Punjab Engineering College, Chandigarh

Academic Policy for the Undergraduate Programmes

1. Introduction

This policy document reflects academic objectives the Punjab Engineering College, Chandigarh and the strategies envisaged to achieve the same.

2. Academic Objectives

The educational objectives of the undergraduate programmes of Punjab Engineering College, Chandigarh are:

1. To impart science-based engineering education to develop professional skills that will prepare the students for *immediate* employment in the relevant branch of engineering in industry, as against the model that just prepares them for post-graduate education.

2. To develop the *design capability* among students so that they have the ability to participate in creative, synthetic and integrative activities of the relevant branch of engineering.

3. To develop among students *breadth* of knowledge so that they have familiarity with many important technical areas.

4. To develop among students ability to apply in *depth* knowledge of one or more specializations within the relevant branch of engineering.

5. To develop *communication skills* so that the students are able to express ideas clearly and persuasively, in written and oral forms.

6. To develop among students the awareness of, and the competence to be savvy users of information technology.

7. To develop ability to design and perform experiments in the relevant discipline, and to acquire the ability to interpret and evaluate experimental results.

8. To develop among students the ability to *work with others*, in professional and social settings.

9. To create among students the curiosity, the desire and the ability to keep learning throughout life.

10. To develop an understanding among students of the *human, social and business context* in which they will utilize their engineering skills.

11. To develop a *global view* among students so that they can appreciate diversity in the world and in intellectual pursuits.

12. To develop ability to recognize and appreciate the importance of *ethical standards* in professional work.

3. The Challenges

The main challenges in designing an appropriate curricular programme to achieve these objectives are:

1. The spread in abilities of students: Even when it is ensured that the minimum entry standards are high enough for the lowest-capability student to undertake a science-based engineering curriculum, there are students at the top end who are not sufficiently challenged if the courses are taught to include all.

2. The previous training of the students does not orient them towards engineering as a prescriptive profession. There appears to be a high level of numerical orientation among students.

3. Even though students joining our programmes have learnt their science through English as the medium of instruction, many of them do not have sufficient ability to use English for communication at a level where they can be considered to have sufficient proficiency in technical/professional communication.

4. The semester system and the requirement to split the curriculum into course units create a severe problem in students seeing each course as a separate entity. There is an increasing tendency to forget what a student learns in an earlier semester as he/she moves up.

4. Strategies to Achieve the Academic Objectives

Keeping in view the objectives and the challenges, the following strategies will be adopted:

1. **Technology Orientation:** The curricula will be so framed that a student would be exposed to more of technology courses at the very beginning of the academic programme. The exposure to workshop practice has to increase. *(Challenge 2)*

2. **Engineering Core:** There is a vast engineering core knowledge that every engineer of whatever discipline must have. To meet this, the curriculum would have two two-semester courses, namely, Integrated Mechanical Engineering, and Integrated Electrical Engineering. The first course will be required for all non-mechanical disciplines (Computer Science and Engineering, Electrical Engineering, Electronics and Communications Engineering, and Information Technology), and the second by all non-electrical disciplines (Aeronautical Engineering, Civil Engineering, Mechanical Engineering, Metallurgical Engineering, and Production Engineering). *(Objective 3)*

3. **Design Orientation:** Design forms a very important part of engineering as a prescriptive discipline. We intend to make design training an integral part of our curricula. To ensure that students learn to design, the design training should not be confined to just a few capstone courses, but should start from the very beginning, and in as many courses as possible. The students should be required to undertake open-ended problems, the successful solutions of which should train students to look up data-books, to integrate knowledge learnt in different courses or at least in different parts of a course, to understand that most design problems require iterative methods, to appreciate that optimisation and sensitivity analyses are necessary tools of design, and to take holistic view of problems. To implement this, the design content of each curriculum will be tracked. For each 15-hour worth of design work required in a course, one *design point* will be assigned to the course. A student must earn at least 30 *design points* before completing a B.Tech. degree curriculum. Some of these design projects should involve groups of students working together.*(Challenge 2; Objectives 1, 2, 5, 8)*

4. **Honours Programme**: To provide sufficient challenge to the brighter students, an *Honours* programme will be offered. In this programme the students will be encouraged to overreach and undertake extra learning units, assignments, projects, etc., over and above what is prescribed for the regular course. A student will have to register for the course under the *Honours* programme at

the beginning of the semester. Such courses will be identified with the letter *H* suffixed to the course number. The grade in the *Honours* course will depend upon the student's performance in the regular material prescribed for the course *as well as* in the extra material covered. For a student to *graduate with Honours*, she/he must earn *at least* one-half of the total credits in courses with *H* as a suffix. The Senate shall provide rules for administration of the *Honours* programme.

The academic programmes shall ensure that there are an adequate number of courses available under the Honours option. *(Challenge 1)*

5. **Remedial English Programme:** The College will administer a diagnostic test to assess the new student's ability to use the English language effectively. Those that are found to lack the minimum required proficiency will be advised to join a remedial programme on at-cost basis. *(Challenges 1,3; Objective 5)*

6. **Professional Orientation:** Each academic programme shall have a standing committee consisting of industry professionals who will review the programmes each semester and will advise on the necessary modifications in programmes to help students acquire the professional orientation that prepares them for *immediate* employment in the relevant branch of engineering. *(Objective 1)*

7. **Science and Mathematics**: Each curriculum must stress the scientific basis of engineering practice. Each programme should have at least 6 courses in science and mathematics, developed to train the students in the tools required for a specific discipline. *(Objective 1)*

8. **Breadth and Depth Requirements**: Each curriculum should be so designed that it covers the essentials of the major sub-divisions of a discipline. The students may be required to select electives from within groups of courses classified according to the major sub-divisions of the discipline so that a depth area can be built. Electives must be arranged in streams of sub-disciplines. A student must choose at least one stream of three courses. Other courses could be diverse *(Objectives 3, 4)*

9. **Information Technology**: In today's information-oriented global economy, university graduates must be savvy users of information technology. That is why our programmes will use information technology as an effective tool to deliver content. *(Objective 6)*

10. **Experimental Methods**: It is expected that the laboratory courses will be carefully designed so that a student learns that there is an experimental methodology, that it is field-independent, that it has been found reliable, and that it can be followed by students to make decisions at each stage from formulating the objectives to analysing the results. The purpose of the laboratory experiments should be *to teach* experimental methods to obtain design information *rather than to demonstrate* physical phenomena. The students also must learn the necessity of proper error analysis. A course in virtual instrumentation will be a desirable feature. *(Objective 7)*

11. **Humanities and Social Sciences:** Our students need to develop in an all-round manner and must understand the human and the social contexts within which all professional activities take place. For this reason the programmes should have about 10% content related to humanities and social sciences. *(Objectives 10, 11, 12)*

12. **Comprehensive Viva:** There shall be a comprehensive oral examination at the end of the programme that will test a student on his comprehension of the discipline as a whole. *(Challenges 4).*

Curricular Requirement

Science and Mathematics	
Mathematics	Two common courses, third and fourth to be specified by the Department. The fourth course may be replaced (by a Department) with an Engineering Core Course.
Physics	Two common courses *plus* a one lab course.
Chemistry	One common course *plus* a one lab course
Technical Arts	Introduction to Mechatronics Introduction to Engineering Design Introduction to Computing Introduction to Manufacturing Engineering Graphics Vacation Workshop project
Engineering Core	A two-course package of Unified Electrical Engineering (for non-electrical disciplines) or Unified Mechanical Engineering (for non-mechanical disciplines) Any two (or three in case the department has elected to take only three Mathematics courses) from: Rate Processes Materials science Solid Mechanics Fluid Mechanics Thermodynamics Analogue and Digital Electronics Signal and Systems Communications Engineering
Discipline Core: *Breadth requirement*	15 courses to include at least four laboratory courses.

Discipline Electives: *Depth requirement*	4 courses of which at least three should be in any one stream.
Humanities and Social Sciences	4 elective courses
Open Electives: *from any course being offered in the College*	2 courses
Capstone project	2 courses
Industry Internship Semester	Optional: if a student chooses a semester-long Industry internship, it will replace three discipline electives and two open elective courses.
Vacation Training	One four-week training required of all students who do not opt for Internship Semester