

MANUAL OF ACCREDITATION

Third Edition 2019



Engineering Accreditation Division
Pakistan Engineering Council

MANUAL OF ACCREDITATION

2019



ENGINEERING ACCREDITATION BOARD

Third Edition (Amended Ver. of Accreditation Manual-2014)

**PAKISTAN ENGINEERING COUNCIL
ATATURK AVENUE (EAST), G-5/2
ISLAMABAD, PAKISTAN**

FOREWORD

Pakistan Engineering Council (PEC) is an autonomous statutory body, enacted by the Parliament, to regulate the engineering profession in the country. The PEC Act 1976 as amended in 2011 has set up an Engineering Accreditation Board (EAB), formerly known as Engineering Accreditation and Qualification Equivalence Committee (EA&QEC), to monitor the growth and quality of engineering education in Pakistan. For this purpose, PEC EAB is continuously engaged in evolving accreditation procedures and policies, revision of accreditation criteria and their parameters, and establishing appropriate benchmarks.

The process of accreditation initially launched through inspection of examinations during early 80's, evolved over time; benchmarking with the best international practices it transformed into a formalized process published in 2007 as the first *Manual of Accreditation*. This manual employed concepts of quality assurance in Engineering Education adopted by developed countries, and devised a systematic quantitative assessment mechanism against a set of well-defined accreditation criteria. After becoming provisional member of WA in June 2010, PEC made significant efforts to transform engineering education in Pakistan by introducing the concept of Outcome Based Education (OBE) as a paradigm shift, and transitioned towards OBA accreditation system adopting the guidelines followed by member countries of International Engineering Alliance (IEA). Accordingly, the Manual of Accreditation was revised in 2014 to not only shift the focus of accreditation from quantitative to qualitative assessment, but also to emphasize practicing Environment, Health and Safety (EHS) concepts, Complex Engineering Problem (CEP) solutions, Problem Based Learning (PBL) and Open-Ended Labs, etc. targeting embodiment of the desired 12 Graduate Attributes Exemplars in the engineering graduates. These efforts bore fruit when Pakistan was declared as full signatory of Washington Accord (WA) of International Engineering Alliance (IEA) in June 2017, after a comprehensive evaluation of PEC accreditation system by three WA Signatory's team comprising of Dr. Jung Soo Kim of South Korea (ABEEK), Mr. Colin Peter Smith of United Kingdom (ECUK), led by Mr. Basil Wakelin of New Zealand (EngNZ).

This turned out to be a timely initiative as HEIs made significant efforts to adopt Outcome Based Education (OBE) in their respective institutions to ensure that their graduates had the required innovative knowledge, technical skillset and responsible professional attitude to meet the needs of all stakeholders and enabling their global mobility. Due emphasis on *Engineers and Society*, and *Environment and Sustainability* aspects in Program's Learning Outcomes (PLO) helped the graduates realize the importance to pursue the targets set through UN's SDGs (agreed in Paris Accord 2016) and the requirements of World Economic Forum (WEF).

Implementation of Manual-2014 over the past five years highlighted, as a result of internal CQI, certain enhancements to improve the overall accreditation system and to acclimatize the umbrella reforms of PEC leadership, pertaining to modern trends in engineering education/ accreditation, as an outcome of continuous consultative dialogue with academia and industry. Consequently, PEC constituted a Committee for a comprehensive review of the Manual who, incorporating valuable feedback from all stakeholders, finalized this 3rd Edition

of Manual of Accreditation in December 2019. This Manual provides flexibility to HEIs and encourages them to design multidisciplinary curriculum and offer courses in emerging technological and ICT domains, with the ultimate objective of providing state-of-the-art skillsets in line with SDGs, to their engineering graduates. It is expected that this Manual will facilitate HEIs and other stakeholders to comply with the required quality assurance standards by enhancing the minimum level of mastery of engineering graduates.

This Manual exhibits the dedicated teamwork of the Convener EAB / Vice Chairman PEC, Engr. Prof. Dr. Fazal Ahmad Khalid, and his team of Accreditation Manual Revision Committee (AMRC) comprising of Engr. Prof. Dr. Saeed-ur-Rehman, Engr. Prof. Dr. M. Younus Javed, Engr. Prof. Dr. S. Wilayat Hussain, Engr. Prof. Dr. M. Inayatullah Khan Baber, Engr. Dr. Asif Raza, Engr. Prof. Dr. Muddassar Farooq and Engr. Dr. Nasir Mahmood Khan, including the overall secretarial support of EAD officials of PEC.

PEC acknowledges the support and efforts of engineers from industry and academia, who contributed in revising and updating the document, especially members of AMRC and EAB of PEC.



Engr. Jawed Salim Qureshi
Chairman
December 29, 2019

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Acronyms

ADM	Accreditation Decision Meeting
CLO	Course Learning Outcome
CPD	Continued Professional Development
CQI	Continuous Quality Improvement
Cr Hrs	Credit Hours
DAI	Degree Awarding Institution
EAB	Engineering Accreditation Board / Engineering Accreditation and Qualification Equivalence Committee (EA&QEC)
ECRDC	Engineering Curriculum Revision and Development Committee
GA	Graduate Attributes
GAs	Graduate Assistants
GB	Governing Body
HEC	Higher Education Commission
HEI	Higher Education Institution
IBCC	Inter-Board Committee of Chairmen
IEA	International Engineering Alliance
KPI	Key Performance Indicator
MFS	Minimum Faculty Strength
MOST	Ministry of Science of Technology
NCRC	National Curriculum Review Committee
OBA	Outcome Based Assessment
OBE	Outcome Based Education
SAR	Self-Assessment Report
SRO	Statutory Regulatory Order
PE	Professional Engineer
PEC	Pakistan Engineering Council
PEO	Program Educational Objectives
PEVs	Program Evaluators
PLO	Program Learning Outcome
QEC	Quality Enhancement Cell

RAs	Research Associates
RE	Registered Engineer
RP	Resource Person
TAs	Teaching Assistants
WA	Washington Accord
SDGs	Sustainable Development Goals

Glossary

Academic staff	Staff responsible for teaching and learning activities in the program leading to the award of an engineering degree.
Accredited Program	An engineering program whose graduates are acceptable for registration with PEC. This is accorded to a program that satisfies the minimum standard for accreditation set by EAB, and is also notified in SRO.
Concern	A criterion, policy, or procedure broadly in compliance but requiring improvement to avoid compromised quality of the program or currently in compliance but the potential exists for the situation to change resulting in non-compliance in future. Progress on the corrective measures is required prior to the next review.
Course	Subject offered in the program.
Deficiency	A criterion, policy, or procedure either does not exist or is in the elementary stage. Compliance is required.
Degree	An engineering qualification in Pakistan recognized by PEC and HEC.
Faculty	The entity which includes schools and departments responsible for designing and conducting the program to be accredited.
Graduate	Anyone who has been conferred a degree.
Opportunity For Improvement (OFI)	A criterion, policy, or procedure is in compliance and would be further strengthened by incorporating suggested measures/improvements.
Professional Engineer	An engineer registered with PEC under Section 16(1) of PEC Act.
Program	The sequence of structured educational experience undertaken by students leading to completion, on satisfactory assessment of performance.
Program Evaluators	A panel of evaluators appointed by EAB to verify program compliance with accreditation criteria.
Program Not Accredited	This is the status of a program that fails to meet the minimum standard for accreditation and has major shortcomings. In such a case, a further application is not normally considered within the next one year.
Registered Engineer	An engineer registered with PEC under Section 16(1) of PEC Act.
Stakeholders	Parties having an interest (direct or indirect) in the program output, for example, employers, sponsors, faculty members and students.
Student	Anyone undertaking an undergraduate program.
Support staff	Staff responsible for supporting teaching, learning and administrative activities in program implementation.
Weakness	A criterion, policy, or procedure lacks strength of compliance leading to the compromised quality of the program. Corrective measure is required to strengthen compliance prior to the next review.
Withdrawal of Accreditation	EAB reserves the right to cease/terminate the accreditation if there is non-compliance or breach of accreditation requirements after accreditation has been given.

CHAPTER – 1
ACCREDITATION POLICY

1.1 Introduction

PEC is a statutory body to regulate the engineering profession including quality of engineering education. EAB is the autonomous entity, working under PEC umbrella, entrusted with the task to perform functions related to accreditation of engineering programs under the relevant provisions of PEC Act 1976 and Bye-laws. This chapter describes the need for accreditation and relevant policy guidelines and provisions of the Act.

Accreditation is a process of quality assurance, through which a program in an approved institution is critically appraised at intervals not exceeding five years to verify that the program meets the norms and standards prescribed by the PEC EAB from time to time. Accreditation provides assurance that the academic aims and learning objectives of the program are pursued and achieved through the resources currently available, and that the institution running the program has demonstrated capabilities to ensure effectiveness of the educational program(s), Continuous Quality Improvement (CQI) and followed the spirit of Outcome-Based Education (OBE) over the period of accreditation cycle. Moreover, the Institution has adopted a quality assurance framework that demonstrates that the graduates of its programs have attained all Graduate Attributes (GAs) as prescribed in the PEC Manual. New institutions planning to offer engineering programs must complete a process of initial assessment by PEC before launching a program and admitting the first class of students.

A major policy adopted by the PEC EAB is to accord accreditation, not at the institution level, but at the program level. Four-year undergraduate engineering program (Cycle-I) after 12 years of initial education/schooling, and post-graduate engineering programs, i.e. Masters (Cycle-II) and Doctorate (Cycle-III) after 16 & 18 years of education, respectively, are considered for accreditation, as depicted in Table-1. Furthermore, the accreditation status for the programs is decided in terms of Accreditation up to five years, Deferred / Pended up to one year for the removal of deficiencies, and Not Accredited, depending upon the overall quality of the program assessed by the program evaluation team (nature of observations, deficiencies, weaknesses and concerns) after reviewing the rejoinder from the concerned HEI.

1.2 Need for Accreditation

The overwhelming objective of the accreditation process is to recognize and acknowledge the value-addition in transforming students admitted to the program into capable technical professionals, having sound knowledge of fundamentals and an acceptable level of profession real-world challenging technical assignments related to the Engineering profession.

The need and demand for accreditation of educational programs in engineering and emerging technologies in Pakistan has arisen because of the expansion in the number and diversity of such educational institutions and programs. Though education in Engineering Profession continues to be available only to a small fraction of eligible students, it is not possible to meaningfully sustain the present growth rate without an effective and credible undertaking in the quality assessment of the program(s). Such an undertaking will ensure that the institution running the program(s) has the necessary facilities, equipment and faculty resources for the programs, to deliver technically competent manpower that not only meets the local employers' requirements but also of the global job market in the Engineering Profession.

1.3 Scope and Objectives

Following are the scope and objectives of the accreditation process:

- i. to ensure that the graduates of PEC accredited programs possess sufficient academic background and knowledge for pursuing their professional career in engineering;
- ii. to ensure that graduates of PEC accredited programs have attained all prescribed Graduate Attributes (GAs) in Knowledge, Skills and Attitude domains;
- iii. to assure potential stakeholders and public at large in identifying those specific programs which meet the PEC standards for compliance with the accreditation criteria;
- iv. to encourage improvement of standards of professional engineering education in the country through CQI;
- v. to provide guidelines for the up-grading existing programs and for the development of new programs.

1.4 Provisions of PEC Act for Accreditation

The Preamble of the Act clearly states that “whereas the Council shall regulate the engineering profession with the vision that the engineering profession shall function as a key driving force for achieving rapid and sustainable growth in all national, economic and social fields; whereas the Council shall as its mission set and maintain realistic and internationally relevant standards of professional competence and ethics for engineers, and license engineers, and engineering institutions to competently and professionally promote and uphold the standards; and whereas the Council, covering the entire spectrum of engineering disciplines, shall function as an apex body to encourage and promote the pursuit of excellence in engineering profession and to regulate the quality of engineering education and the practice of engineering and thereby promote rapid growth in economic and social fields in Pakistan.”

The jurisdiction/authority to accredit the Engineering Programs of an institution offering any engineering program as such rests solely with the PEC and the relevant provisions of the PEC Act 1976 (amended in 2016) described in Section 2(ii) & (x), 8(b), 10(1) & (2), 11(1) & (2) 14(1) & (2), 15(1) & (2) and 16(1) are given below:

Section 2(ii):

Accredited engineering qualification means any qualification included in the First Schedule or the Second Schedule;

Section 2(x):

Engineering institution means an institution within or outside Pakistan which grants degree, diploma and certificate in engineering and related education and is accredited as such by the Council;

Section 8(b):

Accreditation of engineering qualifications for the purpose of registration of registered engineers, professional engineers.

Section 10: Accreditation of engineering qualifications granted by institutions in Pakistan:

Section 10 (1):

The engineering qualifications granted by engineering institutions in Pakistan which are included in the First Schedule shall be the accredited engineering qualifications for the purposes of this Act.

Section 10 (2):

Any engineering institution in Pakistan which grants an engineering qualification not included in the First Schedule may apply to the Council to have such qualification accredited and the Council may, by notification in the official Gazette, amend the First Schedule so as to include such qualification therein.

Section 11: Accreditation of foreign engineering qualifications:

Section 11(1):

The engineering qualifications granted by engineering institutions outside Pakistan which are included in the Second Schedule shall be accredited engineering qualifications for the purposes of this Act.

Section 11(2):

Any engineering qualification granted by an engineering institution outside Pakistan not included in the Second Schedule may be accredited by the Council, and the Council may, by notification in the official Gazette, amend the Second Schedule so as to include such qualification therein

Section 14: Accreditation of engineering institutions

Section 14 (1):

The Council shall constitute an Engineering Accreditation Board (EAB) for organizing and carrying out a comprehensive program of accreditation of engineering universities, colleges and institutions according to the criteria approved by the Governing Body in consultation with Higher Education Commission.

Section 15: Withdrawal of accreditation

Section 15(1):

When upon report by the EAB, it appears to the Council that the courses of study and examination to be gone through in any engineering institution in Pakistan in order to obtain an accredited engineering qualification or the standards of proficiency required from candidates in any examination held for the purpose of granting such qualification are not such to secure to person holding such qualification

the knowledge and skill requisite for the efficient practice of engineering, the Council shall forward the report to the engineering institution concerned with an intimation of the period within which it may submit its explanation to the Council.

Section 15 (2):

On receipt of the explanation or, where no explanation is submitted within the specified period, on the expiry of that period, the Council, after making such further inquiry, if any, as it may think fit, may, by notification in the official Gazette, direct that an entry shall be made in the First Schedule and Second Schedule, as applicable, against the engineering qualification to which the explanation relates declaring that it shall be an accredited engineering qualification only when granted before a specified date.

Section 16 (1):

The Council shall maintain in the prescribed manner a Register in which shall be entered the names and other particulars of persons possessing accredited engineering qualifications whose application for registration as Registered Engineers (RE), Professional Engineers (PE), Consulting Engineers, Constructors and Operators are, from time to time, granted by the Council.

Section 25A: **Power to make regulations**

The Governing Body may, in consultation with the committee of Vice-Chancellors of the Universities of Engineering and Technology of Pakistan set up by the Higher Education Commission, make regulations, not inconsistent with the provisions of the this Act and the bye-laws, to provide for — (a) minimum standard of courses of study and practical training for obtaining graduate and post-graduate engineering qualifications to be included in the First and Second Schedules; (b) minimum requirement for the content and duration of courses of study as aforesaid; 23 (c) minimum qualifications for admission to engineering institutions offering course of study and laying down minimum standard for holding admission examinations; (d) qualification and experience required of teachers for appointment in engineering universities, colleges and institutions; (e) minimum standards of examinations, and duration and standard of practical training, for securing accreditation of engineering qualifications under this Act; and (f) qualifications and experience required of examiners for professional examinations of accredited engineering qualifications.

Furthermore, under Section 27 of the Act, undertaking of “Professional Engineering Work”, without registration with the Council has been made an offence, and subjected to penalty due to infringement of a law / regulations.

Section 25A of the PEC Act pertaining to “*Regulation for Engineering Education in Pakistan*” may be used as reference in addition to Accreditation Criteria and Policies as part of accreditation process.

1.5 Engineering Accreditation Board of PEC

The Governing Body of Pakistan Engineering Council (PEC) constitutes EAB (formerly known as EA&QEC) for the same term as of the Governing Body, by nominating its Chair and Members from the Governing Body having relevant experience (on engineering education, accreditation and regulations) and showing willingness to contribute. The Chair EAB may co-opt additional members, who are well versed in accreditation process, academic / professional regulations and management, from academia and industry in order to make it broad based with balanced representation.

1.5.1 Composition of the Engineering Accreditation Board.

(1) The EAB shall consist of the following, namely:-

- (a) Chair EAB to be nominated by the PEC Governing Body amongst its members. S/He should have rich a professional standing and repute with a postgraduate engineering qualification and relevant experience of academia or industry particularly in engineering education, regulations pertaining to higher education and accreditation.
- (b) EAB will consist of seventeen (17) members including the Chair EAB to be nominated by the PEC Governing Body amongst its members having relevant experience and professional standing and willingness to contribute. The distribution of the EAB will be 70% from academia and 30% from Industry.
- (c) To further strengthen and make EAB a broad-based forum, Chair EAB may co-opt a maximum of four members from academia or industry who are well-versed in accreditation system in consultation with EAB.
- (d) Executive Director HEC or his nominee from Academics / Accreditation / Quality Assurance Division not below BPS-20.
- (e) Executive Director of Engineering Accreditation Division (EAD) of the Council

One-third from the outgoing EAB shall be retained to ensure continuity of policies/practices, and representation of all Provinces and Federation.

(2) (a) ED (EAD) will also act as Secretary of the EAB.

(b) Members of EAB shall comply with the Code of Conduct approved by EAB.

1.5.2 Powers, Functions and Role of Engineering Accreditation Board:

The EAB shall function under umbrella of the Council in-line with the relevant provisions given under the PEC Act to perform activities related to accreditation and engineering education, and as per the powers delegated by the Governing Body. The following shall be the powers and functions of the EAB but not limited to, namely:-

- i. Formulate and review guidelines, procedures, standards and criteria for accreditation of Engineering Programs (Accreditation Manual) at undergraduate and post-graduate level engineering qualifications to be included in the First and Second Schedules offered by an HEI in-line with internationally accepted practices and procedures.

- ii. Prepare and promulgate the policy guidelines and standards for launching a new engineering program and any change in the scope of engineering program of an HEI.
- iii. Provide facilitation, consultation and response to queries/complaints specifically pertaining to accreditation of engineering programs of institution(s).
- iv. Devise and monitor the implementation of EAB policies and procedures as approved time to time by the Governing Body.
- v. Evaluate the programs at regular intervals not exceeding five years, with the third-year being the preparatory period for the next re-accreditation.
- vi. Appoint a Program Evaluation Team pertaining to accreditation of engineering program(s) offered by an HEI or any other similar activity tasked by the EAB.
- vii. Receive and review evaluation reports by the Evaluation Teams, and to communicate its findings to the institutions concerned for their rejoinder for the purpose of factual accuracy on the observations reported in the evaluation reports.
- viii. Decide whether accreditation should be granted, as well as the conditions to be imposed, if there is such a need.
- ix. Maintain and publish a directory of all accredited programs (First Schedule and Second Schedule of PEC ACT 1976) periodically.
- x. Process appeals against the decision of EAB in the manner as described in the Accreditation Manual approved by the Council.
- xi. Represent PEC in mutual recognition/substantial equivalence of programs and agreements on academic qualifications/accords with other jurisdictions and relevant international forums.
- xii. Approve program evaluators (PEVs) from academia and industry as per approved criteria and maintain a database to plan, detail and execute accreditation visits.
- xiii. Facilitate for the capacity building of HEIs, PEVs, Faculty, Quality Directors, EAB Members and EAD staff through necessary trainings, workshops and seminars.
- xiv. Advocate for the meaning and value of PEC accreditation to major technical employers and other key stakeholders of the Council.
- xv. Examine and formulate benchmark criteria for substantial equivalence on the quality of engineering education of a program offered by an HEI, both within the country (First Schedule) and abroad (Second Schedule), to establish their acceptability for registration as a sufficient qualification and training in a particular engineering discipline/specialized area.
- xvi. Constitute various task-based committees to work with EAD to facilitate the working of the EAB for decision making. The Conveners of these committees shall submit their recommendations to Chair EAB for further deliberations and decision making by the EAB.
- xvii. Act as 'Think Tank' on engineering education for the Council.
- xviii. Keep the Council abreast on all proceedings and functions, including the decision making, the EAB shall submit its report to the Governing Body for perusal and endorsement. Wherever necessary, make recommendations to

the Council to uplift the quality of engineering education, standards and enhancement of professional competency.

- xix. Submit recommendations to Chairman PEC for change/replacement of ED, in case the performance of the appointed incumbent is not satisfactory. In this case the incumbent may be transferred/replaced with any other suitable Senior Additional Registrar.
- xx. Facilitates the scrutiny process through credential assessment by a designated committee headed by Chair EAB for hiring of the services of a suitable Executive Director (ED) that shall be Head of Engineering Accreditation Division of PEC. The recommendation of EAB Committee on the suitable persons in order of merit be submitted to PEC Selection/Promotion Board for their onward interview and placing recommendations to the Chairman PEC for approval.

Performance evaluation of ED is assessed by the Chair EAB and duly signed recommendations are submitted to the Chairman PEC for approval of extension of term(s), or otherwise. Any activity or function, not mentioned above under this clause, may be adopted or assigned by the PEC Governing Body in-line with PEC Act 1976.

Institutions are expected to continue to maintain the minimum standards to satisfy the laid down criteria on which accreditation has been initially given to a program. If, at any time, the EAB considers that an accredited program is no longer in conformity with the criteria, the accreditation given may be suspended or withdrawn. The reasons for the same, however, will be communicated to the concerned institution.

1.5.3 The Engineering Accreditation Division (EAD)

The Engineering Accreditation Division (EAD) at PEC Head Office will serve as the Secretariat of the EAB and is facilitated by PEC Head / Branch offices. It will look after the diversified and expanded scope of EAB covering accreditation, regulations, capacity building, curriculum and maintaining standards in-line with best international practices under the relevant provisions of PEC Act 1976 and Engineering Accreditation Byelaws.

1.5.3.1 Functions and Role of EAD:

EAD is also involved in:

- i. Execution of Accreditation visits from planning to process of decision making by the EAB.
- ii. Imparting regular trainings for PEVs, Faculty, QEC Directors, EAD and relevant officials.
- iii. Contributing in the development / review of National Engineering Curricula jointly with HEC (ECRDC) as described under the functions of EAB and PEC Act 1976.
- iv. Maintaining database of PEVs, Faculty, Students and archiving of all EAB proceedings/minutes of meetings, policy reforms and agreements/MoUs with national/international organizations.
- v. Establishing collaborations with international professional engineering bodies.
- vi. Assisting and supporting PEC Vice Chancellors Committee (VCC) in formulating the Regulations on Engineering Education in Pakistan.

1.6 Launching of New Programs

Institutions desirous of starting an engineering program are advised to follow the PEC guidelines described in the document entitled “*Guidelines for Launching a New Program*” as approved by EAB and Governing Body of the Council.

1.7 Types of Accreditation Visits

In relation to accreditation of engineering programs, the following are various types of visits conducted by PEC:

1.7.1 Zero Visit

Institutions should apply for zero visit by providing detailed information to PEC according to the questionnaire for conformance evaluation of the essential requirements of starting a new engineering program as provided in the referenced document mentioned in Section 1.6. Zero visit is mandatory and the details / deadlines to submit the application are as per the prevailing EAB policy accessible through the PEC website.

1.7.2 Interim Visit

The programs approved by EAB through zero visit are required to apply for an interim visit at the end of first year of each new program to ascertain its preparedness for the next phases. The institution has to provide detailed documentation, as per the questionnaire for critical analysis along with the progress based on the zero visit report, to ensure quality of engineering program(s). The details / deadlines to submit the application for the interim visit are as per the prevailing EAB policy accessible through PEC website.

1.7.3 Accreditation Visit

An institution applying for accreditation visit is expected to fulfill all the requirements pertaining to faculty, curriculum, laboratories, library, infrastructure, finances and other allied facilities as per the accreditation guidelines. Program seeking accreditation for the first time is required to ensure submission of SAR to PEC before the commencement of 7th semester, and the accreditation visit during final year. The programs seeking renewal of accreditation status (Re-Accreditation) should apply within last year, but not exceeding six months before the expiry of the accreditation period granted.

1.7.4 Confirmatory Visit

This visit is necessitated only if required by the EAB as a result of any deferred / pended / conditional accreditation decision, based on the accreditation visit report of the program, to confirm the removal of deficiencies.

1.7.5 Change-of-Scope Visit

An accredited program would be required to apply for a Change-of-Scope visit under the

following circumstances:

- i. An increase in the student enrollment
- ii. A change in the scope of the program / curriculum / nomenclature / legal status / location
- iii. Addition of new stream/specialization in the program's scheme of study

The application for this visit must be submitted at least 6 months before the date of effective implementation of the proposed change (or changes).

1.7.6 Un-Scheduled / Periodic Visits:

This visit shall be conducted under the directions of the Chairman, PEC in any extraordinary circumstances being reported in writing against an HEI. The visit shall not be planned in advance and the concerned HEI shall be informed one day in advance. The Chairman PEC shall constitute the Program Evaluation team comprising of three members (one convener/expert plus 2 experts). The transportation and boarding/lodging charges shall be borne by the concerned HEI on actual basis.

The visit report shall be submitted to the Chairman, PEC no later than 24 hours after conducting the visit. Chairman, PEC shall forward this report to EAB for appropriate recommendation before making any decision.

1.8 Eligibility Requirements to Apply for Accreditation

The qualifying requirements are meant to screen out Programs that do not meet the core requirements of the assessment criteria. Failure to meet any one of the qualifying requirements may disqualify the Program from further assessment/ process.

There are 7 components of the qualifying requirements to be eligible to submit the SAR for the accreditation of a program. Each Program is required to satisfy all the following requirements:

- i. The legal status/requirement from the relevant bodies, specifying the particular legal arrangements as a Charter/ Degree Awarding Institution (DAI), Constituent or Affiliated institution, or any other type, etc.
- ii. Minimum 130 credit hours, out of which a minimum of 85 credit hours of engineering and computer science courses and a minimum of 30 credit hours of non-engineering (mathematics, humanities and natural sciences) courses offered over a period of four years (8 semesters).
- iii. Final Year Design / Capstone Project (6 credit hours).
- iv. Full-time dedicated engineering faculty (not shared with any other program of the same level) should be minimum of eight (8) faculty members for one section ensuring that student-teacher ratio does not exceed 25:1, irrespective of number of sections/ allowed intake of the program.
- v. Progress/ Compliance Report (CQI) on the last PEC visit observations / EAB decision.
- vi. Summary of Gap Analysis and Initiatives taken on Outcome Based Assessment implementation.
- vii. Duly completed and signed SAR as per prescribed format.

In case of first accreditation of a new program, the institute should also provide the compliance reports on the Zero / Interim visits.

If the Program has met all the eligibility requirements (Template Annexed), a detailed assessment of the Program based on the accreditation criteria as explained in the relevant sections will be carried out.

1.9 Provision for withdrawal

The institutions have the option to withdraw a program during the accreditation process by a written request to the Visiting Team Convener, after being informed of its strengths and weaknesses, but before the Visiting Team holds formal discussion among its members for finalizing the 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 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.

In case of Provisionally Accredited programs, PEC may withdraw accreditation granted if the program fails to exhibit CQI in line with the observations of previous evaluation report.

1.10 Accreditation Fee Structure

Fee for various types of accreditation visit (i.e. Accreditation, Re-Accreditation, Confirmatory/Compliance, Zero, Interim, Change of Scope, and Appeal cases) shall be as prescribed by PEC EAB/EA&QEC from time to time approved by competent authority of the Council.

Note: Please refer to PEC Secretariat / website (www.pec.org.pk) for the current fee structure / policy for various types of assessment visits.

CHAPTER – 2
ACCREDITATION PROCEDURE

2.1 Introduction

This chapter highlights the process and procedures pertaining to the program accreditation by PEC. The accreditation process, whether for a first accreditation or re-accreditation, involves a comprehensive assessment which starts with a review of the information submitted in SAR, followed by a detailed on-site accreditation visit by the Evaluation Team appointed by EAB; and preparation of the accreditation report on findings and recommendations by the team.

2.2 Accreditation Process

Program accreditation process is initiated through submission of formal accreditation request (i.e. SAR) by the institutions. Institutions are expected to submit detailed dossier including required information as per the templates given in annexures and the requisite fee. Preliminary scrutiny is carried out at PEC Secretariat (EAD) as per the qualifying requirements given in Sec 1.8. Various steps involved in accreditation process are illustrated in the flow diagram given in Figure-1.

Accreditation Process Flow Diagram

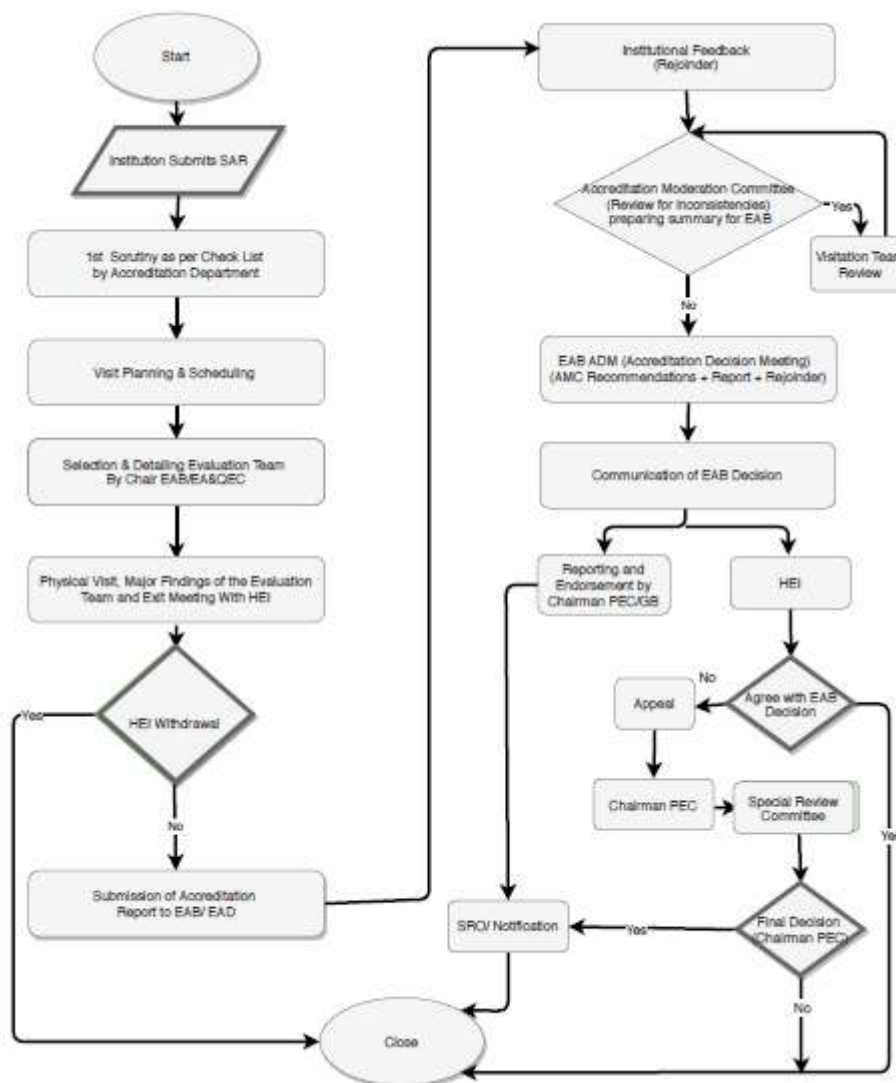


Figure-1. PEC Accreditation Process Flow Diagram

The accreditation process generally completes in six to nine months period as explained below. Institutions are, therefore, advised to submit their application well in advance preferably one year before the expiry of last accreditation term / batch.

A Program might be able to obtain accreditation, for a specified period, after taking concrete actions on the above-mentioned steps. However, the entire accreditation process will be repeated at the expiry of the accreditation period. The maximum period of accreditation shall be 5 years. However, if accreditation is pended due to deficiencies identified, the institution is required to provide a compliance report to PEC within given time highlighting the corrective measures taken along with the evidence. This may be followed by a confirmatory visit.

2.2.1 Steps in Accreditation Process

Step 1	SAR submitted to PEC Secretariat; first scrutiny carried out by Engineering Accreditation Division (EAD) as per the qualifying requirements and comprehensive information/ data required in-line with each criterion. The Institution is asked to provide any additional data / information, if required, to have a comprehensive information for PEVs. This step is considered complete when the SAR along with all the requisite data is available with EAD-Secretariat.
Step 2	Visit planning, scheduling and selection of program evaluation team by EAB. The Program Evaluation Team is provided with SAR along with the archives of previous accreditation reports, including compliance/ progress reports, if any, and the EAB decision taken for previous accreditation related visits of the program. PEC representative will coordinate with team members and the institute for providing any additional information, if required.
Step 3	Pre-visit meeting will be conducted for a program/ multiple programs as per schedule prior to on-site visit, which starts by a meeting with the Head of the Institution as per the visit schedule conveyed to HEI. The accreditation visit comprises of brief presentations by the Dean/ program head, visit to Laboratories and workshops, Library(ies), other Infrastructure/Facilities, meeting with administrative staff, faculty, students and other stakeholders such as alumni, employers and internal meetings of PEVs etc.
Step 4	Exit meeting with the Management, Principal/Deans to briefly share the strengths and weaknesses of the program. At this stage, the institution may decide to withdraw the program accreditation for further process, however, further discussion/ arguments from the HEI is not allowed. Any explanation or addition of data/ information for the program be given with Rejoinder as elaborated in the next step.
Step 5	Discussion among team members followed by compiling of Visit Report and submission to EAB. EAD also sends a copy of the report to the institution, excluding team's recommendations for the accreditation decision. These recommendations are only meant for the considerations of EAB for the final decision regarding the accreditation status of the program.
Step 6	Institution may submit Rejoinder/Comments on the report within stipulated time of its receipt, as per EAB policy. If the Institutional rejoinder is not received by the due date, it is assumed that the Institution agrees to the observations of the Team.

Step 7	Consideration of the Report and the Rejoinder by EAB will be subject to moderation/ review for conformance to the criteria and inconsistencies, if any in the report, and to furnish further recommendations for EAB decision.
Step 8	Communicating the Accreditation Decision to PEC GB/Chairman and the concerned Institution, uploading on PEC website, followed by Gazette Notification (SRO) for the benefit of the public and stakeholders.

2.3 Accreditation Decisions

The EAB in its Accreditation Decision Meeting (ADM) may decide about the accreditation status of an individual program, based on the compliance levels (i.e. deficiency, weakness, concern and OFI defined in the Glossary) of the nine (9) accreditation criteria, in one of following ways:-

- i. **Accredited for full cycle of five years:** Programs meeting or exceeding all accreditation criteria, though with some concerns.
- ii. **Accredited for less than five years:** Programs meeting all the accreditation criteria but no major deficiency though may have some weaknesses/ concerns.
- iii. **Deferred/Pended up to one year to ensure removal of deficiencies/ weaknesses:** In case program has a few major weaknesses which can be removed within a specified period of time. Re-consideration would require an evidence based compliance report or a confirmatory-visit once the weaknesses are removed.
Not Accredited: Programs not ready for accreditation due to non-conformance to a number of criteria or serious deficiencies in major attributes.

2.4 Appeals

In case an institution wishes to appeal for a review of the action on accreditation taken by the EAB, a written application along with the prescribed fee should be sent to the Secretariat of EAB within 30 days of the date of notification of the action. On receipt of such an application, and being satisfied about its prima facie case, the Chairman PEC may appoint a special Committee, consisting of a minimum of three members including Vice Chairman PEC as Chairman and two subject specialists who were not initially involved in the program evaluation to conduct the appeal review. A meeting of the committee will be convened, wherein the institution and the members of EAB may be invited to present their cases. The committee may also visit the institution, if necessary. The recommendations of this committee will be considered by the Chairman PEC for making a final decision; the same will be communicated to EAB.

2.5 Activities in Accreditation Visit

2.5.1 Composition of Program Evaluation Team

The Visiting Team consists of a Convener, two PEVs for each program, and a PEC official to provide the secretarial support. The program evaluation team includes experienced / qualified academicians / engineers having no conflict of interest with the institution to be visited, and

who are selected on the basis of their high standing in the profession, ability to assess curricula, competence in appraisal based on overall objectives and performance towards the achievements of set goals. The PEVs from academia will have a doctoral degree with a minimum of five years teaching, research and practical experience. Professional engineers who are registered with PEC and have at least 10 years industrial / field experience are included as a PEV. PEVs are selected based on relevant qualification, professional experience and accreditation training. PEC secretariat will maintain an updated list of qualified PEVs pertaining to all engineering disciplines. PEC shall arrange and conduct accreditation training workshops for potential PEVs.

Once the evaluation team is finalized, the schedule of the visit is communicated to HEI. The institution may request that a certain designated PEVs to be excluded from the team in case of any conflict of interest by submitting a justified reason in writing to PEC within a week after receiving the schedule of the visiting team. In case of valid reason(s), Chair EAB will replace the designated evaluation team member(s).

2.5.2 Team Convener

The Convener of program evaluation team has the overall responsibility for the accreditation visit. The Convener assigns duties to each team member keeping in view the overall perspective. He should be familiar with the accreditation process and will gather in advance the earlier reports, if any. He has the responsibility for preparing the consolidated team report and its timely submission, for the consideration of the EAB. The Convener of the visiting team may preferably be a member of the EAB.

One of the senior members of program evaluation team will be appointed to take on the role of the Convener, if the Convener is unable to undertake the visit for unforeseen circumstances.

2.5.3 Program Evaluators

The program evaluators (PEVs) are responsible for the evaluation of an individual program. Usually, there are two PEVs (preferably one from industry) for each program. In case two programs with substantially similar curricula 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 PEVs include evaluation with reference to the accreditation criteria 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.

In case a PEV is unable to undertake the visit due to circumstances beyond his/ her control, the Convener will consult EAD for a suitable replacement.

2.5.4 PEC-EAD Representative/Official

PEC-EAD official is responsible to provide all secretarial facilities, coordinate between visiting

team members and the institute, and ensure availability of relevant information. PEC representative shall give detailed briefing about the visit, institutional data and previous accreditation visit report(s) to the team. PEC representative will also ensure compilation of visit report on the last day of visit for submission to the EAB. He/She will also help to provide necessary policy level updates to the program evaluation team as and when required.

2.5.5 Observers in Program Accreditation Visit

EAD may include observers(s) in the program evaluation team to build their capacity by providing on-job training to act as potential PEVs in future or to see the whole process of evaluation/accreditation for any specific purpose. The role of such observers shall remain strictly non-participatory during the entire accreditation visit unless specifically permitted by the Convener and HEI. An Observer must neither transmit nor reveal the contents of documents and information obtained during the accreditation visit to any third party other than PEC. All observers must also adhere to the Code of Ethics as prescribed in the “Code of Ethics for Observer”.

2.5.6 Activities during the Visit

Normally, the visiting team requires two days to complete the evaluation of a program. However, for multiple programs, the visit may be scheduled for three days. In this case, the visit will be planned to hold respective presentations in a combined session followed by the 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 are the typical activities carried out during three days of Program Evaluation Visit:

- a. Pre-visit meeting among the PEVs to Review the program(s) SAR, identification and discussion on issues, preparation of inquisitive checklist and PEVs’ worksheet for further probing / clarification during the on-site visit;
- b. Meeting with Head of Institution, Dean, Program Head and senior administration of the institution;
- c. Interaction with program as well as shared faculty from supporting departments to assess the program strength and its conduct;
- d. Interaction meetings with students, alumni and other stakeholders including employers for obtaining their feedback;
- e. Meeting with services and administrative officials of the institute in connection with provision of support regarding finance, infrastructure, examination, admission & registration etc.;
- f. Review and analysis of all the documents furnished by the department / institution;
- g. Visits to laboratories, library, computing facilities, auditorium, sports facilities, hostels, faculty offices, classrooms, career placement office, medical and such

other facilities.

- h. A concluding meeting with senior management of the program and institution to share observations of the visiting team.
- i. Compilation of Program Evaluation Report

2.5.7 Schedule of Program Evaluation Team

Following is a typical schedule of the visiting team

Day 0: The Convener holds a pre-visit meeting with the program evaluation team members in connection with the evaluation of the program, preferably in the evening before the first day of the visit. The meeting is mainly focused on the points of concern noted by the team members and exchange of views on the information provided in SAR. The team uses a program evaluation worksheet throughout to assist in the evaluation and discussion.

Day 1: Typical activities include:

- i. Opening meeting with senior administration of the institution;
- ii. Presentation by the Head of the Department of program being evaluated and ensuing discussion;
- iii. Assessment and analysis of documents displayed in the exhibit room;
- iv. Visit of program laboratories and allied facilities;
- v. Interaction with students;
- vi. Visit to supporting and interdisciplinary departments and discussion with supporting staff;
- vii. Visit to allied facilities such as library, computing, internet, medical, sports, hostels etc.;
- viii. Meeting with the faculty members;
- ix. Second review meeting of team members regarding assessment of the program.
- x. The evaluation team may request for any additional information / data or facts for clarifications to resolve issues or queries;

Day 2: Typical activities include:

- i. Review of any additional information/data or facts, requested by the visiting team, for clarifications to resolve issues or queries.
- ii. Discussion with Alumni, Employers and other stakeholders
- iii. Third review meeting of team members on overall assessment of the program;
- iv. Sharing observations (strong and weak areas of the program) with the higher management of HEI;
- v. Final meeting (post-visit) of the team members for compilation of draft visit report;
- vi. Submission of final visit report to EAD for EAB, OR it may be extended to third day if required by the Convener.

Day 3: Continuation of the final meeting to complete and finalize the visit report, and handing it over to EAD official/representative for EAB and departure.

A typical schedule of accreditation activities for a single/ multiple program(s) is given at Annex-

The institution shall arrange an exhibit-room for displaying the relevant documents including but not limited to the followings:

- i. A copy of latest prospectus
- ii. Admission details/policies for the concerned engineering programs.
- iii. Program curriculum, evidence of benchmarking, regular review and consistency with PEC / HEC guidelines and adoption of Outcome Based Education (OBE) System
- iv. Course files, lab manuals and student feedback for the subjects offered in the program.
- v. PEOs and PLOs assessment and attainment folders indicating complete process.
- vi. Random check of students' work, question papers and answer sheets and student attendance record.
- vii. Proof/evidence that assignments are properly graded
- viii. Evidence of exposure to Complex Engineering Problems (CEPs) and activities, Problem based learning, design projects and open ended labs.
- ix. Availability of training aids for imparting quality education
- x. Record of student internship and employer feedback
- xi. Evidence for continuous quality improvement (CQI) of the program and implementation plan
- xii. Record of minutes of meetings; policy documents, faculty profile; syllabi; research publications; project reports, Industrial Advisory Board/ Committee and other such documents required as evidence
- xiii. Record of Final Year Projects and sample reports
- xiv. Validity of PEC Registration for all Engineering Faculty / Staff
- xv. Details pertaining to faculty members to verify their requisite qualifications, publications, R&D projects and research funding
- xvi. Continuing Professional Development (CPD) and other training for faculty / staff
- xvii. Proof/evidence of faculty workload
- xviii. Details of laboratories with equipment, its supporting staff and lab manuals.
- xix. Evidence for provision of general environment, health and safety (EHS).
- xx. A copy of approved budget (previous and current years) for the university and concerned engineering programs to be evaluated. Including current endowment fund status.
- xxi. Details of self-generated financial resources through consulting, field/ lab testing etc. and their distribution if any
- xxii. Details of conference, seminars, CPD courses and colloquia held by the department/institution
- xxiii. Controller of Exams, Treasurer / Finance Manager, Registrar, concerned faculty members, alumni, employers and students should be available to the program evaluation team along with relevant records
- xxiv. Actions taken by the university / institution on deficiencies/ weaknesses and concerns pointed out in last visit report (if applicable)
- xxv. Other additional document(s) required in support of the program.

CHAPTER – 3
CRITERIA FOR ACCREDITATION

3.1 Introduction

An engineering program shall be assessed by EAB to enable graduates of the program to register as graduate engineers with the PEC. The evaluation process is based on a set of broad-based criteria, compatible with international engineering standards, developed through a comprehensive consultative process involving relevant stakeholders from academia and industry of the country as well as international experts. Each criterion serves to assess the level of compliance to certain specific aspects of the institutional and program's effectiveness in line with its vision, mission and educational objectives. Hence, each of them is described in terms of quality attributes, amenable to a substantially objective and qualitative assessment.

3.2 Accreditation Criteria

PEC-EAB encourages the institutions to continuously strive for the attainment of excellence. The EAB's accreditation processes are designed to facilitate HEIs in identifying the strength and weakness of their program as far as the level of compliance against specified quality criteria is concerned. The assessment involves a review of qualifying requirements (Sec. 1.8) and evaluation of an engineering program's conformance to the following criteria.

Criterion 1 - Program Educational Objectives (PEOs)

Criterion 2 - Program Learning Outcomes (PLOs)

Criterion 3 - Curriculum and Learning Process

Criterion 4 - Students

Criterion 5 - Faculty and Support Staff

Criterion 6 - Facilities and Infrastructure

Criterion 7 - Institutional Support and Financial Resources

Criterion 8 - Continuous Quality Improvement

Criterion 9 – Industrial and International Linkages

Institutions seeking accreditation of their programs are expected to satisfy each criterion. They are required to adhere to these criteria during the validity period of accreditation granted. They are also encouraged to periodically review the strengths and weaknesses of their programs and strive for their continuous improvement.

3.2.1 Criterion 1 - Program Educational Objectives (PEOs)

The institution applying for accreditation should have a well-defined vision and a set of goals articulated in the form of a mission statement. The program offered by the institution should also have well defined objectives. Program educational objectives (PEO) are broad statements that describe what graduates are expected to demonstrate a few years after graduation. It should be ensured that the program objectives are aligned with the vision and mission of the institution. Institute mission and program's objectives should be articulated and made known to everyone in the institution through institutional publications and websites.

The successful pursuit and realization of the mission and objectives, and the means adopted to accomplish them bring out the quality of the institution and its programs.

Program educational objectives are based on the needs of the program's constituencies and are linked to student outcomes and learning assessment process. The objectives should be clear, concise, realistic and measurable within the context of the committed resources and should define the competitive/unique advantage of the program over similar programs in other peer institutions. A process should be developed to assess the level of attainment of the program objectives to evaluate effectiveness of the academic program. It should include feedback from employers, alumni, faculty and other stakeholders. The evaluation results should be utilized for redefining/improving the program objectives.

The program seeking accreditation must demonstrate that the following are in place:

- a) Well-defined and published Program Educational Objectives
- b) Program's educational objectives consistent with the Institute's mission
- c) Program's educational objectives based on the stakeholder's needs
- d) A process in place to evaluate the attainment of educational objectives
- e) Evaluation results used for continuous improvement of the program

Note: Since the graduates of a program, which is being accredited for the first time, or the one which is in the initial phases of its accreditation (e.g. whose only one/two batches have graduated so far), the assessment data towards attainment of the PEOs should be available.

3.2.2 Criterion 2 - Program Learning Outcomes (PLOs)

Program Learning Outcomes are the narrower statements that describe what students are expected to know and able to do by the time of graduation. These relate to the knowledge, skills and attitude that the students acquire while progressing through the program.

The program must demonstrate that by the time of graduation, the students have attained a certain set of knowledge, skills and behavioral traits, at-least to some acceptable minimum level. This minimum threshold value (i.e. KPI for PLO attainment) should not be less than 50% even to begin with; however, as the program progresses through its evolution, it is expected that this minimum threshold value would subsequently be raised to higher values as a result of program's CQI. Specifically, it is to be demonstrated that all students of a batch to be accredited have acquired the following graduate attributes (GAs):

GA1 Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

GA2 Problem Analysis: An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

GA3 Design/Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

- GA4 Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- GA5 Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
- GA6 The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- GA7 Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of, and need for, sustainable development.
- GA8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- GA9 Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- GA10 Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- GA11 Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- GA12 Lifelong Learning:** An ability to recognize the need for, and have the preparation and ability to engage in, independent and life-long learning in the broadest context of technological change.

In addition to incorporating the graduate attributes (GA1 – GA12) listed above as the program learning outcomes, the educational institution may also include any additional outcomes if adopted.

Specific details relating to the processes adopted for assessing, evaluating and reviewing the program learning outcomes should be provided. The institution should also present the internal quality assessment cycle adopted by its Quality Enhancement Cell (QEC).

In particular, the program must demonstrate the following:

- a) Well-defined and published Program Learning Outcomes
- b) Program Learning Outcomes linked to the Program Educational Objectives
- c) Program Learning Outcomes encompass all the Graduate Attributes listed above
- d) Mapping of Program Learning Outcomes to Courses
- e) Teaching-learning and assessment methods appropriate and supportive to the attainment of Program Learning Outcomes
- f) Quality of assessment mechanism to evaluate achievement levels for all the Program Learning Outcomes by each student
- g) Process in place by which assessment results are applied to further refine the assessment mechanism and/or redefine the program learning outcomes, thus leading to continuous improvement of the program

3.2.3 Criterion 3– Curriculum and Learning Process

The genesis of any engineering program is the fusion of its stakeholders' perceptions. The academic curriculum of the program should be designed to facilitate / ensure the achievement of program outcomes by all 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 also invoke awareness and comprehension of societal problems amongst the students and should motivate them to seek solutions for improving the quality of life of people in the society. The theoretical content of the curriculum has to be supplemented with appropriate experimentation in laboratories and compliance to the international standards, codes and protocols.

The institution should ensure incorporating the inputs from all stakeholders, especially from the industry, in developing curriculum contents so as to keep the curriculum aligned with the program objectives and outcomes. 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 various learning domains and levels, for example, as defined in Bloom's Taxonomy.

The modern perspective of an engineering curriculum, especially for programs emphasizing OBE, is that it is the most important instrument for grooming the above-mentioned 12 GAs in students. Therefore, it is viewed to consist of a number of Knowledge Profiles (WKs) that inculcate different dimensions of thinking – mathematical, computational, design and creative – among students in Cognitive, Psychomotor and Affective domains. In particular, the institution should ensure that at least the following knowledge profiles are incorporated in the curriculum:

WK1 Natural Sciences: A systematic theory-based understanding of natural sciences applicable to the discipline.

WK2 Mathematics and Computing: The concept-based mathematical thinking, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.

WK3 Engineering Fundamentals: A systematic, theory-based formulation of engineering fundamentals required in an engineering discipline.

WK4 Engineering Specialization: The knowledge of Engineering specialization that provides theoretical frameworks and bodies of knowledge for the accepted practice areas that are at the forefront in a discipline.

WK5 Engineering Design: The *Design Thinking Knowledge* that supports engineering design in a practice area of an engineering discipline.

WK6 Engineering Practice: The Knowledge of engineering practices (technology) in different practice areas of an engineering discipline.

WK7 Engineering in Society: A systematic, comprehension-based knowledge of the role of engineers in a society and the professional issues related to practicing engineering profession in a discipline: ethics and the professional responsibility of an engineer to public safety including the impact of an engineering activity i.e. economic, social, cultural, environmental and sustainability

WK8 Research Literature: Engagement with selected knowledge in the research literature of the discipline.

The curriculum of an Engineering program, which targets the above-mentioned desired elements of **Knowledge Profiles**, enables students to undertake a range of **Complex Problem Solving** and **Complex Engineering Activities** as given in the Table 2 & 3 of Annex-A; as a result, the desired 12 GAs are developed in them by the time of graduation.

Comprehensive pursuance of a curriculum necessitates that all of its related activities should be allocated time intervals as per a well-defined reference. In semester system of education, this reference is "Credit-Hour". One credit hour is defined as:

- (1) One contact hour per week for theory classes (it does not take into account any independent study time)
- (2) Three contiguous contact hours per week of supervised lab work
- (3) Three hours per week related to final year project, including meeting with the supervisor.

The program should be offered as a 4-year (8 Semesters) program. Minimum Fifteen (15) weeks of teaching, excluding time of examination(s), in a regular Fall/ Spring semester is mandatory. However, for the optional Summer semester, minimum eight (8) weeks of teaching should be ensured.

The hallmark of a curriculum is to infuse creative and critical thinking, resourcefulness and entrepreneurial spirits among students. Each program should embody foundation courses as well as the general and specialized professional content of adequate breadth and depth, and should also include appropriate Humanities and Science components. The core of the program should concentrate on acquisition of knowledge and skills in the specific discipline and also ensure exposure to inter-disciplinary areas. There should also be an effective relationship between the curricular content and practice in the field of specialization. In addition, the graduates should demonstrate competence in written as well as oral communication skills, scientific & quantitative reasoning, critical analysis, system design, mathematical and logical thinking, creativity and capacity for life-long learning. The national

qualifications framework (Annex E) pertaining to the knowledge profile (Table 1 of Annex A) for all engineering programs are defined, periodically reviewed and publicized by ECRDC. The framework guidelines set the minimum requirement of courses in humanities, management sciences, natural sciences, mathematics, engineering fundamentals and engineering knowledge at an appropriate breadth and depth applicable to the relevant engineering discipline.

The delivery of subject matter and the assessment process employed should enable the students to develop intellectual and practical skills effectively, as deemed essential for the attainment of program's learning outcomes. Assessment of various learning outcomes should be carried out by employing direct / indirect methods appropriate for that outcome. Complex outcomes which are not easily quantifiable, e.g. communication skills (oral / written), critical thinking, etc. often require rubrics for their assessment. The assessment methods employed should be well understood by the students and the teaching / learning process should motivate them to develop a quest for lifelong 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 the important aspects in reviewing the effectiveness of teaching-learning processes.

In addition to regular teaching/learning activities such as classroom interaction, lab experimentation and faculty consultation, other aspects of student learning such as tutorial system, research / design projects, seminar / workshops and exposure to industrial practice should form an integral part of curriculum. Internal reviews of quality assurance procedures should be carried out periodically.

An engineering program should also cover the following essentials:

3.2.3.1 Internship Program

The program should facilitate and promote cooperative learning through mandatory supervised internship program of continuous 6-8 weeks duration in an engineering practice environment/organization. The training program should be planned and agreed upon by both the institution and the host organization. The institution should receive report about each trainee indicating the training details, interest shown by the student, his/her work habits and punctuality. Assessment of internship program through defined rubrics encompassing respective learning domains shall be demonstrated.

3.2.3.2 Lab Work

The teaching/learning in each core engineering subject must be supported with sufficient practical work in the labs for which each program is expected to have its own dedicated labs. However, for foundation and breadth courses, the labs may be shared, provided the lab occupancy/utilization considering cohort size of the programs sharing these labs ensures sufficient availability of time slots to support students' independent work and Open-ended Labs/PBL/Projects. For this purpose, lab manual containing all experiments for each course must be maintained. The labs should be well-equipped with the requisite equipment/machines such as basic components, modules, measuring instruments, etc. The students should be encouraged to develop practical skills. Also, they should be motivated to come up with their own design ideas and demonstrate the ability to investigate, analyze and solve complex

engineering problems. In this regard, the concept of open-ended labs, complex engineering activities and problem based learning should be employed.

3.2.3.3 Design Projects

In order to hone the practical skills and giving spark to their imagination, the students of an engineering program must be encouraged to undertake design projects as an integral part of every core subject. Such design projects should inculcate intuitiveness, resourcefulness and the spirit to compete. The students should also be motivated to participate in competitions which assign a theme and require the participants to use their ingenuity, creativity and innovation.

3.2.3.4 Final Year Design Project

A final year design project (FYDP) is the confluence of an engineering program. Undertaking a final year design project is a compulsory requirement. It should mainly comprise literature search, individual analysis, modeling and simulation, AI (Artificial Intelligence) and computational data analytics, design and putting together various hardware, software, firmware and Algorithm Engineering / Informatics related to the program to demonstrate a functional concept including rapid prototyping, where applicable.

Design projects shall include complex engineering problems and design of systems, components or processes integrating core areas and meeting specified needs with appropriate consideration for public health and safety along with cultural, societal, and environmental considerations encompassing SDGs. A project of this nature should invariably lead to an integration of the knowledge and practical skills as mandated in the GAs. In this context, a project of interdisciplinary nature should be encouraged. The final-year design project should span over at least two consecutive semesters, i.e. semester 7 & 8, totaling 6-credit hours.

The assessment of a FYDP is an important activity in which the attributes of a complex engineering problem or activity be assessed through well-defined mechanism of rubrics and standard operating procedures (SOPs). The FYDP report shall adhere to the best practices and guidelines of report writing for projects.

3.2.3.5 Assessment of Learning Outcomes

Since curriculum courses are mapped to various PLOs, the assessment of Course Learning Outcomes (CLO) provides a direct method of assessment of the relevant PLOs. The appropriateness of the assessment methods along with the level of achievement against the targeted outcomes must be evaluated. Mapping of CLOs of each course to respective PLOs at appropriate levels in relevant learning domains, nature of assessment tools (direct/indirect/rubrics) and the process of evaluation to determine the attainment of CLOs and PLOs should be demonstrated through reasonably convincing evidences.

The HEI must ensure that by the time the student complete all the requirements / activities targeted in the program curriculum, they must have attained all the 12 GAs in their respective domains, and that they have adequate exposure of handling various types of complex engineering problems and activities utilizing the knowledge profile and attributes groomed in them by the program.

In particular, the program must demonstrate the following:

- a) The curriculum is designed considering Program Learning Outcomes and stakeholders' requirements/feedback in line with the guidelines of National Engineering Qualifications Framework.
- b) The curriculum provides requisite level of general as well as specific professional content of adequate breadth and depth, and includes appropriate components in Natural Sciences and Humanities.
- c) The complete modern logical view of the curriculum by clearly demonstrating that it consists of all 8 Knowledge Profiles (WKs) as mentioned in the above. The courses that belong to a particular knowledge profile should be mapped to it in a separate table as mentioned in Table 1 of Annexure 'A'.
- d) Theoretical learning in classroom is supplemented by practical laboratory work supporting the attainment of required skills through hands on experimentation in well-equipped labs.
- e) The program provides ample exposure to complex engineering problems and activities, and sufficient opportunities for invoking intuitiveness and originality of thoughts through design projects, problem-based learning and open-ended labs.
- f) In addition to classroom learning, the teaching-learning process employs tutorial sessions, seminars, workshops, group-discussions and outside-class teacher-student interactions aimed to encourage and facilitate learning.
- g) Appropriate assessment methods are employed to ascertain attainment of various learning outcomes, i.e. CLOs and PLOs ensuring attainment of GAs by the time of graduation.

3.2.4 Criterion 4 - Students

The quality of students admitted and their academic progression are important considerations in evaluating the success of a program in achieving its set outcomes and objectives. The institute must frame and enforce policies for admitting fresh as well as transfer students into the program.

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

In order to inculcate ethical practices and inter-personal skills in program graduates, the institute should provide ample opportunities / facilities for extra- and co-curricular activities. Provision of in-door and out-door sports facilities for physical fitness and mental endurance should be ensured. The necessary administrative and financial support should be provided for establishing student clubs, societies, and chapters for various co-curricular activities. These activities are meant to transform the students / graduates into professional engineers. Students should be encouraged and facilitated to participate in national and international exhibitions / engineering competitions.

3.2.4.1 Admission Criteria

The entry requirement to the program shall be assessed to ensure that the students accepted have the minimum qualifications required for training and education as an engineer. It is to be ascertained whether the students being admitted in the program qualify the minimum eligibility criteria prescribed by PEC for various programs (PEC's Regulations for Engineering Education in Pakistan), and whether the merit is strictly being followed.

PEC has set the following minimum requirements for admission into any engineering program:

- 60% marks in F.Sc (Pre-Engineering) / Equivalent Qualification
- Qualifying the Entry Test

Institutions are expected to have well laid-out and transparent procedure to compute overall merit for admission into an engineering program. Equivalence of the Examination passed by the candidate shall be determined by Inter Board Committee of Chairmen (IBCC) and eligibility 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 through an assessment process. The program intake should be in line with the maximum intake allowed by EAB (Sec. 1.8).

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 offered admission and the number of students who have finally joined the program.

3.2.4.4 Transfer of Students

The institute shall develop a clear, documented and well publicized policy on transfer of students from other institutions. The policy shall take into account evaluation of credit equivalence for the subjects studied in an accredited program of a HEC recognized institution and should be based on justifiable grounds. Not more than a maximum of 50% of the total credit hours required for the degree program should be transferred. All such cases of student transfer should be intimated to PEC for information and record at the time of acceptance by the institution.

3.2.4.5 Academic Counseling

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

3.2.4.6 Career and Student Wellness Counseling

In addition to the course specific guidance, the institute should have designated student counselors who would 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 and policies/procedures of the program is highly desired. The student wellness counselor(s) should also provide assistance to students in managing their health, financial, stress, emotional and spiritual problems.

3.2.4.7 Class Size (Theory)

This aspect pertains to the number of students per section for the theory classes. For all subjects, class size should not exceed 50 students per section. Where the main subject instructor is an experienced PhD faculty, and is being duly assisted by appropriate number of GAs/TAs/RAs/LEs for conducting scheduled Tutorials/Help-Sessions and/or with advertised office-hours for off-class guidance of the students, a bigger class size may be justified.

3.2.4.8 Class Size (Practical)

For laboratory sessions, the number of students conducting experiments in the laboratory at one time should be such as to ensure sufficient practical exposure and proper guidance / supervision by the GAs/TAs/RAs/LEs. For hands-on type experiments, the number of students per workstation should be limited to 3-4 per workstation; whereas for labs which are demonstrative in nature, relatively larger number of students per workstation may be considered reasonable. Adequate number of GAs/TAs/RAs/LEs and associated staff should be available for effective guidance and help to students during their practical sessions.

3.2.4.9 Semester Academic Load

This aspect pertains to the number of credit-hours taken by students in each semester, and the appropriateness of each subject's workload in consideration of its credit-hours. Students should not be overburdened with workload that may be beyond their ability to cope with, or may hamper their assimilation of the subject matter and optimal performance. Academic load in a semester should preferably be in the range of 15 ~18 Cr Hrs as prescribed by PEC/HEC.

3.2.4.10 Completion of Courses and Student Feedback

This aspect pertains to the completion of subject contents as published in the official program catalog and/or website. All the subject topics as well as the practical experiments meant to be covered for the particular course must be completed during the prescribed time. The information should be gathered from the official record, e.g. course-file as well as through feedback and interaction with students.

The course-file is an important instrument to monitor and evaluate the effectiveness of the delivery of the course. All engineering programs in Pakistan are required to maintain course-files for each course taught in the curriculum. A course file must include all relevant data (such as given below) which could become the basis of evaluation.

- Course Description including course contents, recommended text books, lecture breakdown, office hours for students, CLOs with taxonomy levels and their mapping to PLOs, Assessment tools and their weightage, grading policy etc.
- Schedule of sessionals/ mid-term tests and final examination.

- Samples of best, worst and average answer sheets, along with the question paper and model solutions of each sessional(s)/ midterm / quizzes/ assignments and final examination.
- Record of make-up classes for any unscheduled holiday.
- Breakdown of laboratory experiments pertaining to the course and record of successful conduct.
- Record of CLOs assessment and attainment
- Instructor course feedback form
- Recommendation and suggestions related to the course for the next session.

3.2.4.11 Participation in Competitions

Students' participation in national / international engineering exhibitions and / or competitions not only provides an opportunity to display their projects, exchange ideas and compete with teams from other institutions but also helps to broaden their horizon and provides a platform to the program faculty and administrators to benchmark their program. Winning positions / prizes in such competitions serves to highlight the strong area of the program and builds confidence in the students. Thus, the program should encourage and facilitate participation in such competitions / exhibitions.

3.2.4.12 Student Performance Evaluation

This aspect pertains to the various mechanisms being used for evaluating students' performance in the program courses, and their suitability and affectivity for assessment of the level of achievement of course learning outcomes. This may include a review of various class assignments, quizzes, research reports, examinations as well as lab projects 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 to monitor students' progress in a direct manner. It is expected that the program should demonstrate a minimum number of such class assignments, quizzes and examinations for assessment of PLOs.

In particular, the program must demonstrate the following:

- a) A proper policy is in place for admission of new students and also for the transfer of students from other accredited programs, and to ensure that the student admission criteria meets or exceeds basic eligibility criteria prescribed by PEC; and the annual intake should be as per allowed by PEC.
- b) The program ensures conducive learning environment, e.g. manageable semester load as well as appropriate class and lab group sizes, and sufficiency of student support services including provision of dedicated academic as well as non-academic counselling and facilitation / support for participation in national / international engineering exhibitions and competitions.

- c) A proper mechanism is in place to ensure completeness of courses and maintaining record of classroom activities, i.e. lectures, quizzes, exams, etc. in the course files.
- d) Progress of individual students is properly monitored for the attainment of program learning outcomes, and appropriate corrective measures are suggested / implemented, including extra coaching, in case some deficiency or weakness is observed for particular students.

3.2.5 Criterion 5–Faculty and Support Staff

The faculty strength, qualifications, level of competencies, commitment and attitude play a vital role in the accomplishment of program objectives and outcomes. This, in turn, depends upon the recruitment process, incentives, faculty development programs and the workload of the faculty.

The program must have sufficient number of dedicated full-time faculty members to ensure adequate level of student-teacher interaction, and to provide necessary counseling to students. A viable engineering program is expected to comply with PEC's criteria for the minimum number of dedicated program faculty members (Sec. 1.8). Each engineering program should strive for establishing itself independently; for this reason, faculty sharing with other engineering departments should be practiced essentially for the required inter-disciplinary courses. For the same reason, visiting faculty from other academic institutions and/or industry should only be engaged occasionally and that too for teaching specialized / 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 postgraduate qualifications, as per the criteria of eligibility set in PEC Regulation for Engineering Education. A teaching staff with BS 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 while occasionally assisting institutional administration. The faculty must demonstrate complete familiarity with Outcome-Based Educational approach. They are expected to have the ability/authority required to ensure proper conduct of the program, and to develop/implement processes for evaluation, assessment and Continuous Quality Improvement (CQI) of the program. Their familiarity with the program objectives and outcomes, understanding of the outcome-based assessment cycle, and enthusiasm for developing more effective programs are the key elements to ensure attainment of program objectives.

Employment and retention of qualified faculty and supporting staff is an indication of managements' commitment and seriousness towards institute's mission and program objective. Adequate employment security coupled with salaries and benefits commensurate with position, and periodic evaluation for vertical mobility should be ensured and made known. The institute should implement an effective mechanism for mentoring and

academic/professional development of the faculty to ensure their continuity and retention. In addition, some sort of performance appraisal mechanism should also be in place to monitor the continued effectiveness of the faculty and their adherence to program's objective and outcomes.

The institute should encourage faculty for establishing linkages with industry for bringing in sponsored research projects and securing 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 and qualifications, the faculty members should possess hands-on experience, communication skills, attitude and commitment to program's objectives. There shall also be sufficient, qualified and experienced technical and administrative staff to provide support to meet the program objectives.

3.2.5.1 Faculty Strength

This aspect pertains to the faculty employed for the program. Faculty members employed on full-time basis and dedicated to the program are considered as *Full-Time Dedicated Faculty* members. Full-Time Faculty also means that the faculty member has served the program for a minimum of one semester.

Faculty members who are serving in the same institute as full-time regular faculty dedicated to some other program, and are being used to teach subjects related to their disciplines in the under-review program, are termed as *Shared Faculty*.

A program may occasionally invite qualified and experienced engineering professionals from industry as well as other academic institutions to impart state-of-the-art knowledge and applied skills/techniques to the program students. Such professionals are called *Visiting Faculty* members.

3.2.5.2 Faculty Qualifications

This aspect pertains to the HEC/PEC recognized degrees held by the program faculty. 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 must have postgraduate qualifications (equivalent to 18 years or higher). A teaching staff with an engineering accredited degree but having vast industrial/field experience (at least 10 years) and proven specialized expertise may be considered as an exception.

3.2.5.3 Full-Time Dedicated Faculty (FTDF) and Minimum Faculty Strength (MFS)

This aspect pertains to the full-time program faculty members, possessing requisite qualification and registered with PEC as such and teaching program specific engineering subjects. The absolute minimum number of such faculty members for a program is given in Sec 1.8 (iv); however, the Minimum Faculty Strength (MFS) of such faculty members required

for the program is based on the number of sections (considering section of up to 50 students) admitted per year in the program, and is estimated as follows:

1. Full-time Engineering faculty should be a minimum of 8 faculty members for one section and additional faculty required for each subsequent section(s) admitted per year, to maintain prescribed STR of 20:1, actively engaged in teaching program specific engineering subjects. Active engagement in the program requires teaching at least 2 course-sections per year to the program's degree students.
2. Out of these, the number of faculty members holding PhD qualification should be at least two (02) per section of an Intake Batch of one section of up to 50 students. However, one (01) additional PhD faculty will be required for each subsequent section of the Intake Batch.

This minimum faculty requirement sets the bare minimum; however, the management should ensure that actual *Full-Time Dedicated Faculty* (FTDF) members be sufficient in number to ensure adequate level of student-teacher interaction, and to provide necessary student advising/ counseling/ intuitiveness.

For this purpose, non-engineer faculty members having PhD in the relevant disciplines may also be employed to a maximum of 20% of MFS (this maximum %age may be varied by EAB for each discipline). These non-engineering faculty members should, however, be engaged to teach only those subjects which are relevant to their areas of research and specialization.

In addition to the core teaching faculty, which must hold post-graduate qualifications, the institute/program is encouraged to employ Full-Time academic support staff, in the form of *Teaching Assistants* (TAs), *Graduate Assistants* (GAs), and/or *Research Associates* (RAs) enrolled in graduate programs to provide academic support/facilitation to students in the form of extra coaching in terms of tutorials and/or problem-solving sessions to supplement the theoretical knowledge as well as Research/Lab projects, including the dedicated *Lab Engineers* (LEs) hired full time for the purpose. These TAs/GAs/RAs/LEs must be graduate engineers holding BS Engineering degrees and registered with PEC. For the purpose of computing student-teacher ratio, these TAs/GAs/RAs/LEs would be accounted for up to a maximum of 20% of FTDF, each one counted as One-Half. The concerned faculty member of the course involved in teaching theory component shall be supervising its lab component as well.

Giving due consideration to the natural mobility of faculty members for various reasons, such as pursuing higher qualifications, availing Post-Doctoral research opportunities and/or 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 counting towards student-teacher ratio, up to a maximum of 20% of FTDF.

3.2.5.4 Shared Faculty

This aspect pertains to those faculty members who are serving in the same institution as a full-time faculty dedicated to some other programs and are being used to teach subjects related to their disciplines in the under-review program. This would include faculty from other engineering disciplines as well as faculty from departments of Mathematics, Humanities, and

Physical and Management Sciences. For the purpose of computing student-teacher ratio, shared faculty members would be considered up to a maximum of 25% of FTDF, to be counted as One-Half.

3.2.5.5 Visiting Faculty

A program may occasionally invite qualified and experienced engineering professionals from industry as well as other academic institutions to impart state-of-the-art knowledge and applied skills/techniques to the program students. However, each engineering program should strive for establishing itself independently; for this reason, the number of such visiting faculty members should be kept to a minimum and that too for teaching only specialized/advanced-level courses. This number should not exceed 20% of FTDF; furthermore, these visiting faculty members are not counted towards computation of student-teacher ratio.

3.2.5.6 Student-Teacher Ratio

This aspect pertains to student-teacher ratio (20:1) generally prescribed as the best practice for the undergraduate programs. The actual number of required faculty will be worked out on this basis. For computing student-teacher ratio, total number of students enrolled in four years, not exceeding the annual intake allowed by EAB, would be considered. In addition to FTDF, TAs/RAs/GAs/LEs and shared faculty from other departments/disciplines would be counted as described in various sub-sections of Section 3.2.5 above.

3.2.5.7 Faculty Training and Mentoring

This aspect pertains to the training and mentoring of the faculty members for making them effective in their role as instructors, student advisors, academic planners, and curriculum developers. Senior faculty is expected to undertake the responsibility to guide and help in providing mentoring support on regular basis. Not only there should be a systematic plan of activities for the training of newly inducted/young faculty members, the institute/program should also devise a strategy to conduct workshops/seminars as a refresher for the existing program faculty.

The faculty must be trained with Outcome-Based Education (OBE) system. Their familiarity with the program objectives and outcomes, understanding of the Outcome-Based Assessment (OBA) cycle, enthusiasm for developing an effective program, and the ability to become an active player in this regard are the keys to ensure the attainment of program objectives. They are expected to have the ability to ensure proper implementation of the program, and to develop processes for evaluation, assessment and CQI.

A formal training program to groom the faculty to become effective instructors in applying pedagogical skills in all aspects of Teaching, Learning and Assessments covering all domains of Knowledge, Skills and Attitude, should be instituted.

Following are some of the key points that should be covered during various phases of training.

- Program educational objectives and Program learning outcomes
- Outcome-based assessment cycle and its implementation
- General aspects of lectures delivery
- Modes and means of effective student-teacher interaction

- Using quizzes/assignments/exams/projects/viva as effective assessment tools
- Evaluation of assessment results to gauge level of attainment of CLOs and PLOs
- Preparing and maintaining course files

3.2.5.8 Faculty Development and Career Planning

Employment and retention of qualified faculty is an indication of commitment by the HEI management and its seriousness towards accomplishment of its vision, mission and program objectives. Faculty strength, qualifications, level of competencies, commitment and attitude play a vital role in the accomplishment of program objectives and outcomes.

To inculcate a sense of professional satisfaction and commitment to the program among faculty members, adequate employment security coupled with salaries and benefits commensurate with position, and periodic performance evaluation for vertical mobility should be ensured and made known to the faculty.

The institute should implement an effective planning for academic/professional development of the faculty to ensure their continuity and retention; in addition, some sort of performance appraisal mechanism should also be in place to monitor the continued effectiveness of the faculty and their adherence to program's objectives and outcomes. Institute should have adequate provisions for scholarships leading to PhD, training and sabbatical leave for Post-doc research to promote professional growth and development. Workload for young faculty enrolled in postgraduate programs should be reduced to facilitate their pursuits in their research program.

3.2.5.9 Pyramid of Academic Structure

This aspect pertains to the number of faculty members on various professional ranks (i.e. Professors, Associate Professors, Assistant Professors and Lecturers) within the program. The institutions are encouraged to determine the number of faculty members on various ranks without a bar on the ratio among different ranks to encourage promotion to deserving candidates. The faculty pyramid provided by HEC should be treated as a guideline specifying the *bare minimum number* of higher rank positions. The adherence to this bare minimum must be ensured as a least requirement. While observing the mentioned pyramid, the program head of an engineering program should possess a PhD degree in a relevant Engineering discipline coupled with required experience to lead an engineering program.

3.2.5.10 Faculty Workload

This aspect pertains to the extent and nature of workload assigned to faculty members. Faculty workload should be such that it should not hinder their effective performance in teaching and research. The faculty workload should be as per the HEC/ PEC guidelines, with an average not exceeding 12 credit hours per week.

3.2.5.11 Faculty Research and Publications

The institute should foster research activities among its faculty members, by supporting participation in national/international conferences, workshops, etc. Faculty members should contribute actively in research and are expected to publish research papers each year in reputed national and international ISI indexed journals.

The institute should make provisions in the budget for allocations to participate and organize workshops, conferences, colloquia, etc. Policies for sabbatical leaves and short/summer leaves for the faculty to take-up post-doctoral research assignments at other national / international institutions /organizations should also be made.

The institute should encourage faculty members for establishing linkages with industry to provide consultancy, design services and to provide solutions to their developmental issues. Interaction with industry and sponsoring national/international agencies to attract R&D funding is one of the important factors indicating the dynamism of the program as well as its faculty members. The efforts of faculty members, who secure R&D funding from industry/donors, should be acknowledged in the form of reduced workload and/or financial incentives.

In particular, the program must demonstrate the following:

- a) Sufficient pool of faculty members, with postgraduate qualifications in the relevant discipline, is available to cover all areas of the program.
- b) The faculty pool has a reasonable mix of experienced and junior faculty members and their numbers is sufficiently large in comparison to the number of student so as to provide adequate level of teacher-student interaction.
- c) There is a formal mechanism for regular guidance and training of faculty members on pedagogical skills and OBE concepts / practices, and friendly policies for retention and professional development of faculty members.
- d) The program promotes and facilitates its faculty members to engage themselves in meaningful research and to interact with industry and sponsoring agencies for carrying out sponsored projects.
- e) Faculty is actively involved in R&D and publications in reputed journals and conferences, and also plays effective role for formulation and implementation of policies that enable the program achieve its outcomes and objectives.

3.2.6 Criterion 6–Facilities and Infrastructure

The candidate institution shall ensure availability of needed infrastructure, not limited to the availability of land, buildings, equipment, library, laboratories, workshops, computing facilities, seminar hall, auditorium, playgrounds, hostels, recreational and healthcare facilities, etc. In addition, cafeteria, transport, consulting and career placement services should be provided as per requirement for the program. The intention is to make the institution fully aware of present and future needs of the program. An evidence of strong financial commitment and availability of the needed finances for the program has to be ensured.

Similarly the classrooms, offices, laboratories, and associated equipment must be adequate to provide conducive atmosphere to attain PLOs. Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available and accessible to faculty and students, and should be systematically maintained and upgraded.

HEI must ensure that all facilities are maintained and adhered to best practices related to Environment, Health and Safety (EHS). There should be an effective Institute policy on EHS and it should be ensured that all students, staff, contractors, temporary workers and visitors are made aware of their individual responsibilities. In particular, Safety should be observed

being practiced; for example, a functional safety management system put in place, safety signage are visible, safety markings are clear and according to standards, fire extinguishers meet the intended function, safety items (eye wash, shower, hazardous disposal place/containers, ventilation, Zero Discharge Policy, etc.) are available and maintained, and exits are accessible during learning sessions. The periodic safety audit of EHS policies/practices shall be conducted on annual basis for appropriate remedial actions. The institute shall promote Green Campus initiatives in line with the environment friendly and sustainable development policies.

Following documentary evidences should be furnished with clear description in self-assessment report by candidate institution for the accreditation / re-accreditation of engineering program(s).

- a) 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.
- b) Provision and 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.
- c) Policies related to EHS and evidence of their efficient and effective implementation at the institution as well as program levels.

The information required in items **(a)** and **(b)** to be provided in the supporting documents, but not limited to, is:

- Master plan of physical facilities.
- A summary, in tabulated form, of the lecture hall facilities (provide number, capacity, and audio video facilities available).
- Details of the Program specific laboratories.
- A summary of recreational, and sports facilities, and other amenities.
- A summary of information on recent / continuous improvements and planned improvements in these facilities.

3.2.7 Criterion 7–Institutional Support and Financial Resources

This criterion deals with the financial resources and their commitment to ensure financial sustainability of an engineering program. The main objective is to glean and assess the adequacy of these resources in sustaining the program, with a view to upgrade it for future enhancements. Hiring and retaining qualified faculty members in sufficient numbers is a pre-requisite for a vibrant program. Obviously, this needs continued financial commitment in addition to creating a conducive environment.

The availability of infrastructure in terms of classrooms, well-equipped labs and well stocked library are also essential requirements. In addition to teaching and learning, the program must demonstrate avenues of R&D pursuits to enable students and faculty transform their

innovative and original thinking into practice. All these activities demand availability of sufficient financial resources and their proficient management.

Needless to say, a sound engineering program must be economically viable to ensure its sustainability and future enhancements. Therefore, it is essential that an institution requesting accreditation of an engineering program should provide the requisite information and data to the PEC for evaluating its fiscal health. The clarity and accuracy of the information will facilitate an objective assessment of adherence to this criterion.

The required information comprises income and expenditure details which can be extracted from the approved budgets for the current as well as two previous, but consecutive, financial years. In case of new programs, last two years approved budget will suffice. Institution is required to provide copies of the approved budgets and last-year audited accounts.

Specifically, the program must demonstrate the following:

- a) Adequacy of financial resources to ensure program's sustainability in terms of recurring expenses and developmental requirements
- b) Evidence of continued financial commitment, for example, in terms of increasing endowment fund

3.2.8 Criterion 8–Continuous Quality Improvement (CQI)

Imparting quality engineering education should be regarded as a significant and long-term component of all activities carried out by HEIs. This requires that a Quality Management System (QMS) must be in place to assure the achievement of Program Objectives and Outcomes. Planning, implementation, monitoring and improvement are the essential elements of any Quality Management System, which provide quality assurance confidence to various stakeholders on the graduates' demonstrable outcomes.

Whereas the QMS covers the entire spectrum of HEI's activities related to infrastructure, finances, management, human resource, academics and all aspects of students' campus life, i.e. from admission to graduation, and interactions with them even after their graduation, its main impetus is expected to revolve around ensuring the attainment of objectives and outcomes of academic programs. For this purpose, a Quality Enhancement Cell (QEC) must be established which should play a key role in streamlining and ensuring the quality assurance through appropriate assessment and improvement mechanisms leading to Continuous Quality Improvement (CQI) of academic programs for the attainment of their CLOs, PLOs and PEOs.

Continuous improvements are assured only if a proficient closed-loop system is designed through involvement of QEC and the concerned engineering departments. The institution should have well defined processes for quality assessment and improvement. This criteria deals with the steps taken for improvement of program quality and in particular steps taken in the light of the observations of last accreditation visit.

As stated in earlier sections, the concept of accreditation of an engineering program is the demonstration of adherence to the laid down criteria of PEC. Any weakness and/or non-conformance observed during the last accreditation and evaluation visit must be addressed, and the subsequent compliance report from the institution should be based on verifiable

remedial measures. Prior to its submission to PEC, it is expected that the Quality Enhancement Cell (QEC) of the institution should have already confirmed the veracity of the actions taken for CQI.

In addition to providing the details of its CQI processes, the program should provide information / reports that demonstrate continuous quality improvement related to various accreditation criteria described in this manual. In particular, the program should provide following documents:

- a) Self-assessment reports based on surveys and feedback from the stakeholders
- b) Corrective Actions Reports showing a process for improving the quality of a program when some anomalies are observed in executing different elements of the curriculum
- c) Report of implementation plan based on the observations of last accreditation visit and the remedial actions taken by the institute.
- d) Evidence of program's efforts to enhance its faculty strength, addition of new facilities and new initiative, since the last accreditation visit, to assist in the attainment of program outcomes and objectives.

3.2.9 Criterion 9–Industrial and International Linkages

The main outcome of engineering education shall be to have a meaningful impact on the society in which the engineers would practice their profession. Engineering education and research should become a catalyst of transforming the industry into an engine of economic growth. Engineering graduates and the faculty members must become a part of this "value chain" by proposing solutions to technical problems being faced by the industry and also by bringing innovation and automation in the industry. Transformation of the world into a global village necessitates that the young engineering graduates should be exposed to not only the technical challenges of the local industry but also those which are being addressed world over. They should be trained to take a global perspective while proposing the solution of technical problems and be conscious of sustainability and the impact of engineering solutions on environment and society in a global sense. This mission can only be achieved if the HEI promotes and facilitates industrial and international linkages among its faculty members and students.

The HEI needs to have a policy that not only encourages such collaborations with national and international industry, academic and research institutions but also recognizes and provides incentives to faculty members who establish such linkages and subsequently undertake collaborative / funded industrial or R&D projects, or generate revenue by providing consultancy or training services to the industry. To facilitate such collaborations, the policy should promote mobility of faculty members in industry, especially during the semester and summer breaks, to embed themselves with industrial managers/experts to better understand their technical challenges that may transform into research problems and/or lead to real world problems to be solved by the students as their FYP. Such industry related / sponsored FYPs provides opportunities for the students to get exposed to various professional and quality standards being practiced in industry, thus preparing them for a successful engineering career in the field.

Such a policy framework will not only truly enhance industrial collaborations by establishing real industry-academia linkages but would also enable HEIs to contribute to the GDP of the country helping it to achieve its economic growth in a sustainable manner; that in turn would help in achieving SDGs. The focus on projects related to 14 grand challenges of engineering outlined by National Academy of Engineering shall help in creating a meaningful measurable societal impact by bringing a positive changes in our communities and society.

Faculty and student exchange programs with international academic institutions provide opportunities to explore new avenues of teaching-learning methodologies and pedagogical skills, and leads to undertaking of joint R&D projects and MS and PhD theses supervision. HEIs should strive for establishing such collaborations with leading universities in the world.

Involvement of and feedback from industry and employers of the program is an essential part of the curriculum review process that is used to plan and then evaluate the attainment of program's objectives. Thus a formal mechanism of seeking guidance from industry and getting them involved in the program design and evaluation through regular meetings of an Industrial Advisory Board is a must. Moreover, the feedback from the industry must be put in place.

In particular, the program must demonstrate the following:

- a) Formal mechanism is in place and also regularly practiced for active participation of industry in program development, revision and updation, especially in areas experiencing rapid changes and also for attainment/ revision of PEOs.
- b) The program provides students the opportunities to acquire industrial experience through internships, and design projects supervised by professional engineers working in industry.
- c) The program encourages faculty members for pursuing collaborations with industry as well as reputed international academic and research institutions for joint R&D, design consultancy and training services to industry; and have policies to facilitate and reward the fruitful efforts of such faculty members.

CHAPTER – 4
GUIDELINES FOR SELF-ASSESSMENT REPORT

4. Introduction

The institution applying for accreditation must submit documents that provide accurate information and sufficient evidence for the purpose of evaluation. For each program to be accredited, unless otherwise stated, the institution shall submit the following documents:

- i. Self-Assessment Report (as per the format described below).
- ii. Duly filled annexures provided in the PEC Accreditation Manual.
- iii. Supporting Material / Documents.

4.1 Self-Assessment Report Format

A Self-Assessment Report is an account of the institution's plan, implementation, assessment and evaluation of the program conducted. It reflects the processes with results obtained and their analyses used for continuous quality improvement at all levels of the program's activities. This appropriately bound document, ranging between 50–100 pages with all pages numbered. A table of contents shall provide the information and description about the program to enable the Program Evaluation Team to objectively assess the program for the purpose of accreditation. The emphasis shall be on the qualitative description of each aspect and criterion, and how these meet the standards and expectation as set out in this Manual. In other words, this summary document is a form of Self-Assessment of the institution's program.

The general structure of the Self-Assessment Report shall conform to the following sections. The institution is advised to provide accurate information as detailed in Chapter 3 of this Accreditation Manual.

- Provide general information on the institution and the specific program.
- Provide detailed information on program history of accreditation (year of accreditation, conditions imposed and actions taken).
- Describe any self-initiated improvements made in the program and the year the changes were introduced.

4.1.1 Program Educational Objectives

- 4.1.1.1 State the vision and mission of the institution and/or faculty.
- 4.1.1.2 Describe the process of formulation, improvement and approval of the PEOs.
- 4.1.1.3 Describe the PEOs and state where they are published.
- 4.1.1.4 Describe how they are consistent with the vision and mission of the institution and/or faculty and stakeholders' requirements.
- 4.1.1.5 Describe the processes used to evaluate the achievement of PEOs.
- 4.1.1.6 Describe how the results obtained from evaluation are being used to improve the effectiveness of the program.

4.1.2 Program Learning Outcomes

- 4.1.2.1 List the PLOs and state where they are published.

- 4.1.2.2 Describe how the PLOs relate to PEOs (as per template given in **Annex B**).
- 4.1.2.3 Describe how the PLOs encompass the requirements of Section 3.2.2 of this Manual.
- 4.1.2.4 Describe the processes used to establish and review the PLOs, and the extent to which the program's various stakeholders are involved in these processes.
- 4.1.2.5 Describe the mapping of courses with PLOs (as per template given in **Annex-D**).
- 4.1.2.6 Describe the data gathered and the results of the assessment of PLOs.
- 4.1.2.7 Explain how the assessment results are applied to further develop and improve the program.
- 4.1.2.8 Describe the materials, including students' work and evidence of complex engineering problems/ activities, problem based learning (PBLs), open ended labs (OELs), class projects (CPs), and FYPD that demonstrate achievement of the PLOs.
- 4.1.2.9 Provide tabulated information of CEPs/CEAs exercised particularly in Breadth & Depth courses along with few examples indicating relevant domain(s) and taxonomy levels towards the attainment of mapped PLOs.

4.1.3 Curriculum and Learning Process

- 4.1.3.1 Describe the program structure and course contents to show how they are appropriate to, consistent with, and support, the development of the range of intellectual and practical skills and attainment or achievement of the PLOs (attach outline of each course of the program).
- 4.1.3.2 Describe the program delivery and assessment methods and how these are appropriate to, consistent with, and support, the development of the range of intellectual and practical skills and attainment or achievement of the PLOs covering the relevant engineering standards and protocols.

The information required in Sec 4.1.3.1 -- 4.1.3.2 should include but is not limited to the following (should include relevant templates given in **Annex C~G**, where applicable).

- A matrix linking courses to PLOs (covering the three domains of KSA), highlighting the learning domains and taxonomy levels, to track the contribution of each course to the PLOs (as per template given in **Annex-D**).
- Distribution of curriculum courses in both domains of engineering and non-engineering as prescribed in the Knowledge Area specific to each program (as per template given in **Annex-E**).
- Distribution of the courses offered according to semester (as per template given in **Annex-F**).
- Details of Laboratory equipment / workstations and experiments conducted (as per template given in **Annex-G**).

4.1.4 Students

The information required in Sec. 4.1.4.1 – 4.1.4.6 should include relevant templates given in annexures, where applicable.

- 4.1.4.1 Discuss the requirement and process for admission of students to the program, response and annual intake (as per template given in **Annex-H**).
- 4.1.4.2 Discuss the policies and processes for credit transfer/exemption.
- 4.1.4.3 Discuss mechanism for providing guidance to students on academic, career and aspects pertaining to wellness, student discipline.
- 4.1.4.4 Describe mechanism and adherence to the policies dealing with harassment and plagiarism cases.
- 4.1.4.5 Discuss students' workload, class sizes for theory as well as laboratory sessions and completion of courses.
- 4.1.4.6 Discuss students' activities and involvement in student organizations that provide experience in management and governance, representation in education and related matters and social activities.
- 4.1.4.7 Discuss Key Performance Indicators (KPIs) to demonstrate students' performance in relation to PLOs.

4.1.5 Faculty and Support Staff

The information required in Sec. 4.1.5.1 – 4.1.5.4 should include relevant templates given in annexures, where applicable.

- 4.1.5.1 Discuss the strength and competencies of the academic staff in covering all areas of the program, and in implementing the outcome-based approach to education (as per template given in **Annex-I ~ K**).
- 4.1.5.2 Discuss how the overall staff workload enables effective teaching (including student-teacher ratio), student-staff interaction, student advising and counseling, institutional service and research activities, professional development and interaction with industry.
- 4.1.5.3 Discuss processes for faculty development, training and retention.
- 4.1.5.4 Discuss the sufficiency and competency of technical and administrative staff in providing adequate support to the educational program.

4.1.6 Facilities and Infrastructure

- 4.1.6.1 Discuss the adequacy of teaching and learning facilities such as classrooms, learning-support facilities, study areas, information resources (library), computing and information-technology systems, laboratories and workshops, and associated equipment to cater for multi-delivery modes.
- 4.1.6.2 Describe the adequacy of support facilities such as hostels, sport and recreational centers, health centers, student centers, and transport in facilitating students' life on campus and enhancing character building.

The information required in Sec 4.1.6.1 -- 4.1.6.2 should include but is

not limited to the following:

- A summary of the lecture facilities (give number, capacity, and audio video facilities available).
- A summary of the laboratories (list down the details of workstation available in each laboratory).
- A summary of the workshops (list down the equipment/machinery available in each workshop).
- A summary of the computer laboratories (list down the hardware and software available).
- A summary of recreational facilities.
- A summary of information on recent improvements and planned improvements in these facilities.

4.1.7 Institutional Support and Financial Resources

- 4.1.7.1 Discuss institution's financial commitment and support to sustain and enhance the quality of program. Also summarize the salient features in a tabular form (as per the template given in **Annex-L**)

4.1.8 Continuous Quality Improvement

- 4.1.8.1 Discuss the mechanism for the following: program planning; curriculum development; curriculum and content review; responding to feedback and inputs from stakeholders including industry advisors, students and alumni; tracking the contribution of individual courses to PLOs; tracking outcomes of performance through assessment, including rubrics; reviewing of PEOs and PLOs; and continuous quality improvement.
- 4.1.8.2 Discuss the implementation plan based on the observations of the last accreditation visit and the remedial actions taken. The information required in Sec 4.1.8.1 -- 4.1.8.2 should include but is not limited to the following:
- Evidence on the participation of faculty members and support staff as well as students in the continuous quality improvement process.
 - Evidence on the development of academic staff through opportunities in further education, industrial exposure, as well as research and development.
 - Policies, internal processes and practices that are in place at all levels within the institution relating to the accreditation criteria as stated in Chapter 3 of this Manual.

4.1.9 Industrial Linkages

- 4.1.9.1 Describe the existence of active industry advisory board/ committee and formal involvement of industry in development and review of PEOs.
- 4.1.9.2 Discuss opportunities for collaborative design projects and supervised internship for students.
- 4.1.9.3 Discuss different HEI policies to encourage faculty and students to engage with the Industry to have industry-sponsored projects.

**ANNEXURES
(A – L)**

Annex A

Table 1: The Mapping of Courses to Knowledge Profiles

Knowledge Profiles	Courses	CLOs
WK1		
WK2		
WK3		
WK4		
WK5		
WK6		
WK7		
WK8		

Table 2: Range of Complex Problem Solving

	Attribute	Complex Problems
1	Preamble	Engineering problems which cannot be resolved without in-depth engineering knowledge, and have some or all of the characteristics listed below:
2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.
3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.
4	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.
5	Familiarity of issues	Involve infrequently encountered issues
6	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.
7	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.
8	Consequences	Have significant consequences in a range of contexts.
9	Interdependence	Are high level problems including many component parts or sub-problems.

Table 3: Range of Complex Engineering Activities

	Attribute	Complex Activities
1	Preamble	Complex activities means (engineering) activities or projects that have some or all of the following characteristics listed below:
2	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).
3	Level of interaction	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues.
4	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.
5	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.
6	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.

Annex B

Mapping of PEOs to PLOs / Graduate Attributes (Sec 3.2.2)

		PEOs				
		PEO_1	PEO_2	PEO_3	PEO_4	_
S. No.	PEC Graduate Attributes (as defined in Sec 3.2.2)					
1.	Engineering Knowledge					
2.	Problem Analysis					
3.	Design/ Development of Solutions					
4.	Investigation					
5.	Modern Tool Usage					
6.	The Engineer and Society					
7.	Environment and Sustainability					
8.	Ethics					
9.	Individual and Team Work					
10.	Communication					
11.	Project Management					
12.	Lifelong Learning					

System of Instructions and Examination

Nature of Academic Sessions:

Semester / Term / Annual

No. of sessions in the Program (4/8/8/12)

Duration of a session (in weeks)

Total: _____ Teaching: _____

Total No. of courses in the Program:

No. of courses in a session:

Min. _____ Max. _____

Total contact-hours for a Theory course per session:

Total contact-hours for a Practical course per session:

Weekly contact-hours for a Theory class:

Weekly contact-hours for a Practical class:

Attach Academic Calendars (for Current & the Previous years):

Attach Grade-Sheets for LAST ONE-year (All Batches) as per the following format:

Grade-Sheet

Intake Batch: _____

Session (Term/Semester/Year): _____

Course Code	Course Name	No. of Students Securing Grades (or %age Ranges, i.e.<40, 40-50, 50-60, 60-70, 70-80, 80-90, >90)									
		Total	A+	A	B+	B	C+	C	D+	D	F
EE1021	Circuit Analysis I	45	2	4	6	12	12	6	4	2	2

Annex D

Mapping of Courses to PLOs

Semester No.	Course Code	Course Title	Learning Domains and Taxonomy Levels											
			1	2	3	4	5	6	7	8	9	10	..	
1	MT10001	Calculus	C533											
	HU1021	English Grammar	3											
		Subject 3	3							A2				
		Subject 4	3		3									
		Subject 5	3			3								
		Subject 6					P3			3				
2	CE1052	OOPS	3											
		Subject 2	3											
		Subject 3	3											
		Subject 4	3				3							
		Subject 5	3											
:			3											
			1											
:														
:														
8		Subject 1												
		Subject 2												
		Subject 3												
		Subject 4												
		Subject 5												
		Subject 6												

National Qualifications Framework – Curriculum Design

Domain	Knowledge Area	PEC/HEC Recommended	Institute's Program Breakup
		Credits	Credits
Non- Engineering	Mathematics		
	Humanities		
	Management Sciences		
	Natural Sciences		
Engineering	Computing		
	Engineering Foundation		
	Major Based Core (Breadth)		
	Major Based Core (Depth)		
	Inter-Disciplinary Engineering (Electives)		
	Senior Design Project		
	Industrial Training (Summer)		
Total		130 – 136	

Annex F

Course Offerings

NOTE: Attach the listing of Course-Contents for ALL courses

Semester No.	Sr. No.	Course Code	Course Title	Credit Hours	Knowledge Area	Pre-requisite Courses (if any)
1	1	CE3204	HDL Based Design	(3-1-4)	Major Based Core (Breadth)	1- Digital Logic Design (CE1102) 2- Microprocessor Architecture (CE2213)
	2	MT3101	Numerical Techniques	(3-0-3)	Natural Sciences	1- Linear Algebra (MT3023)
	3					
	4	HU1001	Communication Skills	(3-0-3)	Humanities	
	5					
				Total Cr. Hrs.	14-3-17	
2	1	CE3205		(3-1-4)	Major Based Core (Depth)	
	2	MT3101	Numerical Techniques	(3-0-3)	Management	
	3					
	4					
	5	CS1005	Object-Oriented Programming	(3-1-4)	Computing	
				Total Cr. Hrs.	14-3-17	
3						
			Total Cr. Hrs.	14-3-17		
:	:	:	:	:	:	
:	:	:	:	:	:	
:	:	:	:	:	:	
8						
			Total Cr. Hrs.	14-3-17		

List of Electives

Area of Specialization	Sr. No.	Course Code	Course Title	Credit Hours	Knowledge Area	Pre-requisite Courses (if any)
Semiconductors	1					
	2					
	3					
	4					
Power Systems	1					
	2					
	3					
	4					
	5					
Digital Design	1					
	2					
	3					

Annex G

Laboratories & Lab Work

Number of Total Engineering+Computing Courses: _____

Number of Lab Courses: _____

Number of Laboratories: _____

Attach Lab Commitment Charts for each Lab (for current & the previous semester/term):

Attach List of Experiments and name of Instructor(s) for each Lab course (for current & the previous semester/term):

Sr. No.	Name of Laboratory (Staff Names--Qualifications)	Lab(s) of Course(s) Conducted in the Lab.	Type(s) of Workstations (No. of each type)	Nature of Experiments	No. of Students per Workstation
1	Communication Systems Lab 1:Mr. Lab Engr. -- BE (Elect) 2:Mr. Lab. Asst -- DAE (PWR) 3:Mr. Lab Attend. -- FA	1- Communication Theory 2- Wave Propagation & Antennas 3- Microwave Engineering	1-Analog Communication Trainers (6)	Demonstration	4 to 5
			2-Digital Communication Trainers (8)	Demonstration	3 to 4
			3- Antenna Trainers (6)	Demonstration	4 to 5
			4- Microwave Trainers (4)	Demonstration	6 to 7
2	Electronics Circuits Lab 1:Mr. Lab Engr. -- BE (Elect) 2:Mr. Lab. Asst -- DAE (PWR) 3:Mr. Lab Attend. -- FA	1- Circuit Analysis I	Workbenches, each with Power-supply, Signal Generator, Oscilloscope, Multimeter, Breadboard, Components (14)	Hands-on	2
		2- Circuit Analysis II			
		3- Electronic Devices & Circuits			
		4- Integrated Electronics			

Annex H

Student Admissions & Enrollments

Sr. No.	Intake Batch	Total Applicants	Total Admissions offered*	Total Students Admitted	Present Strength	No. of Section(s)
1	Fall 2010	300	200	95	4	2
2	Fall 2011	500	380	152	30	4
3	Fall 2012	120	95	53	32	1
4	Fall 2013	550	420	181	125	4
	Total			1005*	682	

Note * = Total admission offered in all the Merit lists.

Annex I

Faculty Strength

List of **Full-Time Departmental Teaching Faculty**, sorted by Designation

Sr. No.	Name	PEC #	Designation	Joining Date	Details of Qualifications			Specialization	Experience Teaching (Total) Years	Dedicated / Shared	Cr. Hrs. taught in the Current & Last Semesters	
					Degree	Year	Institution				MS	BS
1			Professor & Head of Department		Ph.D.				10 (15)	Dedicated	6+3	3+0
					MS							
					BS							
2			Professor		Ph.D.				08 (10)	Dedicated	6+6	9+0
					MS							
					BS							
3			Associate Professor		Ph.D.				06 (10)	Dedicated	3+3	12+0
					MS							
					BS							
4			Assistant Professor		Ph.D.				02 (03)	Shared	3+9	0+12 (06)**
					MS							
					BS							
5			Assistant Professor		Ph.D.				0.5 (01)	Dedicated	0+0	0+6
					M.S							
					B.Sc.							
6			Lecturer		M.Sc.				03 (03)	Shared	0+0	6+9 (09)**
					B.Sc.							
7			Lecturer		M.Sc.					Dedicated	0+0	12+0
					B.Sc.							

** Taught to other Departments/Degrees

List of Shared/Visiting Faculty from other Departments/Organizations, sorted by Designation.

Sr. No.	Name	PEC #	Designation	Details of Qualifications			Specialization	Department / Organization	Cr. Hrs. taught in the Current & Last Semesters	
				Degree	Year	Institution			MS	BS
1			Professor	Ph.D.				Dept. of Mech. Engg	3+0	3+3
				MS						
				BS						
2			Assistant Professor	Ph.D.				Dept. of Natural Sciences	0+3	3+6
				M.S						
				B.Sc.						
3			Lecturer	M.Sc.				Dept. of Islamic Studies	0+0	3+3
				B.Sc.						
4			Senior Engineer	M.Sc.				PTCL	0+0	0+6
				B.Sc.						

List of Full-Time Lab. Engineers/GAs/RAs/TAs

Sr. No.	Name	PEC #	Designation	Details of Qualifications			Specialization	Joining Date	Workload (Contact Hours)	
				Degree	Year	Institution			Current Semester	Last Semester
1			Lab. Engr.	BE				9	12	
2			Lab. Engr.	BE						
3			Lab. Engr.	BE						
4			Lab. Engr.	BCS						

Annex J

Faculty Summary

Present Scenario

Number of New Faculty members inducted in the program since last PEC Visit

	Faculty teaching Engineering Subjects				Faculty teaching Non-Engineering Subjects			
	BSc	MSc	PhD	TOTAL	BSc	MSc	PhD	TOTAL
Program Faculty (Dedicated)								
Program Faculty (shared with other programs)								
Shared Faculty (from other programs)								
Visiting Engg. Faculty								
TA / RA								

BSc	
MSc	
PhD	

Scenario at the time of Last PEC Visit

Number of Faculty members who left the program since last PEC Visit

	Faculty teaching Engineering Subjects				Faculty teaching Non-Engineering Subjects			
	BSc	MSc	PhD	TOTAL	BSc	MSc	PhD	TOTAL
Program Faculty (Dedicated)								
Program Faculty (shared with other programs)								
Shared Faculty (from other programs)								
Visiting Engg. Faculty								
TA / RA								

BSc	
MSc	
PhD	

Faculty Workload

List the faculty members in the same sequence as listed in ***Faculty Strength*** sheet

Sr. No.	Name	Degree Level	Current Semester Loading			Last Semester Loading		
			Credit Hours		Course Titles	Credit Hours		Course Titles
			Theory	Practical		Theory	Practical	
		BS						
		MS/PhD						
		BS						
		MS/PhD						
		BS						
		MS/PhD						
		BS						
		MS/PhD						
		BS						
		MS/PhD						
		BS						
		MS/PhD						
		BS						
		MS/PhD						

Financial Health

University Income Details

Sr. No.	Source of Income	Current Fiscal-Year	1st Previous Fiscal-Year		2nd Previous Fiscal-Year	
			Budgeted	Actual (as per Audit Report)	Budgeted	Actual (as per Audit Report)
A	Grants from HEC					
B	Self-Finance Schemes					
C	Tuition-Fee					
D	.					
E	.					

University Expenditure Details

Sr. No.	Expenditure Head	Current Fiscal-Year	1st Previous Fiscal-Year		2nd Previous Fiscal-Year	
			Budgeted	Actual (as per Audit Report)	Budgeted	Actual (as per Audit Report)
A	Faculty and Supporting Staff Salaries					
B	Maintenance of Existing Facilities					
C	.					
D	.					
E	.					

Table-1: Tracks / System of Education in Pakistan

Minimum Age	Years of Education	General Education	Engineering Education	Technology Education	
27	22				
26	21	Ph.D	Ph.D Engg. (3 Years Program)	Ph.D / D. Tech (3 Years Program)	
25	20				
24	19				
23	18	M. Phil.	Master of Engg. (2 Years Program)	M. Tech 24 Cr Hrs Course work 06 Cr Hrs Practical / Field Project	
22	17				
21	16	Master's Degree	Bachelor of Engg. (4 Years Program)	B.Tech (Hons) (4 Years Program)	
20	15				
19	14	Bachelor's Degree			
18	13				
17	12	<u>Intermediate / Higher Secondary Education</u>		DAE (3 Years program)	
16	11	Humanities (FA) I.Com Pre. Medical ICS F.Sc. (Pre Engg. Subjects) / A level			
15	10	Matriculation (High School Education) or O level (3 Years)			
14	9				
13	8	Middle Level Education / Junior High School			
12	7				
11	6				
10	5				
9	4				
8	3	Primary Education / Elementary School			
7	2				
6	1				
5					
4		Nursery / Kindergarten School			
3					

<HEI Logo>

<Name of HEI>

SELF ASSESSMENT REPORT

<Complete Name of the Engineering Program>

<Name of the School / Faculty / Department>

Submitted to

EAB / EA&QEC
Pakistan Engineering Council



<Month Year>

This Page should be on HEI Letterhead

Subject: SAR for the Program of <as per the degree nomenclature>

1. The requirements as per the Check List below to qualify for the process of accreditation under the PEC OBA Manual of Accreditation-2014 have been addressed / verified:

Check List:

S. No.	Qualifying Requirement	HEI Check/ Remarks	PEC Check/ Remarks
i.	The legal status/requirement from the relevant bodies, specifying the particular legal arrangements as a Charter/ Degree Awarding Institution (DAI), Constituent or Affiliated institution, or any other type, etc		
ii.	Minimum 130 credit hours, out of which a minimum of 85 credit hours of engineering and computer science courses and a minimum of 30 credit hours of non-engineering (mathematics, humanities and natural sciences) courses offered over a period of four years (8 semesters).		
iii.	Final Year Design / Capstone Project (6 credit hours).		
iv.	Full-time dedicated engineering faculty (not shared with any other program of the same level) should be minimum of 8 faculty members for one section ensuring that student-teacher ratio does not exceed 25:1, irrespective of number of sections/ allowed intake of the program.		
v.	Progress / Compliance Report (CQI) on the last PEC visit observations / EAB decision.		
vi.	Summary of Gap Analysis and Initiatives taken on Outcome Based Assessment implementation.		
vii.	Duly completed and signed SAR as per prescribed format.		

2. The Self-Assessment Report (SAR) is hereby submitted for consideration of PEC EAB/EA&QEC to process for accreditation of the program of –(name of the program)--, Batch(es)-----.

Signature: _____
(Head of the Department)

Date: _____

Signature: _____
(Dean/Head of the Institution)

Date: _____

Signature: _____
(Accreditation Department, PEC)
Date: _____

Pakistan Engineering Council

Program Evaluation Visit Schedule

- HEI Name -

- Program Name -

Date of Visit: _____

Day 1 (Thursday, 17th October, 2019)

Time / Venue	Program Evaluators (PEVs)	Convener / Team Leader (TL)
07:00 - 08:00	Breakfast at boarding place	
08:00 - 09:00	Move to HEI	
09:00 – 09:15	PEC EAB Visitation team to be received by HEI representatives	
09:15 – 09:45 Venue: Coordinator(s): (same for all the programs)	<p>a. Opening Meeting with Head of the Institute (HOI) and his Team :</p> <ul style="list-style-type: none"> • Welcome Remarks by the HOI and introduction of his Team (Deans, HODs, Senior Faculty, Registrar etc.) • Opening and briefing by Convener on the purpose of visit, followed by Introduction of his Panel/PEVs, <p>b. Presentation by Dean/HOI on the salient features/strengths of HEI. May broadly cover but not limited to the following points:</p> <ul style="list-style-type: none"> • Vision, Mission, governance, organizational structure, academic infrastructure • Institutional financial sustainability, resource generations and their effective utilization for CQI • Academic support units, QA and their contributions to the programs • Overview on recent developments in education delivery, infrastructure, mentoring and learning facilities 	<p>(10 min)</p> <p>(10 min)</p>

	<ul style="list-style-type: none"> Any future Plans / Roadmap <p>c. Q&A on the issues common to all Programs (10 min)</p> <p>Criterion 6: Facilities and Infrastructure Criterion 7: Institutional Support and Financial Resources</p>		
09:50 – 11:00 Venue: Coordinator(s)	<p>To be conducted by PEVs</p> <ul style="list-style-type: none"> Tour of program specific Lab facilities, computing facilities, workshops and project labs, etc. observing: Safety precautions/measures Adequacy of well-equipped & furnished Labs Conduct of program specific laboratories, class rooms lectures in progress <p>Criterion 3: Curriculum and Learning Process Criterion 6: Facilities and Infrastructure</p>	<p>To be conducted by Team Leader</p> <ul style="list-style-type: none"> Visit of common facilities, like Library, Computing Centre, common laboratories/workshops, convocation hall, medical facilities, hostels, sports and such other facilities. <p>Criterion 6: Facilities and Infrastructure</p>	Venue: Coordinator(s) (same for all the programs)
11:00 – 12:00 Venue: Coordinator(s)	<p>a. Presentation on the Program overview under accreditation by Head of Department (HoD)/Sr Faculty (15 min) (parallel sessions by PEVs Team at respective department) May broadly cover but not limited to the following points:</p> <ul style="list-style-type: none"> Program Educational Objectives (PEOs), Participation of Stakeholders, design & implementation mechanism Overview on Design, Assessment and Evaluation process of PLOs attainment Overview of Curriculum design, Breadth & Depth, Course delivery, CLOs assessment & evaluation methods, Revision/CQI Satisfying National Qualification Framework Academic performance of students, participation in professional activities and their achievements Faculty strength & development, R&D activities CQI and Industrial Linkage / Internship Program etc. 		
	<p><u>Questions &Answers</u> (45 min)</p> <p>Criterion 1: Program Educational Objectives Criterion 2: Program Learning Outcomes Criterion 3: Curriculum and Learning Process Criterion 8: Continuous Quality Improvement Criterion 9: Industrial Linkages</p>		

<p>12:00 – 13:00</p> <p>Venue:</p> <p>Coordinator(s)</p>	<p>Review of various documentation available at the <u>Exhibit room</u> pertaining to :</p> <ul style="list-style-type: none"> • Admissions details, students attendance record, prospectus, • Teaching and learning process, Contents of curriculum, and its regular review, Lesson plans & course delivery, marked assignments, Question papers, Mid and Term Exams, assessment and evaluation of CLOs & PLOs, Course Folders, Outcome Attainment Folders • Process addressing corrective actions taken and implementation at various levels/loop, Feedback from students and faculty, Alumni, employers/industry etc. • Faculty research and other projects • Seminars /workshops / conferences conducted • CPD events conducted, faculty training, Orientation program for safety issues/training etc. • Evidence of exposure to complex engineering problems • Review of Final Year Project (FYP) reports. <p>Criterion 2: Program Learning Outcomes Criterion 3: Curriculum and Learning Process Criterion 4: Students Criterion 8 Continuous Quality Improvement</p>	
<p>13:00 – 14:00</p> <p>Venue :</p>	<p>Lunch & Prayer Break</p>	
<p>14:00 – 15:30</p> <p>Venue:</p> <p>Coordinator(s)</p>	<p>Review of various documentation at the <u>Exhibit Room</u> - Continued</p>	
<p>15:30 – 16:00</p> <p>Venue:</p> <p>Coordinator(s)</p>	<p>Interaction with students to probe: <i>(in small groups or individually in parallel sessions as per PEVs convenience, sample of various years of students)</i></p> <ul style="list-style-type: none"> • effectiveness of content delivery and assessment methods • participation in professional society activities / Club activities • Internship programs • Placement and career counseling arrangements <p>Criterion 2: Program Learning Outcomes Criterion 4: Students</p>	
<p>16:00- 16:45</p> <p>Venue:</p>	<p>Interaction with Faculty, TAs/RAs, Lab Engineers, Technical/Lab supporting staff <i>(in small groups or individually in parallel sessions as per PEVs convenience)</i></p>	<p>To be conducted by Team Leader</p> <p>Interaction with heads of Examinations, QEC, Placement Bureau, and Safety Committee, Registrar, Treasurer etc.</p>

Coordinator(s)	Criterion 2: Program Learning Outcomes Criterion 3: Curriculum and Learning Process Criterion 5: Faculty and Support Staff	Criterion 7: Institutional Support and Financial Resources Criterion 8: Continuous Quality Improvement Venue: Coordinator(s): (same for all the programs)
16:45 – 17:30 Venue:	PEVs' Review Meeting <i>(parallel sessions in respective programs)</i> <ul style="list-style-type: none"> Review based on the First Day's assessment List of any additional data/information required to be shared with respective HoD 	
17:30 – 18:00 Venue:	Meeting with Dean/HoD to discuss in triangulation various findings of Day-1 evaluation <i>(parallel sessions in respective programs)</i> May cover the following exemplar points <ul style="list-style-type: none"> Check on remediation of shortcomings/improvements from previous accreditation visit Evaluation of Content delivery methods and Course outcomes towards attainment of PLOs Improvements in the course content, delivery and assessment methods based on level of attainment of CLOs and PLOs Share the list of additional data/information required 	
18:00	Departure to Boarding Place	
19:30 – 21:00	PEVs review meeting: Chaired by Convener/TL <ul style="list-style-type: none"> Exchange and discuss about the findings/issues of Day 1 evaluation Drafting Day 1 evaluation findings/Worksheet update 	TL chairs the meeting: <ul style="list-style-type: none"> Provide general guidelines Supervise evaluation findings/Worksheet update Check the consistency for all the programs
21:00 – 21:45	Team Dinner	

Day 2 (Friday, 18th October, 2019)

Time	Program Evaluators(PEVs)	Convener / Team Leader (TL)
07:00 - 08:00	Breakfast at boarding place	
08:00 - 09:00	Move to the HEI	
09:00 - 09:15	PEC EAB visiting team to be received by HoD/Program Coordinator	
09:15-10:45 Venue: Coordinator(s)	To be conducted by PEVs at Exhibit Room Review of additional data requested on Day 1	To be conducted by Team Leader Meeting with the officials concerned to evaluate the effective functioning of Institution level Quality Monitoring and Assurance (if required)

10:45-11:30 Venue: Coordinator(s)	<p>Meeting with Dean /HoD to review:</p> <ul style="list-style-type: none"> • Appropriateness of assessment tools used for PLOs and PEOs • Documents and evidences relevant to the attainment of PLOs/CLOs • Compliance report and actions taken for quality improvement. <p>Criterion 2: Program Learning Outcomes Criterion 8: Continuous Quality Improvement</p>	Team Leader may join any of the program team to ensure consistency and to answer any uncommon issues raised during program specific evaluation.
11.30-12.30 Venue:	<p>Interim Review meeting of PEVs (separate for each program):</p> <ul style="list-style-type: none"> • Discussion among PEVs for summarizing the observations made during evaluation 	
12.30- 14:00 Venue: Coordinator(s)	<p>Meeting with stakeholders (Alumni and Employer/Industry etc.) of the program. <i>(PEVs may conduct parallel session to interact with various stakeholders, separately with Alumni and Employers)</i></p> <ul style="list-style-type: none"> • Level of participation (formal or informal involvement) in the program (Alumni, Employer/Industry) • Feedback and involvement in curriculum and formulating PEOs (Alumni, Employer/Industry) • Attainment of PEOs and satisfaction level (Alumni, Employer/Industry) • Feedback on the competency/ performance /Level of satisfaction of graduates. (Employer/Industry) • Practice of internship (Employer/Industry) • Collaborative Industrial projects sponsored. (Employer/Industry) <p>Criterion 1: Vision, Mission and Program Educational Objectives Criterion 9: Industrial Linkages</p>	Continued over lunch break/prayers time
13:00 – 14:00 Venue:	Lunch & Prayer Break	
14.00-16.30 Venue:	<p>Final review meeting to revise the draft findings pertaining to Accreditation Criteria, EAB policies and National regulations / standards for both programs, for the exit meeting.</p> <p>TL chairs the meeting and provide general guidelines for triangulation and preparing recommendations for exit meeting.</p> <ul style="list-style-type: none"> • Discussion between PEVs and TL to maintain consistency across both the programs • Listing of Program strengths and observation and concerns/weaknesses to be shared with HOI 	
16:30 – 16:55 Venue: Coordinator(s)	Exit meeting with Hol / Deans / HoDs	
17:00	Departure from the HEI	



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