A Review of NBA Accreditation of Engineering Programs at the Undergraduate Level in India (Tier - II)

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Abstract: India has experienced an unprecedented increase in the count of colleges and universities that offer technical education. It is, however, a concern regarding the quality of technical education graduates in the nation. AICTE, which recognizes the importance of quality technical education, established the NBA in 1994 to establish standards for engineering programs. Taking a significant step forward for engineering education, India became a tentative member of the Washington Accord on the 20th June 2007, and became a permanent member on 2014. Accreditation is centered on outcome-based education. Basically, this is a student-centric approach in which student performance is evaluated based on their knowledge, abilities, and attributes.Today, accreditation is a requirement to assure quality, to elevate graduates to global recognition, and to expand the program. The purpose of this paper is to give a brief overview of the NBA accreditation procedure for UG engineering program. We have outlined the procedure for NBA accreditation of those institutions which are part of Tier-II accreditation system.

Keywords: Technical education; quality assurance; NBA; OBE; SAR; CO; PO. PSO; PEO; Tier-II.

I. INTRODUCTION

Engineering& technology related courses, management courses, architecture &town planning courses, and pharmacy are among the technical courses offered in India as diploma, undergraduate, and postgraduate programmes. Higher education in India has experienced a spectacular growth since the mid-1990s, taking Indian higher education to the 3rd position in the world.As higher education expands more and more in this country, there is debate about how to assess quality, & higher education institutions and programs are growing at an unprecedented rate, which makes this imperative. Regulations and standards prescribed by the regulator change over time, requiring the introduction of various quality assurance and to make sure accredited institutions and programs meet or exceed accreditation standards.The goal of accreditation is to

provide the public with a quality assurance scheme that provides certification of assessment that is valid for a stated period of time and recognition for those educational institutions that meet commonly accepted standards of quality or meet criteria laid down by authoritative agencies[1]. A key step toward improving education is meeting quality goals. Pursuing excellence is the principal goal of nearly all HEIs. The National Board of Accreditation (NBA) of India is a signatory to the Washington Accord [2].Many internationally renowned engineering programs will be accredited as part of the agreement.Accreditation of engineering academic programs is based on the Washington Accord, which sets forth the criteria, policies, and procedures [2]. Accreditation focuses primarily on Outcome Based Education (OBE). In this approach, students' performance or outcomes are measured based on their knowledge, skills, and attributes [3]. In order to prepare global engineers for the rapidly changing workplace, outcome-based accreditation is essential. To meet educational quality standards, accreditation is a crucial step [1].

II.   THE NATIONAL BOARD OF ACCREDITATION

As stipulated in Section 10(u) of its Act, the All India Council of Technical Education (AICTE) established the National Board of Accreditation of India (NBA) in 1994to ascertain the quality of educational programs offered by AICTE-approved institutions in fields such as engineering, technology, medicine, architecture, and others.

As of the 7th of January 2010, NBA became an independent organization with the purpose of ensuring quality, accuracy, and relevance of technical education [1]. Programs such as engineering & technology, management, architecture, pharmacy, hotel management & catering fall within this category.NBA Rules and Memorandum of Association were modified in April 2013 so that the NBA has complete administrative and financial independence from AICTE. The NBA evaluates technical institutes based on standardized evaluation criteria.The NBA shall focus on institutional goals and objectives, infrastructure facilities, academic rigor, curriculum design, support services such as libraries, laboratories, instruments, and computer facilities, etc. and any other aspect that will assist educational institutions in getting graduates ready to compete with the industry.

III.   ACCREDITATION POLICY

NBA accreditation is limited to courses in Engineering courses, Management courses, Computer Application courses, Pharmacy courses, Hotel Management and Catering Technology [1]. No accreditation for part-time programs.

The following general policies serve as the guide for accrediting technical schools:

- The NBA accredits specific technical programs of institutionthat has been officially authorized by the AICTE or other relevant regulatory body, and not the institution entirety.

- Applications are only considered for the programs which has been continuously running uninterrupted throughout at least two recent graduation batches.

- Through the e-NBA portal, institutions can apply for accreditation and must submit a Self-Assessment Report (SAR) in thepredefined format.

- Name of a program must correspond to the title on graduation degree of student's and with the approval letter from the regulating body.

- It is prescribed for the institution going for accreditation to pay the fee in two stages: 10% when submitting Pre-Qualifiers, and the balance 90% when submitting the SAR.

- NBA evaluates technical institutes based on standardized evaluation criteria.

- The institutions must indicate the status of accreditation correctly for every program.

- As part of its evaluation process, NBA appoints a Visiting Team that conducts on-site assessments of the program over two or three days when all academic activities for the applied program & regular lectures should take place as per the institution's schedule.

- Institutions can withdraw their application for a visit during the exit meeting, but only if they provide a written request to the Team Chair at that time. Once the visiting team departs, no withdrawal requests will be accepted.

- An Institution may appeal to NBA's Appellate Committee (AC) in less than 30 days of receiving the final decision of the NBA regarding their accreditation status, if they are dissatisfied with the decision.

- During the expert visit, if accreditation is withdrawn or fails to receive accreditation, a new application can be submitted & may be considered 1 year after the date of the previous visit.

- The institution can pay an additional 25% cost to postpone the visit once the expert team has been formed for the visit.Cancellation fees of 25% will be deducted from the institution's fee if the institution decides to cancel the visit.Upon withdrawal of a program which has been already accepted by the NBA for its further consideration after the fee has been paid, 10% of the accreditation fee is subject to deduction by the NBA.
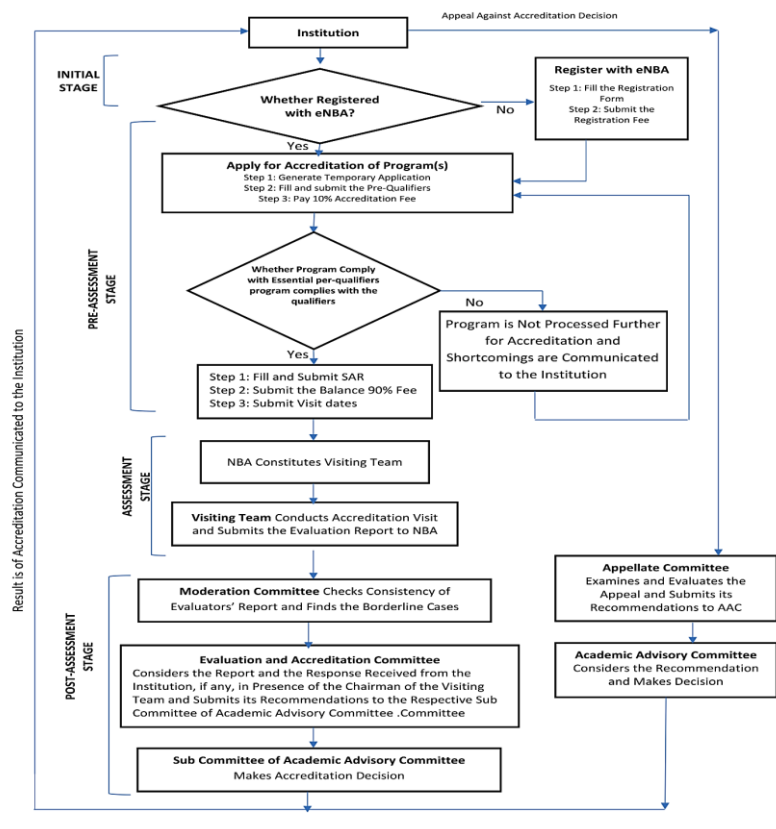
IV.   ACCREDITATION PROCESS

The accreditation process can be divided into four steps:i) The Initial Phase; ii) The Preliminary-Evaluation Phase; iii) The Evaluation Phase; and iv) ThePost Evaluation Phase.

- Institutions wishing to be accredited by NBA must register with e-NBA and complete the Initial Stage process as shown in Fig. 1. After submitting their registration forms, they will receive a response within 15 working days.

- To complete the accreditation process, institutions must submit 10 percent of the total accreditation fee, along with filled-in pre-qualifiers, after generating the temporary application

through the e-NBA portal. As instructed by the e-NBA website, the institution must submit the remaining 90 percent of the fee for programs with pre-qualifiers that are approved.

- The NBA will review the Self-Assessment Report (SAR) and take any necessary action after it is uploaded to the e-NBA portal.
- Upon receiving the SAR, NBA invites the institution to suggest dates for the visit and begins preparing. Upon confirmation of the date by the institution, NBA creates the visiting & evaluating team. Each programme is assigned a Chair and two evaluators.

Fig.1. Stages of NBA Accreditation Process

- Pre-visit reports are prepared by the Chairperson and the Evaluators based on the SAR. The committee members visit on planned dates and submit aguidelines-based report to determine the strengths/weaknesses/ deficiencies/observations regarding the programme concerned.
- After the accreditation team visit, the experts prepare an evaluation report for the NBA.
- NBA sends the Pre-visit report, the visit report, and the comprehensive report to the Moderation Committee after it receives them from the Chairperson.
- In the case of Under Graduate engineering programmes, the report is firstly presented before the Moderation Committee, and then to the Evaluation and Accreditation Committee. The chair of the expert team is present while this is being done.
- The EAC's suggestions are considered by the AAC's concerned Sub Committee before a final decision is made on accreditation.

- The institution may appeal the accrediting status of the program within 30 days of receiving the notice and paying the costs if unsatisfied.
- A compliance report and a compliance fee must be submitted by an institution that already has UG Engineering and UG Pharmacy accreditation that expires within six months of its validity.
- During the expert visit, if accreditation is withdrawn or fails to receive accreditation, a new applicationcan be submitted &may be considered 1 year after the date of the previous visit.

V. ACCREDITATION CRITERIA

Criteria 1: Vision, Mission and Program Educational Objectives (PEOs)

Criteria 1 is all about publishing the Vision and Mission of institution and the Vision, Mission & Program Educational Objectives (PEO's) of the engineering program which is going for first time accreditation or re-accreditation. This institute's vision and mission describe what it intends to accomplish over time.In order for the program to remain focused, the department's Vision and Mission statements must be aligned with the Vision and Mission statements of the institution.

Typically, providing graduates with a PEO describes what they are expected to accomplish after their graduation. The PEO may be governed by local/regional, global& the vision statement of the institute.During the process of defining the PEO's, all stakeholders of the institute should participate. It is crucial that the program's PEO supports the program's mission.

In evaluating this criterion, the following factors are important:

- Mention and indicate the department's and institution's Vision and Mission statements along with the Program Educational Objective statementsto stakeholders that where they are been published and distributed and the record should be established showing dissemination is being done properly among all the stakeholders.
- Provide a diagrammatic interpretation of the entire process of defining and framing the Vision and Mission of the Institute along with the stakeholders involved,which will be listed along with the documents supporting the process (meeting minutes, meeting notices, etc.).
- In the form of a matrix, ensure that PEOs are consistent with the Department's mission statement written in phrases from Mission statements to PEO's of the program specifying proper justification.

Criterion 2:Program Curriculum and Teaching Learning Processes

The program's core is the curriculum and its teaching/learning methods.A major tool for achieving Program Outcomes is Curriculum Assessment and Evaluation. An engineering curriculum typically consists of: Contents of Basic Sciences, Humanities, & Program Specific Courses; Laboratory Work; and Project Work. A Tier-2 Institution's Curriculum and Evaluation are administered by the university, so an institution can achieve the Program Outcome (PO) within the provided curriculum by adhering following key points:

Describe the process of identifying the extent to which the university curriculum is in compliance with the POs and Program Specific Outcome (PSO); also state if any curricular gaps are identified.If a gap exists in the curriculum, consider adding additional content or materials, lab experiments, or projects to the curriculum, or get in touch with the university/BOS about filling the gap [4].

To improve quality of teaching and learning, the following steps must be followed as per NBA:
• Maintain compliance with the University's academic calendar.
• ICT assisted learning, interactive classrooms, real-life examples, etc. are all pedagogical interventions that should be implemented.
• Methods should be put in place to encourage bright students and support weak ones.
• A class room's ambience; student engagement efforts; the quality of lab experience related to performing, recording, and analyzing experiments; maintenance of Practical record book; evaluation of each experiment should be carried out.
• Taking feedback from students regularly, analyzing it, and taking appropriate action should be the key to effective teaching and learning.
• Ensure that internal semester question papers and assignments reflect outcomes / learning levels and provide evidence of Course Outcomes' (COs) coverage.
• Implement appropriate methodology to identify, allocate, continuously monitor and evaluate projects that contribute to the attainment of POs and PSOs.
• Industry-supported laboratories for students should be installed where industry-based programs can be designed, along with providing a partial delivery of any regular course for students.
• Initiatives for industrial / internship / summer training for longer than two weeks should be conducted for students.

Criterion 3:Course Outcomes and Program Outcomes
Preparing a SAR entails continuous evaluation and improvement. After studying a certain course or program, a student's outcome is what they are able to accomplish [5]. The outcomes can be categorized in four levels, including CO, PO, PSO and PEO.
At the end of a course, students acquire knowledge skills called Course Outcome's. The Program Outcome's represent what an engineer should know, be able to do, and be able to behave after completing a four-year engineering program. After completing a specific engineering program, PSOs define what graduates should be able to do. In the PEO, all the students who completed significant years of study after graduation and participated in the program are described.

To evaluate this criterion, take into account the following factors:

- For every course, a CO must be defined, and the CO should be precisely mapped to the PO/PSO of the course. A clear explanation of the program mapping matrix and course mapping matrix, as well as how assessment tools are used to evaluate course/content delivery, as well as how lab and project work contribute to reaching CO and PO, is required.

- A PO's achievement can be measured directly or indirectly.Essentially, direct assessment is the process of examining or observing the student's abilities against measurable criteria. However, indirect methods, which are based on rubrics, are more suitable for program outcomes that are unquantifiable, difficult to explain, and not evaluated by standardized tests or surveys, opinions.

- Two or three assessment years' results of any PO should be recorded as they are vital to the process of Improvement of the program on a continuous basis.

Criterion 4: Students' Performance

Students' academic performance should be closely monitored by the educational institution. In each academic year, the institution must provide information on the sanctioned intake and corresponding admissions in the program for three consecutive years (it is recommended that at least 50% of first-year students enroll),Student success after the first year with backlogs and without, academic performance after the second and third years, placements/higher education/professional experience (at least 40% of students of the program should be placed, get into higher education, and pursue entrepreneurial endeavors) as per the format given in the SAR. Program students are encouraged to become involved in professional organizations/chapters and to conducttechnical events at the institute. Students are also encouraged to work on technical magazines, newsletters, and other publications. Students of the program are also to encourage to participate in inter-institute, inter-state events.

Criterion 5 - Faculty Information and Contributions

Student-Faculty Ratio (SFR) shall be provided through the program for three full academic years.which must range between 1:15 and 1:25, the required Faculty Cadre Ratio must be as per the AICTE norms, Faculty Qualifications as per AICTE norms, Faculty Retention during the assessment period should be at least 50% of the required faculty using CAYm3 as a base year, Curriculum-specific competencies of faculty, Innovation in faculty teaching, Faculty professional development programmes, academic research, funded research, development and consultancy together with Faculty Performance Appraisals and Development Systems and visits, adjuncts, and emeritus faculty engagement(with minimum of 50 hr/year interaction on the program should be made) in accordance with the SAR format.

Criteria 6:Facilities and Technical Support

For the program outcome to be achieved, the institution must provide sufficient infrastructure.

There must be sufficient amount of Classrooms and tutorial rooms, rooms for meetings, the seminar hall, rooms for conference, faculty offices and well-equipped computing resources and equipment's in labs which relevant to the program need to be adequately furnished, maintained, upgraded, and used in a way that provides an optimal learning environment.

Adequate number of qualified technical support staff must be available to support the students of the program by using the available equipment, computers, and labs; the institution should also offer opportunities for the technical staff to upgrade their skills and advance their careers.

In order to fulfill curriculum requirements, and to provide the PO and PSO for the department, the institution must provide information about the lab equipment, maintenance, and safety measures pertaining to it.

Criteria 7:Continuous Improvement

A Criterion is an assessment of the quality of an academic program at the course level, program level and institute level, which is the heart of the NBA process, Continual improvement.Delivering courses, assessing students, and developing curriculum are improved through the analysis of CO attainment and PO attainment.

For the last three assessment years, the institute should provide a summary of - Evaluation of each PO and actions taken in response, description of the academic audit process and the measures taken, improvements in Higher Education & Placement, and substantial improvements in the quality of students admitted during the last three years of assessment.

Criteria8:First Year Academics

Students in the first year of graduate studies study a variety of courses from the departments of science, mathematics, and humanities.A ratio of 1:15 to 1:25 should be maintained by the Institution/provided to students, AICTE regulations should be followed for faculty qualification to teach first year common courses, the use of relevant assessment tools to achieve first-year course outcomes and program outcomes as per the benchmark set for each individual course, and taking action for continuous improvement of relevant POs and PSOs (based on evaluation).

Criteria 9:Student Support Systems

Students' academic support systems are vital to the teaching-learning process. It is advisable to maintain information on mentoring, feedback analysis, rewards mechanisms, self-learning modules and opportunities for learning beyond syllabus, career guidance, training & placement, entrepreneurship cell, as well as co-curricular and extracurricular activities as outlined in the SAR.

VI.   AWARD OF ACCREDITATIONFull

Accreditation:

The following requirements must be met for a program to earn full accreditation for six years:
- It is recommended to achieve an average of 750 points from 1000 points, with a minimum of 60% in mandatory categories (Criteria 4 to 6).
- Including lateral entry, the UG program should have a 50% average admission rate over three years (CAYm1, CAYm2, and CAYm3).
- The number of PhDs available in the department must equal or exceed 30% of the faculties required, averaged over two academic years (CAY and CAYm1).
- Over the course of three academic years, faculty-to-student ratio should be less than or equal to 1:20 years (CAY, CAYm1, CAYm2).
- For two years, the department should have at least 2 full-time professors with PhDs, 1 professor on a regular basis, and at least 1 associate professor.

Provisional Accreditation:
The following requirements must be met for a program to earn Provisional accreditation for three years:
- It is recommended to achieve an average of 600 points from 1000 points, with a minimum of 40% in mandatory categories (i.e. Criteria 5).
- Including lateral entry, the UG program should have a 50% average admission rate over three years (CAYm1, CAYm2, and CAYm3).
- The number of PhDs available in the department must equal or exceed 10% of the faculties required, averaged over two academic years (CAY and CAYm1).
- An average ratio of faculty to students should be less than or equal to 1:25 over three academic years (CAY, CAYm1, CAYm2).
- The department should have at least 1 professor or 1 associate professor on a regular basis with PhD degree for two academic years.

No Accreditation:
The program will not be considered for accreditation if it scores less than 600 marks or less than 40% in Faculty Information and Contributions [6].

VII.   CONCLUSION
Programs or institutions are audited during the accreditation process to ensure that the Standards and Norms established by the regulatory body continue to be met or exceeded.Recognition occurs when a program or institution meets certain standards. As a means of promoting and recognizing academic and technical excellence in colleges and universities, NBA accreditation is of vital importance. As a result of NBA accreditation, students, employers, and the general public have a way to verify the quality of educational programs Furthermore, the NBA promotes

excellence in technical education through its development approach to continuous quality improvement. As a step forward for improving India's higher-education system, the Washington Accord will allow Indian graduates to compete globally, but the major drawback to getting NBA Accreditation under TIER-II is that only the NBA accredited degree programs are eligible for recognition by other Washington Accord signatories.

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