

**Guidelines for Submitting AC-1 Form  
for  
Accreditation / Re-Accreditation  
of  
Engineering Programmes**

## **EXPLANATORY NOTES TO FILL IN AC-1 PROFORMA FOR ACCREDITATION OF AN ENGINEERING PROGRAMME**

1. AC-1 Proforma is a questionnaire arranged in a way to include all possible attributes required for academic evaluation of an engineering program incorporating the requirements of almost all internationally-recognized accrediting bodies of engineering including ABET (Accreditation Board for Engineering and Technology), USA.
2. AC-1 Proforma requires data of all such attributes which are essentially required by the PEC (Pakistan Engineering Council) to evaluate an engineering program being offered by an institution in Pakistan for the purpose of its recognition.
3. Guidelines for AC-1 Proforma further elaborate the nature of information required by the PEC. In case more information or clarification on any aspect of the questionnaire is required by an institution for any/all of its programs, the Registrar PEC may be contacted.
4. Each page of AC-1 Proforma after being duly filled in must be signed by the head of concerned department offering that program before its submission to the PEC.
5. The purpose of accreditation is to identify those institutions which offer professional programs in engineering worthy of recognition by the PEC. Accreditation exercise is also intended to provide guidance for the improvement of existing programs for an overall improvement of engineering education in Pakistan.
6. While accreditation of an engineering institution in the US is voluntary, about 99% of US engineering institutions apply for accreditation to ABET mostly at baccalaureate level. In Pakistan however, this is the mandatory and statutory obligation of the PEC to register all qualified engineers.
7. The prime considerations of PEC in evaluating any engineering program are:
  - a. That it is considered as containing the requisite HEC-approved engineering curriculum as minimum requirement.
  - b. That the program must also meet the requirements of the PEC.
8. The PEC criteria are intended to ensure an adequate foundation in science, humanities and social sciences, engineering sciences, engineering analysis and design methods and preparation for pursuing higher engineering specializations. The criteria afford sufficient flexibility in science requirements to permit expression of an institution's individual qualities.
9. The overall curriculum must provide an integrated educational experience to develop the ability to apply the pertinent knowledge to identification and solution of practical problems in an area of engineering specialization.

10. After receiving the AC-1 Proforma duly filled in, the institution is visited by the members of engineering accreditation and quality evaluation committee and engineering program is evaluated by using the already approved criteria in AC-2 form and its guidelines in addition to a visit report.
11. After the above exercise by the PEC, the evaluation of engineering program is processed through requisite channels and ultimately a final decision on accreditation/re-accreditation is taken by the Chairman PEC regarding recognition or otherwise of a program of an institution.
12. Before admitting the students, it is the responsibility of institution to ensure that minimum infrastructural facilities, adequate full-time faculty and other requirements of the PEC are satisfactorily met for the purpose of accreditation. The maintenance of minimum standards by already-accredited programs is also the responsibility of the concerned institution. In case of failure to acquire/maintain the required standards, the accreditation may be denied or re-accreditation may not be granted as the case may be.
13. PEC strongly recommends that annual system of examination may be gradually phased out and institutions should get converted to semester system at an early date.
14. Net instructional hours mean the time spent in the lecture theaters/laboratories by the students under the supervision of a teacher according to his approved timetable.
15. Every possible effort should be made to enhance the morale of the faculty in order to achieve good academic results.
16. Revision of curriculum on regular basis while considering international trends, job position in the market and the demand of industry, is a good sign for the improvement of engineering education on continuous basis.
17. Internal resource generation "including income from short courses, seminars, consulting services and testing of material, equipment and structures" is also essential for a program to attain self-sufficiency.
18. The main strength of any program is its regular full-time faculty. All aspects pertaining to it would be given special consideration in the evaluation process.

## **EXPLANATION OF ATTRIBUTES FOR AC-1**

### **1. MANAGEMENT AND INFRASTRUCTURE OF THE INSTITUTION**

#### **1.1 AUSPICES**

This aspect pertains to the type of status i.e. corporate, university, institute, affiliated college, constituent college or independent college.

#### **1.2 ORGANIZATIONAL SETUP**

This aspect pertains to essential governance and management setups including financial and academic infrastructure like Syndicate, Senate, Academic Council, Board of Studies, Deans, Chairmen, Heads of Divisions, Registrar, Treasurer, Controller of Examination, Director Sports and Health Services. In case of a private institution, it must be managed by a Foundation / Trust, properly registered under the law.

#### **1.3 CONTROL**

This aspect pertains to academic and administrative powers given to essential organs mentioned above. The financial powers should be decentralized to the extent possible.

### **2. FINANCES**

This aspect pertains to the financial resources available to the institution from various sources such as grant by the Higher Education Commission (HEC), self-financing and other income generation schemes etc. An audited balance sheet duly audited by a registered chartered accounting firm should be attached.

### **3. FACULTY**

(Separately for undergraduate and postgraduate including PhD. In case of combined/joint faculty, the distribution of duties/work load shall be given)

#### **3.1 STRENGTH AND QUALITY OF FACULTY**

This aspect pertains to the faculty employed. The faculty members who are full-time employees dedicated to the program would be considered as permanent faculty. Full-time also means that the faculty has served the institution at least for a minimum of one year. Two shared faculty members would be counted as one regular faculty.

#### **FULLTIME FACULTY**

This aspect pertains to regular, full-time faculty teaching core subjects based on 20:1 student-teacher and 2.5:1 subject-teacher ratio for UG programs. Separately, the team will examine the faculty dealing with humanities, mathematics and sciences, and record its observations. For PG, see relevant section in AC-3 Form (page 107).

### **3.1.2 PART-TIME (OVER AND ABOVE FULL-TIME) FACULTY**

Upto 20% teaching staff may be allowed on part-time basis as a temporary arrangement (but only in special circumstances). This aspect pertains to visiting faculty.

### **3.1.3 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 relating to their disciplines of the under-review program. To ensure that each program develops independently, the maximum limit of shared faculty is 25% of the regular strength. However, while employing the shared faculty, teaching load limit, as prescribed in Section 3.1.9, should be strictly adhered to.

### **3.1.4 ACADEMIC QUALIFICATION**

This aspect pertains to the HEC/PEC-recognized degrees of regular/full-time faculty members. Article (6) of Regulations for Engineering Education in Pakistan is reproduced below, which indicates the academic qualifications for engineering faculty.

S.No.	Post	Minimum Qualifications and Experience
1	2	3
1.	<b>Lecturer</b>	1 <sup>st</sup> Class Bachelor's Degree in relevant branch of engineering provided he is enrolled in master's level engineering programme. However, after 2010 all applicants should be at least MS / M.Sc. Engineering.
2.	<b>Assistant Professor</b>	<p>a. Master's degree in relevant field. However, after 2010 30% should be Ph.Ds, after 2012, 60% should be Ph.Ds, and by end of 2015, 100% should be Ph.Ds.</p> <p>b. 2 year teaching/research experience in a recognized Institution/College/University or 2 years professional experience in the relevant field in a national or international organization.</p>
3.	<b>Associate Professor</b>	<p>a. Ph.D degree in relevant field recognized by HEC in consultation with PEC.</p> <p>b. 7 years teaching /research experience in</p>

a recognized Institution / College /University or 7 years professional experience in the relevant field in a national or international organization out of which 2 years must be teaching experience.

OR

10 years teaching experience with at least 4 years experience at the Post-Ph.D level in HEC recognized University or Post-graduate Institution or professional experience in the relevant field in a national or international organization after year 2012.

c. 5 research publications to be systematically increased to 10 research publication with at least 4 in last 5 years after 2012, in journals of international repute, recognized by HEC-PEC.

4. **Professor**
- a. Ph.D degree in relevant field, recognized by HEC in consultation with PEC.
  - b. 12 years including 5 years teaching experience.
  - c. 15 years teaching / research experience with at least 8 years experience at the Post-Ph.D level in HEC recognized University or Postgraduate Institution or International Organization after year 2012.

OR

10 years Post-Ph D teaching / research experience in a recognized University or a postgraduate institution or professional experience in relevant field in a national or international organization after year 2012.

d. 8 research publications to be systematically increased to 15 research publications with at least 5 in last 5 years after 2012, in journals of

international repute, recognized by HEC-PEC.

The universities are encouraged to determine the number of faculty members on professorial ranks (i.e. Prof., Assoc. Prof. and Asst. Prof.) without a bar on the ratio among different ranks to encourage promotion to deserving candidates.

### **3.1.5 TRAINING OF FACULTY**

It is strongly recommended that each newly-inducted faculty member undergoes eight-weeks training to become an effective teacher. There should be no exception even in case of postgraduate faculty. This training should be suitably designed to encompass at least the following aspects.

- General aspects of lecture delivery including thorough preparation.
- Use of support systems during lecture delivery.
- Mode and means of efficient student-teacher interactions.
- Developing course files.
- Dedicated office-hours and their effectiveness.
- Conducting effective quizzes/mid-term tests/final exams.
- How to make home work an effective tool to assess students.
- The role of attendance in learning.
- Lecture breakdown to ensure complete course coverage.
- Making semester system more transparent and effective.
- Code of conduct and integrity issues.
- Dress code.
- Teacher as a role model.
- Communication skills and ability to disseminate knowledge especially at the conceptual level.
- Student psychology and how to deal with them, without hampering their investigative and questioning attributes.

### **3.1.6 FACULTY DEVELOPMENT AND CAREER PLANNING**

This aspect pertains to the improvement schemes of faculty qualification.

### **3.1.7 SALARIES AND BENEFITS**

This aspect pertains to the salaries and benefits of the teaching staff of the institution, which may be compared with the other Public / Private institutions.

### **3.1.8 PEC REGISTRATION AND UPDATION (Qualifications etc).**

It is highly desirable that all engineering faculty members be registered with the PEC, except for non-engineering subject specialists.

### **3.1.9 TEACHING LOAD**

This aspect pertains to the number of credit-hours teaching per week, based on actual number of teachers present with single section teaching at a time both for annual and

semester system of Instructions. The following guidelines for weekly credit-hours are given with an average load not exceeding 09 credit-hours per week. However, one credit hour for lab work means three contact hours in the lab in a semester system.

Professor	: 9	} (Any combination of teaching, research and admin duties but with maximum attention to research).
Associate Professor	: 9 – 12	
Assistant Professor	: 8 – 12	{ (With maximum focus on teaching, but some time for research and hands-on experience).
Lecturer	: 8 – 14	

### **3.1.10 STUDENT: TEACHER RATIO**

This aspect pertains to the permissible student-teacher ratio which has been presently agreed as (20:1) for UG programs, considering the core faculty only. On this basis, the actual number of required faculty may be worked out. This will be brought to the level of 15:1 subsequently.

### **3.1.11 SUBJECT: TEACHER RATIO / CREDIT-HOURS**

The concept of subject-teacher ratio pertains to the annual system of instructions and examination. For semester system, the faculty loading is defined in terms of credit-hours per week. The PEC plans to get the system of education fully semesterised by September 2010. For the time being however, both criteria need to be considered.

## **4. ACADEMIC PROGRAM**

(Separately for undergraduate and postgraduate including PhD)

This aspect pertains to the academic program for the whole academic period leading to the award of a degree in engineering.

### **4.1 OBJECTIVES**

The objectives of the program and its visualized outcome should be clearly highlighted.

### **4.2 CURRICULUM**

#### **4.2.1 HEC / PEC GUIDELINES**

HEC has laid down minimum guidelines for syllabi of all major engineering programs taught in Pakistan. While imparting education, the institution may avail the flexibility of diversification and additions based on the changes taking place internationally but with due consideration to the minimum requirements set by the HEC / PEC.

The HEC and PEC have also agreed on the contents of engineering and non-engineering courses as: engineering courses 65-70% and non-engineering courses: 30-35%.

#### **4.3 SYSTEM OF INSTRUCTIONS AND EXAMINATIONS (AS EVIDENT BY COURSE FILES)**

The semester system is universally followed for obvious advantages it offers over annual system. The semester system will become more successful as we improve the quality of faculty. All engineering institutions will be required to convert to the semester system by Sept. 2010 when faculty except lecturers (MSc) will be required to have PhD degrees. Therefore, the universities are encouraged to make necessary planning to achieve the target. Another deficiency in the examination of annual system lies in the form of choice, which encourages selective study. This must be done away with latest by March 2009. The bi-annual system should be converted into semester system as early as possible.

##### **4.3.1 INSTRUCTIONS**

##### **4.3.2 EXAMINATIONS**

#### **4.4 TEXTBOOKS**

Prescribed textbooks, codes and design aids may be examined in the light of international practices.

#### **4.5 NET INSTRUCTIONAL HOURS**

This aspect pertains to the total contact-hours committed to theory and laboratory/practical work for effective teaching of different subjects. The length of a semester should preferably be 16-20 weeks.

#### **4.6 CURRICULUM REVISION**

This aspect pertains to curriculum revision in the light of national, HEC and international requirements and on the demand of the industry. On conclusion of the final examinations, the Board of Studies of each department should have a mandatory meeting to discuss this issue exclusively.

### **5. LABORATORIES AND ALLIED STAFF**

(Separately for undergraduate and postgraduate including PhD. In case of joint or combined labs, separate work stations, equipment and spaces shall be indicated)

This aspect pertains to the departmental infrastructure in the context of quality and adequacy of laboratory equipment, space and technical staff.

#### **5.1 ADEQUACY AND QUALITY OF EQUIPMENT AVAILABLE IN LABORATORIES AND WORKSHOPS**

#### **5.2 EQUIPMENT UTILIZATION**

#### **5.3 AVAILABILITY OF LABORATORY STAFF**

The PEC strongly recommends that each major laboratory must be supervised by a qualified engineer who should be supported by a diploma holder in relevant technology.

#### **5.4 QUALIFICATION OF LABORATORY STAFF**

#### **5.5 TECHNICAL COMPETENCY OF LABORATORY STAFF**

#### **5.6 ADEQUACY AND QUALITY OF ADMINISTRATIVE/ SUPPORT STAFF**

### **6. LIBRARY**

This aspect pertains to the collection and efficient and smooth running of main library considering related programs of the institution.

#### **6.1 BUDGET**

A minimum of Rs. 1.0 Million budget should be allocated to cater for: (a) addition of 100 new/latest books per year; (b) expenses of 3 journals and 3 magazines per program & (c) maintenance/operational cost of the library.

#### **6.2 BOOKS**

This aspect pertains to the availability of various volumes available in the central library which should include books published within the last 10 years pertaining to different

disciplines of the institution. A minimum of 3,000 distinct books should be available relevant to each program.

### **6.3 BOOK BANK**

This aspect pertains to the availability of textbooks in the central library for borrowing by the students of different disciplines for the whole session.

### **6.4 LIBRARY EQUIPMENT**

This aspect pertains to various items of equipment of the central library such as photocopiers, computers, scanners, video and audio equipment, CD ROMS, computerized search etc. Library software is available in the market which can help in improving the functioning of the library in all aspects.

### **6.5 JOURNALS**

This aspect pertains to the availability of different research journals for different disciplines in the library such as gazettes, magazines, periodicals, journal publications, etc. The institution must be linked to the HEC-supported on-line access to research journals. A minimum of 3 magazines and 3 journals per program must be subscribed through hard copies.

## **7. STANDARD AND QUALITY OF INSTRUCTION**

(Separately for undergraduate and postgraduate including PhD)

### **7.1 COMPLETION OF COURSES**

#### **7.1.1 THEORY**

This aspect pertains to completion of theory courses during the prescribed period as per official record.

#### **7.1.2 PRACTICAL**

This aspect pertains to the completion of assigned practical experiments to a course during the prescribed period as per official record.

### **7.2 PERCEPTION OF STUDENTS**

This information may be gathered from the random sampling of students in an independent environment.

#### **7.2.1 THEORY**

## **7.2.2 PRACTICAL**

### **7.3 COURSE FILE**

The practice of course file is adopted internationally to monitor as how effective the course has been taught. It is strongly recommended that all engineering institutions in Pakistan make maintenance of course-file mandatory. A course file must include all relevant data (such as given below) which could become the basis of evaluation.

- Lecture breakdown for entire semester.
- List of subjects taught, teaching notes and sample of practical printouts
- Schedule of monthly / mid-term tests and final examination.
- Breakdown of laboratory experiments pertaining to the course and record of successful conduct.
- Samples of best, worst and average answer sheets, along with the question paper of each exam, quiz and home work.
- Samples of quizzes.
- Listing of textbook and other reference books pertaining to the course.
- Record of make-up classes for any un-scheduled holiday.
- Details of office hours for tutoring etc.
- Recommendation and suggestions related to the course for the next session.

### **7.4 STUDENTS' FEEDBACK**

This aspect pertains to the performance evaluation of the faculty members through secret feedback of students at the end of each semester, and the remedial measures taken.

## **8. STUDENTS**

(Separately for undergraduate and postgraduate including PhD)

### **8.1 ADMISSIONS**

It is to be examined whether the students are admitted in accordance with the minimum eligibility conditions prescribed by the PEC and whether the merit is strictly followed. The PEC has set the following minimum requirements for admission into an engineering program:-

#### **For undergraduate:**

- Matric/O level (with science) : 60%
- F.Sc/A level (pre-engineering/Computer Science) : 60%
- Entry test : 50% (pass marks)

\*Note: However, if any University admits a candidate with less than 60% from the backward areas (not below 50%) marks, the University will then arrange a three to six month zero semester for preparing the students for qualifier

examination in pre-engineering core subjects, in which these provisionally admitted candidates will be required to secure at least 60% marks to confirm their permanent admissions.

**For PG, refer to Chapter 8 (pages 98 – 103).**

## **8.2 ADMISSION RESPONSE AND PERCENTAGE ADMITTED**

This aspect pertains to the ratio of students selected and the total number of applications received.

## **8.3 INTAKE**

This aspect pertains to the number of students admitted considering the capacity of a given engineering program and its allied available facilities.

# **9. ACADEMIC BUILDINGS AND OTHER ALLIED FACILITIES**

## **9.1 BUILDINGS (HIRED OR OWNED)**

This relates to central and departmental building infrastructure in the context of academic and administrative requirements.

## **9.2 CONVOCATION HALL/ AUDITORIUM**

## **9.3 OTHER ALLIED FACILITIES**

This aspect pertains to existence of seminar rooms, reproduction facilities, audiovisual aides, computer facilities for staff and students etc.

# **10. ANNUAL COST PER STUDENT**

(Separately for undergraduate and postgraduate including PhD)

The actual expenditure incurred on each student per year, based on overall recurring budget, should be worked out and compared with the standard cost of engineering education in Pakistan.

# **11. FINANCIAL SUPPORT TO STUDENTS**

(Separately for undergraduate and postgraduate)

This aspect pertains to various scholarships and interest-free loans which the students may get from various sources.

# **12. CLASS SIZE**

(Separately for undergraduate and postgraduate including PhD)

## **12.1 THEORY**

This aspect pertains to the number of students per section. For UG engineering subjects, the class size may not exceed 40 students. For non-engineering subjects, bigger class of 60 - 70 students may be allowed but only with appropriate verifiable infrastructural support.

## **12.2 PRACTICAL**

This aspect pertains to the number of students per workstation/experimental setup.

## **13. OFFICE HOURS FOR ACADEMIC COUNSELING**

This aspect pertains to the guidance available to the students from teachers through dedicated office-hours beyond the scheduled time-table.

## **14. OTHER FACILITIES FOR STUDENTS**

This aspect pertains to hostel accommodation, auditorium, sports facilities, gyms, transport, health centre, clinic, guest house etc.

### **14.1 HOSTEL(S) ACCOMMODATION**

### **14.2 SPORTS FACILITIES (including swimming pool, gym etc)**

### **14.3 TRANSPORT FOR STUDENTS**

### **14.4 OTHER FACILITIES**

This aspect pertains to other common facilities such as cafeteria, health centre, clinic, guest house, club etc.

## **15. YIELD (Separately for undergraduate and postgraduate including PhD)**

This aspect pertains to the yearly percentage of the graduating students to the respective intake.

## **16. DROPOUTS**

(Separately for undergraduate and postgraduate including PhD)

## **17. AVERAGE DURATION**

(Separately for undergraduate and postgraduate)

This aspect pertains to the actual number of calendar years actually spent for graduation with respect to the minimum prescribed time limit.

## **18. INTERNSHIP / PRACTICAL TRAINING**

This aspect pertains to the involvement of students in practical training in industry, user organizations etc, during summer vacations.

## **19. QUALITY OF PRODUCT**

## **19.1 PLACEMENT BUREAU**

Each university should have a placement bureau that will maintain record of students' employment, assist the students in placement and interact with relevant employers.

## **19.2 ALUMNI'S SATISFACTION**

This aspect pertains to the opinion of former graduates regarding the quality and adequacy of their education, and that of fresh graduates of the same institution and in the same discipline. The institutions are encouraged to develop a data base of outgoing graduates to receive their feedback through the placement bureau and from alumni's associations.

## **19.3 EMPLOYER'S FEEDBACK**

The quality of the engineers produced by the institution may be assessed on the basis of market survey made by the end users, Public Service Commission, employers and hired consultants etc.

## **19.4 ACCEPTANCE FOR ADMISSIONS IN FOREIGN UNIVERSITIES**

The data available from regular faculty members regarding admission of their graduating students in foreign universities in graduate programs.

## **19.5 AVERAGE STARTING SALARIES OF GRADUATES**

This aspect pertains to the market forces which determine the salary package of a fresh graduate of an Institution, depending on their quality.

## **19.6 AVERAGE TIME TAKEN TO FIND A JOB**

The time taken after graduation to find a job is a reflection on the quality of the graduate.

# **20. OPERATIONAL BUDGET**

This aspect pertains to the allocated recurrent budget compared with the demanded budget of the institution and its adequacy.

# **21. DEVELOPMENT BUDGET**

This aspect pertains to the budget available for development of Infrastructural academic and administrative facilities.

# **22. INVESTMENT AND INTERNAL RESOURCE GENERATION**

## **22.1 INVESTMENT**

This aspect pertains to the investment of various funds available with the institution such as G.P. Fund, Pension, C.P. Fund, Benevolent Fund, income from self-finance scheme and surplus funds available after appropriations etc. The institution may consider initiating the loan scheme to facilitate deserving students.

## **22.2 INTERNAL RESOURCE GENERATION**

This aspect pertains to the internal resources generated through short courses, seminars, consulting services and testing etc.

# **23. RESEARCH AND PUBLICATIONS**

The work regarding research carried out in each engineering program of the Institution will be examined in the light of attributes of good faculty members who are Ph.D. degree holders, Consultancy & Design experience, interaction with industry and user organizations to attract R&D funds and indulgence in research etc. and papers published in the refereed journals.

## **23.1 FACULTY RESEARCH GRANT**

## **23.2 EFFECTIVE UTILIZATION OF RESEARCH GRANT AND ITS NET OUTCOME**

## **23.3 FACULTY PUBLICATIONS IN HEC APPROVED JOURNALS**

Research is very important for a dynamic program. In a year, each faculty member is expected to publish at least 1 - 2 good papers in a reputed referred journal.

## **23.4 CONTINUITY OF FACULTY RESEARCH**

To ensure continued commitment to research by each faculty member.

## **23.5 ACADEMIC COLLABORATION**

This aspect pertains to the collaboration with national and foreign universities for joint research, training, data exchanges and holding of seminars etc. The collaboration can be quite effective if the objectives of the program are clearly defined.

## **23.6 TEXTBOOKS WRITTEN BY FACULTY MEMBERS**

## **23.7 BUDGETARY ALLOCATION FOR CONFERENCES, SEMINARS, COLLOQUIUM ETC.**

### **23.8 COMPUTER AND INTERNET FACILITIES**

This aspect pertains to computer facilities (i.e. computers, scanners, internet facilities, printers etc.) provided in the department for the students and teachers.

### **23.9 ACCESSIBILITY OF FACULTY/STUDENTS TO COMPUTER/INTERNET FACILITIES AND INTERNATIONAL DATABASES**

This aspect pertains to the computing facility / library available in the department and its degree of accessibility to the students.

## **24. INDUSTRIAL LINKAGE**

### **24.1 INDUSTRIAL LIAISON OFFICE**

Presence of Corporate Office in the University for linkage with industry and other organizations.

### **24.2 COMMERCIALIZATION OF RESEARCH FINDINGS**

## **25. WEBSITE**

Each engineering institution must have its web page where accreditation status of each program should be clearly and correctly displayed. It should also contain information of all major parameters of accreditation such as faculty, laboratory equipment, laboratory staff, R&D activities undertaken and library facilities etc.