

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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BEST PRACTICES

NAAC Self-Study Report | Criterion VII | 7.2

The Department of Computer Science & Engineering is committed to producing technically proficient, research-oriented graduates who are equipped to meet the demands of a rapidly evolving industry. The following best practices reflect the department's sustained efforts in curriculum innovation and research culture promotion, and are documented in the NAAC-prescribed format.

Best Practice 1: Industry-Aligned Curriculum & Skill Integration

1. Context	The rapid pace of technological advancement in domains such as Artificial Intelligence, Machine Learning, Cloud Computing, Blockchain, and the Internet of Things (IoT) has fundamentally altered the skill expectations of the global IT industry. Traditional curricula, which are often static and examination-driven, fail to bridge the gap between academic learning and industry readiness. The Department of Computer Science & Engineering recognized this gap and took proactive measures to establish a living curriculum that continuously evolves in alignment with industry trends, accreditation standards, and higher education requirements. This practice is embedded in the department's academic governance through a structured Industry-Academic Interface Cell.
2. Objectives	<ul style="list-style-type: none">• To ensure that the curriculum remains contemporary and relevant by integrating emerging technologies and industry-demanded competencies.• To foster partnerships with leading organizations to incorporate real-world inputs into course design, delivery, and evaluation.• To prepare graduates for both immediate employment and higher education (M.Tech / Ph.D.) through a dual-track skill development approach.• To promote application-based, outcome-oriented pedagogy aligned with NEP 2020 and NBA/NAAC accreditation frameworks.• To reduce the skill gap between industry requirements and student competencies through targeted electives and certification programs.
3. The Practice	The department undertakes a systematic annual curriculum review involving industry representatives, alumni in senior technical positions, and senior faculty members. Outcome-Based Education (OBE) principles guide the design of every course, with learning outcomes mapped to Programme Outcomes (POs) and Programme-Specific Outcomes (PSOs). Elective courses in Cloud Computing (AWS/Azure fundamentals), Deep Learning, Blockchain Technology, and Cybersecurity have been introduced at the third and fourth year levels. Industry experts are invited as guest lecturers and visiting faculty for specialized modules. Students are encouraged to supplement their coursework with NPTEL, Coursera, and vendor-specific certifications (such as

	AWS Certified Cloud Practitioner, Google Associate Cloud Engineer). Mandatory internship credits ensure that students receive real-world exposure prior to graduation. The curriculum also accommodates vertical electives that allow students to specialize according to emerging career trajectories.
4. Evidence of Success	<ul style="list-style-type: none"> ✓ Placement rates have consistently improved, with students recruited by leading technology companies in AI/ML and cloud computing roles. ✓ Multiple students have earned globally recognized certifications from AWS, Google, and Microsoft alongside their degree requirements. ✓ The revised curriculum has received positive feedback in exit surveys, with students rating industry alignment significantly higher than in previous cohorts. ✓ Increased enrollment in M.Tech and Ph.D. programs reflects stronger academic preparation through research-oriented electives. ✓ Industry mentors report a marked improvement in the technical readiness and problem-solving aptitude of final-year students. ✓ The curriculum review process has been institutionalized through the Board of Studies (BoS) minutes and formally documented.
5. Problems Encountered & Resources Required	<ul style="list-style-type: none"> ⚠ Rapid obsolescence of content: technology evolves faster than annual revision cycles, requiring interim updates between formal curriculum revisions. ⚠ Resource constraints: procurement of licensed software platforms, cloud credits, and lab equipment involves significant recurring expenditure. ⚠ Faculty upskilling: continuous training of faculty in newly introduced domains demands dedicated time and institutional investment. ⚠ Student heterogeneity: varying levels of foundational knowledge make it challenging to pace advanced courses effectively. ⚠ Coordination with affiliating bodies to obtain approval for newly designed electives can involve administrative delays.

Best Practice 2: Promotion of Innovation, Research Culture & Experiential Learning	
1. Context	Higher education institutions are increasingly evaluated on their contribution to knowledge creation and not merely knowledge dissemination. The Department of Computer Science & Engineering identified that a passive, classroom-centric learning environment was limiting students' potential for innovation and independent inquiry. To address this, the department initiated a multi-pronged strategy that simultaneously fosters research culture among faculty and students and embeds hands-on, experiential learning into the pedagogical framework. This practice is grounded in the belief that genuine learning occurs when theoretical concepts are applied to solve authentic problems, and that a research-active environment is a necessary precondition for academic excellence.
2. Objectives	<ul style="list-style-type: none"> • To cultivate a culture of inquiry, experimentation, and knowledge generation among both students and faculty members.

	<ul style="list-style-type: none"> • To increase the department’s research output in terms of peer-reviewed publications, patents filed, and externally funded projects. • To integrate project-based learning, mini-projects, and hackathons as core components of the academic experience. • To support students and faculty in pursuing higher education and collaborative research through structured mentorship. • To establish the department as a recognized center for research in AI/ML, Blockchain, IoT, Cloud Computing, and Cybersecurity.
3. The Practice	<p>The department has established a Research & Innovation Cell that coordinates all research activities, tracks publication targets, and maintains liaison with funding agencies such as DST, SERB, and AICTE. Every faculty member is encouraged to maintain an active research agenda with at least one journal publication per year. Students are introduced to research methodology from the second year onward, and final-year projects are structured as research-grade investigations with literature reviews, hypothesis-driven experiments, and formal documentation. The department organizes annual hackathons, coding marathons, and idea-pitching competitions in collaboration with industry partners. Faculty members serve as mentors for M.Tech dissertations and Ph.D. scholars, ensuring a continuous pipeline of research activity. Guest lectures by researchers from IITs, NITs, and international institutions expose students to the global research landscape.</p>
4. Evidence of Success	<ul style="list-style-type: none"> ✓ Faculty have published research papers in SCI, Scopus-indexed and UGC-CARE listed journals, reflecting sustained research productivity. ✓ Students have filed patents in domains including AI-based healthcare diagnostics, IoT-driven smart agriculture, and Blockchain-enabled supply chain systems. ✓ The department has successfully executed funded research projects under government schemes, with sanctioned grants utilized for lab augmentation. ✓ Multiple student teams have won or received recognition at national-level hackathons and smart India hackathons (SIH) events. ✓ Enrolment in the department’s MTech program has grown, partly attributable to the research environment that attracts motivated candidates. ✓ A functional prototype laboratory enables students to convert conceptual projects into demonstrable technology solutions.
5. Problems Encountered & Resources Required	<ul style="list-style-type: none"> △ Attracting and retaining research-active faculty in a competitive academic job market remains a persistent challenge. △ Access to high-performance computing infrastructure for large-scale AI/ML experiments requires capital investment beyond routine budgetary provisions. △ Students often lack prior exposure to research writing and publication norms, necessitating dedicated workshops and one-on-one mentoring. △ Navigating patent filing procedures requires legal and administrative support that may not always be readily available within the institution. △ Balancing research responsibilities with teaching load can lead to faculty time constraints, particularly during examination periods.

Best Practice 3: Experiential Learning & Hands-on Approach

1. Context	<p>In the domain of Computer Science & Engineering, conceptual understanding alone is insufficient for professional competence. Employers consistently highlight the lack of practical, problem-solving ability as a critical shortcoming among fresh graduates. Recognizing that knowledge is best consolidated through application, the Department of Computer Science & Engineering has institutionalized an experiential learning model wherein every course is accompanied by a structured practical component. This approach is supported by a modern laboratory ecosystem, a culture of project-based learning, and regular participation in industry-facing competitive events such as hackathons. The practice aligns with the National Education Policy (NEP) 2020's emphasis on competency-based education and its vision of moving away from rote learning toward deep, applied understanding.</p>
2. Objectives	<ul style="list-style-type: none">• To ensure that every theoretical course is complemented by hands-on laboratory sessions that reinforce applied understanding of core concepts.• To develop students' ability to independently design, build, test, and present solutions to real-world computational problems.• To instill a problem-solving mindset through structured mini-projects, major capstone projects, and open-ended design challenges.• To provide exposure to industry-standard tools, programming environments, and development workflows within the academic setting.• To build collaborative teamwork, project management, and technical communication skills through group-based project experiences.• To promote healthy competition and creative thinking through participation in hackathons, coding contests, and inter-departmental challenges.
3. The Practice	<p>The department follows a 'lab-integrated curriculum' model in which each theory course carries a corresponding laboratory course with a minimum of two practical hours per week. Laboratory manuals are updated each academic year to reflect current tools and frameworks. From the second year onward, students undertake mini-projects in groups of three to four, which are evaluated through mid-semester demonstrations and viva voce. Final-year students execute a major project over two semesters that requires literature survey, problem formulation, development, testing, and formal report writing. The department's computing laboratories are equipped with industry-standard IDEs, simulation software, and cloud sandbox environments. A dedicated Innovation & Prototype Lab enables students to work with Raspberry Pi, Arduino, IoT sensor kits, and edge AI hardware. The department organizes an annual internal hackathon and facilitates student participation in Smart India Hackathon (SIH), ICPC, and other national-level events. Industry mentors periodically review project progress and provide real-world feedback. Case studies drawn from actual industry scenarios are integrated into coursework to bridge the gap between classroom instruction and professional practice.</p>
4. Evidence of Success	<ul style="list-style-type: none">✓ Students have consistently qualified for and participated in the Smart India Hackathon (SIH), with several teams reaching the grand finale stage.✓ The mini-project and major-project framework has produced functional prototypes in domains including smart health monitoring, crop disease detection using AI, and blockchain-based document verification.✓ Feedback from campus recruiters confirms that students demonstrate stronger coding proficiency and system design thinking compared to peers from comparable institutions.

	<ul style="list-style-type: none"> ✓ Several mini-projects have been extended into research publications and patent disclosures by student-faculty teams. ✓ Exit survey data reveals that practical and project-based components are consistently rated among the most valuable aspects of the program by graduating students.
<p>5. Problems Encountered & Resources Required</p>	<ul style="list-style-type: none"> △ Maintenance of laboratory hardware and software licenses involves recurring expenditure that must be planned carefully within departmental budgets. △ Ensuring equitable access to high-end computing resources during peak project periods (end-of-semester) can strain laboratory capacity. △ Students from non-programming backgrounds at entry level require additional bridge-course support before they can meaningfully engage with hands-on activities. △ Evaluating open-ended projects fairly and consistently across multiple faculty evaluators demands well-defined rubrics and calibration sessions. △ Coordinating with industry mentors for regular project reviews requires sustained relationship management and scheduling flexibility on both sides.