FOREWORD

Recent expansion of higher education sector in Pakistan and abroad has necessitated the focus on quality of engineering education. The quality and competence of graduates and their relevance is critical for socio-economic uplift and technical manpower required to meet the needs of the country. Pakistan Engineering Council (PEC) is the Regulatory Body to undertake multiple tasks; one of these is to regulate the conduct of engineering education. The quality of engineering programs is ensured through a comprehensive process of accreditation adopting international best practices in vogue. Emphasis is placed on adherence to accreditation standards to ensure quality of engineering programs offered in public and private institutions. Consequently, Degree Awarding Institutions (DAIs) are expected to produce engineers of high caliber and high quality research to meet stakeholders’ requirements.

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, the PEC EAB is tasked to evolve procedures, articulate the criteria, define parameters, and establish appropriate benchmarks.

The PEC EAB has carried out countrywide awareness programs and other essential activities such as benchmarking and finalization of the evaluation procedures. The program of visits for Accreditation commenced in early nineties and provided considerable experience in the assessment process. As a result, various formats / performa used in the assessment process have been revised and updated accordingly.

A major achievement in this regard was publication of first Manual of Accreditation in 2007. This revised Manual of Accreditation (Second Edition 2014) is a continuation of the previous efforts and has significantly changed the procedure from quantitative to qualitative assessment. It has also incorporated all aspects of Outcome Based Education (OBE) in Engineering programs offered in country and its Outcome Based Assessment (OBA).

It is expected that this Manual will provide guidelines to institutions and other stakeholders to meet the required quality assurance standards. PEC acknowledges the support and efforts of engineers, and academicians who contributed in revision and updation of this document, especially members of Working Group / Task Force on Revision of Accreditation Manual and members of EAB. Special thanks are also due for PEC Mentors (BEM, Malaysia and IES, Singapore) for their feedback and valuable suggestions.

Engr. Syed Abdul Qadir Shah
Chairman
Pakistan Engineering Council
February 2014
PREAMBLE

Pakistan Engineering Council (PEC) was enacted in 1976 by the Parliament as an autonomous statutory body to regulate the engineering profession in the country. According to PEC Act 1976 (amended in 2011), the Council was assigned the functions of accreditation of Engineering Qualifications and maintaining a register of persons qualified from an accredited engineering program to practice as Registered or Professional Engineers. Evidently, the purpose of recognition of engineering qualifications is to oversee the growth and quality of technical education in the country. In the past, evaluation of an engineering program was carried out through the inspectors of examinations following well described guidelines. However, over a period of time the process of accreditation was formalized and the first Manual of Accreditation was published in 2007 for implementation by Engineering Accreditation and Qualification Equivalence Committee (EA&QEC). This manual included concepts of quality assurance in Engineering Education adopted by developed countries. After achieving the Provisional Signatory status of Washington Accord (WA) of International Engineering Alliance (IEA) in 2010, the revision of Accreditation Manual was undertaken to harmonize with the practices of WA-Signatories. The Engineering Accreditation Board (EAB), formerly known as EA&QEC is now carrying out the assessment of various engineering programs in the country and has published the 2nd Edition 2014 incorporating WA guidelines and the feedback of local stakeholders, various relevant international forums as well as WA-Mentors. Whereas the Higher Education Commission (HEC) of Pakistan is responsible for quality assurance on institutional level; EAB, which works in harmony with HEC, is responsible for the accreditation of engineering programs in the country.

In recent years, professional preparation of engineers at the undergraduate (Cycle I) and postgraduate levels (Cycle II & III) has undergone significant changes due to a variety of factors including knowledge explosion, new tools and techniques of teaching. A key new element has been interdisciplinary redesign of engineering programs where teams of scholars from different disciplines of knowledge design and implement programs. Each program, while focusing on knowledge profile, design skills and solution to complex engineering problems, also demands understanding of a wider range of peripheral supportive disciplines. Interdisciplinary engineering programs not only demand a solid foundation of mathematics, basic and social sciences but also integrating hitherto isolated engineering systems. Therefore, engineers of the future need to be competent in their chosen fields of specialization and are also required to develop synthesizing skills to solve complex engineering design problems. Engineering education in the 21st century emphasizes the institutional ability and agility to adopt emerging technologies. These developments have also transformed the process of accreditation and quality assurance.

This Manual is targeted to provide details for accreditation of an engineering program in Pakistan. It serves to facilitate Engineering Institutions to meet the minimum standard stipulated for the accreditation of their existing engineering programs or newly proposed programs. The Manual emphasizes one element of program learning outcomes required in the engineering curriculum and to adopt Continual Quality Improvement (CQI) procedures covering Outcome-Based Education (OBE) and Assessment concept. This manual exhibits the cumulative and highly focused efforts of Chairman EAB Engr. Prof. Dr. Niaz Ahmed Akhtar, and the specially constituted working group namely: Engr. Prof. Dr. Muhammad Younus Javed, Engr. Prof. Dr. Fazal Ahmad Khalid, Engr. Prof. Dr. Saeed-ur-Rehman, Engr. Prof. Dr. Ejaz Muhammad and Engr. Dr. Nasir Mahmood Khan.
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<td>Accreditation Decision Meeting</td>
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<td>CLO</td>
<td>Course Learning Outcome</td>
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<td>CPD</td>
<td>Continued Professional Development</td>
</tr>
<tr>
<td>CQI</td>
<td>Continual Quality Improvement</td>
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<td>Cr Hrs</td>
<td>Credit Hours</td>
</tr>
<tr>
<td>DAI</td>
<td>Degree Awarding Institution</td>
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<tr>
<td>EAB</td>
<td>Engineering Accreditation Board / Engineering Accreditation and Qualification Equivalence Committee (EA&amp;QEC)</td>
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<td>GA</td>
<td>Graduate Attributes</td>
</tr>
<tr>
<td>GAs</td>
<td>Graduate Assistants</td>
</tr>
<tr>
<td>GB</td>
<td>Governing Body</td>
</tr>
<tr>
<td>HEC</td>
<td>Higher Education Commission</td>
</tr>
<tr>
<td>HEI</td>
<td>Higher Education Institution</td>
</tr>
<tr>
<td>IBCC</td>
<td>Inter-Board Chairmen Committee</td>
</tr>
<tr>
<td>IEA</td>
<td>International Engineering Alliance</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>MFS</td>
<td>Minimum Faculty Strength</td>
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<tr>
<td>MOST</td>
<td>Ministry of Science of Technology</td>
</tr>
<tr>
<td>NCRC</td>
<td>National Curriculum Review Committee</td>
</tr>
<tr>
<td>OBA</td>
<td>Outcome Based Assessment</td>
</tr>
<tr>
<td>OBE</td>
<td>Outcome Based Education</td>
</tr>
<tr>
<td>SAR</td>
<td>Self-Assessment Report</td>
</tr>
<tr>
<td>SRO</td>
<td>Statutory Regulatory Order</td>
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<tr>
<td>PE</td>
<td>Professional Engineer</td>
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<td>PEC</td>
<td>Pakistan Engineering Council</td>
</tr>
<tr>
<td>PEO</td>
<td>Program Educational Objectives</td>
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<td>PEVs</td>
<td>Program Evaluators</td>
</tr>
<tr>
<td>PLO</td>
<td>Program Learning Outcome</td>
</tr>
<tr>
<td>QEC</td>
<td>Quality Enhancement Cell</td>
</tr>
<tr>
<td>RAs</td>
<td>Research Associates</td>
</tr>
<tr>
<td>RE</td>
<td>Registered Engineer</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------</td>
</tr>
<tr>
<td>RP</td>
<td>Resource Person</td>
</tr>
<tr>
<td>TAs</td>
<td>Teaching Assistants</td>
</tr>
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<td>WA</td>
<td>Washington Accord</td>
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## Glossary

<table>
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<th>Definition</th>
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<tr>
<td>Academic staff</td>
<td>Staff responsible for teaching and learning activities in the program leading to the award of an engineering degree.</td>
</tr>
<tr>
<td>Accredited Program</td>
<td>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.</td>
</tr>
<tr>
<td>Concern</td>
<td>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.</td>
</tr>
<tr>
<td>Course</td>
<td>Subject offered in the program.</td>
</tr>
<tr>
<td>Deficiency</td>
<td>A criterion, policy, or procedure either does not exist or is in the elementary stage. Compliance is required.</td>
</tr>
<tr>
<td>Degree</td>
<td>An engineering qualification in Pakistan recognized by PEC and HEC.</td>
</tr>
<tr>
<td>Faculty</td>
<td>The entity which includes schools and departments responsible for designing and conducting the program to be accredited.</td>
</tr>
<tr>
<td>Graduate</td>
<td>Anyone who has been conferred a degree.</td>
</tr>
<tr>
<td>Opportunity For Improvement (OFI)</td>
<td>A criterion, policy, or procedure is in compliance and would be further strengthened by incorporating suggested measures/improvements.</td>
</tr>
<tr>
<td>Professional Engineer</td>
<td>An engineer registered with PEC under Section 16(1) of PEC Act.</td>
</tr>
<tr>
<td>Program</td>
<td>The sequence of structured educational experience undertaken by students leading to completion, on satisfactory assessment of performance.</td>
</tr>
<tr>
<td>Program Evaluators</td>
<td>A panel of evaluators appointed by EAB to verify program compliance with accreditation criteria.</td>
</tr>
<tr>
<td>Program Not Accredited</td>
<td>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.</td>
</tr>
<tr>
<td>Registered Engineer</td>
<td>An engineer registered with PEC under Section 16(1) of PEC Act.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Parties having an interest (direct or indirect) in the program output, for example, employers, sponsors, faculty members and students.</td>
</tr>
<tr>
<td>Student</td>
<td>Anyone undertaking an undergraduate program.</td>
</tr>
<tr>
<td>Support staff</td>
<td>Staff responsible for supporting teaching, learning and administration activities in program implementation.</td>
</tr>
<tr>
<td>Weakness</td>
<td>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.</td>
</tr>
<tr>
<td>Withdrawal of Accreditation</td>
<td>EAB reserves the right to cease/terminate the accreditation if there is non-compliance or breach of accreditation requirements after accreditation has been given.</td>
</tr>
</tbody>
</table>
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), Continual Quality Improvement (CQI) and following the spirit of Outcome-Based Education (OBE) over the period of accreditation cycle. New institutions planning to offer engineering programs must complete a process of initial assessment by PEC before launching a program and admitting the initial 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 for a four-year under-graduate engineering program after 12 years of initial education/schooling. Furthermore, the accreditation status for the programs is decided in terms of Accreditation up to five years, Deferred / Pendedup to one year for the removal of deficiencies, and Not Accredited, depending upon the overall expert assessment by the team (nature of observations, deficiencies, concerns etc.) and after rejoinder from a concerned institution.

1.2 Need for Accreditation

a. 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 professional skills and personal competence for ready employability in responsible technical assignments.

b. The need and demand for accreditation of technical educational programs in Pakistan has arisen because of the expansion in the number and variety of such educational institutions and programs. Though education in Engineering and Technology continues to be available only to less than ten percent of eligible students, it is not possible to meaningfully sustain the present growth rate without a parallel exercise in quality assessment of the program(s). Such an exercise 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 meets the local employers’ requirements and thereof global job market in the Engineering and Technology sectors.

1.3 Scope and Objectives

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 assure potential stakeholders and public at large in identifying those specific programs which meet the PEC standards for compliance to accreditation criteria.

iii. To encourage improvement of standards of professional engineering education in the country through implementation of CQI.

iv. to provide guidelines for the up-gradation of 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 licensed 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 and register engineers as such rests solely with the PEC and the relevant provisions of the PEC Act 1976 (amended in 2011) described in Section 2(ii), 8(a), 8(b), 10, 14(1) (2) and 16(1) are reproduced below:

Section 2(ii):
“accredited engineering qualification” means any of the qualification included in the First Schedule or the Second Schedule;”

Section 8(a):
“maintenance of a Register of persons qualified to work as registered engineers, professional engineers, consulting engineers, constructors and operators;”

Section 8(b):
“accreditation of engineering qualifications for the purpose of registration of registered engineers, professional engineers;”

Section 10 (1) & (2):
“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.

(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 14 (1):

“14(1) The Council shall constitute an Accreditation Committee for organizing and carrying out a comprehensive program of accreditation of engineering universities, colleges and institutions etc. according to the criteria approved by the Governing Body in consultation with Higher Education Commission”.

Section 16 (1):

“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 and 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.”

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

1.5 Engineering Accreditation Board (EAB) of PEC

The Governing Body of PEC constitutes EAB for a three year term (formerly known as EA&QEC), not exceeding the term of Governing Body, by nominating its Chairman and the some Members from the house having relevant experience and interest. The Chairman EAB may co-opt additional members from academia and industry in order to make it broad based with balanced representation, ensuring continuity of one-third members from the outgoing EAB.

Chairman EAB guides and monitors the accreditation process, sanctions the approvals for the visitation schedules and composition of teams, resolves any conflicts between the visitation reports and rejoinders of the institutions regarding the accreditation of the programs. He acts as the Chief Executive for all EAB functions at PEC.

Deputy Chairman, EAB may also be appointed to assist the chairman in the accreditation process and acts as chairman in his absence for a particular meeting/tasks.
The Accreditation Department (AD) at PEC Head Office will serve as the Secretariat of the EAB and is facilitated by PEC Branch offices. The Head of the Accreditation Department will act as Secretary/Member of the EAB. The EAB shall meet at such time and place and at such frequency as decided by the Chairman; however, it shall meet at least three times in a calendar year. To assist EAB in its task, panels of subject experts shall be drawn to constitute the Site Visiting Teams as PEC Program Evaluators (PEVs) for undertaking the evaluation of the programs.

The major functions of EAB are described below:

i. to implement PEC accreditation policy.
ii. to formulate guidelines and procedures for accreditation and the launch of new program.
iii. to evaluate the programs at regular intervals not exceeding five years, with the third-year being the preparatory period for the next accreditation.
iv. to appoint an Evaluation Team to accredit each engineering program.
v. to receive and review evaluation reports by the Evaluation Teams, and to communicate its findings to the institutions concerned for their rejoinder.
vii. to decide if accreditation should be granted, as well as the conditions to be imposed, if there is such a need.
vii. to publish a directory of all accredited programs (First Schedule) periodically.
vi. to respond to PEC on complaints and appeals regarding the accreditation process / decisions.
viii. to represent PEC in mutual recognition agreements on academic qualifications with other countries and international forums.
ix. to report its work periodically to PEC Governing Body.
xi. Capacity building / Training for faculty, PEVs, Quality Directors, EAB Members and EAD staff, etc.

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.

1.6 Launching of New Programs

Institutions desirous of starting an engineering program are advised to carefully study the Guidelines for Launching a New Program.

1.6.1 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 above referenced document. Zero visit is mandatory and the details / deadlines to submit the application are as per the prevailing EAB policy accessible through PEC website.
1.6.2 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 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 objective / curriculum / nomenclature
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.

1.8 Qualifying Requirements

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 and each Program is expected to have all the components. These components are:

i. Applicant institution must satisfy the legal status/requirement of 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. A minimum of 128 credit hours of which minimum of 65% credit hours must be from core engineering courses offered over a period of four years (8 semesters).
iii. Final year project (minimum 6 credit hours)
iv. Full-time dedicated engineering faculty (not shared with any other program of the same institution) should be minimum of 8 ensuring that 4 faculty members per additional section, and matching student-faculty ratio of 25:1. The request for evaluation / accreditation of the program would not be entertained by PEC unless the program fulfills this minimum faculty requirement
v. Progress on / Compliance Report on the last PEC visit observations / EAB decision.
vi. Summary of initiatives to adopt Outcome Based Assessment (Program Learning Objectives and Outcomes)
vii. Duly completed and signed SAR as per prescribed format.
In case of the 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 qualifying requirements, 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.
CHAPTER – 2
ACCREDITATION PROCESS
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 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 Five years: Programs meeting or exceeding all accreditation criteria, though with some concerns or minor weaknesses.

ii. Accredited for less than five years: Programs meeting all the accreditation criteria, but no severe deficiency though may have some major weaknesses / serious concerns.

iii. Deferred / Pended up to one year to ensure removal of deficiencies: In case program has a few severe deficiencies 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 deficiencies are removed.

iv. Not Accredited: Programs not ready for accreditation due to non-conformance to one or more criteria or serious deficiencies in major attributes

2.3 Types of Accreditation Visits

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

2.3.1 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.

2.3.2 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.
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 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 visitation, 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 final decision; the same will be communicated to EAB.

2.5 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 (Accreditation Department) 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.

![Figure 1. PEC Accreditation Process Flow Diagram](image-url)
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.

After taking action on above steps, should a program be successful in obtaining accreditation, the entire process will be repeated at the expiry of the specified 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.

### 2.5.1 Steps in Accreditation Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>SAR submitted to PEC Secretariat; first scrutiny carried out by Engineering Accreditation Department (EAD) as per the qualifying requirements. The Institution is asked to provide any further data / information, if required. This step is considered complete when the SAR along with all the requisite data is available with EAD-Secretariat.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Visit planning, scheduling and selection of visitation team by EAB. Visitation Team is provided with SAR along with the archives of previous accreditation reports and the decision of EAB at the time of last accreditation, if any, for the program. PEC representative will coordinate with team members and the institute for providing any additional information, if required.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Pre-visit meeting conducted. On-site visit starts with a meeting with the Head of the Institution, following the visit schedule, i.e. presentation by the program head, visit to Laboratories, Libraries, Workshops, and other Infrastructure/Facilities, meeting with administrative staff, faculty, students and other stakeholders such as alumni, and employers.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>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 from consideration for accreditation.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Discussion among team members followed by compiling of Visit Report and submission to EAB. EAD also sends a copy of the report, excluding team’s recommendations to EAB for the accreditation decision, to the institution. These recommendations are only meant for the considerations of EAB for the final decision regarding the accreditation status of the program.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Institution may submit Rejoinder/Comments on the report within 30 days of its receipt. If the Institutional rejoinder is not received by the due date, it is assumed that the Institution agrees to the observations of the Team.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Consideration of the Report and the Rejoinder by the Moderation Review Committee to see conformance to the criteria and inconsistencies if any in the report, and to furnish recommendations for EAB decision.</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
2.6 Activities in Accreditation Visit

2.6.1 Composition of PEC Evaluation Team

The Visiting Team consists of a Convener, two PEVs, and a member from PEC staff to provide secretarial support. The Visiting Team includes senior 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 earned a doctorate and minimum of five years of teaching, research and practical experience. Representative from industry possessing minimum Master's qualification and considerable professional experience may be 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.

Upon finalization of evaluation team, institution may request for 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 visiting team. In case of valid reason(s), Convener / Chairman EAB will replace the designated evaluation team member(s).

2.6.2 Team Convener

The Convener of the Visiting 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 gather in advance the earlier reports, if any. He has the responsibility for the preparation of 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 the Visiting Team will be appointed to take on the role of the Convener, if the Convener is unable to undertake the visit for unforeseen circumstances.

2.6.3 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. The member from an industry or user organization can be included only in the final visit during 3rd or 4th year of the program. The latter can sometimes serve as an expert for more than one program depending on his competence and abilities. However, in case two programs with substantial similarity in course contents are being offered within a Department, a single set of two/three PEVs may be chosen for both the programs. For programs in emerging or inter-disciplinary areas, more PEVs can be included in the team depending on the need.

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

The PEVs deputed for accreditation purposes should be senior professionals having enough requisite teaching / research experience. Availability of these PEVs may be sought well in advance and the candidate institution will be informed about the composition of the visiting team. The candidate institution may object to the assignment of a PEV provided it submits proof of any verifiable conflict of interest with the assigned PEVs.

In case a PEV is unable to undertake the visit due to circumstances beyond his/ her control, the Convener of the team will nominate another PEV in consultation with PEC, keeping in view the guidelines for selection of PEVs.

2.6.4 PEC Staff Member

The member 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 convener. PEC representative will also ensure compilation of visit report on the last day of visit for submission to the EAB. They will also help to provide necessary policy level updates to the visitation team when and where required.

2.6.5 Activities during the Visit

Normally, the visiting team require 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 visit to common facilities during the first day. All relevant documents and information should be made available and displayed in the exhibit room for scrutiny and analysis. Qualitative facts such as professional attitude, commitment to academics and R&D activities, conduciveness of environment, and morale of the faculty and students should also be taken into consideration while evaluating the program.

Following activities are expected to be completed during the visit:

a. Meeting with senior administration of the institution;

b. Discussion with program as well as shared faculty from supporting departments to assess the program strength and its conduct;

c. Interaction meetings with students, alumni and other stakeholders including employers for obtaining their feedback;

d. Meeting with services and administrative officials of the institute in connection with provision of support regarding finance, infrastructure, examination, admission & registration etc.;

e. Review and analysis of all the documents furnished by the department / institution;
f. Visits to laboratories, library, computing facilities, auditorium, sports facilities, hostels, faculty offices, classrooms, career placement office, medical and such other facilities.

g. A concluding meeting with senior management of the program and institution to share observations of the visiting team.

2.6.6 Schedule of the Visiting Teams

Following is a typical schedule of the visiting team:

Day 0: Firstly the Convenor holds a pre-visit meeting with 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 provided information. The team uses a pre prepared worksheet throughout to assist in the evaluation and discussion.

Day 1: The schedule includes:

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. Discussion with alumni, employers and other stakeholders;
ix. Meeting with the faculty members;
x. Second review meeting of team members regarding assessment of the program.
xi. 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. Third review meeting of team members on overall assessment of the program;
iii. Sharing observations (strong and weak areas of the program) with the higher management of HEI;
iv. Final meeting (post-visit) of the team members for compilation of draft visit report;
v. Submission of final visit report to EAD for EAB

There is an optional Day-3 morning schedule for continuation of the final meeting of Day 2 to complete compilation of visit report.
The institution shall arrange an exhibit-room for displaying the relevant documents including but not limited to the followings:

i. Samples of minutes of meetings; policy documents; faculty profile; syllabi; research publications; project reports.

ii. Details pertaining to faculty members to verify their requisite qualifications and to ensure their continuity and effectiveness for teaching, learning & research pursuits.

iii. Program curriculum, evidence of regular review and consistency with PEC / HEC guidelines and adoption of Outcome Based Education (OBE) system.

iv. Course files for the subjects offered in the program.

v. Evidence for continuous assessment and improvement of the program and implementation plan.

vi. Random check of students’ work, question papers and answer sheets and student attendance record.

vii. Annual budgets for the period under review.

viii. Details of laboratories with equipment, its supporting staff and lab manuals.

ix. Measures taken for provision of general safety, health and environment.

x. Availability of training aids for imparting quality education.

xi. Mapping of Program Educational Objectives / Course Learning Outcomes (PEOs/CLOs) with Program Outcomes.

xii. Other additional document(s) required in support of the program.

2.6.7 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 – 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. As indicated in earlier paragraphs, the evaluation process is based on a set of broad-based criteria developed through a lengthy participatory process concerned with engineering education all over Pakistan and is compatible with international engineering standards. Each criterion serves to assess a principal feature of the institutional activities and program’s effectiveness as per its educational objectives. Hence, each of them is described in terms of quality attributes, amenable to a substantially objective and qualitative assessment.

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 - Industry Linkages

3.2 Accreditation Criteria

One of the objectives of PEC is to encourage the institutions to continually strive for the attainment of excellence. The EAB evaluation processes are designed to facilitate identification of strengths and weaknesses of the programs seeking accreditation.

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 mission statement and a set of goals. 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 achieve a few years after graduation. It should be ensured that the program mission and objectives are aligned with the vision of the institution. Program mission and 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. A process should be developed to assess the level of attainment of the program objectives to evaluate effectiveness of the academic programs. It should include feedback from faculty, employers, alumni and other stakeholders. The evaluation results should be utilized for redefining/improving the program objectives.

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

a) Well-defined and published Program Objectives
b) Program’s educational objectives consistent with the institute 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 continual 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 data related to the level of attainment of the program objectives is not required.

3.2.2 Criterion 2 - Program Learning Outcomes (PLOs)

Program outcomes are the narrower statements that describe what students are expected to know and be 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. Specifically, it is to be demonstrated that the students 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 importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

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.

An Engineering program which targets to develop the above mentioned attributes in its graduates must ensure that its curriculum encompasses all the desired elements of Knowledge Profile as given in table 1 of Annex A. The range of Complex Problem Solving and Complex Engineering Activities is given in the tables (2&3).

Specific details relating to the processes adopted for assessing, evaluating and reviewing the program outcomes should be provided. The institution can 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 Outcomes
b) Program Outcomes linked to the Program Objectives
c) Program Outcomes encompass desired outcomes listed above
d) Mapping of Program 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 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 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. The theory content of the curriculum has to be supplemented with appropriate experimentation in laboratories.

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 approach and levels defined in Bloom’s taxonomy.

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-semester 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 original 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 oral communication, scientific &
quantitative reasoning, critical analysis, system design, 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 National Curriculum Review Committees (NCRC) of
Higher Education Commission (HEC) in consultation with PEC and HEIs. 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 in
program 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 life-long learning.

The academic calendar, number of instructional days, quality of faculty, contact hours per
week, design and delivery of syllabi, student evaluation and feedback are 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 demonstrate the following essentials:

3.2.3.1 Internship Program

The program should facilitate and promote cooperative learning through supervised
internship program of continuous 4-6 weeks duration in an engineering practice
environment/organization. The training program should have been planned and agreed to
between 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.

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 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 and problem based learning may be introduced.

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 Project

A final year project is the confluence of an engineering program. Undertaking a final year project is a compulsory requirement. It should mainly comprise literature search, individual analysis, design and putting together various hardware, software and firmware modules to demonstrate a functional concept.

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

3.2.3.5 Assessment of Learning Outcomes

The program must ensure that each student has achieved all PLOs to acceptable level through assessment of CLOs. The appropriateness of the assessment methods along with the level of achievement against the targeted outcomes must be evaluated. Mapping of program outcomes to individual courses, nature of assessment tools (direct/ indirect/rubrics) and the process of evaluation to determine the attainment of PLOs should be demonstrated through reasonably convincing evidences.

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 objectives and outcomes. 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 proficient engineers.

3.2.4.1 Admission Criteria
The entry requirement to the program shall be assessed to ensure that the students accepted are at 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 Chairman’s Committee (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 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 an 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 time-table. The office hours must be publicized by the instructors by posting them on the office doors/notice-boards. Tutorials, problem-solving and/or help sessions, when planned, should be scheduled and made a part of the time-table. 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 engineering subjects, average class size should be limited to 40-50 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 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. For non-engineering subjects, a bigger class size of 70-80 students may be allowed.

### 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 Lab. Engineers. For hands-on type experiments, the number of students per workstation should be limited to 2-3 per workstation; whereas for labs which are demonstrative in nature, relatively larger number of students per workstation may be considered reasonable. Adequate number of Lab. Engineers 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 over-burdened 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 un-scheduled 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. It 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.

### 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 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 interdisciplinary 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; and also occasionally assist in institutional administration. The faculty must demonstrate complete familiarity with Outcome-Based Educational (OBE) 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-TimeDedicatedFaculty 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 Full-Time Dedicated Faculty (FTDF)

This aspect pertains to the full-time program faculty members, possessing post graduate qualification and registered with PEC as such, teaching core 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 40-50 students/section) admitted per year in the program, and is estimated as follows:

1. For each section admitted per year, there should be at-least 4 engineering faculty members actively engaged in teaching core engineering subjects. Active engagement in the program requires that the faculty member must be engaged in delivering the program curriculum (not being shared with other disciplines/department) and must have taught at-least 2 course-sections per year to the program’s degree students.
2. The number of FTDF holding PhD qualification should be atleast equal to the number of sections admitted per year.
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. To achieve this objective, the prescribed student-teacher ratio is 25:1 (maximum).

For this purpose, non-engineer faculty members having PhD in the relevant disciplines may also be employed to a maximum of 20% of MFS (which 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) to provide academic support/facilitation to students in the form of extra coaching for theory as well as Research/Lab. projects, and holding subject tutorials and/or problem-solving sessions. These TAs/GAs/RAs must be graduate engineers holding BS Engineering degrees. For the purpose of computing student-teacher ratio, these TAs/GAs/RAs would be counted as being equivalent to One-Half, up to a maximum of 20% of FTDF.

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.

Program faculty which is being shared with other disciplines/departments would be counted as One-Half while computing student-teacher ratio.

3.2.5.3 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, etc. Shared faculty members engaged for the program must have post-graduate qualifications. For the purpose of computing student-teacher ratio, shared faculty members would be computed as One-Half, up to a maximum of 25% of FTDF.

3.2.5.4 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, further, these visiting faculty members are not counted towards computation of student-teacher ratio.
3.2.5.5 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. A teaching staff with an engineering accredited degree but having vast industrial/field experience and proven specialized expertise may be considered as an exception.

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 will be taken as 4-times the number of admission seats per year. In addition to FTDF, TAs/RAs/Gas and shared faculty from other departments/disciplines would be counted as half.

3.2.5.7 Faculty Training and Mentoring

This aspect pertains to the training and mentoring of the faculty members for making them more 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 more 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.

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

- Teacher’s training program
- Program objectives and 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
- Preparing and maintaining course files

3.2.5.8 Faculty Retention, Development and Career Planning

Employment and retention of qualified faculty is an indication of managements’ commitment and seriousness towards institute’s mission and program objective. 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 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 objective 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 compensate 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, however, must be ensured on the least. While observing the mentioned pyramid, the program head of an engineering program should possess a PhD degree in relevant 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 in their effective performance in teaching and research. The faculty workload should be as per the HEC guidelines, with an average not to exceed 9-12 hours per week.

3.2.5.11 Faculty Research & Publications

The institute should foster research activities among its faculty members, by supporting participation in national/international conferences, workshops, etc. Faculty members, especially those holding PhDs degrees, should contribute actively in research, and are expected to publish 1-2 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 funds from industry/donors, should be acknowledged in the form of reduced workload and/or financial incentives.

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 project 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 there is 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, etc.) are available and maintained, and exits are accessible with grilles unlocked during learning sessions.

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).

i. The adequacy of teaching and learning facilities such as classrooms, learning-support facilities, study areas, information resources (library), computing and information-technology systems, laboratories, workshops, and associated equipment to cater for multi-delivery modes.

ii. Describe the adequacy of support facilities such as hostels, sports and recreational centers, healthcare centers, student centers, and transport in facilitating students’ life on campus and enhancing character building.

The information required in items i. and ii. should be provided in the supporting documents but is not limited to the following:
- Master plan of physical facilities.
- A summary, in tabulated form, of the lecture hall facilities (give number, capacity, and audio video facilities available).
- Details of the Program 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 support an engineering program. The main objective is to glean and assess the adequacy of these resources in sustaining the program, with a view to its up-gradation and 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 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 details. 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, only one or two budgetary figures will suffice. Institution is required to provide copies of the approved budgets and last-year audited accounts.

3.2.8 Criterion 8–Continuous Quality Improvement

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.

The QMS should provide appropriate quality control and assurance on the graduates’ demonstrable outcomes. Having a QMS also provides quality assurance confidence to various stakeholders that the institution/program would continually improve. If the HEI has the plan, implements it, and the completion of the quality cycles is widespread, it implies the strength of its QMS.

On the other hand, an HEI may have a well-designed QMS but its implementation may lack adequate monitoring or may be devoid of taking necessary actions (i.e. closing the loop) and yet the institution is unaware of these concerns and/or not taking corrective measures --- that would indicate a practically non-existent QMS.
As stated in earlier paragraphs, the concept of accreditation of an engineering program is the demonstration of adherence to the laid down criteria of PEC. The weaknesses and non-conformance observed during the last accreditation and evaluation visit must be addressed to remove the deficiencies. Obviously, the subsequent compliance report from the institution should be based on verifiable remedial measures. Prior to its submission to PEC, it is desired that the internal Quality Enhancement Cell (QEC) of the institution should have already confirmed the veracity of the actions taken for CQI.

Continuous improvements are assured only if a proficient closed-loop system is in place. The institution should have well defined process for quality improvement. This aspect 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.

The institution should also provide details of the procedure of internal assessment which is part of the internal quality assessment as part of QEC program. The institutions should demonstrate and provide information and reports that are prepared for continuous quality improvement related to different accreditation criteria described in this manual. The institution should also provide following documents:

i. Self-assessment reports based on Surveys and feedback from the stakeholders

ii. Report of implementation plan based on the observations of last accreditation visit and the remedial actions taken by the institute.

3.2.9 Criterion 9–Industrial Linkages

This aspect relates to industrial collaboration and linkages program of the institution in order to provide opportunity to students for training, consultancy, R&D and exposure to professional practices. Students are expected to undertake assignments from industry to provide solutions to complex engineering problems. Students and faculty should be encouraged to establish collaboration for R&D and product development related projects, with due regard to environmental and societal impact. Feedback from the industry and employers is crucial and an essential part of curriculum review process used to evaluate attainment of the program objectives.
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) in Hardcopy
ii. Duly filled annexures provided in the Manual, in Hardcopy.
iii. Supporting Material / Documents, either in Hardcopy or in Digital form.

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, used in continual quality improvement at all levels of the program’s activities. This appropriately bound document, ranging between 50 – 100 pages with all pages numbered and a table of contents, shall provide the information and description about the program to enable the Evaluation Panel to objectively assess the program for the purpose of accreditation. The emphasis shall be on 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 PEOs and state where they are published.
4.1.1.3 Describe how the PEOs are consistent with the vision and mission of the institution and/or faculty and stakeholders' requirements.
4.1.1.4 Describe the processes used to evaluate the achievement of PEOs.
4.1.1.5 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 student work and other evidence, that demonstrate achievement of the PLOs.

4.1.3 Curriculum and Learning Process

4.1.3.1 Discuss 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.

4.1.3.2 Discuss 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.

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 to identify and track the contribution of each course to the PLOs (as per template given in Annex-D).
- Distribution of the engineering courses according to areas specific to each program (as per template given in Annex-E).
- Distribution of the related non-engineering (general education) courses.
- 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.
4.1.4.4 Discuss students' workload, class sizes for theory as well as laboratory sessions and completion of courses.
4.1.4.5 Discuss students' activities and involvement in student organizations that provide experience in management and governance, representation in education and related matters and social activities.
4.1.4.6 Discuss Key Performance Indicators (KPI) 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 continual 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 continual 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 Discuss the involvement of industry in discussions and forums, professional practice exposure, and collaborative projects / research for the solutions to engineering problems.
ANNEXURES
(A – L)
## Table 1: Knowledge Profile

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>A systematic, theory-based understanding of the natural sciences applicable to the discipline.</td>
</tr>
<tr>
<td>K2</td>
<td>Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.</td>
</tr>
<tr>
<td>K3</td>
<td>A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.</td>
</tr>
<tr>
<td>K4</td>
<td>Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.</td>
</tr>
<tr>
<td>K5</td>
<td>Knowledge that supports engineering design in a practice area.</td>
</tr>
<tr>
<td>K6</td>
<td>Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.</td>
</tr>
<tr>
<td>K7</td>
<td>Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.</td>
</tr>
<tr>
<td>K8</td>
<td>Engagement with selected knowledge in the research literature of the discipline.</td>
</tr>
</tbody>
</table>
Table 2: Range of Complex Problem Solving

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Complex Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Preamble</td>
<td>Engineering problems which cannot be resolved without in-depth engineering knowledge, and have some or all of the characteristics listed below:</td>
</tr>
<tr>
<td>2 Range of conflicting requirements</td>
<td>Involve wide-ranging or conflicting technical, engineering and other issues.</td>
</tr>
<tr>
<td>3 Depth of analysis required</td>
<td>Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.</td>
</tr>
<tr>
<td>4 Depth of knowledge required</td>
<td>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.</td>
</tr>
<tr>
<td>5 Familiarity of issues</td>
<td>Involve infrequently encountered issues</td>
</tr>
<tr>
<td>6 Extent of applicable codes</td>
<td>Are outside problems encompassed by standards and codes of practice for professional engineering.</td>
</tr>
<tr>
<td>7 Extent of stakeholder involvement and level of conflicting requirements</td>
<td>Involve diverse groups of stakeholders with widely varying needs.</td>
</tr>
<tr>
<td>8 Consequences</td>
<td>Have significant consequences in a range of contexts.</td>
</tr>
<tr>
<td>9 Interdependence</td>
<td>Are high level problems including many component parts or sub-problems.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Complex Activities</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1 Preamble</td>
<td>Complex activities means (engineering) activities or projects that have some or all of the following characteristics listed below:</td>
</tr>
<tr>
<td>2 Range of resources</td>
<td>Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).</td>
</tr>
<tr>
<td>3 Level of interaction</td>
<td>Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues.</td>
</tr>
<tr>
<td>4 Innovation</td>
<td>Involve creative use of engineering principles and research-based knowledge in novel ways.</td>
</tr>
<tr>
<td>5 Consequences to society and the environment</td>
<td>Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.</td>
</tr>
<tr>
<td>6 Familiarity</td>
<td>Can extend beyond previous experiences by applying principles-based approaches.</td>
</tr>
</tbody>
</table>
### Annex B

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

<table>
<thead>
<tr>
<th>PEOs</th>
<th>PEO_1</th>
<th>PEO_2</th>
<th>PEO_3</th>
<th>PEO_4</th>
<th>PEO_5</th>
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<tbody>
<tr>
<td><strong>PEC Graduate Attributes (as defined in Sec 3.2.2)</strong></td>
<td></td>
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<td>Engineering Knowledge</td>
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<td>Problem Analysis</td>
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<tr>
<td>Design/Development of Solutions</td>
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<td>Modern Tool Usage</td>
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</tr>
<tr>
<td>The Engineer and Society</td>
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<td>Environment and Sustainability</td>
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<td>Project Management</td>
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<td>Lifelong Learning</td>
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</table>
System of Instructions and Examination

Nature of Academic Sessions:

- No. of sessions in the Program (4/8/8/12)
- Duration of a session (in weeks)
- Total No. of courses in the Program:
- No. of courses in a session:
- 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:

Semester / Term / Annual

Total: ___________ Teaching: ___________

Min. ___________ Max. ___________

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): ___________

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Total</th>
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<th>A</th>
<th>B+</th>
<th>B</th>
<th>C+</th>
<th>C</th>
<th>D+</th>
<th>D</th>
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<td>Circuit Analysis I</td>
<td>45</td>
<td>2</td>
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### Mapping of Courses to PLOs

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<th>Semester No.</th>
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<th>Course Title</th>
<th>Level of Emphasis of PLO (1: High; 2= Medium; 3=Low)</th>
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<td>OOPS</td>
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<td>Subject 2</td>
<td></td>
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### National Qualifications Framework – Curriculum Design

<table>
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<tr>
<th>Domain</th>
<th>Knowledge Area</th>
<th>PEC/HEC Recommended</th>
<th>Institute's Program Breakup</th>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Overall</td>
</tr>
<tr>
<td></td>
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<td>Credits</td>
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<tr>
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<td>Humanities</td>
<td>As per discipline specific NCRC guidelines</td>
<td>25% – 35 %</td>
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<td>Natural Sciences</td>
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<tr>
<td>Engineering</td>
<td>Computing</td>
<td>As per discipline specific NCRC guidelines</td>
<td>65% – 75%</td>
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<td>Major Based Core (Breadth)</td>
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<td>Major Based Core (Depth)</td>
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<td></td>
<td>Inter-Disciplinary Engineering Breadth (Electives)</td>
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<td>Senior Design Project</td>
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<td></td>
<td>Industrial Training (Summer)</td>
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<td></td>
<td>Total</td>
<td>130 – 138</td>
<td>100%</td>
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</table>
## Annex F

### Course Offerings

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

<table>
<thead>
<tr>
<th>Semester No.</th>
<th>Sr. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Knowledge Area</th>
<th>Pre-requisite Courses (if any)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>CE3204</td>
<td>HDL Based Design</td>
<td>(3-1-4)</td>
<td>Major Based Core (Breadth)</td>
<td>1- Digital Logic Design (CE1102)</td>
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<td>2- Microprocessor Architecture (CE2213)</td>
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<tr>
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<td>2</td>
<td>MT3101</td>
<td>Numerical Techniques</td>
<td>(3-0-3)</td>
<td>Natural Sciences</td>
<td>1- Linear Algebra (MT3023)</td>
</tr>
<tr>
<td></td>
<td>3</td>
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</tr>
<tr>
<td></td>
<td>4</td>
<td>HU1001</td>
<td>Communication Skills</td>
<td>(3-0-3)</td>
<td>Humanities</td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total Cr. Hrs.</strong></td>
<td>14-3-17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 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

<table>
<thead>
<tr>
<th>Area of Specialization</th>
<th>Sr. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Knowledge Area</th>
<th>Pre-requisite Courses (if any)</th>
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<td>Power Systems</td>
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<td>Digital Design</td>
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</tbody>
</table>
## 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):

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Laboratory (Staff Names--Qualifications)</th>
<th>Lab(s) of Course(s) Conducted in the Lab.</th>
<th>Type(s) of Workstations (No. of each type)</th>
<th>Nature of Experiments</th>
<th>No. of Students per Workstation</th>
</tr>
</thead>
</table>
| 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)  
2-Digital Communication Trainers (8)  
3- Antenna Trainers (6)  
4- Microwave Trainers (4)  

Demonstration  
Demonstration  
Demonstration  
Demonstration  

4 to 5  
3 to 4  
4 to 5  
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  
2- Circuit Analysis II  
3- Electronic Devices & Circuits  
4- Integrated Electronics  

Workbenches, each with Power-supply, Signal Generator, Oscilloscope, Multimeter, Breadboard, Components (14)  

Hands-on  

2 |
### Student Admissions & Enrollments

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Intake Batch</th>
<th>Total Applicants</th>
<th>Total Admissions offered*</th>
<th>Total Students Admitted</th>
<th>Present Strength</th>
<th>No. of Section(s)</th>
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<td>300</td>
<td>200</td>
<td>95</td>
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<td>Fall 2011</td>
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<td><strong>1005</strong>*</td>
<td><strong>682</strong></td>
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Note * = Total admission offered in all the Merit lists.
## Annex I

**Faculty Strength**

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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>PEC #</th>
<th>Designation</th>
<th>Joining Date</th>
<th>Details of Qualifications</th>
<th>Specialization</th>
<th>Experience Teaching (Total) Years</th>
<th>Dedicated / Shared</th>
<th>Cr. Hrs. taught in the Current &amp; Last Semesters</th>
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<tr>
<td>1</td>
<td>Professor &amp; Head of Department</td>
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**Taught to other Departments/Degrees**
### List of Shared/Visiting Faculty from other Departments/Organizations, sorted by Designation.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>PEC #</th>
<th>Designation</th>
<th>Details of Qualifications</th>
<th>Specialization</th>
<th>Department / Organization</th>
<th>Cr. Hrs. taught in the Current &amp; Last Semesters</th>
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</thead>
<tbody>
<tr>
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### List of Full-Time Lab. Engineers

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<th>Designation</th>
<th>Details of Qualifications</th>
<th>Specialization</th>
<th>Joining Date</th>
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<th>Current Semester</th>
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### Faculty Summary

#### Present Scenario

<table>
<thead>
<tr>
<th>Faculty teaching Engineering Subjects</th>
<th>Faculty teaching Non-Engineering Subjects</th>
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<tbody>
<tr>
<td>Program Faculty (Dedicated)</td>
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</tr>
<tr>
<td>Program Faculty (shared with other programs)</td>
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<tr>
<td>Shared Faculty (from other programs)</td>
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</tr>
<tr>
<td>Visiting Engg. Faculty</td>
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<td>TA / RA</td>
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#### Scenario at the time of Last PEC Visit

<table>
<thead>
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<th>Faculty teaching Engineering Subjects</th>
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<tr>
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<tr>
<td>Shared Faculty (from other programs)</td>
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<tr>
<td>Visiting Engg. Faculty</td>
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<tr>
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## Faculty Workload

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

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<th>Current Semester Loading</th>
<th>Last Semester Loading</th>
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## Financial Health

### University Income Details

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<td>Actual (as per Audit Report)</td>
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<td>Grants from HEC</td>
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### University Expenditure Details

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