

**Program Accreditation Policy
and
Procedures Manual
for
Engineering & Other Technologies
Revised 2023**



National Technology Council

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Foreword

National Technology Council, Pakistan, was established by the Higher Education Commission (HEC) as a statutory subsidiary, and autonomous organization to regulate the quality, and delivery process, of engineering and other technology education programs to produce skilled engineering, and other technologists who help in the socio-economic development of Pakistan. The strategic focus of National Technology Council is to improve quality of technology education programs that are based on Outcome Based Education (OBE) and Outcome Based Assessment (OBA) systems, through a comprehensive accreditation and certification framework, using international best practices. NTC developed a Program Accreditation Policy and Procedures Manual, First Edition 2017, incorporating all aspects of OBE and OBA applicable to engineering technology education programs run in the country. The Manual is a guideline for the Higher Education Institutions (HEIs) and other stakeholders to meet desired quality assurance standards. Using NTC's Manual as a benchmark, Degree Awarding Institutions (DAIs) are expected to produce competent engineering technologists who not only meet stakeholders' requirements, but also contribute effectively to national development.

NTC acknowledges the active support from engineers, engineering technologists and academicians who helped develop this Manual.

Chairperson NTC

Preamble

National Technology Council (NTC) was established by HEC under Sub-section (e) of Section 10, of the ordinance No LIII of 2002, dated 11 September 2002, and HEC notification No.19-3 /HEC/HRM/2015/9721, dated 7th September 2015, published in the gazette of Pakistan on October 2, 2015, as a statutory autonomous body, with the status of an independent, self-accounting unit. NTC has a mandate to carry out accreditation and certification of all 4-year baccalaureate programs leading to engineering, and other technology degrees, obtained after a minimum of 16 years of academic learning. Accreditation ensures that high quality technology education programs are run in Higher Education Institutions (HEIs) in the country, and that the programs, and respective HEI's, meet defined standards, and are substantially comparable to international best practices of the Sydney Accord. Engineering, and other technology education curriculum is aligned with guidelines of HEC and NTC and ensures a Continual Quality Improvement (CQI) culture, aligned with Outcome Based Education system.

This Manual incorporates quality assurance concepts in engineering and other technology education based on OBE and OBA systems adopted by developed countries. The Manual provides guidelines to HEIs, DAIs, and other stakeholders, to meet required quality assurance standards for accreditation of their engineering and other technology programs. The Manual defines learning-outcome elements that include Program Education Outcomes (PEOs), Program Learning Outcomes (PLOs), and Course Learning Outcomes (CLOs), required in technology curriculum that cover OBE and OBA concepts, and ensures CQI procedures. The PLOs and CLOs are also mapped to appropriate levels of Blooms Taxonomy.

Vision

Produce technologists with marketable skill sets that earn them personal dividends, and with their hands-on, cutting-edge technology prowess, be a key driver in Pakistan's transformation and development.

Mission

Help and facilitate HEIs to develop, implement, and monitor, technology academic programs in compliance with NTC's regulatory framework that produce high quality technologists with required professional attributes, and who are creative, innovative, and have hands-on technical skills that benefit society and leverage national development.

Objectives

NTC's prime objective and function is to regulate engineering, and other technology academic programs at the baccalaureate level and above, and ensure accredited programs satisfy quality academic standards that are benchmarked with international best practices, and that Graduate Technologists meet registration requirements of NTC.

To regulate engineering, and other technology academic programs, NTC shall:

- i.** Regulate all programs under its mandate by accreditation and stop admissions in those that are not accredited. Accreditation is mandatory.
- ii.** Share with the HEI's running technology programs the sequence and timing of accreditation visits necessary to accredit and regulate their programs. These include 1) Zero Visit, 2) Interim Visit, 3) Confirmatory Visit, and 4) Final or Accreditation Visit. The HEI should be aware of the guidelines, protocols, norms, and standards as specified in this Manual.
- iii.** Help HEI's to understand OBE and OBA systems.
- iv.** Help HEI's to develop a CQI system which uses feedback from stakeholders for improvement of academic programs to better meet needs of industry.
- v.** Help HEI's to develop a technical education eco-system that produces competent human resource that is competitive, and compatible with national goals of economic growth, and social development that meets international standards.
- vi.** Ensure that graduates satisfy minimum academic requirements for registration as Graduate Engineering Technologists.

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Notes

- This Manual and the Accreditation Criteria are dynamic and may change from time to time. However, changes shall not be applied retrospectively to programs.
- Accreditation Criteria is overarching and applies to all engineering technologies disciplines.
- There is a defined “programs criteria” that applies to a particular discipline of engineering technology.

Abbreviations

No.	Acronym	Definition
1	AIC	Accreditation Inspection Committee
2	ARC	Appeal Review Committee
3	CLOs	Course Learning Outcomes
4	CQI	Continuous or Continual Quality Improvement
5	CPD	Continual Professional Development
6	DAE	Diploma Associate Engineering
7	DAI	Degree Awarding Institutions
8	FTDF	Full Time Dedicated Faculty
9	GAs	Graduate Assistants
10	HEC	Higher Education Commission
11	HEIs	Higher Education Institutions
12	HOD	Head of Department
13	ICS	Intermediate Computer Sciences
14	IBCC	Inter Board Chairmen Committee
15	IEA	International Engineering Alliance
16	KPI	Key Performance Indicator
17	MFS	Minimum Faculty Strength
18	NCRC	National Curriculum Review Committee
19	NRT	National Register of Technologist
20	NTC	National Technology Council
21	OBA	Outcome Based Assessment
22	OBE	Outcome Based Education

No.	Acronym	Definition
23	PEVs	Program Evaluators
24	PEOs	Program Education Objectives
25	PhD	Doctor of Philosophy
26	PHOs	Practical Handouts
27	PLOs	Program Learning Outcomes
28	QEC	Quality Enhancement Cell
29	QIC	Quality Improvement Committee/Cell
30	RAs	Research Assistants
31	R&D	Research and Development
32	SA	Sydney Accord
33	SAR	Self-Assessment Report
34	SFT	Supervised Field Training
35	SIT	Supervised Industrial Training
36	SKP	Student Knowledge Profile
37	TAs	Teaching Assistants
38	TAB	Technology Accreditation Board
39	TSK	Technology Specific Knowledge

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CHAPTER – 1

Program Accreditation Policy and Procedures Manual for Engineering Technologies

1.1. Introduction

NTC has a mandate to carry out “Accreditation and Certification” of all 4-year programs at bachelor level, leading to engineering technology degrees, spanning over 16 years of academic learning. Accreditation ensures that high quality engineering technology education programs are run by Higher Education Institutions (HEIs), and respective HEIs have to conform to the Outcome Based Education (OBE) System in keeping with the Sydney Accord. Engineering technology education curriculum is aligned with guidelines of HEC and NTC, and ensures Continual Quality Improvement (CQI) culture, in the spirit of Outcome Based Education system.

1.2. Importance of Accreditation

Accreditation is a form of quality assurance to ensure that HEIs offer high quality engineering technology education programs. In this context, services, operations and resources of an HEI, and program curriculum are examined and evaluated by an external body to determine compliance with a set of standards, benchmarked with best international practice, and updated periodically in keeping with dynamic and evolving technological fields and modern industry. The Accreditation process gives the HEI an opportunity to conduct in-depth analysis of its strengths and weaknesses, to protect and promote interests of all stakeholders.

1.3. Scope

The following 4-year degree programs of technologies fall in the scope of NTC:

a) Engineering Technologies:

- i. B.E. Tech (Aeronautical)..... {read asBachelor of Engineering Technology (Aeronautical)}
- ii. B.E. Tech (Agro-Industrial)
- iii. B.E. Tech (Air Conditioning)
- iv. B.E. Tech (Aircraft Maintenance)

- v. B.E. Tech (Architectural)
- vi. B.E. Tech (Automotive)
- vii. B.E. Tech (Aviation)
- viii. B.E. Tech (Bioengineering)
- ix. B.E. Tech (Biomedical)
- x. B.E. Tech (Chemical, Process, Plant)
- xi. B.E. Tech (Civil)
- xii. B.E. Tech (Coal)
- xiii. B.E. Tech (Computers)
- xiv. B.E. Tech (Construction)
- xv. B.E. Tech (Cyber Security)
- xvi. B.E. Tech (Mechanical Drafting/Design)
- xvii. B.E. Tech (Electrical)
- xviii. B.E. Tech (Electronics)
- xix. B.E. Tech (Electromechanical)
- xx. B.E. Tech (Energy)
- xxi. B.E. Tech (Environmental)
- xxii. B.E. Tech (Fire Protection)
- xxiii. B.E. Tech (Food)
- xxiv. B.E. Tech (Garments)
- xxv. B.E. Tech (Industrial)
- xxvi. B.E. Tech (Information)
- xxvii. B.E. Tech (Instrumentation and Control Systems)
- xxviii. B.E. Tech (Manufacturing)
- xxix. B.E. Tech (Marine)

- xxx. B.E. Tech (Materials)
- xxxi. B.E. Tech (Mechanical)
- xxxii. B.E. Tech (Mechatronics)
- xxxiii. B.E. Tech (Metallurgy)
- xxxiv. B.E. Tech (Mining)
- xxxv. B.E. Tech (Nuclear)
- xxxvi. B.E. Tech (Petroleum)
- xxxvii. B.E. Tech (Software)
- xxxviii. B.E. Tech (Space Science)
- xxxix. B.E. Tech (Surveying / Geomatics Materials)
- xl. B.E. Tech (Telecommunications)
- xli. B.E. Tech (Textile)

b) Life Sciences Technologies:

- i. BS Animal Production & Technology
- ii. BS Biotechnology

c) Applied Physics Technologies

- i. BS Nano-Technology / Nano Science and Technology
- Some of these programs may be running under different nomenclature in HEI's, e.g., BSc Textile Engineering Technology for (xxxix). The HEI's are advised to change the nomenclature to that given above. However, programs currently running with different nomenclatures should run their course with that name: new admissions to the program must be under the new nomenclature.
- Additional emerging disciplines and degree programs in engineering technologies, or other technologies, that fall within the ambit of NTC, shall be added to the list in future, after recommendations of the Council, and approval of the Controlling Authority.

1.4. Technology Accreditation Committee (TAC)

The Technology Accreditation Committee(s) comprise of 5 members, chaired by the Vice Chairman NTC, and as approved by the Council and notified by NTC. The major functions of Technology Accreditation Committee (TAC) are as follows:-

- i. To implement NTC Accreditation Policy
- ii. To recommend guidelines for launching of new technology program and subsequent program accreditation
- iii. To assess and review recommendations of AIC at regular intervals.
- iv. To decide whether accreditation should be granted or not, as well as conditions to be imposed.
- v. Revision of accreditation policies in keeping with dynamic industrial needs and international standards.

1.5. Registration Requirements for Graduate and Professional Engineering Technologists

The registration will be carried out in respect of the 4 years accredited degree programs normally consisting of 130-140 credit hours and 16 years of academic learning through F.Sc Pre Engineering or equivalent, A-level, ICS, DAE. The registration against nominal fee will be open to the Engineering Technology Degree Programs i.e. B.Sc. mentioned in Scope, Section 1.3 of this manual.

Engineering Technology graduates prior to 2017, belonging to HEC recognized Universities / Institutions and permeating through 4 years Technology Degree will also be considered for registration in following categories:

- i. Registration as 'Graduate Engineering Technologists' on payment of Rs. 5,000/- for lifetime registration. The Graduates holding BSc Engineering Technology / B. Tech (Hons) / B. Tech / BS Technology / BE Technology / BSc Technology Degrees will be registered on production of photocopy of HEC's attested Degree and Transcript. However, the cut-out date for their registration would be 31st December 2021, after which only the Graduates permeating through NTC's accredited programs would be eligible for registration by NTC.
- ii. Registration as 'Professional Engineering Technologist' after acquiring 5 years of post-degree experience in the relevant Technology Discipline and on production of photocopy of HEC's attested Degree and Transcript along with experience certificates issued by the competent authority of the concerned organizations/departments. The Registration fee would be Rs. 10,000/- for life time registration.
- iii. The foreign degree holders will also be required to produce HEC's equivalence certificate.

Note: The prescribed Registration fee mentioned above may change subject to approval of the Council.

1.6. Technology Registration Committee (TRC)

The Technology Registration Committee(s) comprise of 3 members, as approved by the Council and notified by NTC. The appeals against decisions of TRC shall be addressed by Appellate Committee notified by NTC to adjudicate appeal cases. The major functions of Technology Registration Committee (TRC) are as follows:-

- i. To approve registration of graduate engineering technologists and professional engineering technologists in national register of technologist.
- ii. To make recommendations for revision of Registration policies in keeping with dynamic industrial needs and international standards.

CHAPTER – 2

Accreditation Process

2.1 Introduction

This chapter highlights the process and procedures pertaining to the program accreditation by NTC. The accreditation process, whether for a first accreditation or re-accreditation, involves a comprehensive assessment which starts with a review of the information submitted by HEI in Self-Assessment Report (SAR) as contained in chapter 4 of this manual, followed by the Accreditation Inspection Committee (AIC) visit and subsequent preparation of the accreditation report based on findings and recommendations of AIC team to the NTC.

2.2 Qualifying Requirements

Qualifying Requirements screen out Programs falling below the minimum core threshold of the assessment criteria. Failure to meet any one of the Qualifying Requirements shall disqualify the Program and stop further processing. There are eight (8) components of the Qualifying Requirements, and each Program is expected to have all components. These components are:

- i. The HEI must satisfy the legal status requirement from relevant bodies, specifying whether it has a Charter, is a Degree Awarding Institution (DAI), is a constituent or affiliate of an institution etc.
- ii. Engineering Technology Program are of 4 years duration, and comprise of 130 - 140 credit hours, with the following ratios:
 - Core Technology Subjects: 70% credit hours
 - Allied Subjects: 30% credit hours
- iii. The 8th semester, or 7th and 8th semesters are for Supervised Industrial Training (SIT). In Framework A, SIT is in 8th semester only. In Framework B, SIT is in both 7th and 8th semesters. (Minimum requirement is 16 credit hours, 8 hrs. a day, 5 days a week)
- iv. Hand-on and theoretical part of the SIT may be based on a 60:40 ratio, i.e., 60% time is spent on hands-on training, and 40% time on theoretical aspects of the SIT. HEI's must have MOUs with industry and field organizations for the SIT during 8th, or 7th and 8th semesters.
- v. A full-time core technology faculty, with a minimum of 6 (1 Professor, 1 Associate Professor, 2 Assistant Professors and 2 Lecturers) is required per program. Furthermore, a student-faculty ratio of 20:1 or better is desired.

- vi. Compliance to observations of the last AIC visit must be reflected in SAR.
- vii. A summary of initiatives to adopt OBE.
- viii. A duly completed and signed SAR including compliance report as per prescribed format given in Chapter 4 of the Manual

In case of first accreditation of a program, the HEI should provide the compliance on the Zero / Interim visit observations. If the Program has met all the qualifying requirements, NTC will assess the Program based on this Manual.

2.3 Accreditation Process and Parameters

Generally, the steps involved in the accreditation process are as follows:

- i. The Higher Educational Institution will make an application for accreditation by submitting the prescribed Fee and according to Self-Assessment Report SAR as given in chapter 4 of this manual. If a new program is to be started or already accredited program is to be re-accredited, the application will be submitted at least 6 months before the start of a new program or before sixth semester of the already accredited program.
- ii. NTC will form Accreditation Inspection Committee (AIC) to evaluate the submitted information. The Committee will be headed by a Team Leader, and the number of members & their field of expertise on the Accreditation Committee will depend on the program to be accredited. NTC will adopt the following guidelines in determining the composition of the (AIC)
 - a. An academic (or formerly an academic) member, preferably trained in line with Outcome Based Education (OBE) system conforming to Sydney Accord requirements, shall be included in the Team.
 - b. Expert Representatives from respective key stakeholders from Engineering Technologies shall be included in the committee.
 - c. The AIC Leader should not be a current academic in an educational institution in the region of the country where Accreditation will be in process.
- iii. The (AIC) may, before visiting and evaluating the submitted information, request HEI through Secretary NTC for additional information, where necessary.
- iv. If the information provided is sufficient, the (AIC) Leader will request the Secretary of the NTC/Program Coordinator to liaise with the Educational Institution to develop a schedule or program for an on-site visit and subsequent Evaluation.

- v. If observers are to be included in the on-site visit, the Secretary of the NTC/ Program Coordinator will seek prior written consent from the Educational Institution, as its expenses will be charged to the HEI in addition to the normal Fee.
- vi. The AIC will carry out the on-site visit, which could take between two to three days.
- vii. The AIC will meet, prepare and submit its summary report to NTC within 5 days after the on-site visit; and formal report within 30 days after the visit.
- viii. On the basis of the report by the AIC and its recommendations, a decision on accreditation will be made by NTC. Accordingly, the Higher Educational Institution (HEI) will be informed of the decision by NTC.
- ix. An appeal, if deemed necessary, against the decision of NTC will have to be submitted in writing within 30 days of the date of NTC decision report.
- x. The duration of accreditation will depend upon the recommendation of AIC and the subsequent approval by the NTC.

Accreditation of Four (4) years Technology Degree Program will be carried out by NTC, and considering the following aspects:

- i. Program Education Objectives
- ii. Program Learning Outcomes
- iii. Curriculum and Learning Process
- iv. Students Related
- v. The faculty and Supporting Staff
- vi. Infrastructure and other Facilities
- vii. HEI's Management Structure, Financial Health and Program Support
- viii. Continuous Quality Improvement (CQI)
- ix. Industrial Linkages

2.4 Accreditation Inspection Committee (AIC)

The visiting team referred to as Accreditation Inspection Committee (AIC) consists of 3 to 4 members, the Team Lead, two Experts/Evaluators of the respective field under consideration and NTC Representative. The experts/evaluators should have earned preferably Doctorate or at least Master's degree related to program(s) under accreditation and having at least 10 years of teaching-cum-industrial and practical experience. The AIC will include participants who have no

conflict of interest with the Degree Awarding Institution (DAI) / Higher Education Institution (HEI) to be visited and who are selected based on their high standing in the profession, ability to assess curricula, competence in appraisal based on overall objectives and performance towards the achievement of set goal.

2.4.1 Team Lead

The Team Lead of the Accreditation Inspection Committee (AIC) has the overall responsibility for the accreditation visit. The Team Lead assigns duties to each team member keeping in view the overall perspective. He should be familiar with the accreditation process and gather in advance the earlier reports, if any. He has the responsibility for the preparation of consolidated team report and its timely submission for the consideration of the NTC. If Team Lead is unable to undertake the visit due to unforeseen circumstances, one of the senior members of the team will be appointed by Chairperson/Secretary NTC to fulfill the role of Team Lead.

2.4.2 NTC Representative

The member is responsible for providing all secretarial facilities, coordinating between Accreditation Inspection Committee (AIC) and the Institute, availability of relevant information and ensure compliance to accreditation process. NTC representative shall give detailed briefing about the visit, institutional data and previous accreditation visit report(s) to the Team Lead. NTC representative will also ensure compilation of visit report on the last day of visit for submission to the NTC. He/she will also help to provide necessary policy level updates to the AIC when and where required.

2.4.3 Program Evaluators (PEVs)

The Program Evaluators (PEVs) are responsible for the evaluation of an individual program. Usually there are two evaluators, preferably one from industry or having industrial experience for each program. The members from an industry or user organization can be included only in the final visit during 3rd or 4th year of the program. The latter can sometimes serve as an expert for more than one program depending on his competence and abilities. However, in case two programs with substantial similarity in course contents are being offered within a department, a single set of two/three PEVs may be chosen for both the programs. For programs in emerging or inter-disciplinary areas, more PEVs can be included in the team depending on the need.

The duties of the Program Evaluators (PEVs)

0 include evaluation with reference to the criteria given earlier, through physical verification of infrastructure / facilities, records, interviews with administrators, faculty, alumni, students / stakeholders and other activities, which they find necessary for the total performance appraisal. The PEVs are also required to mention strengths and weaknesses against each criterion in the worksheet.

The Program Evaluators (PEVs) deputed for accreditation purposes should be senior professionals having enough requisite teaching / research experience. Availability of these PEVs may be sought well in advance and the candidate institution will be informed about the composition of AIC. The candidate institution may object to the assignment of a PEVs provided it submits proof of any verifiable conflict of interest with the assigned PEVs. In case a PEV is unable to undertake the visit due to circumstances beyond his/ her control, the Team Lead of the team will nominate another PE in consultation with Secretary NTC, keeping in view the guidelines for selection of PEVs.

2.5 Types of Accreditation Visits

In relation to "Accreditation of Engineering Technology Programs" following are various types of visits conducted by NTC:

2.5.1 Zero Visit

Higher Education Institutions (HEIs) desirous of starting new technology programs shall apply for a Zero Visit by NTC, six (6) months before launching the program. The application must provide detailed information on prescribed Form (NTC/ZV - 001), along with the prescribed fee. Zero Visit is mandatory to get a go-ahead, green signal from NTC for launching new programs. The HEI must not advertise for admissions prior to approval by NTC.

2.5.2 Interim Visit

Once a program commences after getting a green signal from NTC (after the Zero Visit), the HEIs must apply for an Interim Visit, along with prescribed fee, at the start of fourth semester of the new program.

This is essential to ascertain HEIs preparedness for the next phase of the Program. The HEI must provide detailed information and documentation as per NTC Form (SAR) for critical analysis, and to gauge the progress since the Zero Visit Report and observations. Details and deadlines for submittal of the application for the Interim Visit are as per the prevailing NTC policy.

2.5.3 Change-of-Scope Visit

An accredited program is required to apply for a Change-of-Scope Visit if:

- i. The already allowed student enrollment needs to be increased.
- ii. There is a change in the scope of the program objective, curriculum, or nomenclature.

(NTC allows 10% upward revision of core subjects, and 10% downward revision in allied subjects. Any best compromise between 80:20 and 70:30 is acceptable. Allied subjects shall not be more than 30% of the total. Any revision must have approval of the Academic Council of the HEI, not effect total credit hours, and under intimation to NTC).

- iii. There are addition of new streams or specialization in the program's Scheme of Study

Note: Application for change-of-scope visit must be submitted at least 3-months prior to implementing the proposed change.

2.5.4 Accreditation and Reaccreditation Visit

An institution applying for accreditation visit is expected to fulfill all Outcome Based Education system requirements pertaining to PEOs, PLOs, CLOs and their mapping, curriculum, Faculty, laboratories, library, infrastructure, finances, Continuous Quality Improvement CQI and other allied facilities as per the accreditation guidelines. Program seeking accreditation for the first time is required to ensure submission of relevant form to NTC at-least six months before the commencement of Program. The programs seeking renewal of accreditation status (Re-Accreditation) should apply before sixth semester.

2.5.5 Confirmatory Visit

This visit is necessitated only if required by the NTC as a result of any deferred / pended accreditation decisions due to deficiencies that can be removed within 6 months.

2.6 Provision for Withdrawal

The Higher Education Institutions (HEI) has the option to withdraw an "Engineering Technology Program(s) Accreditation" during the Accreditation Inspection Committee (AIC) visit through written request to the AIC Team Leader after being informed of its strengths and weaknesses, but before the AIC makes final decision and submits a Report. However, the accreditation visit fee will not be refunded.

The purpose of this provision is to enable the institutions to improve the program quality in keeping with qualifying requirements mentioned in section 1.6 above after making the necessary investments and corrections to overcome the indicated weaknesses, rather than be assigned a 'Not Accredited' status. The institution can apply again for the accreditation of program(s) being withdrawn together with the prescribed fees.

2.7 Activities in AIC Visit

Normally, the Accreditation Inspection Committee (AIC) requires two days to complete the evaluation of a program. However, for multiple programs, the visit may be scheduled for more days. In this case the visit will be planned to hold respective presentations in a combined session followed by visit to common facilities during the first day. All relevant documents and information should be made available and displayed in the exhibit room for scrutiny and analysis. Qualitative facts such as professional attitude, commitment to academics and R&D activities, conduciveness of environment, and morale of the faculty and students should also be taken into consideration while evaluating the program.

Following activities are expected to be completed during the visit:

- a. Meeting with senior administration of the institution.
- b. Discussion with full time and shared program faculty to assess strengths and weaknesses of the program and its conduct.
- c. Interaction meetings with students, alumni and other stakeholders for obtaining their feedback.
- d. Meeting with management officials of the higher education institute in connection with provision of support regarding Finance, Infrastructure, Examination, Admission & Registration etc.
- e. Review and analysis of all the documents furnished by the department / institution.
- f. Visits to laboratories, library, computing facilities, auditorium, sports facilities, hostels, faculty offices, classrooms, career placement office, medical, safety & security infrastructure and such other facilities on site.
- g. A concluding meeting with senior management of the program and institution to share observations of the visiting team.

2.8 Scheduling AIC Visit

1. Pre-visit Meeting, Afternoon / Evening before Day of Visit

- Team introduction and briefing of panelists.
- Private plenary meeting of all members participating in the accreditation visit, chaired by AIC Team Leader. (Observers are invited to attend, if any)

2. Day One of the Visit

- Introduction with Dean / principal
- Presentation / Briefing by HEI
- Briefing in keeping with Self-Assessment Report (SAR) i.e. Curriculum, Faculty, Students, Labs, Library, Infrastructure and Alumni
- Improvements since last visit or against previous observations

3. Assessing Program Objectives and Outcomes

- Mission and Program Objectives
- Program Outcomes and Teaching Processes
- Assessment system, exam papers, marked scripts, final year projects, effectiveness of teaching and learning, internal curriculum development, curriculum Mapping, quality assurance, student feedback mechanism, and other records.

4. Checking Classrooms

- Two to three classrooms (size: 12 – 15 sq.ft per student, teaching aids, furniture etc.)
- Students interview (Admissions, Course Outline, Subjects, Examination, Extra-curricular activities, scholarships etc.)
- Demonstration of student outcomes / attributes in accordance with Sydney Accord (Student Knowledge Profile)
- Students' assessment
- Students' perception
- Students feedback

5. Examining Infrastructure

- Faculty offices
- Laboratory Audit (desirable Lab/Workshop Size 35 – 45 sq. ft. per student):
- Library Audit (minimum of 1200 books of 300 titles and 3 journals/magazines of international reput e per program):
- Auditorium and examination hall (size desirable 12 – 15 sq. ft. per person), sports facilities and other allied facilities
- Safety and Security Audit (safety and security measures and disaster plan)

6. Day Two of the visit

1. Faculty Meeting
2. Course File Audit / Teacher's Folder
3. Examine faculty Research projects and publications: View selected facilities to assess Research and Development work being undertaken by the faculty i.e. Research work & papers, books written, participation in conferences & seminars
4. Meeting with School Dean to review issues raised, Finances and Governance
5. Exit meeting with Dean / Principal
6. Compilation of reports and forms by AIC with recommendations

2.9 Accreditation Decisions

Based on the program evaluation report by the Accreditation Inspection Committee (AIC), and endorsed by Technology Accreditation Committee (TAC), NTC may adjudicate on the accreditation status of a program in one of following ways:

1. Accredited for two years:

Programs that meet all accreditation criteria have no severe deficiencies but have some minor weaknesses and concerns.

2. Accredited for one year:

Programs that meet all accreditation criteria have no severe deficiencies but have major weaknesses and serious concerns.

3. Deferred up to one year for removal of deficiencies:

Programs with severe deficiencies that can be removed within a year. Re-consideration will require a Confirmatory Visit by the AIC once the deficiencies are removed, and a positive compliance report thereon.

4. Not accredited:

Programs not ready for accreditation due to non-conformance to one or more criterion/s, or with major deficiencies.

2.10 Accreditation Fees

Fees for Zero, Interim, Change of Scope, Confirmatory or Compliance, Accreditation, Re-Accreditation, and Appeal cases shall be as prescribed by the Council and notified by the NTC:

Note: Accreditation fee may change from one accreditation cycle to the next, subject to approval by the Council. Please refer to NTC Secretariat and NTC website for the prevalent fee structure.

2.11 Appeals

If an HEI wishes to appeal for review of an action taken by the AIC/NTC regarding accreditation, a written application, along with the prescribed fee, should be sent to NTC within 30 days from the date the action was notified. The appeal should be accompanied by a report substantiating the request. On receipt of application, and after being satisfied, prima facie, that it is warranted, it shall be placed before the Appellate Authority, called "*Appeal Review Committee (ARC)*", to conduct the review.

A meeting of ARC will be convened, wherein the HEI and the Team Lead of AIC shall be invited, to hear the case. The ARC may also visit the HEIs premises to finalize their report. Recommendations of the ARC will be considered by Chairperson NTC for a final decision. The entire process must be completed within 30 working days after receipt of the appeal.

CHAPTER – 3

Criteria for Accreditation

3.1 Introduction

All engineering technology programs must be evaluated by AIC, and accredited by NTC, before graduates of the programs can be registered as Graduate Engineering Technologists. The evaluation process is based on a set of broad-based criteria gleaned from the collective intellect and wisdom of stakeholders concerned with engineering technology education in Pakistan and is compatible with international standards.

The cornerstone of accreditation policy is based on the Outcome Based Education (OBE), and Outcome Based Assessment (OBA) Systems. Accreditation criteria are benchmarked with, 1) HEC's Undergraduate Policy, 2) NTC Framework. The criteria substantially conform to, 3) Educational accords of the International Engineering Alliance (IEA), and to the, 4) Sydney Accord (SA).

OBE focuses on what students can do with knowledge they acquire, and the skills they must develop in the education process. OBE requires restructuring of curriculum, content delivery, assessment protocols, and reporting practices, to ensure achievement of high order learning and skills. Each criterion serves to assess a principal feature of the HEIs activities, and program effectiveness, according to the educational objectives. Hence, each of them is described in terms of quality attributes amenable to a substantially objective and qualitative assessment. The AIC evaluation processes are designed to identify strengths and weaknesses of programs. HEIs seeking accreditation of their programs are required to satisfy each criterion, and continuously adhere to these during the validity period of accreditation granted. NTC encourages HEIs to periodically review the strengths and weaknesses of their programs, continually striving to attain excellence.

3.2 Accreditation Criteria

Once an HEI has achieved the Qualifying Requirements of Section 1.6, the engineering technology programs are measured on the following criteria:

Criterion 1 – Program Educational Objectives (PEOs)

Criterion 2 – Program Learning Outcomes (PLOs)

Criterion 3 – Curriculum and the Learning Process

Criterion 4 – Students Related

Criterion 5 – Faculty and Supporting Staff

Criterion 6 – Facilities and Infrastructure

Criterion 7 – HEI's Management Structure, Financial Health and Program Support

Criterion 8 – Continuous Quality Improvement

Criterion 9 – Industrial Linkages

3.2.1 Criterion 1 – Program Educational Objectives (PEOs)

An HEI applying for accreditation should have succinct Vision and Mission Statements, and a set of goals. The program offered by the HEI should also have well defined Program Mission Statement and Objectives. Program Educational Objectives (PEOs) are broad statements of goals that graduates are expected to achieve after the learning process. Documents pertaining to each program (e.g., Prospectus, scheme of studies etc.) must clearly and publicly articulate its Mission, Objectives, and desired Outcomes to everyone in the HEI through publications and websites. Program Mission Statement and Objectives must be aligned with the HEI's Vision and Mission Statements. Program Mission and objectives should be articulated. Successful pursuit and realization of the Mission and Objectives, and the means adopted to accomplish them, bring out the quality of the HEI and its programs. PEOs are a synthesis of the outcomes of various program constituents and are linked to the student learning and outcome assessment process.

PEOs must be clearly worded, concise, realistic, and measurable within the context of the committed resources.

Some examples are given below:

After completing the program, the graduating student:

PEO 1: Will have demonstrable knowledge of engineering technology appropriate for career pursuits and fulfilling workplace needs.

PEO 2: Will understand, diagnose, communicate, and provide solutions to technical problems that benefit society.

PEO 3: Will have intellectual curiosity to pursue and acquire new knowledge and skills that bolster his capacity to strengthen and improve the technology domain.

PEO 4: Will have ethical values to deal successfully with social, technical, and professional situations at work or in personal life.

HEIs must develop a process to assess the level of attainment of the Program Objectives and evaluate effectiveness of the program. It should include feedback from faculty, employers, alumni, and other stakeholders. The evaluation results should be utilized for redefining and improving the Program Objectives.

To accredit any program, the following must be in place:

- a) Well-defined and widely published HEIs Vision and Mission Statements, and Program Mission Statement.
- b) Well defined PEOs that are consistent with the HEIs Vision and Mission Statements, and Program Mission Statement.
- c) Clear mapping of HEIs Vision and Mission Statements with PEOs (Annexure 1)
- d) PEOs based on stakeholders needs and inputs.
- e) A process to evaluate attainment of PEOs (Annexure 2)
- f) A process to use PEOs evaluation results for continual improvement of the program.

3.2.2 Criterion 2 - Program Learning Outcomes (PLOs)/Graduate Attributes

PLOs are narrower statements describing what students are expected to know, and able to do, on graduation. These relate to knowledge, skills, and attitude that the students acquire during the program. The PLOs must demonstrate that graduates have attained a minimum, acceptable level of knowledge, skills, and behavioral traits, after completing the program.

It is expected that graduates have acquired the following Graduate Attributes that substantially comply to the Sydney Accord:

- (i) **Engineering Technology Knowledge:** An ability to apply knowledge of mathematics, natural science, engineering technology fundamentals, and engineering technology specialization, to defined and applied engineering technology procedures, processes, systems or methodologies.
- (ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze Broadly Defined Engineering Technology Problems to reach substantiated conclusions, using analytical tools appropriate to the discipline or area of specialization.
- (iii) **Design and Development of Solutions:** An ability to design solutions for Broadly Defined Engineering Technology Problems that help design of systems, components or processes that meet specified needs, while being cognizant of public health and safety issues, and conscious of cultural, societal, and environmental considerations.
- (iv) **Investigation:** An ability to investigate Broadly Defined Engineering Technology Problems by locating, searching, and selecting relevant data from codes, data bases and literature, and finally, by designing and conducting experiments to provide valid conclusions.

- (v) **Tool Usage:** An ability to select and apply appropriate techniques, resources, modern technology, and IT tools, including prediction and modelling, to Broadly Defined Engineering Technology Problems.
- (vi) **The Engineering Technologist and Society:** An ability to understand the societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to engineering technology practice and solutions to Broadly Defined Engineering Technology problems.
- (vii) **Environment and Sustainability:** An ability to understand and evaluate the sustainability and impact of engineering technology work in the solution of Broadly Defined Engineering Technology Problems in societal and environmental contexts.
- (viii) **Ethics:** Understand and commit to professional ethics and responsibilities and norms of engineering technology practice
- (ix) **Individual and Teamwork:** An ability to function effectively as an individual, and as a member or leader in diverse teams.
- (x) **Communication Skills:** An ability to communicate effectively on Broadly Defined Engineering Technology activities with engineering technologist community, and with society at large, by comprehending and writing effective reports and design documents, make effective presentations, and give and receive clear instructions.
- (xi) **Project Management:** An ability to demonstrate knowledge and understanding of engineering technology management principles and apply these to one's own work, as a member or leader in a team, and to manage projects in multidisciplinary environments.
- (xii) **Lifelong Learning:** An ability to recognize the need for and engage in independent and life-long learning in engineering technologies.

In addition to incorporating Graduate Attributes (i) to (xii) listed above as PLOs, the HEIs may also include additional outcomes.

The program must demonstrate that:

- a. PLOs are linked to PEOs (Annexure 3)
- b. Courses are mapped to CLOs (Annexure 4)
- c. Teaching, learning, and assessment methods are appropriate, and support attainment of CLOs.
- d. There is a robust assessment mechanism to evaluate student-achievement levels of PLOs.
- e. A process is in place to apply assessment results to refine the assessment protocols, and refine the program and course outcomes, that bolsters Continuous Quality Improvement (CQI) of the program.

3.2.3 Criterion 3 – Curriculum and Learning Process

The academic curriculum of the program should be designed to facilitate and ensure achievement of program outcomes by students. This is achieved by offering a balanced combination of technical and non-technical contents, coupled with appropriate assessment and evaluation methods. It should have a well-defined core of essential subjects which should be supported by requisite compulsory as well as elective courses. It should invoke in students' awareness and comprehension of societal problems and motivate them to seek solutions for improving the quality of their lives. The theory content of the curriculum must be supplemented with appropriate field work and experiments in laboratories.

The HEI should incorporate inputs from all stakeholders, especially from the industry, in developing curriculum contents, to keep it aligned with the PLOs. The program structure should cover the essential fundamental principles at the initial stages, leading to integrated studies in the final year of the program in consonance with the approach and levels defined in Bloom's Taxonomy. Bloom's Taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three hierarchical models cover learning objectives in Cognitive, Affective and Sensory Domains.

Comprehensive pursuance of a curriculum necessitates that all related activities should be allocated time duration according to a well-defined reference. In semester system of education, this reference is "Credit-Hour".

- One credit hour is defined as 1 hour of lecture per week for a minimum of 15 weeks in a semester.
- One credit hour is awarded for 3 hours of laboratory or workshop for a minimum of 15 weeks in a semester.
- One credit hour is awarded for 2 hours of supervised and compulsory tutorial session for a minimum of 15 weeks in a semester, subject to a maximum of one credit hour for each subject in that semester.
- One credit hour for Supervised Industrial Training (SIT) is awarded for each week, comprising of 5 working days in the week, and 8 hours of training per day.

The minimum credit hours for an engineering technology degree program of 4 years duration, stretched over 8 semesters, with entrance qualification of F.Sc. or equivalent or DAE/A-level/ICS, are between 130- 140.

The 130 -140 credit hours must be in the following ratio:

- Core technology subjects: : 70 %
- Allied or related subjects : 30%

Note: This ratio must also conform to the latest HEC Undergraduate Policy framework.

Allied or related subjects include General Studies, Safety and Health, Ethics, Management, Industrial Psychology, Engineering Economics, Islamic and Pakistan Studies etc.

NTC allows 10% upward revision of core subjects, and corresponding 10% downward revision in allied or related subjects. In no case allied or related subjects shall be more than 30%. Such revisions must be through the Academic Council and other relevant bodies of the HEI, must not affect total credit hours of the program, and must be shared with NTC.

In addition:

- Remedial classes in basic sciences and basic mathematics shall not earn credit hours.
- Laboratory work that is part of the curriculum and complements engineering technology theory, shall be considered integral part of the engineering technology subjects.
- Final year projects that are part of the curriculum and complement engineering technology studies, shall carry a minimum of 6, and a maximum of 12 credit hours.
- Supervised Industrial Training (SIT) is an integral part of the curriculum with the following caveats:
 - SIT must be in a reputable industry.
 - SIT shall be for a minimum of 16 weeks (during 8th semester only), or 32 weeks (during 7th and 8th semesters).
 - SIT shall earn credit hours as follows:
 - a. For a 16-week program (8th semester only): 16 credit hours @ 8 hours per day, 5 days per week.
 - b. For a 32-week program (7th and 8th semesters): 32 credit hours @ 8 hours per day, 5 days per week.
 - The HEI shall be responsible for ascertaining the capacity of the training organization, and the capabilities of the training staff involved in training.
 - The Accreditation Inspection Committee (AIC) will ascertain the SIT program to ensure attainment of training objectives. It shall require verifiable evidence regarding details of the SIT program, robust industrial involvement, trainee assessment protocols etc. A detailed Training Logbook for each student must be maintained.

The hallmark of technology curriculum is to infuse original thinking, provide hands-on training, and bolster resourcefulness and entrepreneurial spirit among students. Each program must be composed of foundation courses, general courses, humanities, science, and specialized professional content of adequate depth

and breadth. The program-core should concentrate on acquisition of knowledge and skills in the specific discipline while ensuring exposure to inter-disciplinary areas. There must be an effective and direct nexus between curriculum content and market needs in the field of specialization. In addition, graduates must demonstrate competence in oral communication, scientific and quantitative reasoning, critical analysis, system design, logical thinking, creativity, and capacity for life-long learning.

The general framework and knowledge profile for engineering technology programs are periodically reviewed, revised according to recent technological and knowledge developments, and published by National Curriculum Review Committees (NCRC) of the Higher Education Commission (HEC). The contents of each constituent course of the curriculum offered by the HEI must be updated accordingly. Evidence to this effect should be presented to AIC on their accreditation visits.

The subject delivery and assessment process must enable students to develop intellectual and practical skills effectively, as deemed essential in program outcomes. Mapping of program outcomes relating to 1) engineering technology knowledge, 2) problem analysis, 3) finding solutions, 4) use of modern tools, 5) engineering technologist and society, 6) communication skills, 7) environment, 8) ethics and lifelong learning etc. must be done to the curriculum and associated program activities, to ascertain that desired program-learning-outcomes (PLOs) have been achieved. Assessment of PLOs should be carried out by using appropriate direct and indirect methods. Complex outcomes which are not easily quantifiable, e.g., communication skills, critical thinking, etc. often require additional rubrics for assessment. The assessment methods employed should be easily understood by students, and the teaching-learning process should motivate them to develop a quest for life-long learning.

The academic calendar, number of instructional days, quality of faculty, contact hours per week, design and delivery of syllabi, student evaluation and feedback are important aspects in reviewing the effectiveness of teaching-learning processes. In addition to regular teaching- learning activities such as classroom interaction, laboratory experiments and faculty consultation, other aspects of learning such as tutorials, research and design projects, seminars, workshops, and exposure to industrial practices, should be an integral part of the curriculum. Internal reviews and other quality assurance procedures should be carried out periodically.

Engineering technology programs should also demonstrate the following:

3.2.3.1 Assessment Protocols of Program of Study

Policy framework for assessment procedures of program of study must be maintained by the faculty. The HEI should at least have the following systems in place:

- a. Examination regulations.
- b. Criteria and assessment procedure for grading.
- c. Setting up examination papers.
- d. Level of examination papers.
- e. Assessment procedures for final year projects and SIT.
- f. A student portal as part of HEI's website, and
- g. Teachers Files.

The HEI may have an external program-examiner for each program to independently review overall academic standards. The external examiner should be a person of good standing in the academic, engineering or engineering technology profession. The external examiner carries out overall assessment of the program, including teaching and other staff, as well as all subjects and laboratory work undertaken by students. Assessment is made at the end of each academic year. The external examiner's report must be aligned to the Self-Assessment Report (SAR) and included in the application for accreditation visits.

3.2.3.2 Assessing Learning Outcomes

The program must ensure that students have achieved all Program Learning Outcomes (PLOs) to an acceptable level, by assessing Course Learning Outcomes (CLOs). Appropriate assessment methods must be used to evaluate achievement levels against targeted outcomes. Mapping of PLOs to CLOs, the nature of assessment tools used (direct, indirect, and rubrics), and the evaluation process to determine attainment of PLOs, should be demonstrated by HEIs with verifiable evidence.

There must be processes in place to get feedback from students, graduates, employers, and representatives of the wider community, and evidence of systemic review and application of this information, for continuous improvement of program objectives, including curriculum content and quality of

teaching and learning. Post-program processes should include graduate employment data, alumni surveys documenting achievement, and employers' surveys of longer-term performance and development.

3.2.3.3 Supervised Industrial Training (SIT)

The program should incorporate cooperative learning through an SIT program of 1) either a continuous 16-week duration (in 8th semester only), or 2) continuous 32 weeks duration (7th and 8th Semesters) in an organization or environment practicing engineering technology. SIT program should be mutually planned, and agreed, between the HEI and the host organization. The training organization should have on-the-job trainers, and maintain a student's Training Logbook, kept by students, and required for assessment and evaluation of students learning later.

The trainers must be thoroughly conversant with a wide variety of engineering technology processes at a practical level and can gauge appropriate processes and required levels for young technologists. Whilst it is desirable for students to get a feel for the skills involved, the central aim is to understand and appreciate processes, not to acquire craft skills. Clearly, many of the latest processes and large scale or costly operations can only be subject of observation or demonstration, and visits to technology practicing works may be helpful in many such cases. Exposure to engineering technology practice must be integrated throughout the curriculum. In addition, exposure to professional engineering technology practice may also be obtained through the following:

- a. Guest lectures.
- b. Employing staff with industrial experience.
- c. Courses on professional ethics and conduct.
- d. Industrial visits.
- e. Industry-based final year projects.
- f. Use of logbooks in which experiences are recorded, as part of trainee assessment for SIT.

There is no substitute for first-hand experience in a real-life engineering technology environment. NTC strongly advocates that all faculty and other staff teaching technology courses must acquire exposure to such experience, in addition to other elements suggested, and assist students in gainful employment.

3.2.3.4 Laboratory Work

Teaching in each core engineering technology subject must be supported with sufficient practical work in laboratories. For this purpose, a "Laboratory Manual" containing Practical Handouts (PHOs) of experiments for each course must be maintained. The laboratories should be well-equipped with the requisite up-to-date software, and equipment consisting of basic components, modules, measuring instruments, etc. Students should be encouraged to develop practical skills, preferably working in groups of not more than 5 on a workstation. Contact hours of students spent in laboratories and SIT constitute approximately 70% of the total program time. This develops in engineering technologists the confidence to deal with new and unusual engineering technology problems in their specific fields.

3.2.3.5 Design Projects

To hone their practical skills and titillate their imagination, students of an engineering technology program must undertake design projects as an integral part of every core subject. These design projects must inculcate in students' intuitiveness, resourcefulness, and spirit to compete. Students should also be motivated to participate in thematic competitions that require participants to use their ingenuity, creativity, and innovative ideas.

3.2.3.6 Final Year Project

Students shall undertake a final year project that is either self-standing, or part of SIT. The project introduces a real professional approach to engineering technology studies. For this reason, the use of projects as a vehicle for teaching and integration of theory and practice in subject areas is strongly encouraged throughout the program. While group projects are appropriate for work in earlier year, the final year project demands individual analysis and can be assessed independently from the work of others. The student is expected to develop techniques in literature review and information prospecting.

Final year projects shall include Broad Engineering Technology problems, including parts or processes integrating core areas, and meeting specified needs while remaining cognizant of public health and safety, cultural, societal, and environmental considerations. Such projects should lead to integration of knowledge and practical skills as mandated in the program outcomes.

3.2.3.7 Tutorials

Tutorials should be part and parcel of the program to complement the lectures. A tutorial session should preferably not exceed twenty-five (25) students at any time.

3.2.4 Criterion 4 – Student Related

The quality of students admitted, and their academic progression are important considerations in evaluating the success of a program in achieving its objectives and outcomes. The HEI must frame policies for admitting fresh, as well as by-transfer, students into the program. These policies must adhere to HEC and NTC standards.

The HEI should devise mechanisms to guide students regarding academic and career matters. Policies should be made to maintain a manageable teaching load in all semesters. The institute must provide a conducive teaching-learning environment and monitor and evaluate students' progression towards achieving program outcomes and objectives. The monitoring and evaluation processes should be adequate to ensure fulfillment of program requirements up to the required level of quality and standards by all graduating students.

3.2.4.1 Admission Criteria

Admission policy must be based on merit alone, and open to all candidates regardless of religion, race, creed, and financial resources. Along with other requirements, an entrance test for potential students must be held to assess and ensure that accepted students have the minimum qualifications required for training and education in an engineering technology program. It must be ascertained that students are admitted on merit and qualify the minimum eligibility criteria prescribed by NTC for various programs.

For admission to engineering technology programs, the students must:

- Have minimum 50% marks in F.Sc. (Pre-Engineering) or Equivalent Qualification A-level / ICS / DAE / B.Sc. (Excluding Sports and Hafiz-e-Quran)
- Have passed the Entrance Test

HEIs must have well laid-out and transparent procedure to calculate overall merit for admission into engineering technology Programs. It is suggested that students who fulfil minimum admission requirement are admitted using the following weightages:

- 70% for academic qualifications (F. Sc. Or Equivalent / ICS / DAE / B.Sc. etc.)
- 30% for Entrance Test
- Equivalence of examination passed shall be determined by Inter Board Chairmen Committee (IBCC), and criteria set by the concerned HEI.

3.2.4.2 Annual Intake

This aspect pertains to the number of students admitted considering the capacity of the program and its allied facilities. The program intake should be in-line with the maximum intake allowed by NTC.

3.2.4.3 Admission Response

This aspect pertains to the number of applicants applying for admission into the program, and the ratio of the number of applicants admitted and the number of students who finally join the program.

3.2.4.4 Transfer-Students from Other Institutions

HEI must develop a clearly worded, documented, and well publicized policy on transfer of students from accredited programs of other institutions. The policy must evaluate the subjects studied, and their credit-equivalence, in a similar program run by an institution, and this must be based on verifiable grounds. A maximum of 50% of the total credit hours required for the technology degree program can be transferred. All cases of transfer-students must be intimated to NTC at the time of admission by the HEI. The HEI shall not admit transfer-students beyond the NTC approved class size.

3.2.4.5 Class Size (for theory)

For engineering technology subjects, the desirable average class size is 40 students per class-section, with a maximum up to 45. Furthermore, the student-teacher ratio must preferably be 20:1, with a maximum of 25:1, along with adequate resources and infrastructure needed for the program. Classroom size must provide 12 sq ft space per student. The principal subject instructor must be experienced, preferably with a PhD degree, who is assisted by appropriate number of teaching assistants (GAs, TAs, or RAs) to conduct tutorials, help-sessions, and off-class student guidance.

3.2.4.6 Class Size (for practicals)

For laboratory sessions, the number of students conducting experiments at one time should ensure that they get sufficient practical exposure and individual guidance from the Laboratory Instructor. For hands-on experiments, the maximum number of students per workstation must be limited to 5. However, for laboratory work that is demonstrative in nature, a larger number of students per workstation is reasonable. An adequate number of Laboratory Instructors, and associated staff, must be available for effective guidance and help to students during practical sessions.

3.2.4.7 Semester Academic Load

This aspect pertains to the number of courses, and total credit-hours, taken by students in a semester. The course content, time, and effort it takes for its completion must be rationally correlated with the assigned credit hours. Students should not be overburdened with workload that may be beyond their ability to cope with, hamper assimilation of the subject matter, and thwart their optimal performance. The academic load in a semester should be in the range of 12 - 18 Cr Hrs., as per HEC guidelines.

3.2.4.8 Completion of Courses and Student Feedback

It is imperative that subject contents described in the curriculum, published in the program catalog, prospectus, and/or website, are completed in full. All subject topics, and practical experiments prescribed for the course, must be completed according to schedule, and within the prescribed time. The information must be available in official records (e.g., course files). AIC can also ascertain this by interaction with students.

3.2.4.9 Student Knowledge Profile

After 4 years of study in a program, the student should have:

- a. A systematic, theory-based understanding of natural sciences applicable to the discipline.
- b. A grasp of concept-based mathematics, numerical analysis, statistics, and aspects of computer and information science to support analysis and use of models applicable to the discipline.
- c. A systematic, theory-based formulation of engineering technology fundamentals required in an accepted discipline.
- d. Specialized engineering technology knowledge that provides theoretical framework for an accepted discipline.

- e. Knowledge that supports engineering technology design.
- f. Knowledge of technologies applicable in the discipline.
- g. A comprehension of the role of technology in society and addressing issues by applying technology.
- h. Understanding of ethics and their impact: economic, social, environmental and sustainability
- i. An engagement with technological literature of the discipline.

3.2.4.10 Student Performance Evaluation

This aspect pertains to different tools used to evaluate students' performance in the program courses, and their suitability and effectiveness for assessment of level of achievement of CLOs. This may include review of various class assignments, quizzes, research reports, examinations as well as laboratory projects, laboratory notebooks and viva-voce. The number and variety of such assessment tools, and their coverage of subject topics in a manner which ensures a reasonably accurate assessment of students' level of achievement against various learning outcomes, is the key in monitoring students' progress directly. It is expected that the program must have a minimum number of class assignments, quizzes and examinations for assessment of PLOs.

3.2.4.11 Academic Counseling

This aspect pertains to the guidance available to students from teachers through dedicated office hours beyond the scheduled timetable. The office hours must be publicized by instructors by posting them on the office doors and noticeboards. Tutorials, problem-solving, and help-sessions, should be scheduled and made a part of the scheme-of-studies. Research Assistants (RAs), Teaching Assistants (TAs), and Graduate Assistants (GAs) engaged to provide extra coaching and subject assistance, especially when assisting the principal instructor with a larger class-size, should also maintain specific designated hours for off-class assistance and counseling. Individual students' academic progress should be monitored, and corrective measures taken, on regular basis through a well-defined mechanism.

3.2.4.12 Career and Student-Wellness Counseling

In addition to the course specific guidance, the HEI should have designated student counselors who advise and counsel students regarding academic as well as career matters. A formal orientation session for the newly admitted students to apprise them about the salient requirements, policies and

procedures of the program is highly desired. Student-wellness counselor(s) should help students in managing their health, financial issues, emotional stress, and spiritual problems.

3.2.4.13 Financial Support to Students

The HEI must provide other financial benefits to students like scholarships and interest-free loans. HEI must maintain a special fund that sustains financial support to students throughout the program. The HEI must strive to allow access to deserving students who are financially constrained.

3.2.4.14 Extra and co-curricular activities

To inculcate ethical practices and interpersonal skills in students, the HEI should provide facilities, and ample opportunities for extra- and co-curricular activities. Provision of indoor and outdoor sports facilities for physical fitness and mental endurance should be ensured. Necessary administrative and financial support must be provided to establish student clubs, societies, and chapters for various co-curricular activities. These activities will transform students into well-rounded and proficient engineering technologists.

3.2.4.15 Participation in Competitions

Students' participation in national and international technology-specific exhibitions and competitions provides an opportunity to display their projects, exchange ideas, and compete with teams from other institutions. This broadens student's horizon and provides faculty and administrators a platform to benchmark their programs with others. Winning positions and prizes in such competitions highlight the strength of the program and builds student-confidence. The HEIs should encourage and facilitate participation in such competitions and exhibitions.

3.2.4.16 Alumni Satisfaction

This aspect pertains to alumni's opinion regarding the quality and adequacy of their education in the HEI. The HEIs are encouraged to develop a database of outgoing graduates and create a mechanism through Placement Bureaus and Alumni Associations to receive feedback for program improvement.

3.2.5 Criterion 5 – Faculty and Supporting Staff

The faculty strength, qualifications, level of competencies, commitment, and attitude play a vital role in accomplishment of program objectives and outcomes. This depends upon the recruitment process, incentives, faculty development programs, and faculty workload. The program must have enough dedicated, full-time faculty members to ensure adequate student-teacher interaction and provide necessary counseling to students. A robust, full-term engineering technology program must comply with HEC criteria for the minimum number of six dedicated program faculty members, i.e., 1 Professor, 1 Associate Professor, 2 Assistant Professors and 2 Lecturers. A student-teacher ratio of 20:1 is desirable. Each engineering technology program should strive to establish itself independently for core courses; faculty sharing with other departments should ideally be restricted to inter-disciplinary courses. For the same reason, visiting faculty from other academic institutions and industry should be engaged occasionally, and that too for teaching specialized and advanced courses. However, the number of such visiting faculty members should be kept to a minimum.

The program faculty must have appropriate qualifications and competencies to cover all areas of the curriculum. The qualifications of the faculty are generally gauged by the advanced degrees held by them, practical experiences and their scholarship and research. It is expected that all teaching faculty shall have at least postgraduate qualifications, as per the eligibility criteria set by HEC. A teaching staff with a bachelor level education, but having vast industrial experience and proven specialized expertise, may be considered as an exception.

The faculty is expected to act not only as instructors and researchers but also as student advisors, faculty mentors, academic planners, curriculum developers, internal auditors, and occasionally assist in HEIs administration. The faculty must demonstrate complete familiarity with the Outcome Based Educational (OBE) approach. They must ensure proper conduct of the program, develop evaluation processes, assessment protocols, and Continuous Quality Improvement (CQI) policy for the program. Their familiarity with the program objectives and outcomes, understanding of the Outcome Based Assessment (OBA) process, and enthusiasm to develop more effective programs are key elements that ensure attainment of program objectives.

Employment and retention of qualified faculty and supporting staff is an indication of managements' commitment and seriousness towards HEIs Mission and Program Objectives. Adequate employment security, coupled with salaries and benefits commensurate with positions, and periodic evaluation for vertical mobility should be ensured and made known. The HEI should implement an effective mechanism for mentoring and professional development of faculty to ensure their continuity and retention. In addition, a performance appraisal mechanism should also be in place to monitor the continued effectiveness of the

faculty and adherence to the program objective and outcomes. For instance, students' feedback may be documented, and teachers' course files could be examined.

The HEI should encourage faculty to establish linkages with industry to bring in sponsored research projects, and secure research grants from sponsoring agencies. Faculty workload should be such that it should not hinder their effective performance in both teaching and research. Besides being adequate in number with appropriate qualifications, faculty members should possess hands-on experience, good communication skills, professional attitude, and commitment to the program's objectives. There shall also be sufficient, qualified, and experienced technical and administrative staff to help meeting program objectives.

3.2.5.1 Academic Structure

The number of faculty members in various professional ranks (i.e., Professors, Associate Professors, Assistant Professors, Lecturers and Eminent Educationists) within the program should be clearly defined. The HEIs are encouraged to determine the number of faculty members of various ranks, without a bar on the ratio among different ranks, to encourage promotion of deserving candidates. The faculty pyramid provided by HEC is a guideline specifying the bare minimum higher rank positions. Adherence to this bare minimum must be ensured. The program-head of an engineering technology program should preferably possess a PhD degree in the relevant discipline, coupled with required experience, to lead the program.

3.2.5.2 Full – Time Faculty

This aspect pertains to full-time faculty members teaching core engineering technology subjects. The minimum number of faculty members for a program is given in Section 3.2.5; however, the actual Minimum Faculty Strength (MFS) required for the program is based on the number of students (allowing maximum 45 students per section) admitted per year in the program, and is estimated as follows:

For each program at maturity (after year 4), there should be at least 6 faculty members (1 Professor, 1 Associate Professor, 2 Assistant Professors and 2 Lecturers) teaching core subjects. Active engagement requires that a dedicated faculty member must be engaged in delivering the program curriculum and must teach at least 2 courses per year. A request for an accreditation visit shall not be entertained by NTC unless the program fulfills this minimum faculty requirement. This faculty requirement sets the bare minimum; however, program managers should ensure that actual Full-Time Dedicated

Faculty (FTDF) members are sufficient in number to ensure appropriate level of student-teacher interaction, and to provide necessary student counseling. To achieve this objective, the prescribed student-teacher ratio is 20:1 or better.

3.2.5.3 Shared Faculty

Faculty members serving in the HEI as a full-time dedicated faculty in some other programs and asked to teach subjects related to their disciplines in the under-review program, are called “shared faculty”. This includes faculty from other technology disciplines, as well as faculty from departments of Mathematics, Humanities, Physical and Management Sciences, etc. Shared faculty members engaged for the program must have post-graduate qualifications. For computing student-teacher ratio, shared faculty members would be counted as one-half, up-to a maximum of 25% of FTDF.

3.2.5.4 Ancillary faculty

In addition to the core teaching faculty with post-graduate qualifications, the HEI is encouraged to employ full-time academic supporting staff, such as Teaching Assistants (TAs), Graduate Assistants (GAs), and Research Associates (RAs) to provide academic support to faculty, and facilitate students in the form of extra coaching for theory as well as research projects, holding subject tutorials, and problem-solving sessions. These TAs, GAs, and RAs must be graduates at least. For computing student-teacher ratio, each TA, GA, or RA would be counted equivalent to one-half, up-to a maximum of 20% of FTDF. Full time Lab instructors such as Lab Engineers and Lab Technologists would be counted equivalent to one half up to a maximum of 25% of FTDF.

Giving due consideration to natural mobility of faculty members for various reasons, such as pursuing higher qualifications, availing post-Doctoral research opportunities, and seeking better career options, a faculty member who has contributed to teaching for more than a semester, and whose timely replacement is made in the relevant field, should also be considered in calculating student-teacher ratio, up-to a maximum of 20% of FTDF. Faculty that is shared with other disciplines or departments would be counted as one-half while computing student-teacher ratio.

3.2.5.5 Visiting Faculty

A program may occasionally invite qualified and experienced professionals from industry as well as other academic institutions to impart state-of-the-art knowledge, applied skills, and techniques to students. However, each technology program should strive to establish itself independently; for this

reason, the number of such visiting faculty members should be kept to a minimum, and that too for teaching specialized, and advanced-level courses. Their number should not exceed 20% of FTDF. These visiting faculty members are not counted towards computation of student-teacher ratio.

3.2.5.6 Faculty Qualifications

This aspect pertains to the HEC recognized degrees held by the program faculty. The program faculty must have appropriate qualifications as per HEC Appointment Criteria and competencies to cover all areas of the curriculum. The qualifications of the faculty are generally gauged by the advanced degrees held by them, practical experiences, their scholarships, and research. It is expected that all teaching faculty must have at least a postgraduate qualification. A teaching staff with a graduate degree and having vast industrial or field experience, and proven specialized expertise may be considered as an exception.

3.2.5.7 Student-Teacher Ratio

A student-teacher ratio of 20:1 is considered optimal for undergraduate programs. The actual number of required faculty shall be worked out on this basis. For computing student-teacher ratio, actual number of students will be counted.

3.2.5.8 Faculty Training and Mentoring

Training and mentoring of faculty members are important initiatives in making them more effective as role models, instructors, advisors, academic planners, and curriculum developers. Senior faculty is expected to mentor, guide, and help junior colleagues on a regular basis. The HEI must have a planned schedule of activities to train newly inducted faculty members. Additionally, there must be regular workshops, seminars, and refresher courses for the entire faculty.

The faculty must be highly trained, and have exhaustive knowledge, regarding Outcome Based Education (OBE), and Outcome Based Assessment (OBA) concepts. They must fully understand concepts like Program Educational Objectives (PEOs), Program Learning Objectives (PLOs), and Course Learning Objectives (CLOs). They must have the ability to implement the program efficiently, develop assessment and evaluation processes, and use results to constantly tweak the system for Continuous Quality Improvement (CQI). Along with a total understanding of the academic cycle, they must be enthusiastic to develop more effective programs, and actively strive to attain program objectives.

Some key concepts and areas that should be covered during different phases of *Faculty Training and Mentoring* are:

- Program Objectives and Outcomes (OBE, PEOs, PLOs, and CLOs)
- Outcome Based Assessment (OBA) cycle and its implementation
- General aspects of lectures delivery
- Modes and means of effective student-teacher interaction
- Use of quizzes, assignments, exams, projects, and viva voce as effective assessment tools
- Evaluation of assessment results to gauge attainment of Course Learning Outcomes (CLOs)
- Preparing and maintaining course files that must cover:
 - course outline
 - weekly course plan
 - lecture wise topics covered.
 - aggregate award list
 - best, average, and worst quizzes, assignments, mid-semester papers, and end-semester papers
 - class attendance
 - class timetable, and
 - course completion certificate, duly signed by HOD.

3.2.5.9 Faculty Retention, Development and Career Planning

Retention of good faculty is a measure of the HEIs commitment, and seriousness, towards achieving its mission, and the program objectives. Faculty strength, qualifications, level of competencies, commitment, and attitude play a vital role in the accomplishment of program objectives and outcomes. For faculty to be professionally satisfied, and have a deep commitment to the program, it is imperative to have a policy that provides them adequate employment security, salaries and benefits commensurate with their position, and periodic performance reviews for vertical mobility.

An effective academic and professional faculty development program will ensure their continuity and retention. There must be a faculty performance appraisal mechanism that monitors their overall effectiveness, measures their adherence to program's objective and outcomes, and appreciate with

benefits good performers. The HEI should have adequate provisions for scholarships leading to PhD, for training, and sabbatical leave for post-Doc research to promote professional growth and development. The workload for faculty enrolled in PhD and post-Doc programs should be reduced to allow them time to pursue their programs effectively.

3.2.5.10 Faculty Workload

This aspect pertains to the extent and nature of workload assigned to faculty members. Faculty workload in administrative matters should be such that it should not hinder their effective performance in teaching and research. The faculty teaching and research workload should be in line with HEC recommendations.

3.2.5.11 Faculty Research and Publications

Besides teaching, research and research publications are equally important functions of an HEIs. It is imperative that the HEI should encourage and foster research activities among faculty members. They must be facilitated to participate in national and international conferences, workshops, etc. Faculty members, especially those with PhD degrees, are expected to be active researchers, and are expected to publish at least 1 research paper each year in reputable national or international journals and conferences. The HEI should make budgetary allocations to participate in, and organize, workshops, conferences, colloquia, etc. Policies for sabbatical leaves, short leaves, and summer leaves for faculty to take-up post-Doc research assignments at other national or international organizations should be in place.

The HEI must encourage faculty members to establish linkages with industry and provide consultancy, design services and solutions to their developmental issues. Interaction with industry, and national or international sponsoring agencies, to attract R&D funding is an important indicator of the dynamism of the program, as well as its faculty members. Faculty members who secure R&D funds from industry or donors must be appreciated and acknowledged with financial incentives and reduced workload.

3.2.6 Criterion 6 – Infrastructure and other Facilities

The HEI must have the necessary program-centric infrastructure such as land, buildings, equipment, library, laboratories, workshops, computing facilities, seminar hall, auditorium, playgrounds, hostels, recreational, healthcare facilities, etc. In addition, student-centric facilities like cafeteria, transport, counseling,

and career placement services should be provided as per requirement for the program. This will ensure a robust and sustainable program. The HEI must show availability of the needed finances, and a strong financial commitment for sustainability of the program.

The number and size of well-lit and airy 1) classrooms, 2) laboratories (along with the requisite equipment), 3) offices, and 4) other facilities like hall etc., must provide a conducive atmosphere to attain Program Learning Outcomes (PLOs). Modern teaching tools, ancillary equipment, computing resources, and laboratories appropriate to the program must be available to, and accessible by, faculty and students, and should be properly maintained, and periodically upgraded. Laboratories and workshops should be adequately equipped for experiments and “hands on experience” in core subjects. Appropriate experimental facilities must be available for students to gain substantial experience in understanding and operating laboratory equipment and conducting experiments. The equipment must be designed for the latest technology practice in vogue.

In the undesirable circumstance where laboratory work is undertaken at another university, or in the industry, adequate and verifiable arrangements must be made that provide reasonable time and opportunity for students to conduct experiments.

The HEI must also provide a safe and secure learning environment for students, faculty, and other staff members. Strict and extensive safety and security measures must be in place to avoid any untoward accident. A well laid out disaster plan should be in place in line with the government instructions.

The following, clearly described, documentary evidence should be furnished in the Self-Assessment Report (SAR) by candidate HEI for accreditation or re-accreditation of technology program(s):

- i. The adequacy of teaching and learning facilities such as classrooms, learning-support facilities, study areas, information resources (library), computing and information-technology systems, laboratories, workshops, and associated equipment to cater for multi-delivery modes.
- ii. The adequacy of support facilities such as hostels, sports and recreational centers, healthcare centers, student centers, and transport in facilitating students’ life on campus and enhancing character building.

The information required in (i.) and (ii.) above should be provided in the minimum supporting documents below:

- Master plan showing all physical facilities.
- Detailed drawings of each facility
- A summary, in tabulated form, of the lecture hall facilities (give number, capacity, and audio video facilities available) and auditorium
- Details of the program laboratories and equipment therein

- Details of library, books, journals, and access to national and international databases
- A summary of recreational, sports facilities and other amenities
- A summary of recent, continuous, and planned improvements in these facilities
- A summary of safety and security measures of all facilities, along with a disaster plan

3.2.7 Criterion 7 – HEI’s Management Structure, Financial Health, and Program Support

This criterion focuses on the HEIs governance, financial health, and commitment to support engineering technology program/s. Governance starts by having functional management bodies like the Syndicate, the Senate, the Academic Council, the Board of Faculties, and the Board of Studies. IN addition, the HEI must have senior level department heads and managers, such as Deans, Chairpersons or Head of Departments, and Registrar, Treasurer, Controller of Examination, Director Sports, Director Health Services etc. The HEI must operate quality programs holistically, transparently, and with integrity to ensure fulfillment of its Mission through robust management structures, manned by competent administrative leadership, faculty, non-faculty staff, and students. The structure of the program, the team-leads, the committees, and policies must be widely known and communicated to all stakeholders. Such a management and administrative structure promotes effective leadership, supports collaborative planning, and ensures participation of faculty in decision making.

The primary objective is to glean and assess adequacy of resources to sustain the program, keeping in view up-gradation and future enhancements. A sound engineering technology program must be economically viable to ensure sustainability. The bare minimum pre-requisites for a vibrant program are a highly qualified faculty in adequate numbers, and a conducive educational environment. This needs an unhindered financial commitment, and other requirements like functional physical infrastructure, including classrooms, well-equipped laboratories, and well-stocked libraries. In addition to teaching and learning, the program must create avenues for R&D pursuits that enable students and faculty to transform their innovative and creative thinking into practical applications.

As per provisions in the HEIs Act, Statutes, Rules, and Regulations, they may create a G.P. Fund, Pension Scheme, C.P. Fund, and Benevolent Fund, Self-finance Scheme and Student Loan Scheme. The HEI must invest financial resources prudently in income-generating schemes and create financial support systems for deserving students. These activities demand sufficient financial resources and proficient management.

HEIs requesting accreditation of programs must provide the requisite information and data to NTC for evaluation. Clarity, and accuracy of the information provided, will facilitate NTC to gauge adherence to this criterion for an objective assessment. The required information includes, 1) Income Statement, 2)

Balance Sheet, and 3) Budget Statements, duly approved by competent fora, for the current, as well as two previous, but consecutive, financial years. HEIs are required to provide copies of the approved budgets and last year's audited accounts. In case of new programs, only one or two budgetary figures will suffice, i.e., current, and future allocations.

3.2.8 Criterion 8 – Continuous Quality Improvement (CQI)

The HEIs must demonstrate that they regard quality technology education as a significant and long-term component of their activities, and that a robust program needs Continuous Quality Improvement (CQI). This would most commonly be reflected in the HEI's Mission Statement and strategic plans. The HEI must have adequate wherewithal to plan, develop, deliver, review, and monitor engineering technology programs, and ensure academic and professional development of the faculty and other staff. As stated in earlier paragraphs, accreditation of an engineering technology program requires demonstrable adherence to NTC's laid down criteria. Weaknesses and non-conformance observed during the last AIC visit must be addressed prior to the next visit. Subsequent compliance reports from the institution (SARs) should be based on verifiable remedial measures taken. Prior to its submitting the SAR to NTC, it is suggested that the HEIs internal Quality Improvement Committee or Cell (QIC) should confirm veracity of actions taken for CQI.

Continuous improvements are assured only if a proficient closed-loop system is in place. The HEI should have a well-defined CQI process in place. This aspect deals with steps taken for improvement of program quality, and in particular steps taken considering observations of the last accreditation visit. The HEI should provide details of the internal quality assessment procedures which are part of their Quality Enhancement Cell (QEC). The HEIs should provide information and reports to demonstrate various initiatives taken for CQI related to different Accreditation Criteria described in this manual. For best outcomes, the HEI must involve all stakeholders in the CQI process.

Along with other details outlined in this Manual, the SAR should also include:

- i. CQI measures are taken based on surveys conducted, and feedback from stakeholders.
- ii. A detailed implementation plan based on observations of the last accreditation visit, and remedial actions taken by the HEI since.

3.2.9 Criterion 9 – Industrial Linkages

This aspect relates to HEI's linkage and collaboration with the industry to provide opportunity to students for Supervised Industrial Training (SIT), and afford faculty exposure to consultancy, R&D, and other professional practices. A corporate Industrial Liaison Office (ILO) in the HEI for linkages with industry and

other organizations is highly desirable. Industrial collaboration may involve sponsored research, joint research projects, conducting short courses, organizing conferences, sharing R&D facilities, facilitating students in SIT programs, and their job-placement after graduation etc. Through a well-designed marketing strategy, the ILO can help the HEI to identify potential beneficiaries of its R&D undertakings and commercialize the scientific findings for mutual benefit of the users (industry) and the HEI.

Faculty and Students are expected to undertake assignments through ILO to provide solutions to complex engineering technology problems. Students and faculty must be encouraged to collaborate with industry for R&D, and product development related projects, with due regard to environmental and societal impact. Feedback from the industry and employers is a crucial and essential part in the curriculum review process, and evaluating attainment of program objectives.

CHAPTER – 4

Guidelines for Self-Assessment Report (SAR)

4. Introduction

The Higher Education Institution (HEI) applying for accreditation must submit a SAR, complete with documents that provide accurate information and sufficient evidence for purposes of evaluation. For each program to be accredited, unless advised otherwise by NTC, the HEC shall submit the following documents, both in hardcopy and in digital form:

- i. SAR as per the format described below.
- ii. Duly filled Annexures 1 to 18 described in the Manual.
- iii. Supporting material and documents for the SAR and Annexures

4.1. Self-Assessment Report Format

SAR is a detailed account of the HEI's plan, implementation strategy, assessment, and evaluation of the program. It maps the processes with results obtained and uses CQI at all levels to further hone program activities. The document must be appropriately bound, with pages numbered, and a table of contents. SAR must provide all the requisite information about the program to enable the AIC to objectively assess the program for accreditation. The emphasis must be on qualitative description of each aspect and criterion, and how the program meets standards set out in this Manual.

The SAR must provide accurate information regarding the HEI and the program, especially in reference to Chapter 3: Criteria for Accreditation, and more specifically to Section 3.2 Accreditation Criteria, Criterion 1– Criterion 9.

Note: Please beware that AIC will evaluate the Program based on the same criteria, and wrong information provided willfully by the HEI will be held against it.

4.1.1. Criterion-1: Program Educational Objectives (PEOs)

- 4.1.1.1. State the HEI's Vision and Mission Statements, and the Program Mission Statement.
- 4.1.1.2. Describe PEOs and state if they are consistent with 4.1.1.1, and where they are published and exhibited.
- 4.1.1.3. Describe involvement of stakeholders in formulating and reviewing PEOs. (Annexure 1)
- 4.1.1.4. Describe the processes to evaluate achievement of PEOs. (Annexure 2)
- 4.1.1.5. Describe how evaluation results are used to improve Program effectiveness (CQI).

4.1.2. Criterion-2: Program Learning Outcomes (PLOs)

- 4.1.2.1. List PLOs and state where they are published and exhibited.
- 4.1.2.2. Describe how PLOs are linked to PEOs (Annexure 3).
- 4.1.2.3. Describe how PLOs encompass Graduate Attributes as per Section 3.2.3, Criterion 3 – Curriculum and Learning Process.
- 4.1.2.4. Describe mapping of courses with PLOs (Annexure 4).
- 4.1.2.5. Describe how teaching, learning and assessment methods help attainment of PLOs.
- 4.1.2.6. Describe KPIs that assess and evaluate attainment of PLOs at student and cohort levels.
- 4.1.2.7. Describe how program results are used to refine assessment protocols and modify PLOs (CQI).

4.1.3. Criterion-3: Curriculum and Learning Process

- 4.1.3.1. Describe the Program structure, course contents, and how these are appropriate to, consistent with, and support development of desired intellectual and practical skills, and attainment of the PLOs.
- 4.1.3.2. Describe if the curriculum is balanced technical and non-technical course content.
- 4.1.3.3. Describe how Broad Engineering Technology Problems and Broad Engineering Technology Activities are provided to students.
- 4.1.3.4. Describe laboratories, equipment in each, and how they supplement classroom learning.
- 4.1.3.5. Describe how work in laboratories is assessed to ascertain achievement of required skills.
- 4.1.3.6. Describe how CLOs for each course are mapped with Bloom Taxonomy levels, and with PLOs.
- 4.1.3.7. Describe benchmarks to which curriculum is pegged. (National, international, SA etc.)
- 4.1.3.8. Describe how industry and other stakeholders are involved in curriculum development and revision.
- 4.1.3.9. Describe other aspects of student learning such as tutorials, seminars, workshops etc.

- 4.1.3.10. Describe the SIT program.
- 4.1.3.11. Describe teaching modules such as. 1) Problem Based Learning (PBL), 2) Design Projects (DP's), and 3) Open-Ended Laboratories (OEL's) that titillate and challenge students to be original, creative and intuitive.
- 4.1.3.12. Describe the direct and indirect assessment methods used to gauge learning outcomes.

Information required above should also include the following, making use of relevant Annexures given at the end of the Manual:

- i. A matrix linking courses to PLOs, to identify and track contribution of each course to relevant PLOs (seen Annexure-4)
- ii. Details of courses, and laboratory work, workstations, and experiments conducted as per Annexure 6
- iii. Details of an SIT program, and formal method of feedback from employer.

4.1.4. Criterion 4: Student Related

- 4.1.4.1. Describe adequacy and capacity of the program and allied facilities for student intake allowed by NTC (see Annexure 7).
- 4.1.4.2. Describe the HEI policy regarding credit transfer for transfer-students.
- 4.1.4.3. Describe policy for off-class student counseling on academic matters.
- 4.1.4.4. Describe policy for off-class student counseling on non-academic issues like professional career, health, financial, emotional, and spiritual.
- 4.1.4.5. Describe policy regarding semester academic load for students.
- 4.1.4.6. Describe policy regarding class size, number of students per section, laboratory size and number of students per workstation.
- 4.1.4.7. Describe semester wise documentation of course work, including student input.
- 4.1.4.8. Describe policy regarding students' participation in national and international exhibitions, competitions, and similar events.
- 4.1.4.9. Describe the CQI policy that evaluates student performance and takes corrective measures for improvement.

4.1.5. Criterion 5: Faculty and Supporting Staff

- 4.1.5.1. Describe the HEI's academic structure, and the Programs' full-time, shared, and visiting faculty.
- 4.1.5.2. Describe academic qualifications and competencies of Program faculty and show compliance with HEC/NTC criteria.
- 4.1.5.3. Describe processes for faculty development, mentoring, and training including OBE concepts.
- 4.1.5.4. Describe how the workload of faculty and supporting staff is conducive for effective service delivery and adjusted appropriately for those pursuing higher studies.
- 4.1.5.5. Describe policy regarding R&D, faculty publications, research, and earning research projects sponsored by the industry, donor agencies etc.

The information required in Sec. 4.1.5 should include Annexures 9 to 11.

4.1.6. Criterion 6: Facilities and Infrastructure

- 4.1.6.1. Describe adequacy of teaching and learning facilities such as classrooms with comfortable seating, smart-boards, teaching aids, multimedia projectors etc., that ensures a conducive academic environment.
- 4.1.6.2. Describe program-specific laboratories and workshops, and adequacy of equipment in each that complements classroom learning.
- 4.1.6.3. Describe library resources and facilities.
- 4.1.6.4. Describe internet and IT facilities, including broadband internet access, and computing facilities.
- 4.1.6.5. Describe facilities for student counseling, SIT, and career placement.
- 4.1.6.6. Describe ancillary student support facilities such as hostels, sports centers, recreational centers, health care centers, and transport system.
- 4.1.6.7. Describe HEI's safety and security systems, work-place safety (particularly in laboratories), and disaster and rescue plans.

4.1.7. Criterion 7: HEI's Management Structure, Financial Health, and Program Support

- 4.1.7.1. Show an organogram describing essential governance and management structure of the HEI, including the Senate, the Syndicate, the Academic Council, various Committees, etc. List senior management such as Chairmen, Principal, Deans, HoD's, Registrar, Controller of Examination, Treasurer, Director Sports, and Director Health etc., and describe administrative and academic powers given to essential organs above.
- 4.1.7.2. Describe the HEI's financial health, and commitment to support, sustain, and enhance the quality of the Program, summarizing the salient features in a tabular form, as per Annexures 12 and 13.
- 4.1.7.3. Show evidence of continued financial commitment by the HEI, in form of endowment fund, and/or increased recurring and development budgets.
- 4.1.7.4. Show adequacy of funds for R&D activities such as research publications, and presentations etc.

4.1.8. Criterion 8: Continuous Quality Improvement (CQI)

- 4.1.8.1. Describe CQI procedures, including:
 - i. program planning.
 - ii. curriculum development.
 - iii. curriculum and content review.
 - iv. responding to feedback from stakeholders including industry, students, and alumni.
 - v. tracking contribution of courses to PLOs.
 - vi. tracking performance-outcomes through assessment, including rubrics.
 - vii. reviewing PEOs and PLOs; and
- 4.1.8.2. Describe implementation plan based on AIC observations of last accreditation visit, and the remedial actions taken.
- 4.1.8.3. Describe increase in faculty or additional qualifications acquired since last AIC visit.
- 4.1.8.4. Describe improvement in student-teacher ratio since last AIC visit.
- 4.1.8.5. Describe improvement in R&D activities, publications, or consultancies earned since last AIC visit.
- 4.1.8.6. Describe additional infrastructure, laboratory equipment, teaching aids etc. since last AIC visit.

4.1.9. Criterion 9: Industrial Linkages

- 4.1.9.1. Show evidence of an Industrial Advisory Board, Industrial Advisory Committee, or Industrial Liaison Office.
- 4.1.9.2. Show evidence of a formal mechanism seeking feedback from industry, analyzing it, and using results to improve processes to better achieve PEOs.
- 4.1.9.3. Show evidence of SIT and internships for students.
- 4.1.9.4. Show evidence of research projects sponsored by the industry and supervised by the faculty, supervised by outside professionals, or supervised jointly.
- 4.1.9.5. Show evidence of incentives to faculty to design, consult, and supervise industrial projects.

4.2. Compliance Report Regrading Observations of Last AIC Visit

The HEI must include a comprehensive Compliance Report regarding observations of the AIC in the last visit. The report should be clear, concise, preferably in tabular form where necessary.

ANNEXURES

Annexure 1: Mapping of Vision & Mission with PEOs (An example)

Vision & Mission		PEO 1	PEO 2	PEO 3	PEO 4	-
HEI Vision: Improving lives through learning		✓	✓		✓	-
HEI Mission: Promotes excellence in lifelong learning by focusing on student success and community needs		✓	✓	✓	✓	-
Program Mission: The program creates a solid base of Mechanical Engineering Technology knowledge, prepares students to perform well in industry, and creates interest to excel in life.		✓	✓	✓	✓	-
PEO 1	Will have demonstrable knowledge of Mechanical Engineering Technology appropriate to career pursuits, and workplace needs.					
PEO 2	Will have the ability to understand, diagnose, communicate, and provide solutions to technical problems for the benefit of society					
PEO 3	Will demonstrate the intellectual curiosity to actively pursue acquisition of new knowledge and skills necessary to refine and improve his/her abilities to contribute to the technology domain					
PEO 4	Will have ethical commitment that allows them to deal successfully with social, technical and professional situations in their lives and work.					

NOTE: The mapping of PEO to Vision and Mission of the hypothetical HEI shown above is just an example. It is imperative, however, that the HEI must work with, and map, its own Vision, and Mission with PEOs. The HEI must ensure that PEOs are aligned with Program Mission Statement, and HEI's Vision and Mission Statements.

Annexure 2: Assessment of PEOs
(An example)

PEO	Information Base	KPI	Frequency
PEO 1	1. Employment data (Gov/NGOs) 2. Employers survey 3. Alumni data 4. Alumni survey	1. Government data shows 65 % employed (career pursuits and have attained subject knowledge) 2. Employer feedback about PEO 1 is 60 % 3. Alumni data (portal/meeting) about PEO 1 is 75% 4. Alumni survey about PEO 1 is 70 %	1. Data updated once/twice a year 2. Feedback collected each year 3. Data updated every 6 months 4. Feedback collected each year
PEO 2	-	-	-
PEO 3	-	-	-
PEO 4	-	-	-
-			

Note: The table above is only an example. The HEI must use its own PEOs, KPIs, and strategies for assessment.

**Annexure 3: Mapping PLOs to PEOs
(An example)**

PLOs & Graduate Attributes	PEOs					
	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5	-
PLO 1						
PLO 2						
PLO 3						
PLO 4						
PLO 5						
PLO 6						
PLO 7						
PLO 8						
PLO 9						
PLO 10						
PLO 11						
PLO 12						

Note: Program Education Objectives (PEOs) and Program Learning Objectives (PLOs) are defined in Chapter 3, Sections 3.2.1 and 3.2.2

Annexure 4: Courses to Program Learning Outcomes (PLOs)

Sem.	Course Code	Course Title													
			PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	Etc.	
1															
2															
Etc.															

Note: For details of Program Learning Outcomes (PLOs), please refer to Criterion 3, Section 3.2.3

Annexure 6: Laboratory Work
Total Number of Program Courses:
Number of Laboratories:
Number of Laboratory Courses:

(Attach Lab Commitment Charts, for current & preceding semesters)
(Attach experiment list and Instructor(s) name(s) for current and previous semesters)

No.	Name of Laboratory	Lab Staff		Experiments Conducted			Workstations	
		Name	Qualifications	Name	Type			
					Demo	Hands on	No.	Type
1								
2								
3								
Etc.								

Annexure 7: Student admission details

No.	Intake batch	Allowed intake	Total applicants	Students admitted	Current strength
1	First				
2	Second				
3	Third				
4	Fourth				

**Annexure 8: Full-Time Program Faculty
(Dedicated and Shared)**

No	Name	Designation	Joining Date	Qualifications			Specialization	Teaching Experience	Dedicated/shared	Teaching Load in the Current Semester	
				Degree	Year	Institute				MS	BS
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							

Annexure 9: Part-Time and Visiting Faculty

No .	Name	Designation	Joining Date	Qualifications			Specialization	Teaching Experience	Part Time/ Visiting	Teaching Load (Cr. Hrs.)	
				degree	Year	Institute				MS	BS
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							
				PhD							
				MS							
				BS							

Annexure 10: Laboratory Instructors

No.	Name	Designation	Joining Date	Qualifications			Specialization	Experience	Dedicated/ Shared	Lab. Workload (Contact Hours)
				degree	Year	Institute				
				PhD						
				MS						
				BS						
				PhD						
				MS						
				BS						
				PhD						
				MS						
				BS						
				PhD						
				MS						
				BS						
				PhD						
				MS						
				BS						
				PhD						
				MS						
				BS						

Annexure 11: Summary of Faculty

Faculty Strength						
Type	Teaching Core Technology Subjects			Teaching Non-Technology Subjects		
	Bachelors	Masters	Doctorate	Bachelors	Masters	Doctorate
Dedicated Faculty						
Shared Faculty						
Visiting Faculty						
Ancillary faculty						
Total						

Faculty Strength at Last AIC Visit						
Type	Teaching Core Technology Subjects			Teaching Non-Technology Subjects		
	Bachelors	Masters	Doctorate	Bachelors	Masters	Doctorate
Dedicated Faculty						
Shared Faculty						
Visiting Faculty						
Ancillary faculty						
Total						

Annexure 12: HEI's Financial Health

No.	Income Source	Previous Year (PKR in Millions)	Current Year (PKR in Millions)
1	HEC Grants		
2	Tuition Fees		
3	Donor Funds		
4	Endowment Fund		
5	Etc.		

Annexure 13: Development Budget for the Program (PKR in Millions)

Budget Heads	Previous Year	Current Year		Next Year
	Expenditure	Allocation	Expenditure	Estimated Expenditure
New program/s				
Infrastructure				
Classrooms, Lecture Halls				
Laboratories				
Library				
Others				
Totals:				