Department of Physics

Non-Graded Units: Design and practical experience (DPE)

Total Credits earned: Design/ Practical Experience: 05 units

Objective of DPE:

The objective of this non-graded component is to give opportunities to students to learn in an informal setting. This mode of learning, is often more effective than conventional lectures/laboratory work. Second and even more important objective of this non-graded component is to inculcate design thinking among students and facilitate them to gain some design immersion experience. Design and Practical Experience (DPE) component can promote learning by doing which does two important things: Firstly, it allows students to immerse themselves in the environment in which work is to be done, so that they can understand the values and expectations of the target beneficiaries. Secondly, it enables a fresh look at problems, not only at the ways of defining them, but also at the ways to solve those including skill-sets that are required to address them. A shift from problem based learning (acquisition of knowledge) to project based learning (application of knowledge), where the projects are grounded in problems outside the classrooms and laboratories, in everyday scenarios. Thus, DPE bridges division between the curricular and the co-curricular components, and encourages the curiosity and involvement that arises from total absorption in a subject of interest.

As a part of this requirement, every student is expected to earn a minimum of five non-graded units (05 units) of DPE to complete the degree requirements. These units can be earned during the semester as well as during vacation and mid-semester breaks; the salient features of how these units can be earned are mentioned below:

- Courses with design focus without any regular graded credits, which are designated to give design/practical experience units - Maximum 2 units.

- Courses (core or elective) with optional design/practical experience component - Maximum 2 units

- Summer/semester internships by students in R&D/Industry/Universities in India or abroad - Maximum 2 units

- Summer/winter/semester projects under the guidance of institute faculty - Maximum 2 units.

- Participation in design /innovation projects by Innovation Center/ CAIC, etc. - Maximum 2 units.

- One semester internship in Industry, R&D institutions or Universities in India or abroad, for a minimum of 100 working days - Maximum 5 units.
✓ One time activity such as design/practical experience workshop/course/event with 28-42 hours of student involvement during the semester or during semester/mid-semester breaks, etc. - Maximum 1 unit.

DPE activities are not restricted to design of physical products but can also include system level design and experience.

These 5 units of DPE (out of total 15 units) form a compulsory graduation requirement for all the undergraduate (B.Tech. as well as Dual degree) programmes. A student will need to earn these 5 units over the duration of the programme with special consideration and requirements for each component as detailed in the following paragraphs. A student will need to get an S grade in this course to earn the respective non-graded unit(s). Incomplete performance in such courses will be indicated by a Z grade. The student would be required either to repeat the course/activity or continue the project/internship until such time that the evaluating faculty member/committee is satisfied with the effort to award an S grade.

In the following paragraphs, the operational modalities of implementing the above activities of DPE are described so that students can earn the required non-graded units.

1. Management of Non-graded DPE units

Each Department offering UG programme(s) would constitute a DPE Committee along with a Departmental DPE Coordinator to manage the non-graded Design and Practical Experience units.

a) The Departmental DPE Committee would coordinate with T&P Unit to identify and vet industries for internships.
b) The committee would also examine other types of internship (Universities, research laboratories, start-ups etc.) requested by students and approve or deny as per a policy defined by the Department.
c) Students of the Department desirous of earning non-graded DPE units through any other mechanism listed above should request permission of this committee before embarking on the activity. The committee would also coordinate the award of non-graded DPE units for all such activities for the students of the Department through appropriate evaluation mechanisms.
d) The committee would be responsible to evaluate the design activities carried out by the students during internships and recommending award of the non-graded DPE units, or continuation of the internship activity for more days to become eligible for the units, as per the efforts of the students during the internship. The DPE Committee will moderate all Design units awarded to students of that Department. The Departmental DPE Committee also has the responsibility of ensuring that units earned by heterogeneous activities meet the requirements in terms of learning efforts and experience.
e) The Dean Academics will appoint a faculty member who would be the Institute DPE Coordinator for Design and Practical Experience units.
f) Departmental DPE Coordinators, Institute DPE Coordinator and Associate Dean Academics-Curriculum together will form an institute level committee to moderate the non-graded units awarded under interdisciplinary work as well as those offered by
Departments, Centers or Schools not offering UG programmes. This committee would also be responsible to review and modify policies as well as modalities of administering DPE units.

2. Activities covered under Design and Practical Experience

2.1. Specialized Courses with focus related to Design and Practical Experience XXD35y (Maximum 2 Units)

Faculty members of the department may offer elective courses that will not have any credits associated with them but will have only Design and Practical Experience units linked to them. These courses offered by department can be of one unit (28-42 hours of student effort) or two units (56-84 hours of student effort). Faculty members offering these courses will award these units on successful completion of the course requirements, and the same would be moderated by the Departmental Committee for DPE of the department. On successful completion of such courses the students will earn only DPE units but no graded credits.

2.2. Regular Courses with optional Design and Practical Experience Component (Maximum 2 Units)

Faculty members of the department may offer an optional design component of maximum of 2 units in their regular core and elective courses at the time of offering the courses. Faculty offering these design courses will award the design units on successful completion of assigned design work. This would be moderated by the Departmental Committee for DPE.

On approval from Dean Academics, this course would be notified to students by the Departmental DPE committee. Successful completion of the course will give graded credits to students and at the same time they will be eligible for earning (1 or 2) design units if they successfully complete optional design component. Faculty offering these courses will award these design units on successful completion of assigned design work. This would be moderated by the Departmental Committee for DPE. In case the course is offered by Departments/ Centers/ Schools which do not offer a UG programme, the notification prior to beginning of the course and moderation after the end of the course would be done by the Institute level DPE committee.

2.3. Summer Internships in R&D / Industry / Universities in India or abroad (Maximum 2 Units)

Summer internship of 40 days duration are allowed in the summer after the 4th registered semester of the student or later, in which a student can earn 2 design units. In the case of non-industry internships, the work should be research/development/practice oriented, and not classroom course work.

Students can undertake a minimum of 40 working days of internship to earn two design practical experience units during summer vacations in Industry, R&D institutions or
Universities in India or abroad. This would be administered by the Departmental Committee for DPE, which would also be responsible appointing a faculty supervisor for the internship, and for awarding the Design units. Students can proceed with the internship after the Departmental Committee for DPE approves the same. Design units for the internship would be awarded by the Departmental Committee after evaluation at the end of internship period. Details are given in a separate paragraph on internships below. The DPE committee may refer an internship request to the Institute level DPE committee in case the work pertains to areas outside the Department’s interests. Details of the procedure are given in sub-section 3 on internships.

2.4. Semester / Summer / Winter Projects under the guidance of IIT Delhi Faculty (Maximum 2 Units)

Some of the co-curricular activities in the institute that pertain to team based product building such as Robotics, Automobile, IGEM, Aero-modelling etc. can also be considered for earning DPE units. SURA/DISA projects related to design and practical experience too can be brought under this option. In order to be evaluated for Design and Practical Experience Units in such cases, a student should register for XXD35y Minor Design Project floated by Department XX or NDN35y Minor Design Project. In either case, the project would be evaluated by the faculty supervisor. In case the project is interdisciplinary, the faculty supervisor of the project may advise the students to register for the latter. The former would be moderated by the Departmental Committee for DPE while the latter would be moderated by an Institute level committee for DPE for award of Design units.

2.5. One-Semester Internship in Industry/R&D institutions/Universities in India/abroad (Maximum 5 Units)

Semester-long internship of 100 days duration are permitted from the 7th registered semester or later, in which a student can earn 5 design units. Any student opting for semester long internship may also be allowed to work on a start-up.

Students can opt for one semester internship in Industry, R&D institutions or Universities in India or abroad, for a minimum of 100 working days, by appropriately planning for completion of credit requirements for the degree. The student can also opt for a semester break to initiate or work for his/her start up. These are the only activities upon successful completion of which students would be eligible for 5 units of design practical experience. It is mandatory that student’s work during the one-semester internship is supervised by two mentors, one from the institute (appointed by the DPE Committee of the student’s Department) and another from the host organization. In case of semester break for a start up, students will work under the mentorship of a faculty member of the Institute. Students desiring to opt for one semester internship or semester break for start-up as mentioned above are required to plan well in advance and submit a project proposal in consultation with their supervisors (in case of internship) or faculty mentor (in case of start-ups). Students can proceed with the internship after the
Departmental Committee for DPE approves the same. Design units for the internship would be awarded by the Departmental Committee after evaluation at the end of internship period. Details are given in a separate paragraph on internships below. The DPE committee may refer an internship request to the Institute level DPE committee in case the work pertains to areas outside the Department’s interests. Details of the procedure are given in following sub-sections on internships.

2.6. One Time Design Practical Experience Module (Maximum 1 Unit)

For both existing and visiting faculty as well as working professionals from industry, NGO & Freelancers who would like to engage students in a workshop/course related to design and practical experience, this one time module can be offered as one unit course. The procedure for offering these courses would be the same as that for offering short-term specialized module courses (V-courses). A proposal for the course should be sent to the Dean Academics for approval by the Chairman Senate, by the faculty member coordinating the course through the concerned Department / Centre / School. These modules can be typically of 28-42 hours duration, and may be offered during mid-semester breaks, winter/summer vacations and even during non-class hours during the semester.

Table 1. Summarizes the information presented in section 2. Detailed rules pertaining to internships and their administration are given in sub-section 3.

### Table 1. Implementation and Evaluation Plan for Design and Practical Experience Units

<table>
<thead>
<tr>
<th>Activity</th>
<th>Norms for the Activity</th>
<th>Criteria for awarding Units</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses with design focus (which are primarily design courses or has significant design component)</td>
<td>Courses offered as per Institute procedure</td>
<td>Registration by the student in the respective course; Evaluation by course coordinator; Moderation by DPE committee of Department / Institute</td>
<td>1</td>
</tr>
<tr>
<td>Course with optional design/practical experience component</td>
<td>Course Coordinator seeks prior approval of Dean Academics for the offering optional design units prior to commencement of the course</td>
<td>Registration by student for XXD35y / NDN35y; Evaluation by course coordinator; Moderation by DPE committee of Department / Institute</td>
<td>1</td>
</tr>
<tr>
<td>4-week project with Institute Faculty during winter/summer (20 working days)</td>
<td>Notification of projects by DPE Committee of Student’s Department / Institute</td>
<td>Prior approval by DPE Committee of Student’s Dept; Registration by student for XXD35y / NDN35y; Evaluation by Faculty Mentor of the project; Moderation by DPE committee of Department / Institute</td>
<td>1</td>
</tr>
<tr>
<td>8-week project with</td>
<td>Notification of projects</td>
<td>Prior approval by DPE Committee of</td>
<td>2</td>
</tr>
<tr>
<td>Activity</td>
<td>Responsibility</td>
<td>Duration</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Institute Faculty including SURA, DISA, etc. (40 working days)</td>
<td>by DPE Committee of Student’s Department / Institute OR Announcement and selection by appropriate Institute bodies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-week internship during summer with</td>
<td>Prior approval by DPE Committee of Student’s Dept; Registration by student</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry / R&amp;D / University (40 working days)</td>
<td>student in coordination with T&amp;P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One semester internship (100 working days) or One semester break for</td>
<td>Prior approval by DPE Committee of Student’s Dept and Institute; Registration by the student in XXT400 and with T&amp;P; Monitoring by Internship supervisor; Evaluation and Moderation by DPE committee of Department / Institute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>own start ups</td>
<td>Arranged by T&amp;P or self-arranged by the student in coordination with T&amp;P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in design/project activity under the supervision of</td>
<td>Prior approval by DPE Committee of Student’s Dept; Registration by the student in XXD35y / NDN35y; Evaluation by Faculty Mentor of the project; Moderation by DPE committee of Department / Institute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>faculty during semester</td>
<td>Notification of projects by DPE Committee of Student’s Department / Institute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in design/practical/ experience workshop/course/event</td>
<td>The workshop should be offered in the form of a course as per Institute procedure for Short-duration (V-type) courses</td>
<td></td>
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</tr>
<tr>
<td>organized by industry/ organizations/ visitors/ visiting faculty</td>
<td>Registration by the student in the course; Evaluation by Course Coordinator and Visiting Faculty offering the course if any; Moderation by DPE committee of Department / Institute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in Design/innovation projects by Innovation Center/CAIC</td>
<td>Notification by the Faculty in-charge of the corresponding activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bodies, etc.</td>
<td>Prior approval by DPE Committee of Student’s Dept/ Institute; Registration by the student in XXD35y / NDN35y; Evaluation by faculty in-charge of activity / CAIC bodies / Coordinator Innovation Centre; Moderation by DPE committee of Department / Institute</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

✓ A student cannot register for more than 2 non-graded DPE units per summer or 3 non-graded DPE units per registered semester in which a student is on regular academic activity. To take part in activities that can result in more than 3 DPE units, a student has to take the semester off from regular courses.

✓ A single activity cannot be evaluated for more than one purpose: for example, the same project cannot be submitted for graded credits as well as for design units.
3. General Rules on Internship

- A student can do at most two internships for design units, during his/her stay at IIT Delhi. If any student does more than two internships, the design units will be awarded for the first two registered internships only.

- Internships for Design units are permitted only in one of the two following formats:
  a. Summer internship of 40 days duration, in which a student can earn 2 design units.
  b. Semester-long internship of 100 days duration, in which a student can earn 5 design units.

- No other format of internship would be considered for the award of Design units. Design units would be awarded only if training for the stipulated number of working days, as mentioned above, is completed to the satisfaction of the concerned Departmental Committee. Design units would not be awarded against partial completion of the training duration.

- Summer internships are allowed in the summer after the 4th registered semester of the student or later. Semester Internships are permitted from the 7th registered semester or later.

- Internships are permitted in industry, research laboratories or academic institutions involved in research, development and/or technology transfer. Any student opting for semester long internship may also be allowed to work on a start-up. All internships must be approved by the department in advance. In the case of non-industry internships, the work should be research/development/practice oriented, and not classroom course work.

- In all cases, for award of non-graded design units, after completion of the internship, the work must be evaluated by the DPE committee of the student’s Department or the Institute level DPE committee as the case may be. Both in case of activities in the Institute, as well as internships, partial award of units would not be allowed, and the student(s) would be advised to do more work and reappear before the committee in case the work is found wanting in any respect.

- A student can choose from one of the following options in order to complete the Non-Graded component of Design and Practical Experience:
  a. One semester internship, accounting for 5 DPE units.
  b. One summer internship, accounting for 2 DPE units and 3 DPE units from other activities at IIT Delhi.
  c. Two summer internships, accounting for a total of 4 DPE units, and 1 DPE unit from other activities at IIT Delhi.
  d. One summer internship accounting for 2 DPE units and one semester internship, accounting for 5 DPE units. However, a maximum of 5 DPE units can be earned by a student through internships.
  e. No internships: all DPE units can be earned through design / project activities at IIT Delhi.
Both for self-arranged internships and IIT-arranged internships, administration and correspondence would be handled by the Training and Placement Unit. For self-arranged internships, any documentation regarding the bona fide status of students (while applying for training) will be done by UG section. T&P Unit will process the paperwork of the student once the student submits all departmental approvals and the confirmed offer letter from the company to T&P.

3.1 Registration Procedure for internships

Three new internship courses per Department as detailed below are available. Students who would like to opt for training will have to register for one of the three courses as per the following rules:

- The courses are: (XX stands for the two-letter Department Course Code in the following course numbers: BB, CL, CV, etc.)

  a) XXT200 Summer Internship 1: 2 units
     A summer internship of 40 working days.
     Pre-requisites: Earned Credits: 30 (at the time of registration), 45 at the end of the July-November semester preceding the summer.

  b) XXT300 Summer Internship 2: 2 units
     A summer internship of 40 working days, for students who have already done one summer internship.
     Pre-requisites: XXT200

  c) XXT400 Semester Internship: 5 units
     A semester internship of 100 working days.
     Pre-requisites: Earned Credits: 60 (at the time of registration), 75 at the end of the January-April semester preceding the internship. Semester internships could begin in either July or January, synchronized with the starting date of the respective semester.

- Students interested in summer / semester internships should follow the procedure outlined below.

  a) All students opting for internships in summer should register for XXT200 or XXT300 (if opting for second summer internship) during the registration period in October preceding the summer. All those students who register would automatically be enrolled in the T&P process for internship allotment. In case the student wants to arrange the summer internship by himself/herself, and not use a T&P seat, he/she should drop the course in January, and re-register in April.

  b) A student who registers for one of these three courses during January-April semester will not be able to register for any course in the K, L and M slots, and T&P activities will be conducted during the timings of these slots.
c) If a student is selected for an internship through T&P, he/she is bound to go for that internship. If the student does not take up and complete the internship, he/she will be debarred from all further T&P activities (including further internship opportunities and placement procedure). This stringent measure is adopted to ensure that non-serious students do not spoil either the chances of other students or the reputation of IIT Delhi with the companies offering internships through T&P.

d) The data of all the students who register for an internship course will be copied to T&P portal, to make it feasible for the students to apply for internships through T&P. Students who drop the course in January would be excluded from further processing in T&P.

e) T&P Unit will try and arrange internships for as many students as it can. However, it may not be possible for the T&P Unit to arrange internships for all the students who registered.

f) T&P procedure for summer internships will begin in January and will continue in February. If T&P Unit is unable to provide internship to a student by the end of February, the student is exempted from the rule (iii) above, and can start trying for a self-arranged internship.

g) Starting from October 2015, the T&P Unit would handle correspondences and training certificates of all internships, both self-arranged and those arranged through the T&P process. Once committed, a student will be bound to take up and complete the internship, whether it be self-arranged or T&P arranged. Failure to do so will attract stringent penalty, and such students would be debarred from all T&P activities including placements.

- Students, who opt for self-arranged internship, will have to register for one of the courses as per the following schedule:

  a) **Summer Internship**: Registration for XXT200 or XXT300 during the registrations in the month of April preceding the summer semester.
  b) **Semester Internship during an odd semester (beginning in July)**: Registration for XXT400 during the registrations in the month of April preceding the semester.
  c) **Semester Internship during an even semester (beginning in January)**: Registration for XXT400 during the registrations in the month of October preceding the semester.

The list of courses offered in connection with non-graded units of DPE are listed in Table 2.
Table 2. Summary of courses for non-graded units

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Number</th>
<th>Course Name and/or Description</th>
<th>Pre-Requisites</th>
<th>No of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>XXD351</td>
<td>Minor Design Project – 1</td>
<td>EC 50</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>XXD352</td>
<td>Minor Design Project – 2</td>
<td>XXD351</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>XXD353</td>
<td>Minor Design Project – 3</td>
<td>XXD352</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>XXD354</td>
<td>Minor Design Project – 4</td>
<td>XXD353</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>XXD355</td>
<td>Minor Design Project – 5</td>
<td>XXD354</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>XXD356</td>
<td>Minor Design Project – 6</td>
<td>EC 50</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>XXD357</td>
<td>Minor Design Project – 7</td>
<td>XXD356</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>NDN351</td>
<td>Minor Design Project – 1</td>
<td>EC 50</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>NDN352</td>
<td>Minor Design Project – 2</td>
<td>NDN351</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>NDN353</td>
<td>Minor Design Project – 3</td>
<td>NDN352</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>NDN354</td>
<td>Minor Design Project – 4</td>
<td>NDN353</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>NDN355</td>
<td>Minor Design Project – 5</td>
<td>NDN354</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>NDN356</td>
<td>Minor Design Project – 6</td>
<td>EC 50</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>NDN357</td>
<td>Minor Design Project – 7</td>
<td>NDN356</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>XXT200</td>
<td>Summer Internship 1</td>
<td>EC 30</td>
<td>2</td>
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<tr>
<td>16.</td>
<td>XXT300</td>
<td>Summer Internship 2</td>
<td>XXT200</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>XXT400</td>
<td>Semester Internship</td>
<td>EC 60</td>
<td>5</td>
</tr>
</tbody>
</table>

In all above course descriptions, XX and XY stand for the two-letter prefix corresponding to course numbers of academic units: example, XXD351 corresponding to textile technology would be TXL351.

- Physics Department’s DPE Committee:

  1. Prof. D. S. Mehta, Chairman
  2. Dr. J. P. Singh
  3. Dr. G. V. Prakash
  4. Dr. Pintu Das, Convener, E-mail: pintu@physics.iitd.ac.in