FACULTY OF ENGINEERING & TECHNOLOGY, RAMA UNIVERSITY, KANPUR

Department of Mechanical Engineering

FIVE-YEAR STRATEGIC PLAN (2026–2031)

Introduction

Mechanical Engineering is one of the core branches of engineering that plays a crucial role in technological advancement, industrial development, and economic growth. The Department of Mechanical Engineering aims to produce competent engineers equipped with technical knowledge, practical skills, and innovative thinking.

The rapid transformation of industries due to automation, artificial intelligence, sustainable technologies, advanced manufacturing, robotics, and Industry 4.0 requires engineering institutions to continuously update their academic and research frameworks.

NAAC and UGC assign the responsibility to the IQAC for planning, guiding and monitoring Quality Assurance (QA) and Quality Enhancement (QE) activities of the institution. With this background, the Faculty IQAC has undertaken the task of designing a Perspective Plan for the period of five years, commencing from academic year 2022-23 to academic year 2026-27, for balanced growth. The quality indicators of different criteria determined by NAAC have been taken into consideration as the base to create Quality Radars and to set out milestones for the future.

In the preparation of the Perspective Plan, the Faculty IQAC has taken initiatives to obtain inputs from all stakeholders*, viz.*, the management, the faculty, the administrative staff, students of the Faculty, the parents and the peer colleagues. Stakeholders' expectations, management policies, goals and objectives and the vision and the mission statement of our Faculty and the quality policy of the Faculty are also considered as a base for formulation of the perspective plan.

The prime role of IQAC is to suggest quality measures for the betterment of an institution. While preparing a road map for future growth, the members of the IQAC have considered Feedback from all the stakeholders and the recommendations specified in the meetings of the IQAC. Besides, innovative ideas as suggested by all the stakeholders are also carefully incorporated in perspective plan. Student feedback mechanism, self-appraisal and job satisfaction record of teachers, faculty training programs arranged by the Faculty as well as attended by teachers, faculty improvement programs, and introduction of the Research committee to play a proactive role in encouraging teachers for research, are some of the measures initiated with priority.

A midterm review is proposed to be conducted by the end of the 1st and 3rd years 2022-23 and 2023-24, respectively, to appraise the extent to which goals have been achieved. In addition, keeping a scope for midterm correction, the IQAC also proposes an idea of reviewing the perspective plan if needed. This will enable the Faculty to take stock of the accomplishments and to relook into the action plans and untouched/ newer areas to lay stress upon. We hope this will facilitate the Faculty to realign the road map to reach the expectations of stakeholders in a harmonious way.

Vision

To become a center of excellence in mechanical engineering education, research, and innovation, producing globally competent engineers who contribute to sustainable technological development and provide a transformative education to create leaders, innovators and generates new knowledge for society and industry

Mission

The Department of Mechanical Engineering is committed to:

- **a.** Providing high-quality education in mechanical engineering.
- **b.** Promoting research and innovation in emerging technologies.
- **c.** Strengthening industry collaboration and practical experience.
- **d.** Developing ethical, socially responsible engineers.
- **e.** Encouraging entrepreneurship and lifelong learning among students.

OBJECTIVES

Rama University, as a modern research university, performs a diverse set of activities, which include:

- **a.** Educating high quality manpower with the required skills and knowledge at both undergraduate and postgraduate levels.
- **b.** Generating new knowledge through fundamental research.
- **c.** Being a repository of knowledge and of experts.
- **d.** Being a source of new ideas and independent opinions through scholarship.
- **e.** Being a source of innovation leading to solution of local problems, development of new products, processes, and formation of new businesses, leading to wealth and employment generation.
- **f.** To develop the center of excellence in the emerging areas of Mechanical Engineering like the Internet of Things (IoT), Additive Manufacturing etc
- **g.** To motivate faculty for Industry Interaction with objectives to get Sponsored Projects and Placement of Students, internships, etc
- **h.** To sign MOUs with industries to get Industry Sponsored Projects and Internship, Training for Students

In addition to the broad range of activities that the department carries out in pursuit of its mission, the following goals have been identified to be given special emphasis in the strategic key pillars to highlight Rama University into top 500 world university rankings in the next 5 years.

1. Academic Excellence
2. Research Excellence
3. Talent Recruitment
4. Collaborations

Strategic Plan focuses to achieve a reputed ranking in the following list of bodies:

Key Parameters for the Ranking in NIRF, QS World and NBA Accreditation

Focusing Parameters	
NIRF	Teaching, Learning & Resources (TLR)
	Research & Professional Practice
	Graduation Outcomes
	Outreach & Inclusivity
	Perception
QS World Ranking	Academic Reputation
	Employer Reputation
	Faculty/Student Ratio
	Citations per Faculty
	International Faculty Ratio
	International Student Ratio
	International Research Network
	Employment Outcomes
	Sustainability
NBA Accreditation	Criterion 1 – Vision, Mission & Program Educational Objectives
	Criterion 2 – Program Curriculum & Teaching-Learning Processes
	Criterion 3 – Course Outcomes (CO) & Program Outcomes (PO)
	Criterion 4 – Students' Performance
	Criterion 5 – Faculty Contributions
	Criterion 6 – Facilities & Technical Support
	Criterion 7 – Continuous Improvement
	Criterion 8 – First Year Academics
	Criterion 9 – Student Support Systems

Core Values

The department will operate based on the following values:

i. Academic Excellence
ii. Innovation and Creativity
iii. Integrity and Ethics
iv. Collaboration and Teamwork
v. Social Responsibility
vi. Sustainability

Current Status of the Department

Academic Programs

The department currently offers:

i. B.Tech in Mechanical Engineering
ii. M. Tech in CAD/CAM (Mechanical Engineering) (if applicable)
iii. Ph.D. programs (if applicable)

The curriculum covers fundamental areas such as:

i. Thermodynamics
ii. Fluid Mechanics and Machinery
iii. Mechanics of Deformable Bodies
iv. Design of Machine Elements
v. Robotics and Automation
vi. Operation Research
vii. Theory of Machines
viii. Heat Transfer

Efforts are continuously made to encourage faculty members to pursue Ph.D., research publications, patents, and funded projects.

Infrastructure

The department has laboratories such as:

i. Refrigeration & Air Conditioning Lab
ii. Fluid Mechanics Lab
iii. Heat Transfer Lab
iv. Workshop Lab
v. CAD/CAM Lab
vi. Robotics & IoT Lab

The department also maintains computer facilities and workshops for practical learning.

Targeted State of Department

The targeted state of the Department of Mechanical in 2031 should be a significantly improved Department in the areas of faculty, students, and instructional facilities. Due to hires, retirements, etc., the Department should have a significantly different faculty composition. It is important that the Department faculty at that time, therefore, reflect an increased number of female and minority faculty members; however, this must be conjoined with the requirement of maintaining uniformly high standards both at the time on of hiring and during the promotion and tenure process. Note that an important measure in determining high national ranking is diversity in faculty; hence, this is critical for the achievement of the strategic objective and strengthens all aspects of our mission. Hiring process with the caveat that such faculty members should be able to meet teaching and service requirements expected of more traditional faculty members.

The environment in the Department will foster collaboration between faculty, and the Departmental administration will actively seek to encourage faculty teaming. There should be a number of non-tenure-track faculty within the Department who will focus undergraduate teaching and hence allow tenure-track faculty to focus more (but not exclusively) on graduate education and research. Care must be taken to have in place strategies and policies that create a separate rewards structure for both the tenure-track and non-tenure track faculty, thus, providing an adequate path to excel in teaching and research scholarship. Undergraduate student to faculty ratios for tenure-track faculty should be established relative to campus but also in light of strategic objectives. The ratio of graduate to undergraduate student enrollment in the Department should be significantly higher than it is now, with increased Ph.D. student supervision for both major degree programs. Greater quality control for undergraduates should be exercised at both the initial point of entry into the Department as well as throughout the academic career of an undergraduate. This will mandate keeping track of grade point average (GPA) trends both in-house, on campus, and nationally, and increased expectations in terms of student performance and academic achievement.

The instructional laboratories in the Department should be greatly improved, in terms of quality, relevance, degree of tie-in with lecture coursework, etc. Expectations of service, teaching, and research should be clearly defined and weighted to reflect a well-balanced approach in line with the expectations of institutions that are ranked near and above our desired level. However, expectations should be structured to recognize that every tenure-track faculty member will necessarily have a somewhat different balance between these three areas.

Finally, the Academy should be closely involved with both the Department Chair and faculty in facilitating Departmental goals that require external support and sponsorship with emphasis on both infrastructure improvement and faculty development.

Strategic Focus Areas

The Department of Mechanical Engineering will focus on the following key strategic areas to achieve excellence in education, research, innovation, and societal impact.

1. **Academic Excellence and Curriculum Innovation**

   Enhancing the quality of engineering education by integrating modern teaching methodologies, interdisciplinary learning, and outcome-based education (OBE) aligned with NEP 2020.

   - **i.** Curriculum revision aligned with industry and emerging technologies
   - **ii.** Implementation of project-based and experiential learning
   - **iii.** Introduction of interdisciplinary electives
   - **iv.** Use of digital learning platforms and smart classrooms

2. **Research, Innovation and Technology Development**

   Promoting high-quality research and innovation to contribute to technological advancement and national development

   - **i.** Establishment of research groups in emerging areas
   - **ii.** Increase in high-quality journal publications
   - **iii.** Development of patents and prototypes
   - **iv.** Collaboration with research organizations and industries

3. **Emerging Research Areas**

   - **i.** Sustainable Manufacturing
   - **ii.** Robotics and Automation
   - **iii.** Additive Manufacturing
   - **iv.** Renewable Energy Systems
   - **v.** Smart Materials and Advanced Composites

4. **Industry Collaboration and Skill Development**

   Strengthening partnerships with industries to enhance practical learning, training opportunities, and employability of graduates

   - **i.** Industry-sponsored laboratories
   - **ii.** Industrial internships and training programs
   - **iii.** Guest lectures by industry experts
   - **iv.** Collaborative research and consultancy projects

5. **Infrastructure and Laboratory Modernization**

   Developing state-of-the-art laboratories and research facilities to support teaching, research, and innovation activities

   - **i.** Modernization of manufacturing and thermal engineering laboratories
   - **ii.** Establishment of CAD/CAM and simulation facilities
   - **iii.** Development of robotics and automation labs
   - **iv.** Enhancement of digital library and research resources

6. **Student Development and Employability**
   Preparing students for professional careers by enhancing technical skills, leadership qualities, and innovation capabilities
   - **i.** Technical clubs and innovation cells
   - **ii.** Participation in national and international competitions
   - **iii.** Entrepreneurship and startup support
   - **iv.** Career guidance and placement training

7. **Faculty Development and Academic Leadership**
   Encouraging continuous professional development of faculty to improve teaching effectiveness and research productivity
   - **i.** Participation in Faculty Development Programs (FDPs)
   - **ii.** Encouraging research collaborations and consultancy
   - **iii.** Training in modern teaching and research tools
   - **iv.** Recognition and incentives for research excellence

8. **Sustainability and Social Responsibility**
   Promoting sustainable engineering practices and contributing to societal development through engineering solutions
   - **i.** Research on energy-efficient technologies
   - **ii.** Green manufacturing practices
   - **iii.** Community outreach programs
   - **iv.** Awareness programs on sustainable engineering

9. **Global Engagement and Collaboration**
   Developing international collaborations to promote global learning and research opportunities
   - **i.** Academic collaborations with international universities
   - **ii.** Student and faculty exchange program
   - **iii.** Joint research and publications
   - **iv.** Participation in global conferences

SWOT Analysis

Strengths

- **i.** Experienced faculty members
- **ii.** Established laboratories
- **iii.** Strong foundation in core mechanical subjects
- **iv.** Good student intake
- **v.** Support from university administration

Weaknesses

- **i.** Limited research funding

ii. Need for advanced laboratory equipment
iii. Limited international collaborations
iv. Need for increased industry interaction

Opportunities

i. Growing demand for mechanical engineers
ii. Industry 4.0 and smart manufacturing
iii. Research funding from government agencies
iv. Collaboration with industries and research organizations

Threats

i. Increasing competition from other institutions
ii. Rapid technological changes
iii. Industry skill requirements evolving quickly

Strategic Goals (2026–2031)

The department has identified the following strategic goals:

i. Academic Excellence
ii. Enhancement of Teaching and Learning
iii. Industry Collaboration and Skill Development
iv. Student Support and Career Development
v. Quality Assurance and Governance
vi. Research and Innovation
vii. Industry Collaboration
viii. Infrastructure Development
ix. Student Development and Placement
x. Faculty Development
xi. Community Engagement and Sustainability

Strategic Objectives and Action Plans

Academic Excellence

Objective

Enhance the quality of teaching and learning to meet global engineering standards.

Strategies

i. Update curriculum based on Industry 4.0 technologies
ii. Introduce interdisciplinary courses
iii. Implement outcome-based education
iv. Strengthen laboratory-based learning

Research and Innovation

Objective

Promote high-quality research and innovation among faculty and students.

Strategies

i. Increase research publications
ii. Encourage funded research projects
iii. Promote patent filing
iv. Establish research laboratories

Targets (2026-2031)

i. 50+ research publications
ii. 10 patents
iii. 5 funded research projects
iv. 2 research centers

Area	Target by 2031
Research Publications	50+
Patents	10
Industry MoUs	10
Placement Rate	90%
Faculty with PhD	80%
Funded Projects	5

Industry Collaboration

Objective

Strengthen partnerships with industries to enhance practical learning.

Strategies

i. Sign MoUs with industries
ii. Organize industrial visits
iii. Arrange internships
iv. Invite industry experts for lectures

Expected Outcomes

i. Improved employability
ii. Real-world exposure for students
iii. Collaborative research projects

Infrastructure Development

Objective

Upgrade laboratories and facilities to support advanced learning and research.

Plans

i. Establish Advanced Manufacturing Lab
ii. Upgrade Robotics and Automation Lab
iii. Develop 3D Printing and Rapid Prototyping Lab
iv. Install advanced CAD/CAM software

Student Development

Objective

Enhance technical, professional, and entrepreneurial skills of students.

Activities

i. Technical workshops
ii. Student competitions
iii. Hackathons and design challenges
iv. Entrepreneurship training

Expected Outcomes

i. Higher placement rates
ii. Increased student innovation
iii. Improved technical skills

Faculty Development

Objective

Enhance faculty knowledge and research capabilities.

Strategies

i. Encourage Ph.D. completion
ii. Organize faculty development programs
iii. Support conference participation
iv. Provide research grants

Community Engagement and Sustainability

Objective

Promote sustainable engineering practices and community development.

Initiatives

i. Renewable energy projects

ii. Rural technology development
iii. Environmental awareness programs
iv. Community engineering services

Implementation Plan

The strategic plan will be implemented through:

i. Departmental committees
ii. Faculty coordinators
iii. Annual progress reviews
iv. Budget allocation

Each strategic activity will have defined responsibilities and timelines.

Monitoring and Evaluation

To ensure effective implementation, the department will conduct:

i. Annual strategic review meetings
ii. Performance evaluation using KPIs
iii. Progress reports
iv. Feedback from students and industry

Expected Outcomes by 2031

By the end of 2031, the department aims to achieve:

i. Recognition as a leading mechanical engineering department
ii. Strong industry partnerships
iii. Increased research output
iv. Higher student placement rates
v. Enhanced laboratory infrastructure

Conclusion

The Five-Year Strategic Plan 2026–2031 outlines a clear roadmap for the Department of Mechanical Engineering to enhance academic quality, research excellence, industry collaboration, and student success.

By implementing this plan effectively, the department will contribute significantly to technological development, industrial innovation, and societal progress.