinator shall plan three reviews and one external review for the final examination. The evaluation scheme for the project is as follows:

	TW evaluation (200 Marks)	Oral (150 Marks)
Assessment criteria	Rubric 1 for project review 1+Rubric 2 for project review 2 + Rubric 3 for project review 3	External Examination (Rubric 4 for Final examination of project work)

The following guidelines are provided for the conduction of reviews:

- **Review 1:** This review will be planned at the beginning of semester VII (Within 1 month of semester commencement). Review 1 will be purely a synopsis presentation, which will be taken by the DPAC. The assessment of this review will be considered for Internal evaluation. Students shall prepare the presentation on selected project ideas according to their area of interest. The brief presentation with the precise aim and objectives of the project shall be presented in front of the DPAC after taking approval from the respective project guide.
- If the presentation is not satisfactory, then the review committee may recommend to the students to modify their Presentation/Project work in a week and present again.
- Following points can be considered for the preparation of the review 1 presentation synopsis report:
 - Title Page: (Title of Project, Names of Students, Name of Guide)
 - Introduction
 - Need of the project
 - Objectives
 - Scope
 - Problem Definition

- Proposed Initial Design
- Literature referred
- Methodology Planned for achieving the Aim and objectives of the project
- Expenditure
- Time Activity Chart
- References

Rubric 1: Assessment of Project Review 1 (TW Evaluation)
Maximum Marks: 50

LEVELS OF ACHIEVEMENTS

		Excellent	Good	Poor	CO Mapping
a	Topic selection (15)	Innovative and useful for society, Industry, or research (11-15)	Somewhat innovative and useful for society, Industry, or research (5-10)	Useful for limited groups and not innovative (Less than 5)	CO1
b	Problem Definition and Objectives (10)	A selected problem statement is clear. It addresses the need and demonstrates creativity/innovativeness. (8-10)	A problem statement written is appropriate which defines the topic/research area (4-7)	A problem statement written poorly defines the topic/research area. (Less than 4)	CO1, CO2
c	Literature Survey (10)	A detailed survey of useful sources like research papers, reports, books, etc., is carried out. (8-10)	Identified some useful sources like research papers, reports, books, etc. (4-7)	Identified incorrect/very few sources. (Less than 4)	CO1 CO2
d	Methodology (5)	A clearly defined methodology that will satisfy all the objectives (4-5)	The clearly defined methodology will satisfy 50% of the objective (2-3)	The poorly defined methodology which will not satisfy objectives (1)	CO1
e	Project Planning and Expenditure (5)	Detailed and extensive Scheduling with timelines provided for each phase of a project. Work breakdown structure well defined. (4-5)	Good Scheduling of project. Work breakdown structure adequately defined. (2-3)	No Project scheduling was done. No Work breakdown structure was provided. (1)	CO5

f	Individual contribution and completion of work refer to the set plan (5)	Excellent contribution and completion of work. The student is able to demonstrate the work properly and with fluency (4-5)	Contribution is less, and the student is able to demonstrate only some of the work (2-3)	No Contribution and the student is not able to demonstrate the work (1)	CO5
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- **Review 2:** This will be planned after 1 month of review 1. The aim of review 2 is to look into the progress of the student after review 1. The assessment of this review will be considered for Term work evaluation. The DPAC shall check whether the student has answered and compiled the queries raised in review 1. The objective of review 2 is to identify the progress of the student group in line with their methodology planned. The following points can be considered for the Review 2 presentation:

- Study of data
- Modeling/System Design
- Design calculations
- Numerical Simulation /Mathematical model
- Finalization of design

Rubric 2: Assessment of Project Review 2 (TW Evaluation)
Maximum Marks: 75

LEVELS OF ACHIEVEMENTS

		Excellent	Good	Poor	CO Mapping
a	Study of data and Design calculations (25)	Excellent clarity on data collection and design calculation. Covers all the aspects and assumptions. (17-25)	Good clarity on data collection and design calculation. Covers 50% of aspects and assumptions. (8-16)	No clarity on data collection and design calculation. Does not Covers any aspects or assumptions. (less than 8)	CO2, CO3
b	Modeling/System Design and Numerical Simulation /Mathematical model (20)	Excellent study, implementation, analysis, and development of the model (14-20)	Good study, implementation, analysis, and development of the model (6-13)	A poor study, incorrect implementation, analysis, and development of the model (less than 6)	CO3, CO4

C	Finalization of design/Model (20)	Excellent design, which is production ready. (14-20)	An appropriate design that is correct and satisfactory but needs small detailing/modification for production-ready design. (6-13)	A poor design that is not satisfactory and cannot be manufactured. (less than 6)	CO3, CO4
D	Individual contribution and completion of work referring to the set plan (10)	Excellent contribution and completion of work. The student is able to demonstrate the work correctly and with fluency (7-10)	Contribution is less, and the student is able to demonstrate only some of the work (4-6)	No Contribution, and the student is not able to demonstrate the work (Less than 4)	CO5

- **Review 3:** This will be planned after 1 month of review 2. This is the final departmental review of the project work. The assessment of this review will be considered for Term work evaluation. The DPAC shall check whether the student has answered and compiled the queries raised in review 2. The objective of review 3 is to identify the progress of the student group in line with their methodology planned. This review will ensure the completeness of the project work. In this review, the student shall complete the project report and be able to demonstrate the work. The following points can be considered for the review 3:

- Manufacturing/ procurement of components
- Fabrication / Manufacturing of set up
- Experimentation/ Testing
- Data analysis
- Design Validation
- Implementation
- Report writing
- Plagiarism report/ Similarity report **(max 30%)**

Rubric 3: Assessment of Project Review 3 (TW Evaluation)
Maximum Marks: 75

LEVELS OF ACHIEVEMENTS

		Excellent	Good	Poor	CO Mapping
a	Fabrication / Manufacturing of set up (20)	Well-organized and complete manufacturing of test setup. (14-20)	Sufficiently organized and partial completion of setup. (6-13)	Not manufactured (less than 6)	CO3, CO5

b	Experimentation, Validation of Results, and conclusion (20)	Clear result and conclusion, the excellent methodology adopted for experimentation (14-20)	Partial validation of result and conclusion (6-13)	Incomplete result and conclusion (Less than 6)	CO5
c	Report Writing (20)	Written information that demonstrates an insightful, mature grasp of the text related to precise ideas, premises, or images from the literature. Organized report neat, easy-to-read content. Wrote all the report content using own words and key facts. (14-20)	Written information that demonstrates an insightful, proficient grasp of the text related to reasonable, clear ideas, premises, or images from the literature. Organized reports, and most were neat and easy to read. Wrote most of the report content using own words and key facts. (6-13)	Wrote incomplete information that failed to demonstrate any research ideas or premises. Did not organize report; all content was messy and hard to read. Copied most or all of the notes word-for-word from the source. (less than 6)	CO6
d	Individual contribution and completion of work referring to the set plan (15)	Excellent contribution and completion of work. A student is able to demonstrate the work correctly and with fluency (11-15)	Contribution is less, and the student is able to demonstrate only some of the work (5-10)	No Contribution and the student is not able to demonstrate the work (Less than 5)	CO5

- Final Examination:** Final Examination will be scheduled after review 3 as per the schedule provided by the examination section. This examination will be carried out under the supervision of the Project guide and appointed External examiner. For the final examination, the student shall complete the project report in all aspects, including formatting. Each Student shall prepare the report duly signed by the project guide, head of the department, director, and external examiner. Along with this, students are required to prepare two extra copies of the project report duly signed by the above-mentioned authorities. Students shall submit all the data related to project work in soft copy to their guides, including project report, A3 size poster, Presentation, CAD and CAE files, etc.
- The assessment points for the Final examination will be based on CO of project work.

Rubric 4: Final External examination of project work
Maximum Marks: 150

LEVELS OF ACHIEVEMENTS

Criteria (CO)		Excellent	Good	Poor
	Students will be able to			
1.	Demonstrate sound academic fundamentals to formulate and analyze complex Mechanical engineering problems. (out of 25)	Demonstrates understanding of fundamentals and ability to formulate and analyze Mechanical engineering problems. (Problem statement is clearly defined.) (17-25)	Demonstrates understanding of fundamentals but is not able to formulate and analyze Mechanical engineering problems. (Problem statement is not clearly defined.) (8-16)	Demonstrates poor understanding of fundamentals and is not able to formulate and analyze Mechanical engineering problems. (Problem statement is not defined.) (less than 8)
2.	Provide creative/ innovative solutions for complex engineering problems. (out of 25)	The proposed solution addresses the problem statement appropriately, and it also demonstrates creativity/ innovativeness (creative/innovative solution is proposed) (17-25)	The proposed solution addresses the problem statement appropriately, but it doesn't demonstrate creativity/ innovativeness (Ordinary solution is proposed) (8-16)	The proposed solution doesn't address the problem statement appropriately (Solution is not proposed) (less than 8)
3.	Design Mechanical systems/ products/processes for providing solutions to environmental issues/ needs of society/Industry/ safety issues. (out of 25)	Demonstrates excellent understanding of engineering fundamentals to design Mechanical systems/ products/processes and environmental issues/ needs of society/Industry/ safety issues are addressed (17-25)	Demonstrates good understanding of engineering fundamentals to design Mechanical systems/ products/processes, but environmental issues/ needs of society/Industry/ safety issues are not addressed. (8-16)	Demonstrates very Poor understanding of design fundamentals and environmental issues/ needs of society/Industry/ safety issues. are not addressed. (less than 8)
4.	Apply modern modeling and simulation techniques/ computing tools. (out of 25)	Appropriate modeling /simulation techniques/ computing tool is identified and used efficiently for design. (17-25)	Appropriate modeling /simulation techniques/ computing tool is identified but not used efficiently for design. (8-16)	Appropriate modeling /simulation techniques/ computing tools not identified and used. (less than 8)

5.	Work effectively as a team member / Leader in order to manage the project work and finance. (out of 25)	Demonstration of very good coordination among the team members with excellent work and financial management (17-25)	Demonstrated average coordination among the team members with good work and financial management. (8-16)	Demonstration of poor coordination among the team members with poor work and financial management. (less than 8)
6.	Write a report on the research work and present it effectively. (out of 25)	Well-organized project report, neatly dressed with confident body language. systematically and effectively presents the content with a clear understanding and ability to answer queries. (17-25)	Well-organized project report, neatly dressed with confident body language. Presents content with clear understanding but lacks a systematic approach in presentation and is not able to answer queries (8-16)	Not well-organized project report, neatly dressed but low confidence and not able to present content clearly and not able to answer queries. (less than 8)

Evaluation / Assessment of project work:

Internal assessment process of project work:

Assessment of project work Internal Assessment and TW

Review #	Agenda	Assessment	Review marks	Assessment Weightage	CO Covered
Review 1	Synopsis, Problem definition identification	Rubric 1: Project Review 1 (TW)	50	25%	CO1, CO2, CO5
Review 2	Design finalization	Rubric 2: Project Review 2 (TW)	75	37.5%	CO2, CO3, CO4, CO5
Review 3	Demonstration and report writing	Rubric3: Project Review 3 (TW)	75	37.5%	CO3, CO5, CO6
Total:			200	100%	

External assessment process of project work:

Weightages of project work External assessment

Review #	Agenda	Assessment	Review marks	Assessment Weightage	CO Covered
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Final Examination Review	Complete evaluation of the project work	Rubric for Final examination of project work	150	100%	CO1, CO2, CO3, CO4, CO5, CO6
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