IIT Delhi

UG PROGRAMME RULES

COURSES OF STUDY 2024-25

INDIAN INSTITUTE OF TECHNOLOGY DELHI

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IIT DELHI

VISION

To contribute to India and the World through excellence in scientific and technical education and research; to serve as a valuable resource for industry and society; and remain a source of pride for all Indians.

MISSION

To generate new knowledge by engaging in cutting-edge research and to promote academic growth by offering state-of-the-art undergraduate, postgraduate and doctoral programmes.

To identify, based on an informed perception of Indian, regional and global needs, areas of specialization upon which the Institute can concentrate.

To undertake collaborative projects which offer opportunities for long-term interaction with academia and industry.

To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

VALUES

- Academic integrity and accountability.
- Respect and tolerance for the views of every individual.
- Attention to issues of national relevance as well as of global concern.
- Breadth of understanding, including knowledge of the human sciences.
- Appreciation of intellectual excellence and creativity.
- An unfettered spirit of exploration, rationality and enterprise.

COURSES OF STUDY
2024-2025

Undergraduate Programme Rules

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1. UNDERGRADUATE DEGREE REQUIREMENTS, REGULATIONS AND PROCEDURES

1.1 Overall Requirements

1.1.1 B.Tech.

The total credit requirement for the B.Tech. (4-year programme) is 148-158 credits (exact requirement is discipline specific). The minimum and maximum number of registered semesters for graduation requirements are listed in Table 4. For B.Tech. programmes, the total credits are distributed over following categories :

(a) Institute Core (IC):
- Basic Sciences (BS): Mathematics, Physics, Chemistry and Biology courses
- Engineering Arts and Science (EAS): Fundamental engineering courses
- Humanities and Social Sciences (HUSS): At least two courses to be taken in the 200 level and at least one course to be taken in the 300 level. Management Courses (MSL 3XX) are not counted under this category.

(b) Departmental Core (DC): courses of relevant discipline.

(c) Departmental Electives (DE): electives related to the parent discipline.

(d) Programme linked basic sciences/EAS (PL): additional BS/EAS courses that are specified by the department.

(e) Open Category (OC): electives can be taken outside or within the discipline; these credits can be used towards departmental specialization or minor area also (see Sec 1.6).

(f) Non-graded Core (NG) units: These are core requirements and can be earned through formal academic activity and informal co-curricular or extra-curricular activities.

1.1.2 B.Des.

The total credit requirement for the B.Des. (4-year programme) is 149 credits. The minimum and maximum number of registered semesters for graduation requirements are listed in Table 4. For B.Des. programmes, the total credits are distributed over following categories:

(a) Institute Core (IC)

(b) Departmental Core (DC): courses of relevant discipline.

(c) Departmental Electives (DE): electives related to the parent discipline.

(d) Open Category (OC): electives can be taken outside or within the discipline.

(e) Non-graded Core (NG) units: These are core requirements and can be earned through formal academic activity and informal co-curricular or extra-curricular activities.

1.1.3 Dual degree programmes

The total credit requirements for a dual degree programme would depend upon the credit requirements of the B.Tech. and M.Tech. programmes that constitute the Dual Degree. The minimum credit requirement for the award of Dual Degree would typically be 10 less than the total credits of the constituent B.Tech. and M.Tech. programmes. The B.Tech. requirements for a dual degree are same as that given in Section 1.1.1. The M.Tech. part is divided into two categories – Programme Core (PC) and Programme Elective (PE). The minimum and maximum number of registered semesters for graduation requirements are listed in Table 4.

1.2 Breakup of Degree Requirements

1.2.1 Earned Credit Requirements for B.Tech.

The minimum earned credit / unit requirements for B.Tech. degree are given in Table 1.

Table 1 : Degree Requirements of B.Tech. Programmes

	Category	Symbol	B.Tech. Requirements	Remarks
1	Institute Core	IC	58 Credits	Common to all disciplines
2	Programme Linked EAS/BS	PL	0-15 Credits	Discipline specific as decided by the Department
3	Departmental core	DC	65-80 with min. 10 as DE	Discipline specific
4	Departmental Elective	DE		
5	Open Category	OC	10 Credits	Open to student's choice
6	Non-graded Core	NG	11 units	See Sec. 1.3
	Total	***148-158 Credits +11 Non-graded units***		

1.2.2 Earned Credit Requirements for B.Des.

The minimum earned credit/unit requirements for B.Des. degree are given in Table 2.

Table 2 : Degree Requirements of B.Des. Programmes

	Category	Symbol	B.Des. Requirements	Remarks
1	Institute Core	IC	02 Credits	
3	Departmental core	DC	123 Credits	
4	Departmental Elective	DE	15 Credits	
5	Open Category	OC	09 Credits	Open to student's choice
6	Non-graded Core	NG	09 Units	See Sec. 1.3
	Total	***149 Credits + 09 Non-graded units***		

1.2.3 Degree Grade Point Average (DGPA) Requirement

A student must obtain a minimum DGPA of 5.0 to be eligible for award of the B.Tech. degree. The minimum DGPA requirement for M.Tech. part of Dual Degree programme is 6.0. All exceptions to the above conditions will be dealt with as per following regulations:

(a) If a student completes required credits for B.Tech. with DGPA less than 5.0, then the student will be permitted to do additional elective courses under appropriate category to improve the DGPA within the maximum time limit for completion of B.Tech. degree. In case a DGPA of 5.0 or more is achieved within the stipulated period, a B.Tech. degree will be awarded and in case the same is not achieved no degree will be awarded and the student may apply for a diploma.

(b) If a student completes requisite credits for Dual Degree Programme:

(i) with B.Tech. DGPA less than 5.0 but M.Tech. DGPA more than 6.0

The student will be permitted to do additional elective courses (under appropriate category) to improve the DGPA for completion of B.Tech. part within the maximum time limit. In case a DGPA of 5.0 or more is achieved for B.Tech., the student will become eligible for award of the Dual Degree (B.Tech. & M. Tech.) and in case the same is not achieved no degree will be awarded and the student may apply for a diploma.

(ii) with B.Tech. DGPA more than 5.0 but M.Tech. DGPA less than 6.0

The student may opt to do additional elective courses (PE category only) to improve the DGPA within the maximum time limit. If no programme elective (PE) courses are available, other relevant 700 and 800 level courses as approved by the department can be done for the purpose of improving the DGPA. In case DGPA of 6.0 or more is achieved for the M.Tech. part, the student will be eligible for award of the Dual Degree (B.Tech. & M.Tech.). However, in case the same is not achieved at the end of the stipulated period, the student will be eligible for the award of only B.Tech. degree, provided a written request for the same is made to the Dean, Academics.

(iii) with B.Tech. DGPA less than 5.0 and M.Tech. DGPA less than 6.0

The student will be permitted to do additional elective courses under appropriate categories to improve the DGPA for completion of B.Tech. and courses under PE category for completion of M.Tech. degree within the maximum time limit. If no programme elective courses are available, relevant 700 and 800 level courses as approved by the department can be done for the purpose of improving the DGPA of the M.Tech. part. In case a DGPA of 5.0 or more for B.Tech. and 6.0 or more for M.Tech. are achieved, the student will be eligible for award of the Dual Degree (B.Tech. & M.Tech.). However, in case a DGPA 5.0 or more for B.Tech. is achieved but the DGPA of 6.0 or more for M.Tech. is not achieved at the end of stipulated period, the student will be eligible for award of only B.Tech. degree provided a written request for the same is made to the Dean, Academics.

(c) A student may be permitted to do additional elective courses under appropriate elective categories for improving DGPA, even if he/she satisfies all graduation requirements. The student may be permitted to register for courses in the additional semesters, up to the maximum limit in terms of registered semesters for improving his/her DGPA provided a request for the same is made to the Dean, Academics within 15 days of the notification of grades in the final semester. During this period when the student is registered for improving DGPA, no hostel facilities or assistantship will be provided to the student.

(d) A B.Tech. student is eligible to apply for a Diploma provided he/she has earned 100 credits and has exhausted the maximum number of permitted registered semesters for completion of his/her degree. If the student has completed 50 credits (out of 100 credits) from his/her DC+DE+PC+PE categories then the student will be awarded 'Undergraduate Diploma in the respective discipline' on completion. If the student has not completed 50 credits from these categories but has completed 100 credits then he/she will be awarded 'Undergraduate Diploma in Engineering'. The Diploma is not equivalent to an undergraduate degree.

(e) No self-study course will be permitted for the purpose of improvement of DGPA.

1.2.4 Audit Courses

Audit facility is open to all undergraduate (B.Tech./Dual Degree) students who have 85 Earned Credits. A student will be permitted to do any number of audit courses over and above the graduation requirements. The audit limits for graduation are:

(a) B.Tech. (4-year) programme: A maximum of 8 credits from the elective courses in any category out of the total credits required for B.Tech. degree may be completed on audit basis.

(b) Dual-degree programme: A maximum of 8 credits from the elective courses in any category may be completed on audit basis from the UG part of the programme.

(c) A student earns either an NP (audit pass) or an NF (audit fail) grade for an audit course. The audit pass (NP) grade may be awarded if the student satisfies the attendance criteria specified for the course and he/she has obtained at least a 'D' grade. The course coordinator can specify a higher criterion for audit pass at the beginning of the semester. If either of these requirements is not fulfilled, the audit fail (NF) grade is awarded.

(d) Grades obtained in an audit course are not considered in the calculation of SGPA or CGPA.

1.3 Non-graded Core Requirement

As part of the curriculum, non-graded units have been prescribed as core requirements for the undergraduate degree. These units can be earned through a combination of formal academic activities and informal co-curricular or extra-curricular activities. The components of non-graded core requirement are listed in Table 3.

Table 3: Components of Non-Graded Core Requirement for B.Tech. and Dual Degree*

	Components	Minimum NGUs for Graduation	Maximum Countable Towards Total of 11 NGUs
1	Introduction to Engineering and Programme	1	1
2	Language and Writing Skills	2	2
3	Communication Skills/Seminar	1	1
4	NCC/NSO/NSS	1	2
5	Professional Ethics and Social Responsibility	1	2
6	Design and Practical Experience	3	5
	Total	***11***	

***NGU in case of B.Des. programme will be updated later.**

The 11 units listed in Table 3 will be core requirement for students of all undergraduate programmes with entry year 2020 or later. A student must earn these 11 units over the complete duration of the programme with special requirements for each component as explained in Section 4. A student must get 'S' grades to earn these units. Incomplete performance in these components will be indicated by a 'Z' grade.

For components 3-6 in the above table, a special portal called the NGU portal is used for necessary approvals and posting of "S" grades. This portal can be accessed at *https://ngu.iitd.ac.in/index*

A brief description of the six components is given below. For complete details, please refer to Section 4.

(a) Introduction to Engineering and Programme (NIN100) (1 unit)

This course will introduce the students to the vast domain of Engineering in general with a glimpse of the

specifics of various engineering disciplines. All students will be required to register for this course in the first semester for earning 1 unit. These may involve listening to guest lectures, interaction with distinguished alumni, simple product building and product dissection exercises, executing simple design thinking exercises, visit to laboratories (in and outside the Institute) and industry.

(b) Language and Writing Skills (NLN100 and NLN101) (2 units)

All students will be required to participate in Task-Based Language Learning (TBLL) exercises in the first year, through two core courses: NLN100 in first semester and NLN101 in second semester. These language games are designed to enhance their linguistic capabilities in comprehension, both reading and listening, as well as improve their ability to structure and compose ideas in spoken and written communication. Wherever necessary principles of English Grammar will be discussed along with the nuances of technical writing. The Language Needs of a particular class of students will be assessed through an initial language test at the beginning of the first semester. Then, the exercises will be tailored according to the specific language needs of the particular class of students. These exercises could be scheduled during normal academic hours or outside. Based on the performance and regularity, a student may be prescribed additional self-learning exercises and practice sessions during vacations as well, as requirement for securing an 'S' grade.

(c) NCC/NSO/NSS (NCN100/NSN100/NPN100) (Minimum 1 and Maximum 2 units)

NCC/NSO/NSS also form part of the core requirement of the degree. Students will be required to earn at least 1 unit from these activities involving 40 hours of work and a maximum of 2 units for 80 hours of work towards the total NGU requirement.

(d) Professional Ethics and Social Responsibility (PESR) (Minimum 1 and Maximum 2 units)

There is increasing consensus worldwide that professional ethics need to be incorporated into the engineering curriculum to provide students exposure to the kind of professional and ethical dilemmas they might face on an individual basis as well as the larger ethical aspects of technology development. Workshops, discussions/ debates will be organized to sensitize students about Professional Ethics and Social Responsibility (PESR). This component has 3 core courses: NEN110 in first semester, NEN111 in 2nd semester and NEN300 after 3rd year corresponding to a total of 1 unit. Students can earn an extra unit through additional activities, such as PESR workshops (NEN212) and PESR projects (NEN213). For more details, please see Section 4.4.

(e) Communication Skills/Seminar (1 unit)

Communication Skills is an essential requirement for a modern engineer. As a part of the degree requirements, undergraduate students will have to earn 1 unit in communication skills by registering for a seminar course or an equivalent activity. Please see Section 4.5 for details.

(f) Design and Practical Experience (Minimum 3 and Maximum 5 units)

The objective of this non-graded core requirement component is to give opportunities to students to acquire substantial design and practical experience both as a part of formal courses as well as in an informal setting. Second and even more important objective of this course is to inculcate design thinking among students and facilitate gaining some design immersion experience. Design and Practical Experience (DPE) component is introduced to promote learning by doing which does two important things: 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 labs in everyday scenarios, will involve students in reality, and reality in education. Design and Practical Experience bridges division between the curricular and the co-curricular and encourages curiosity and involvement that arise out of total absorption in a subject of interest. Non-graded units in Design and Practical Experience can be earned through one or more of the following:

- Specialized Elective Courses related to Design and Practical Experience (Maximum 2 Units)
- Regular Courses with optional Design and Practical Experience Component (Maximum 2 Units)
- Summer/winter/semester/SURA/DISA projects with Institute faculty, not evaluated for earning credits (Maximum 2 units)

- Co-curricular projects such as Robocon, SAE-minibaja, etc. (Maximum 2 Units)
- Summer Internships with Industry (Maximum 2 Units)
- One Semester Internship (Maximum 5 Units)
- Workshop Module on Design and Practical Experience offered by Faculty/Visitors (1 Unit each)
- Section 4.6 gives complete details for this component.

1.4 Minimum and Maximum Durations for Completing Degree Requirements

(a) The minimum and maximum permitted duration of each academic programme will be determined in terms of number of registered regular semesters, hereinafter called registered semesters. Any semester in which a student has registered for a course will be called a registered semester subject to the following:

(i) Only the First and Second semesters of an academic year can be registered semesters. The summer semester will not be counted as a registered semester.

(ii) A semester when a student has been granted semester withdrawal or granted semester leave will not be considered as a registered semester.

(iii) The semester when a student is suspended from the Institute on disciplinary grounds will not be counted towards the number of registered semesters.

(iv) A semester in which a student is allowed by the Institute to undergo semester - long internship will be counted as a registered semester.

The summer semesters shall normally be available for earning credits. However, after the student has registered for the maximum permissible number of registered semesters, the subsequent summer semesters will not be available for earning credits.

(b) The minimum and maximum permissible number of registered semesters for completing all degree requirements are defined in Table 4.

Table 4: Minimum and Maximum permissible duration for completing degree requirements.

Programme Name	Minimum Number of Registered Semesters	Maximum Number of Registered Semesters Permitted for Completing Degree Requirements
B.Tech.	8	12*
B.Des.	8	12*
Dual Degree	10	14*
*If a student opts for the slow-paced programme, then the maximum permissible number of registered semesters shall be increased by two semesters.		

1.5 Absence During the Semester

(a) A student must inform the Dean, Academics immediately of any instance of continuous absence from classes.

(b) A student who is absent due to illness or any other emergency, up to a maximum of two weeks, should approach the course coordinator for make-up quizzes, assignments and laboratory work.

(c) A student who has been absent from a minor test due to illness should approach the course coordinator for a make-up test immediately on return to class. The request should be supported with a medical certificate from Institute's medical officer. A certificate from a registered medical practitioner will also be acceptable for a student normally residing off-campus provided registration number of the medical practitioner appears explicitly on the certificate.

(d) In case a student misses a minor test on the same day on which he/she has appeared in another test, a medical certificate from the institute's medical must be submitted.

(e) In case of absence on medical grounds or other special circumstances, before or during the major examination period, the student can apply for 'I' grade. At least 75% attendance in a course is necessary for being eligible for request of I-grade in that course. An application requesting I-grade should be made at the earliest but not

later than the last day of major tests. An online application should be made by the student. On submission of a medical certificate / Dean's permission, the Academic Section verifies the certificate and forwards the request to the concerned course coordinator. The course coordinator verifies the attendance requirement and forwards the application to the Head of the Department / Centre / School of the student's programme. Head's approval is contingent upon the satisfaction of attendance requirement. On approval, an 'I' grade is awarded to the student. All evaluation requirements for students with 'I' grade should be completed before the end of the first week of the next semester. Upon completion of all course requirements, the 'I' grade is converted to a regular grade (A to F, NP or NF).

(f) In case the period of absence on medical grounds is more than 20 working days during the semester, a student may apply for withdrawal from the semester, i.e. withdrawal from all courses registered that semester. Such application must be made as early as possible and latest before the start of the major tests. No applications for semester withdrawal will be considered after the major tests have commenced. Dean, Academics, depending on the merit of the case, will approve such applications. Partial withdrawal from courses registered in a semester is not allowed.

(g) If a student is continuously absent from the institute for more than four weeks without notifying the Dean Academics, his/her name will be removed from institute rolls.

1.6 Conditions for Continuation of Registration, Termination/Re-start, Probation and Warning

During the first two registered semesters of an undergraduate(B.Tech./Dual Degree) programme, a student is registered for a total of 34 credits, besides non-graded units. By the end of the first two registered semesters, not including summer, a student is expected to earn a minimum number of credits (excluding non-graded units) as specified in Table 5, in order to continue registration. If a student does not meet this criterion, his/her performance is classified as "Poor Performance", and he / she may opt to start the programme afresh, or else his/her registration will be terminated. This option to re-start the programme is available to a student only once.

Table 5: Criteria for continuation at the end of second registered semester

Description	Earned Credits (excluding non-graded units)		Decision
	GE / OBC / EWS	SC / ST / PD / PwD	
Minimum for Continuation	23	19	Continuation of registration
Poor Performance	≤ 22	≤ 18	Restart (Once only) / Termination of registration

(a) If a student chooses to restart after the first two registered semesters, then his/her credits earned and semesters registered will not be carried over. The re-start will be indicated on the transcript. The re-start will be permitted only once. If at the end of two registered semesters after re-start, the earned credits are less than or equal to 22 for GE / OBC or less than or equal to 18 for SC / ST / PD students, then the registration will be terminated.

(b) Each student is expected to earn at least 12 credits in each registered semester with an SGPA greater than or equal to 5.0. If the performance of a student at the end of any registered semester is below this minimum acceptable level, then he / she will be placed on probation, a warning shall be given to him / her and intimation sent to the parents.

(c) A student placed on probation shall be monitored, including mandatory attendance in classes, special tutorials and mentoring. Mentoring would comprise structured guidance under a senior / postgraduate student.

(d) If the performance of a student on probation does not meet the criterion in item (b) in the following registered semester, then the student would face termination, and will be permitted to register by the Dean, Academics only if the department makes a favourable recommendation. The Head of the Department's recommendation shall be prepared after consultation with the student, and should include (i) feasibility of completing the programme requirements, and (ii) identification of remedial measures for the problems leading to poor performance.

(e) A student on probation can register upto 18 credits in a semester. This can be relaxed in 8^{th}/10^{th} or later registered semester for B.Tech. / Dual Degree students, respectively.

Slow-paced Programme

(a) If a student has earned the minimum credits specified in Table 5 for continuation but has less than 28 Earned Credits at the end of the first two registered semesters, he/she will be eligible to opt for the slow-paced programme. A student opting for such a programme shall be permitted two additional registered semesters for completing degree requirements as indicated in Table 4.

(b) In the slow paced programme, the upper limit for credits registered in a semester will be 18. A student in this programme is expected to earn at least 9 credits with minimum SGPA of 5.0 in any semester, falling which he/she will be issued a warning and placed on probation.

A student placed on probation would be monitored, including mandatory attendance in special tutorials and mentoring.

If the performance of a student on probation does not meet the above criterion in the following registered semester, then the student would face termination and will be permitted to register by the Dean Academics only if the department makes a favourable recommendation. The Head of the Department's recommendation shall be prepared after consultation with the student, and should include (i) feasibility of completing the programme, and (ii) identification of remedial measures for the problems leading to poor performance.

(c) The semester-wise schedule of the slow-paced programme shall be defined by the respective department for each student.

1.7 Scheme for Academic Advising of Undergraduate Students

Advising Scheme for Regular Students

(a) There is a class committee for each entry year of all programmes. The class committee is responsible for providing consistent and uniform academic advice to the entire batch of students.

(b) Class committee shall consist of a Chairperson, at least two faculty members of the department (one of them will function as Convenor of the class committee) and elected student representatives (as per CAIC constitution) including a student coordinator. All student coordinators of courses intended for the batch in a given semester and special advisors of academically weak students will be permanent invitees to the class committee. The faculty members in the class committee would be referred to as Faculty Mentors for the batch.

(c) A Chairperson appointed for each entry year of students by the Head of the Department shall be associated with the batch till it graduates and will provide basic guidance for formulating course plan and electives for the students of the batch.

(d) The Convenor of a class committee will be appointed in a year-specific fashion: for example, the Convenor of the second year class committee would continue in the same position for 3 years, serving consecutive batches.

(e) Students can approach any class committee member for academic advice before registration. In other words, all the three members of the class committee will have the functional role of mentor and local guardian for all the students. In case of need for any exception and relaxation in rules or regulations pertaining to registration of courses, the class committee Convenor will recommend and forward the request.

(f) The faculty members of the committee in consultation with the elected representatives of the students will provide academic advice applicable to all the students in general. The class committee is also expected to discharge following responsibilities:

(i) Considering mid-semester feed-back about courses running in the current semester.

(ii) Identifying electives for the subsequent semester.

(iii) Addressing issues related to scheduling and categorization of courses.

(iv) Organizing STIC events for the batch.

(g) The Class Committee Convenor with the support of student coordinator will organize at least one Student-Teacher Interaction Committee (STIC) event in each semester for interaction between class committee members and all the students of the batch.

(h) The Chairman, Convenor and the other faculty members of first year class committee would be identified by the department prior to the orientation of new students. During orientation, students and their parents will be introduced to these class committee members.

Advising Scheme for Academically Weak Students

(a) The students on probation in each batch will be put under a special advisor, identified by the department, who is expected to monitor the students on probation in a personalized manner. Normally, not more than 5-8 students would be assigned to a special advisor. Heads of Departments will appoint special advisors at the beginning of an academic session.

(b) A meeting of the special advisors with Dean, Academics would be held at the beginning of each semester for coordination of the advising process.

(c) A student on probation is expected to be in close contact with the advisor by meeting him/her at least once every 3 weeks for the entire period during which the student continues to remain in probation. Special advisors will be invitees to the class committee meetings.

(d) Special advisor in consultation with the parents and student counsellor, if required, will make a student-specific academic plan. The special advisor is expected to:

- Closely interact with the weak student and his/her parents
- Formulate individualized academic plan
- Manage and track counselling process of the student, if any, in coordination with the Associate Dean, Student Welfare.
- Approve their registration
- Manage the recommendation/appeal for termination/continuation process in consultation with Head of the Department and Dean, Academics.

(e) At the time of registration for a semester, the student meets his/her advisor if possible with parents, to:

- Identify specific problems and ways to mitigate the same
- Formulate academic plan and target(s) for the semester
- Help Head of the Department in the processing of the student's appeal against termination, if applicable
- Approve the registration of the student online.

(f) The student being placed under probation for the first time may also meet the counsellor during this period, if needed. The counsellor can provide professional help in identifying to resolving problems. Counsellors' input will be available to the special advisor. During the add-drop period, the student, preferably along with his/her parents, should come and meet the Counsellor.

(g) While considering any appeal from an academically weak student for continuation of his registration, the Dean, Academics would consider the following:

(i) whether he/she has met his/her Advisor and Counsellor at the scheduled times on a regular basis and

(ii) whether he/she is regular in help sessions.

Registration of a student under probation will not be approved for the next semester if he/she does not comply with the process of meeting the advisor and counsellor. He/she will then be required to withdraw from the semester.

(h) A student on probation will not be permitted to contest for any position of responsibility. However, he/she will be permitted to participate in extra-curricular activities in a restricted fashion only on specific recommendation of his/her advisor.

An Institute level committee known as the Welfare Committee would monitor the entire operation of academic advising for weak students. Functions of the Welfare committee include monitoring the performance of weak students and making the final recommendations regarding termination/ continuation, restarting first year and slow-paced programme requests. This committee would also evaluate the weak students based on the feed-back regarding

(i) regularity in meeting the advisor and/or counsellor

(ii) student's attendance in help sessions and

(iii) academic performance.

A summary of the weak student's performance would be made available to the class committee members, Head of the student's Department as well as Course Coordinators of the courses in which the student is currently registered.

Student Mentors

(a) Each student will be assigned a student mentor from the same hostel and preferably from the same discipline to mentor students on academic and extra-curricular activities and provide feed-back to the advisor and counselor in case of weak students.

(b) There are individual incentives for good student mentors. Also, hostels performing well on mentoring benefit in terms of points towards BSW trophy.

1.8 Capability Linked Opportunities for Undergraduate (B.Tech./Dual Degree) Students

A student registering for 24 credits in each semester after first year and 26 in two semesters can complete a maximum of 182 credits. Since the graduation requirement for 4-year B.Tech. programmes varies between 148-158 Earned Credits, it will be feasible for capable students to add value to their degrees by registering for additional courses of their choice.

Students can make use of these additional credits in two blocks of 20 credits to opt for:

(a) Minor/Interdisciplinary Area Specialization

(b) Departmental Specialization

A student based on his/her performance and interest can choose either one on both. Successful completion of minor area credits and/or departmental Specialization will be indicated on the degree.

When a student opts for a departmental specialization and/or a minor area, he/she can use 10 open category credits (mandatory degree requirement) towards departmental specialization and/or minor area requirements. For example, a student registered for B.Tech. (Chemical Engineering) and opting for minor area in Computer Science and Engineering, can opt for courses prescribed for minor area in Computer Science and Engineering, as part of mandatory 10 credits requirements under OC. He/she will need to do additional 10 credits in the minor area to be eligible for Minor area specialization in the degree.

A student may not opt for either of the two but can do additional credits through open choice of courses. In case a student cannot meet requirements of a minor area or departmental Specialization, additional credits earned by the student over and above his/her degree requirement will be used for DGPA calculation and will be indicated on his/her transcript.

A set of pre-defined courses of total 20 credits in a focus area comprises a Departmental Specialization if the courses belong to the parent Department of an undergraduate programme, or a Minor/Interdisciplinary Area Specialization if the courses belong to a different Department/Centre/School. Additional conditions and details of individual specializations are given in UG Rules, Section 3.

If any course of a Minor/Interdisciplinary area overlaps with any core course (DC or PC category courses) or elective course (DE or PE category courses) of the student's programme, then credits from this course will not count towards the minor area credit requirements, though this course may contribute towards satisfying the requirement of the Minor/Interdisciplinary area. In such a case, the requirement of 20 credits must be completed by taking other courses of the specialization.

The maximum number of credits per semester may be relaxed upto 28 by Dean, Acaemics for those students who apply for capability-linked option through proper channel.

1.9 Change of Programme at the End of the First Year

(a) An undergraduate (B.Tech./Dual Degree) student is eligible to apply for change of branch at the end of the first year only, provided he/she satisfies the following criteria:

(i)	CGPA for General and OBC category students	:	>8.00
(ii)	CGPA for SC/ST and Person with Disability category students	:	>7.00
(iii)	Earned credits/non-graded units at the end of the second semester of the first year	:	All credits of core and non-graded units of the first year

(iv) Optionally, one first year course would be identified by each programme, in which the grade of the applicant is equal to or above B. A list of such courses identified for various programmes is given in Table 6.

(b) The student should have no disciplinary action against him/her.

(c) Change of the branch will be permitted strictly in the order of merit, in each category, as determined by CGPA

at the end of first year, subject to the limitation that the actual number of students in the third semester in the branch to which transfer is to be made should not exceed its sanctioned strength by more than 15% and the strength of the branch from which transfer is being sought does not fall below 85% of its sanctioned strength.

(d) In case more than one student applying for programme change have the same CGPA, the tie shall be resolved on the basis of JEE ranks of such applicants.

(e) The conditions mentioned in item (a) above will not be insisted upon for change to a branch in which a vacancy exists with reference to the sanctioned strengths, and the concerned student was eligible as per JEE Rank for admission to that branch at the time of entry to IIT Delhi. However, these conditions will continue to apply in case of students seeking change to a branch to which the concerned student was not eligible for admission at the time of entry to IIT Delhi.

Table 6: Qualifying criterion as per a (iv) for change of branch

S. No.	Programme Code and Name of the Programme to which change is sought		Specified Course in which a minimum of B grade is required
1	AM1	B.Tech. in Engg. and Computational Mechanics	APL100: Engineering Mechanics
2	BB1	B.Tech. in Biochemical Engg. and Biotechnology	CML101: Introduction to Chemistry
3	CH1	B.Tech in Chemical Engineering	MTL101: Linear Algebra and Differential Equations
4	CH7	B.Tech. and M.Tech in Chemical Engineering	MTL101: Linear Algebra and Differential Equations
5	CE1	B.Tech in Civil Engineering	APL100: Engineering Mechanics
6	CS1	B.Tech. in Computer Science and Engineering	COL100: Introduction to Computer Science
7	CS5	B.Tech. and M.Tech in Computer Science and Engg.	COL100: Introduction to Computer Science
8	EE1	B.Tech. in Electrical Engineering	None
9	EE3	B.Tech. in Electrical Engg. (Power and Automation)	None
10	ES1	B.Tech. in Energy Science & Engineering	To be decided
11	MS1	Materials Science and Engineering	APL100: Engineering Mechanics
12	MT1	B.Tech. in Mathematics and Computing	MTL100: Calculus
13	MT6	B.Tech. and M.Tech. in Mathematics and Computing	MTL100: Calculus
14	ME1	B.Tech. in Mechanical Engineering	None
15	ME2	B.Tech. in Production and Industrial Engineering	None
16	PH1	B.Tech. in Engineering Physics	PYL101: Electromagnetism & Quantum Mechanics
17	TT1	B.Tech. in Textile Technology	APL100: Engineering Mechanics

1.10 Self-study Course

A self-study course will be from the regular UG (B.Tech./Dual Degree) courses listed in this document (Course description). The main features of a self-study course are as follows:

(a) A student may be given a self-study course not exceeding 5 credits in the final semester if he/she is short by a maximum of 5 earned credits required for graduation and provided that the course is not running in that semester as a regular course. Students in the Dual-Degree programmes are allowed to avail of this provision during their last semester. However, they would be permitted to take only a UG course as a possible self-study course. A student can make use of this provision only once during the programme.

(b) A student may also be permitted to do a U.G. core course not exceeding 5 credits in self-study mode at most

once during the program, provided he/she has failed in it earlier and the course is not being offered as a regular course during that semester.

(c) Students should apply for a self-study course with appropriate recommendation of a Course Coordinator and the Head of the Department of the student's programme. The final sanction of a self-study course to a student is made by the Dean, Academics.

(d) Normally, no formal lectures will be held for a self-study course but laboratory, design and computation exercises will be conducted if they form an integral part of the course.

(e) The Course Coordinator will hold minor and major tests besides other tests/quizzes for giving his/her assessment at the end of the semester. In summer semester, there will be at least one mid semester test and a major test.

(f) The self-study course will run during the total duration of a given semester (Semester I, Semester II, or the summer semester).

1.11 Assistantship for Dual-Degree Programmes

The students of dual-degree programmes will be considered for award of institute research/ teaching assistantship if they have earned 135 credits. Only those students who have either qualified GATE or have a CGPA more than 8.0 will be eligible for this assistantship. The assistantship will be provided for a maximum period of 14 months beginning from the summer semester following eighth semester, provided the student is registered for M.Tech. Major Project in that semester. A student availing assistantship will be required to provide 8 hours of assistance per week besides his/her normal academic work. For continuation of assistantship a student will need to secure SGPA of 7.0 for Ge/OBC and 6.75 for SC/ST. A student will be eligible to receive assistantship from sources other than institute fund or MHRD if he/she has a CGPA of 7.0 and has earned 135 credits.

A student receiving assistantship will be eligible for total of 30 days leave during the 14-month period. He/she will not be entitled to mid-semester breaks, winter and summer vacations.

1.12 Admission of UG Students to PG Programmes

Undergraduate (B.Tech./Dual Degree) students of the Institute are eligible for admission to PG programmes at IIT Delhi. For admission to PG programme the minimum CGPA required at the end of sixth semester shall be 7.5. The student will be awarded both the degrees - B.Tech. and the PG degree on successful completion of the degree requirements of both the programmes with provision for waiver of a maximum of 10 credits.

1.13 Measures for helping SC/ST Students

A number of measures exist for helping students belonging to SC and ST categories. A senior faculty member is appointed as adviser to SC/ST students for advising them on academic and non-academic matters. Financial measures for helping SC/ST students are described in the Prospectus.

1.14 Measures for helping Students with Disabilities

To establish a complete accessible system to help the students with special need, (Office of Accessible Education) has been set-up recently. It is supporting the students with assistive devices and technical training programme. It is also conducting workshops for disability awareness in the campus.

2. UNDERGRADUATE PROGRAMME STRUCTURES

Programme Code: **AM1**

Bachelor of Technology in Engineering and Computational Mechanics

Department of Applied Mechanics

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	12.5
Departmental Courses	
Departmental Core	65.5
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**158**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MTL107	Numerical Methods and Computations	3	0	0	3
COL106	Data Structures and Algorithms	3	0	4	5
ELL201	Digital Electronics	3	0	3	4.5
	Total Credits				***12.5***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category **15**

Departmental Core

APL101	Applied Mathematics for Engineers	3	0	0	3
MLL100	Introduction to Material Science and Engg.	3	0	2	4
APL103	Experimental Methods	3	0	2	4
APL104	Solid Mechanics	3	1	0	4
APL106	Fluid Mechanics	3	1	0	4
APL203	Dynamics of Mechanical Systems	3	1	0	4
APL205	Basics of Computer Aided Design	2	0	0	2
APL206	Engineering Thermodynamics	2	0	0	2
APL207	Heat Transfer	2	0	0	2
AMP262	Solid & Fluids Lab	0	0	4	2
APL302	Basics of Product Design	3	0	2	4
APL311	Introduction to Finite Element Method	3	0	2	4
APL321	Introduction to Computational Fluid Dynamics	3	0	2	4
APL331	Advanced Mechanics of Solids	3	0	0	3
APL361	Advanced Fluid Dynamics	3	0	0	3
APL380	Bio-mechanics	3	0	0	3
APL390	Experimental Techniques in Fluids and Solids	2	0	3	3.5
APL405	Machine Learning in Mechanics	2	0	2	3
APL410	Multi-Scale Modeling and Computation	3	0	0	3
APD411	B.Tech. Project-I	0	0	8	4
	Total Credits				***65.5***

Departmental Electives

APV303	Mechanics of Cricket	1	0	0	1
APL306	Vibration	3	0	0	3
APL340	Chaos	3	1	0	4
APL402	Fluid Structure Interaction	3	0	0	3
APL411	Application of Finite Element Methods	2	0	2	3
APD412	B.Tech. Project-II	0	0	12	6
APL412	Computational Multibody Dynamics	3	0	0	3
APL415	Composite Mechanics and Structures	3	0	0	3
APL421	Application of CFD	2	0	2	3
APL422	Advanced Computational Fluid Dynamics	2	0	2	3
APL424	Introduction to Hydrodynamics Stability	3	0	0	3
APL431	Aircraft Structures	3	0	0	3
APL432	Aero-Elasticity	3	0	0	3
APL433	Introduction to Plates and Shells	3	0	0	3
APL434	Smart Material and Structures	3	0	0	3
APL435	Impact Mechanics and Crash Worthiness	3	0	0	3
APL440	Parallel Processing in Computational Mechanics	3	0	2	4
APL450	Introduction to Soft Robotics	3	0	0	3
APL452	Introduction to Digital Twins	2	0	2	3
APL491	Reliability Engineering	3	0	0	3
APL701	Continuum Mechanics	3	0	0	3
APL713	Turbulence and its Modeling	3	0	0	3
APL715	Physics of Turbulent Flow	3	0	0	3
APL736	Multiscale Modeling of Crystalline Materials	3	0	2	4
ALP737	Advanced Design of Machine Elements	3	0	0	3
APL740	Mechanics of Biological Cells	3	0	2	3
APL742	Advanced Bio-Mechanics	3	0	0	3
APL744	Probabilistic Machine Learning for Mechanics	3	0	2	4
APL745	Deep Learning for Mechanics	3	0	2	4
APL747	Uncertainty Quantification and Propagation	3	0	0	3
APL764	Biomaterials	3	0	0	3
APL765	Fracture Mechanics	3	0	0	3
APL771	Design Optimization and Design Theory	3	0	0	3
APL787	Fatigue Failure and Design	3	0	0	3
ELL715	Digital Image Processing	3	0	0	3
ELL794	Human Computer Interface	3	0	0	3
APL805	Advanced Finite Element Methods	3	0	0	3

Suggested Courses under Open Elective Courses

COL216	Computer Architecture	3	0	2	4
COL334	Computer Networks	3	0	2	4
COL341	Fundamentals of Machine Learning	3	0	2	4
COL333	Principles of Artificial Intelligence	3	0	2	4
COL362	Introduction to Database Mgmt. System	3	0	2	4
MTL180	Discrete Mathematical Structures	3	1	0	4
MTL290	Computing Laboratory	0	0	4	2
MTL342	Analysis and Design of Algorithms	3	1	0	4
MTL458	Operating Systems	3	0	2	4
MTL415	Parallel Algorithms	3	0	0	3

B.Tech. in Engineering and Computational Mechanics

AM1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	0.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MLL100**	**APL106**	**APL104**	**APL101**	**SBL100**	**HUL**										
	Introduction to Materials Science and Engineering	Fluid Mechanics	Solid Mechanics	Applied Mathematics for Engineers	Introduction to Biology for Engineers											
	3 0 2 4	3 1 0 4	3 1 0 4	3 0 0 3	3 0 2 4	3 1 0 4					18	3	4	23.0	0	25.0
IV	**APL103**	**COL106**	**MTL107**	**ELL201**	**CVL100**	**APL206**										
	Experimental Methods	Data Structures and Algorithms	Numerical Methods and Computations	Digital Electronics	Environmental Science	Engineering Thermodynamics										
	3 0 2 4	3 0 4 5	3 0 0 3	3 0 3 4.5	2 0 0 2	2 0 0 2					16	0	9	20.5	0	25.0
V	**APL203**	**APL205**	**AMP262**	**APL302**	**APL380**	**HUL**	**APL207**									
	Dynamics of Mechanical System	Basics of Computer Aided Design	Fluids and Solids Laboratory	Basics of Product Design	Bio-mechanics		Heat Transfer									
	3 1 0 4	2 0 0 2	0 0 4 2	3 0 2 4	3 0 0 3	3 1 0 4	2 0 0 2				16	2	6	21.0	0	24.0
VI	**APL331**	**APL321**	**APL311**	**OC1**	**APL405**	**HUL**										
	Advanced Mechanics of Solids	Intro. to Computational Fluid Dynamics	Introduction to Finite Element Methods		Machine Learning in Mechanics											
	3 0 0 3	3 0 2 4	3 0 2 4	3 0 0 3	2 0 2 3	3 1 0 4					17	1	6	21	0	24.0
VII	**DE 1**	**APL410**	**APL361**	**APL 390**	**DE2**	**HUL**	**APD411**									
		Multi-scale Modeling and Computation	Advanced Fluid Dynamics	Advanced Experiments in Solids & Fluids			B.Tech. Project-I									
	3 0 0 3	3 0 0 3	3 0 0 3	2 0 3 3.5	3 0 0 3	3 0 0 3	0 0 8 4				17	0	11	22.5	0	28.0
VIII	**DE3**	**DE4**	**OC3**	**OC4**	**OC2**											
	3 0 0 3	3 0 0 3	2 0 0 2	2 0 0 2	3 0 0 3						13	0	0	13.0	0	13.0

Total = 158.0

Programme Code: **BB1**

Bachelor of Technology in Biochemical Engineering and Biotechnology

Department of Biochemical Engineering and Biotechnology

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	11
Departmental Courses	
Departmental Core	69
Departmental Electives	10
Open Category Courses	10
Total Graded Credit requirement	**158**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
CLL110	Transport Phenomena	3	1	0	4
MTL102	Differential Equations	3	0	0	3
	Total Credits				***11***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category **15**

Departmental Core

BBL131	Principles of Biochemistry	3	0	3	4.5
BBL132	General Microbiology	3	0	3	4.5
BBL133	Mass and Energy Balances in Biochemical Engineering	3	0	0	3
BBL231	Molecular Biology and Genetics	3	0	3	4.5
BBL331	Bioprocess Engineering	3	0	0	3
BBP332	Bioprocess Engineering Laboratory	0	0	3	1.5
BBL431	Bioprocess Technology	2	0	0	2
BBL432	Fluid Solid Systems	2	0	0	2
BBL433	Enzyme Science and Engineering	3	0	2	4
BBL434	Bioinformatics	2	0	2	3
BBD451	Major Project Part-I (BB1)	0	0	6	3
BBL731	Bioseparation Engineering	3	0	3	4.5
BBL732	Bioprocess Plant Design	3	0	2	4
BBL733	Recombinant DNA Technology	2	0	3	3.5
CLL122	Chemical Reaction Engineering-I	3	1	0	4
CLL231	Fluid Mechanics for Chemical Engineers	3	1	0	4
CLL251	Heat Transfer for Chemical Engineers	3	1	0	4
CLL252	Mass Transfer-I	3	0	0	3
CLL261	Process Dynamics and Control	3	1	0	4
CLP301	Chemical Engineering Laboratory-I	0	0	3	1.5
CLP302	Chemical Engineering Laboratory-II	0	0	3	1.5
	Total Credits				***69***

Departmental Electives

BBL341	Environmental Biotechnology	3	0	0	3
BBL342	Physical and Chemical Properties of Biomolecules	2	1	0	3
BBL343	Carbohydrates and Lipids in Biotechnology	2	1	0	3
BBV350	Special Module in Biochemical Engineering and Biotechnology	1	0	0	1
BBD351	Mini Project (BB)	0	0	6	3
BBL441	Food Science and Engineering	3	0	0	3
BBL442	Immunology	3	0	2	4
BBL443	Modeling and Simulation of Bioprocesses	3	0	2	4
BBL444	Advanced Bioprocess Control	3	0	0	3
BBL445	Membrane Applications in Bioprocessing	3	0	0	3
BBL446	Biophysics	3	0	0	3
BBL447	Enzyme Catalyzed Organic Synthesis	2	0	2	3
BBD452	Major Project Part-II (BB1)	0	0	16	8
CLL477	Materials of Construction	3	0	0	3
BBL734	Metabolic Regulation and Engineering	3	0	0	3
BBL735	Genomics and Proteomics	2	0	2	3
BBL736	Dynamics of Microbial Systems	3	0	0	3
BBL737	Instrumentation and Analytical Methods in Bioengineering	2	0	2	3
BBL740	Plant Cell Technology	3	0	2	4
BBL741	Protein Science and Engineering	3	0	0	3
BBL742	Biological Waste Treatment	3	0	2	4
BBL743	High Resolution Methods in Biotechnology	2	0	2	3
BBL744	Animal Cell Technology	3	0	2	4
BBL745	Combinatorial Biotechnology	3	0	0	3
BBL746	Current Topics in Biochemical Engineering and Biotechnology	3	0	0	3
BBL747	Bionanotechnology	3	0	0	3
BBL748	Data Analysis for DNA Microarrays	3	0	2	4
BBL749	Cancer Cell Biology	3	0	3	4.5
BBL750	Genome Engineering	2	0	2	3
BBL751	Biotechnology Entrepreneurship	2	0	0	2
BBL752	Microbial Ecology	3	0	0	3
BBL754	Optics within Life Science	3	0	0	3
BBL756	Plasmid Biology	3	0	0	3
BBL757	Electromicrobiology and Bioelectrochemical Systems	3	0	0	3
CLL728	Biomass Conversion and Utilization	3	0	0	3

B.Tech. in Biochemical Engineering and Biotechnology

BB1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MLL100**	**CLL110**	**SBL100**	**BBL131**	**BBL132**	**BBL133**										
	Introduction to Materials Science and Engineering	Transport Phenomena	Introductory Biology for Engineers	Principles of Biochemistry	General Microbiology	Mass and Energy Balances in Biochemical Engg.										
	3 0 2 4	3 1 0 4	3 0 2 4	3 0 3 4.5	3 0 3 4.5	3 0 0 3					18	1	10	24.0	0	29.0
IV	**CLL251**	**CLL122**	**CLL231**	**CVL100**	**MTL102**	**HUL2XX**										
	Heat Transfer for Chemical Engineers	Chemical Reaction Engineering-I	Fluid Mechanics for Chemical Engineers	Environmental Science	Differential Equations	Humanities Elective-1										
	3 1 0 4	3 1 0 4	3 1 0 4	2 0 0 2	3 0 0 3	3 1 0 4	2 0 0 2				17	4	0	21.0	0	26.0
V	**BBL231**	**CLL252**	**CLL261**	**CLP301**	**BBP332**	**BBL331**	**HUL2XX**									
	Molecular Biology and Genetics	Mass Transfer-I	Process Dynamics and Control	Chemical Engineering Laboratory-I	Bioprocess Engineering Laboratory	Bioprocess Engineering	Humanities Elective-2									
	3 0 3 4.5	3 0 0 3	3 1 0 4	0 0 3 1.5	0 0 3 1.5	3 0 0 3	3 1 0 4				15	2	9	21.5	0	26.0
VI	**CLP302**	**HUL2XX**	**BBL432**	**BBL434**	**BBL433**	**BBL431**										
	Chemical Engineering Laboratory-II	Humanities Elective-3	Fluid Solid Systems	Bioinformatics	Enzyme Science and Engineering	Bioprocess Technology										
	0 0 3 1.5	3 1 0 4	2 0 0 2	2 0 2 3	3 0 2 4	2 0 0 2					12	1	7	16.5	0	20.0
VII	**HUL3XX**	**OC1 (4)**	**BED451**	**BBL731**	**BBL732**	**BBL733**										
	Humanities Elective-4		B.Tech. Project	Bioseparation Engineering	Bioprocess Plant Design	Recombinant DNA Technology										
	3 0 0 3	3 0 2 4	0 0 6 3	3 0 3 4.5	3 0 2 4	2 0 3 3.5					14	0	16	22.0	0	30.0
VIII	**DE1 (4)**	**DE2 (3)**	**DE3 (3)**	**OC2 (3)**	**OC3 (3)**											
	3 0 2 4	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3						15	0	2	16.0	0	17.0

Total = 158.0

Bachelor of Technology in Chemical Engineering

Department of Chemical Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	7
Departmental Courses	
Departmental Core	67
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**154**
Non Graded Units	**11**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
CML103	Applied Chemistry - Chemistry at Interfaces	3	0	0	3
	Total Credits				***7***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category **15**

Departmental Core

CLL110	Transport Phenomena	3	1	0	4
CLL111	Material and Energy Balances	2	2	0	4
CLL113	Numerical Methods in Chemical Engineering	3	0	2	4
CLL121	Chemical Engineering Thermodynamics	3	1	0	4
CLL122	Chemical Reaction Engineering-I	3	1	0	4
CLL141	Intro. to Materials for Chemical Engineers	3	0	0	3
CLL222	Chemical Reaction Engineering-II	3	0	0	3
CLL231	Fluid Mechanics for Chemical Engineers	3	1	0	4
CLL251	Heat Transfer for Chemical Engineers	3	1	0	4
CLL252	Mass Transfer-I	3	0	0	3
CLL261	Process Dynamics and Control	3	1	0	4
CLL271	Introduction to Industrial Biotechnology	3	0	0	3
CLP301	Chemical Engineering Laboratory-I	0	0	3	1.5
CLP302	Chemical Engineering Laboratory-II	0	0	3	1.5
CLP303	Chemical Engineering Laboratory-III	0	0	3	1.5
CLL331	Fluid-Particle Mechanics	3	1	0	4
CLL352	Mass Transfer-II	3	1	0	4
CLL361	Instrumentation and Automation	1	0	3	2.5
CLL371	Chemical Process Technology and Economics	3	1	0	4
CLD411	B.Tech. Project	0	0	8	4
	Total Credits				***67***

Departmental Electives

CLL133	Powder Processing and Technology	3	0	0	3
CLL296	Nano-engineering of Soft Materials	3	0	0	3
CLL390	Process Utilities and Pipeline Design	3	0	0	3
CLL402	Process Plant Design	3	0	0	3
CLD412*	Major Project in Energy and Environment	0	0	10	5
CLD413*	Major Project in Complex Fluids	0	0	10	5
CLD414*	Major Project in Process Engineering, Modeling and Optimization	0	0	10	5
CLD415*	Major Project in Biopharmaceuticals and Fine Chemicals	0	0	10	5
CLL475	Safety and Hazards in Process Industries	3	0	0	3
CLL477	Materials of Construction	3	0	0	3
CLL704	Natural Gas Processing	3	0	0	3
CLL705	Petroleum Reservoir Engineering	3	0	0	3
CLL706	Petroleum Production Engineering	3	0	0	3
CLL707	Population Balance Modeling	3	0	0	3
CLL720	Principles of Electrochemical Engineering	3	0	0	3
CLL721	Electrochemical Methods	3	0	0	3
CLL722	Electrochemical Conversion and Storage Devices	3	0	0	3
CLL723	Hydrogen Energy and Fuel Cell Technology	3	0	0	3
CLL724	Environmental Engineering and Waste Mgmt.	3	0	0	3
CLL725	Air Pollution Control Engineering	3	0	0	3
CLL726	Molecular Modeling of Catalytic Reactions	3	0	0	3
CLL727	Heterogeneous Catalysis and Catalytic Reactors	3	0	0	3
CLL728	Biomass Conversion and Utilization	3	0	0	3
CLL729	Colloids and Aerosols	3	0	0	3
CLL730	Structure, Transport and Reactions in BioNano Systems	3	0	0	3
CLL731	Advanced Transport Phenomena	3	0	0	3
CLL732	Advanced Chemical Engineering Thermodynamics	3	0	0	3
CLL733	Industrial Multiphase Reactors	3	0	0	3
CLL734	Process Intensification and Novel Reactors	3	0	0	3
CLL735	Design of Multicomponent Separation Process	3	0	0	3
CLL736	Experimental Characterization of Multiphase Reactors	3	0	0	3
CLL742	Experimental Characterization of BioMacromolecules	3	0	0	3
CLL743	Petrochemicals Technology	3	0	0	3
CLL760	Crystal Engineering and Design	3	0	0	3
CLL761	Chemical Engineering Mathematics	3	0	0	3
CLL762	Advanced Computational Techniques in Chemical Engineering	2	0	2	3
CLL766	Interfacial Engineering	3	0	0	3
CLL767	Structures and Properties of Polymers	3	0	0	3
CLL768	Fundamentals of Computational Fluid Dynamics	2	0	2	3
CLL769	Applications of Computational Fluid Dynamics	2	0	2	3
CLL770	Introduction to Microfluidics and Microfabrication	3	0	0	3
CLL771	Introduction to Complex Fluids	3	0	0	3
CLL772	Transport Phenomena in Complex Fluids	3	0	0	3
CLL773	Thermodynamics of Complex Fluids	3	0	0	3
CLL774	Simulation Techniques for Complex Fluids	3	0	0	3
CLL775	Polymerization Process Modeling	3	0	0	3
CLL776	Granular Materials	3	0	0	3
CLL777	Complex Fluids Technology	3	0	0	3
CLL778	Interfacial Behaviour and Transport of Biomolecules	3	0	0	3
CLL779	Molecular Biotechnology and in-vitro Diagnostics	3	0	0	3
CLL780	Bioprocessing and Bioseparations	3	0	0	3
CLL781	Process Operations Scheduling	3	0	0	3
CLL782	Process Optimization	3	0	0	3
CLL783	Advanced Process Control	3	0	0	3
CLL784	Process Modeling and Simulation	3	0	0	3
CLL785	Evolutionary Optimization	3	0	0	3
CLL786	Fine Chemicals Technology	3	0	0	3
CLL787	Statistical Methods for Chemical Engineering	3	0	0	3
CLL788	Process Data Analytics	3	0	0	3
CLL789	Applied Time Series Analysis for Chemical Engg.	3	0	0	3
CLL791	Chemical Product and Process Integration	3	0	0	3
CLL792	Chemical Product Development and Commercialization	3	0	0	3
CLL793	Membrane Science and Engineering	3	0	0	3
CLL794	Petroleum Refinery Engineering	3	0	0	3
CLV796	Current Topics in Chemical Engineering	1	0	0	1
CLV797	Recent Advances in Chemical Engineering	2	0	0	2
CLL798	Selected Topics in Chemical Engineering-I	3	0	0	3
CLL799	Selected Topics in Chemical Engineering-II	3	0	0	3

**Student can take any one of these course.*

B.Tech. in Chemical Engineering

CH1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**CLL110**	**CLL111**	**CLL113**	**CML103**	**HUL2XX**											
	Transport Phenomena	Material and Energy Balances	Numerical Methods in Chemical Engineering	Applied Chemistry: Chemistry at Interfaces												
	3 1 0 4	2 2 0 4	3 0 2 4	3 0 0 3	3 1 0 4						14	4	2	19.0	0	20.0
IV	**CLL121**	**CLL122**	**CLL231**	**CLL251**	**SBL100**	**MLL100**										
	Chemical Engineering Thermodynamics	Chemical Reaction Engineering-I	Fluid Mechanics for Chemical Engineers	Heat Transfer for Chemical Engineers	Introductory Biology for Engineers	Introduction to Materials Science and Engineering										
	3 1 0 4	3 1 0 4	3 1 0 4	3 1 0 4	3 0 2 4	3 0 2 4					18	4	4	24.0	0	26.0
V	**CLL252**	**CLL222**	**CLL331**	**CLL141**	**CLL261**	**CVL100**	**CLP301**									
	Mass Transfer-I	Chemical Reaction Engineering-II	Fluid-Particle Mechanics	Introduction to Materials for Chemical Engineers	Process Dynamics and Control	Environmental Science	Chemical Engineering Laboratory-I									
	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 3	3 1 0 4	2 0 0 2	0 0 3 1.5				17	2	3	20.5	0	22.0
VI	**CLL352**	**DE 1**	**CLL271**	**CLL371**	**CLL361**	**HUL2XX**	**CLP302**									
	Mass Transfer-II		Introduction to Industrial Biotechnology	Chemical Process Technology and Economics	Instrumentation and Automation		Chemical Engineering Laboratory-II									
	3 1 0 4	3 0 0 3	3 0 0 3	3 1 0 4	1 0 3 2.5	3 1 0 4	0 0 3 1.5				16	3	6	22.5	0	25.0
VII	**DE 2**	**DE 3 / OC 1**	**OC 2**	**CLP303**	**CLD411**	**HUL2XX**										
				Chemical Engineering Laboratory-III	B.Tech. Project											
	3 0 0 3	3 0 0 3	3 1 0 4	0 0 3 1.5	0 0 8 4	3 1 0 4					12	2	11	19.5	0	25.0
VIII	**OC1 / DE 3**	**DE 4**	**OC 3**	**HUL3XX**												
	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3							12	0	0	12.0	0	12.0

Total = 154.0

Programme Code: **CH7**

Dual Degree Programme : Bachelor of Technology and Master of Technology in Chemical Engineering

Department of Chemical Engineering

The overall Credit Structure

Course Category	Credits
B.Tech. Part	
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	7
Departmental Courses	
Departmental Core	63
Departmental Electives	09
Open Category Courses	3
Total B.Tech. Credit Requirement	**140**
Non Graded Units	**11**
M.Tech. Part	
Programme Core Courses	33
Programme Elective Courses	12
Open Elective	3
Total M.Tech. Credit Requirement	**48**
Grand Total Credit Requirement	**188**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
CML103	Applied Chemistry - Chemistry at Interfaces	3	0	0	3
	Total Credits				***7***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category **15**

Departmental Core

CLL110	Transport Phenomena	3	1	0	4
CLL111	Material and Energy Balances	2	2	0	4
CLL113	Numerical Methods in Chemical Engineering	3	0	2	4
CLL121	Chemical Engineering Thermodynamics	3	1	0	4
CLL122	Chemical Reaction Engineering-I	3	1	0	4
CLL141	Introduction to Materials for Chemical Engineers	3	0	0	3
CLL222	Chemical Reaction Engineering-II	3	0	0	3
CLL231	Fluid Mechanics for Chemical Engineers	3	1	0	4
CLL251	Heat Transfer for Chemical Engineers	3	1	0	4
CLL252	Mass Transfer-I	3	0	0	3
CLL261	Process Dynamics and Control	3	1	0	4
CLL271	Introduction to Industrial Biotechnology	3	0	0	3
CLP301	Chemical Engineering Laboratory-I	0	0	3	1.5
CLP302	Chemical Engineering Laboratory-II	0	0	3	1.5
CLP303	Chemical Engineering Laboratory-III	0	0	3	1.5
CLL331	Fluid-Particle Mechanics	3	1	0	4
CLL352	Mass Transfer-II	3	1	0	4
CLL361	Instrumentation and Automation	1	0	3	2.5
CLL371	Chemical Process Technology and Economics	3	1	0	4
	Total Credits				***63***

Departmental Electives

CLL133	Powder Processing and Technology	3	0	0	3
CLL296	Nano-engineering of Soft Materials	3	0	0	3
CLL390	Process Utilities and Pipeline Design	3	0	0	3
CLL402	Process Plant Design	3	0	0	3
CLL475	Safety and Hazards in Process Industries	3	0	0	3
CLL477	Materials of Construction	3	0	0	3
CLL704	Natural Gas Processing	3	0	0	3
CLL705	Petroleum Reservoir Engineering	3	0	0	3
CLL706	Petroleum Production Engineering	3	0	0	3
CLL707	Population Balance Modeling	3	0	0	3
CLL720	Principles of Electrochemical Engineering	3	0	0	3
CLL721	Electrochemical Methods	3	0	0	3
CLL722	Electrochemical Conversion and Storage Devices	3	0	0	3
CLL723	Hydrogen Energy and Fuel Cell Technology	3	0	0	3
CLL724	Environmental Engineering and Waste Management	3	0	0	3
CLL725	Air Pollution Control Engineering	3	0	0	3
CLL726	Molecular Modeling of Catalytic Reactions	3	0	0	3
CLL727	Heterogeneous Catalysis and Catalytic Reactors	3	0	0	3
CLL728	Biomass Conversion and Utilization	3	0	0	3
CLL729	Colloids and Aerosols	3	0	0	3
CLL730	Structure, Transport and Reactions in BioNano Systems	3	0	0	3
CLL732	Advanced Chemical Engineering Thermodynamics	3	0	0	3
CLL734	Process Intensification and Novel Reactors	3	0	0	3
CLL735	Design of Multicomponent Separation Processes	3	0	0	3
CLL736	Experimental Characterization of Multiphase Reactors	3	0	0	3
CLL742	Experimental Characterization of BioMacromolecules	3	0	0	3
CLL743	Petrochemicals Technology	3	0	0	3
CLL760	Crystal Engineering and Design	3	0	0	3
CLL761	Chemical Engineering Mathematics	3	0	0	3
CLL762	Advanced Computational Techniques in Chemical Engineering	2	0	2	3
CLL766	Interfacial Engineering	3	0	0	3
CLL767	Structures and Properties of Polymers	3	0	0	3
CLL768	Fundamentals of Computational Fluid Dynamics	2	0	2	3
CLL769	Applications of Computational Fluid Dynamics	2	0	2	3
CLL770	Introduction to Microfluidics and Microfabrication	3	0	0	3
CLL771	Introduction to Complex Fluids	3	0	0	3
CLL772	Transport Phenomena in Complex Fluids	3	0	0	3
CLL773	Thermodynamics of Complex Fluids	3	0	0	3
CLL774	Simulation Techniques for Complex Fluids	3	0	0	3
CLL775	Polymerization Process Modeling	3	0	0	3
CLL776	Granular Materials	3	0	0	3
CLL777	Complex Fluids Technology	3	0	0	3
CLL778	Interfacial Behaviour and Transport of Biomolecules	3	0	0	3
CLL779	Molecular Biotechnology and in-vitro Diagnostics	3	0	0	3
CLL780	Bioprocessing and Bioseparations	3	0	0	3
CLL781	Process Operations Scheduling	3	0	0	3
CLL782	Process Optimization	3	0	0	3
CLL783	Advanced Process Control	3	0	0	3
CLL784	Process Modeling and Simulation	3	0	0	3
CLL785	Evolutionary Optimization	3	0	0	3
CLL786	Fine Chemicals Technology	3	0	0	3
CLL787	Statistical Methods for Chemical Engineering	3	0	0	3
CLL788	Process Data Analytics	3	0	0	3
CLL789	Applied Time Series Analysis for Chemical Engineering	3	0	0	3
CLL791	Chemical Product and Process Integration	3	0	0	3

CLL792	Chemical Product Development and Commercialization	3	0	0	3
CLL793	Membrane Science and Engineering	3	0	0	3
CLL794	Petroleum Refinery Engineering	3	0	0	3
CLV796	Current Topics in Chemical Engineering	1	0	0	1
CLV797	Recent Advances in Chemical Engineering	2	0	0	2
CLL798	Selected Topics in Chemical Engineering-I	3	0	0	3
CLL799	Selected Topics in Chemical Engineering-II	3	0	0	3

Program Core

CLL703	Process Engineering	3	0	0	3
CLL731	Advanced Transport Phenomena	3	0	0	3
CLL733	Industrial Multiphase Reactors	3	0	0	3
CLD880	Minor Project	0	0	8	4
CLD881	Major Project Part-I	0	0	16	8
CLD882	Major Project Part-II	0	0	24	12
	Total Credits				***33***

Program Electives

CLL704	Natural Gas Processing	3	0	0	3
CLL705	Petroleum Reservoir Engineering	3	0	0	3
CLL706	Petroleum Production Engineering	3	0	0	3
CLL707	Population Balance Modeling	3	0	0	3
CLL720	Principles of Electrochemical Engineering	3	0	0	3
CLL721	Electrochemical Methods	3	0	0	3
CLL722	Electrochemical Conversion and Storage Devices	3	0	0	3
CLL723	Hydrogen Energy and Fuel Cell Technology	3	0	0	3
CLL724	Environmental Engineering and Waste Management	3	0	0	3
CLL725	Air Pollution Control Engineering	3	0	0	3
CLL726	Molecular Modeling of Catalytic Reactions	3	0	0	3
CLL727	Heterogeneous Catalysis and Catalytic Reactors	3	0	0	3
CLL728	Biomass Conversion and Utilization	3	0	0	3
CLL729	Colloids and Aerosols	3	0	0	3
CLL730	Structure, Transport and Reactions in BioNano Systems	3	0	0	3
CLL732	Advanced Chemical Engineering Thermodynamics	3	0	0	3
CLL734	Process Intensification and Novel Reactors	3	0	0	3
CLL735	Design of Multicomponent Separation Processes	3	0	0	3
CLL736	Experimental Characterization of Multiphase Reactors	3	0	0	3
CLL742	Experimental Characterization of BioMacromolecules	3	0	0	3
CLL743	Petrochemicals Technology	3	0	0	3
CLL760	Crystal Engineering and Design	3	0	0	3
CLL761	Chemical Engineering Mathematics	3	0	0	3
CLL762	Advanced Computational Techniques in Chemical Engineering	2	0	2	3
CLL766	Interfacial Engineering	3	0	0	3
CLL767	Structures and Properties of Polymers	3	0	0	3
CLL768	Fundamentals of Computational Fluid Dynamics	2	0	2	3
CLL769	Applications of Computational Fluid Dynamics	2	0	2	3
CLL771	Introduction to Complex Fluids	3	0	0	3
CLL772	Transport Phenomena in Complex Fluids	3	0	0	3
CLL773	Thermodynamics of Complex Fluids	3	0	0	3
CLL774	Simulation Techniques for Complex Fluids	3	0	0	3
CLL775	Polymerization Process Modeling	3	0	0	3
CLL776	Granular Materials	3	0	0	3
CLL777	Complex Fluids Technology	3	0	0	3
CLL778	Interfacial Behaviour and Transport of Biomolecules	3	0	0	3
CLL779	Molecular Biotechnology and in-vitro Diagnostics	3	0	0	3
CLL780	Bioprocessing and Bioseparations	3	0	0	3
CLL781	Process Operations Scheduling	3	0	0	3
CLL782	Process Optimization	3	0	0	3
CLL783	Advanced Process Control	3	0	0	3
CLL784	Process Modeling and Simulation	3	0	0	3
CLL785	Evolutionary Optimization	3	0	0	3
CLL786	Fine Chemicals Technology	3	0	0	3
CLL787	Statistical Methods for Chemical Engineering	3	0	0	3
CLL788	Process Data Analytics	3	0	0	3
CLL789	Applied Time Series Analysis for Chemical Engineering	3	0	0	3
CLL791	Chemical Product and Process Integration	3	0	0	3
CLL792	Chemical Product Development and Commercialization	3	0	0	3
CLL793	Membrane Science and Engineering	3	0	0	3
CLL794	Petroleum Refinery Engineering	3	0	0	3
CLV796	Current Topics in Chemical Engineering	1	0	0	1
CLV797	Recent Advances in Chemical Engineering	2	0	0	2
CLL798	Selected Topics in Chemical Engineering-I	3	0	0	3
CLL799	Selected Topics in Chemical Engineering-II	3	0	0	3

Dual Degree Programme : B.Tech. and M.Tech. in Chemical Engineering

CH7

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**CLL110** Transport Phenomena 3 1 0 4	**CLL111** Material and Energy Balances 2 2 0 4	**CLL113** Numerical Methods in Chemical Engineering 3 0 2 4	**CML103** Applied Chemistry: Chemistry at Interfaces 3 0 0 3	**HUL2XX** 3 1 0 4						14	4	2	19.0	0	20.0
IV	**CLL121** Chemical Engineering Thermodynamics 3 1 0 4	**CLL122** Chemical Reaction Engineering-I 3 1 0 4	**CLL231** Fluid Mechanics for Chemical Engineers 3 1 0 4	**CLL251** Heat Transfer for Chemical Engineers 3 1 0 4	**SBL100** Introductory Biology for Engineers 3 0 2 4	**MLL100** Introduction to Materials Science and Engineering 3 0 2 4					18	4	4	24.0	0	26.0
V	**CLL252** Mass Transfer-I 3 0 0 3	**CLL222** Chemical Reaction Engineering-II 3 0 0 3	**CLL331** Fluid-Particle Mechanics 3 1 0 4	**CLL141** Introduction to Materials for Chemical Engineers 3 0 0 3	**CLL261** Process Dynamics and Control 3 1 0 4	**CVL100** Environmental Science 2 0 0 2	**CLP301** Chemical Engineering Laboratory-I 0 0 3 1.5				17	2	3	20.5	0	22.0
VI	**CLL352** Mass Transfer-II 3 1 0 4	**DE 1** 3 0 0 3	**CLL271** Introduction to Industrial Biotechnology 3 0 0 3	**CLL371** Chemical Process Technology and Economics 3 1 0 4	**CLL361** Instrumentation and Automation 1 0 3 2.5	**HUL2XX** 3 1 0 4	**CLP302** Chemical Engineering Laboratory-II 0 0 3 1.5				16	3	6	22.0	0	25.0
VII	**DE 2** 3 0 0 3	**PE 1** 3 0 0 3	**PE 2** 3 0 0 3	**CLP303** Chemical Engineering Laboratory-III 0 0 3 1.5	**CLL703** Process Engineering 3 0 0 3	**HUL2XX** 3 1 0 4	**OC 1** 3 0 0 3				18	1	3	20.5	0	22.0
VIII	**PE 3** 3 0 0 3	**DE 3** 3 0 0 3	**CLD880** Minor Project 0 0 8 4	**HUL3XX** 3 0 0 3	**CLL731** Advance Transport Phenomena 3 0 0 3	**CLL733** Industrial Multiphase Reactor 3 0 0 3					15	0	8	19.0	0	23.0
Summer																
IX	**CLD881** Major Project-I 0 0 16 8	**PE 4** 3 0 0 3	**OE 1** 3 0 0 3								6	0	16	14.0	0	22.0
X	**CLD882** Major Project-II 0 0 24 12										0	0	24	12.0	0	24.0

Total = 188.0

Bachelor of Technology in Civil Engineering

Department of Civil Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	10
Departmental Courses	
Departmental Core	66
Departmental Electives	14
Open Category Courses	10
Total Graded Credit requirement	**158**
Non Graded Units	**11**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

APL107	Mechanics of Fluids	3	1	2	5
APL108	Mechanics of Solids	3	1	2	5
	Total Credits				***10***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

CVL111	Elements of Surveying	3	0	2	4
CVL121	Engineering Geology	3	0	0	3
CVP121	Engineering Geology Lab	0	0	2	1
CVL141	Civil Engineering Materials	3	0	0	3
CVL212	Environmental Engineering	3	0	2	4
CVL222	Soil Mechanics	3	0	0	3
CVP222	Soil Mechanics Lab	0	0	2	1
CVL242	Structural Analysis-I	3	0	0	3
CVP242	Structural Analysis Lab	0	0	2	1
CVL243	RC Design	3	0	0	3
CVP243	Structures & Material (Concrete) Lab	0	0	3	1.5
CVL244	Construction Practices	2	0	0	2
CVL245	Construction Management	2	0	0	2
CVL261	Introduction to Transportation Engineering	3	0	0	3
CVP261	Transportation Engineering Lab	0	0	2	1
CVL281	Hydraulics	3	1	0	4
CVP281	Hydraulics Lab	0	0	2	1
CVL282	Engineering Hydrology	3	0	2	4
CVL321	Geotechnical Engineering	3	1	0	4
CVP321	Geotechnical Engineering Lab	0	0	2	1
CVL341	Structural Analysis-II	3	0	0	3
CVL342	Steel Design	3	0	0	3
CVP342	Structures & Material (Steel) Lab	0	0	2	1
CVL381	Design of Hydraulic Structures	3	0	2	4
CVD411	B.Tech. Project Part-I	0	0	8	4
CVP441	Structural Design & Detailing	0	0	3	1.5
	Total Credits				***66***

Departmental Electives

CVL284	Fundamentals of Geographic Information Systems	2	0	2	3
CVL311	Industrial Waste Management	3	0	0	3
CVL312	Environmental Assessment Methodologies	3	0	0	3
CVL313	Air and Noise Pollution	3	0	0	3
CVL344	Construction Project Management	3	0	0	3
CVL361	Introduction to Railway Engineering	3	0	0	3
CVL382	Groundwater	2	0	0	2
CVL383	Water Resources Systems	2	0	0	2
CVL384	Urban Hydrology	2	0	0	2
CVL385	Frequency Analysis in Hydrology	2	0	0	2
CVL386	Fundamentals of Remote Sensing	2	0	2	3
CVD412	B.Tech. Project Part-II	0	0	12	6
CVL421	Ground Engineering	3	0	0	3
CVL422	Rock Engineering	3	0	0	3
CVL423	Soil Dynamics	3	0	0	3
CVL424	Environmental Geotechniques & Geosyntheses	3	0	0	3
CVL431	Design of Foundations & Retaining Structures	3	0	0	3
CVL432	Stability of Slopes	2	0	0	2
CVL433	FEM in Geotechnical Engineering	3	0	0	3
CVP434	Geotechnical Design Studio	0	0	4	2
CVL435	Underground Structures	2	0	0	2
CVL441	Structural Design	3	0	0	3
CVL442	Structural Analysis-III	3	0	0	3
CVL443	Prestressed Concrete & Industrial Structures	3	0	0	3
CVL461	Logistics and Freight Transport	3	0	0	3
CVL462	Introduction to Intelligent Transportation Systems	3	0	0	3
CVL481	Water Resources Management	3	0	0	3
CVL482	Water Power Engineering	2	0	2	3
CVL483	Groundwater & Surface-water Pollution	2	0	0	2
CVP484	Computational Aspects in Water Resources	1	0	4	3
CVL485	River Mechanics	2	0	2	3
CVL486	Geo-informatics	2	0	2	3
CVL721	Solid Waste Engineering	3	0	0	3
CVL724	Environmental systems analysis	3	0	0	3
CVL727	Environmental risk assessment	3	0	0	3
CVL728	Environmental Quality Modeling	3	0	0	3
CVL740	Pavement Materials and Design of Pavements	3	0	2	4
CVL741	Urban and Regional Transportation Planning	3	0	2	4
CVL742	Traffic Engineering	3	0	2	4
CVL743	Airport Planning and Design	3	0	0	3
CVL744	Transportation Infrastructure Design	2	0	2	3
CVL746	Public Transportation Systems	3	0	0	3
CVL763	Analytical and Numerical Methods for Structural Engineering	3	0	0	3
CVL765	Concrete Mechanics	3	0	0	3
CVL766	Design of Bridge Structures	3	0	0	3
CVL768	Design of Masonry Structures	3	0	0	3
CVL769	Design of Tall Buildings	3	0	0	3
CVL770	Prestressed and Composite Structures	3	0	0	3
CVL771	Advanced Concrete Technology	3	0	0	3
CVL820	Environmental impact assessment	3	0	0	3
CVL822	Emerging Technologies for Environmental Management	3	0	0	3
CVL823	Thermal Techniques for Waste Management	3	0	0	3
CVL824	Life Cycle Analysis and Design for Environment	3	0	0	3
CVL837	Mechanics of Sediment Transport	2	0	2	3
CVL841	Advanced Transportation Modelling	2	0	2	3
CVL842	Geometric Design of Roads	2	0	2	3
CVL847	Transportation Economics	3	0	0	3
CVL857	Structural Safety and Reliability	3	0	0	3
CVL858	Theory of Plates and Shells	3	0	0	3
CVL859	Theory of Structural Stability	3	0	0	3
CVL862	Design of Offshore Structures	3	0	0	3
CVL866	Wind Resistant Design of Structures	3	0	0	3

B.Tech. in Civil Engineering

CE1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**CVL111** Elements of Surveying 3 0 2 4	**CVL121+CVP121** Engineering Geology + Lab 3 0 2 4	**CVL141** Civil Engineering Materials 3 0 0 3	**APL107** Mechanics of Fluids 3 1 2 5	**APL108** Mechanics of Solids 3 1 2 5	**HUL2XX** 3 1 0 4					18	3	8	25.0	0	29.0
IV	**CVL222+CVP222** Soil Mechanics + Lab 3 0 2 4	**CVL242+CVP242** "Structural Analysis-I + Lab" 3 0 2 4	**CVL261+CVP261** Intro. to Transportation Engineering + Lab 3 0 2 4	**CVL281+CVP281** Hydraulics + Lab 3 1 2 5	**CVL100** Environmental Science 2 0 0 2	**HUL2XX** 3 1 0 4					17	2	8	23.0	0	27.0
V	**CVL243+CVP243** RC Design + Lab 3 0 3 4.5	**CVL245** Construction Management 2 0 0 2	**CVL282** Engineering Hydrology 3 0 2 4	**CVL321+CVP321** Geotechnical Engineering + Lab 3 1 2 5	**CVL341** Structural Analysis-II 3 0 0 3	**SBL100** Introductory Biology for Engineers 3 0 2 4					17	1	9	22.5	0	27.0
VI	**CVL212** Environmental Engineering 3 0 2 4	**CVL244** Construction Practices 2 0 0 2	**CVL342+CVP342** Steel Design + Lab 3 0 2 4	**CVL381** Design of Hydraulic Structures 3 0 2 4	**OC 1** 3 0 0 3	**HUL2XX** 3 1 0 4					17	1	6	21.0	0	24.0
VII	**DE 1** 2 0 2 3	**DE 2** 2 0 0 3	**DE 3 / OC 2** 3 0 0 3		**CVP441** Structural Design and Detailing 0 0 3 1.5	**HUL3XX** 3 0 0 3	**CVD411** B.Tech. Project-I 0 0 8 4				10	0	13	16.5	0	23.0
VIII	**DE 4** 2 0 2 3	**DE 5** 3 0 0 3	**OC 2 / DE 3** 3 0 0 3	**OC 3** 3 1 0 4							11	1	2	13.0	0	14.0

Total = 158.0

Bachelor of Technology in Computer Science and Engineering

Department of Computer Science and Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	14
Departmental Courses	
Departmental Core	55
Departmental Electives	11
Open Category Courses	10
Total Graded Credit requirement	**148**
Non Graded Units	**11**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
CVL100	Environmental Science	2	0	0	2
COL100	Introduction to Computer Science	3	0	2	4
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

ELL205	Signals and Systems	3	1	0	4
MTL103*	Optimization Methods and Applications	3	0	0	3
MTL104*	Linear Algebra and Applications	3	0	0	3
MTL105*	Algebra	3	0	0	3
MTL106	Probability and Stochastic Processes	3	1	0	4
PYL102#	Principles of Electronic Materials	3	0	0	3
PYL103#	Physics of Nanomaterials	3	0	0	3
	Total Credits				***14***

* One of these three courses
\# One of these two courses

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

COL106	Data Structures and Algorithms	3	0	4	5
COL202	Discrete Mathematical Structures	3	1	0	4
COL215	Digital Logic and System Design	3	0	4	5
COL216	Computer Architecture	3	0	2	4
COL226	Programming Languages	3	0	4	5
COP290	Design Practices	0	0	6	3
COL331	Operating Systems	3	0	4	5
COL333	Principles of Artificial Intelligence*	3	0	2	4
COL334	Computer Networks	3	0	2	4
COL351	Analysis and Design of Algorithms	3	1	0	4
COL352	Introduction to Automata and Theory of Computation	3	0	0	3
COL362	Introduction to Database Management Systems*	3	0	2	4
COL380	Introduction to Parallel and Distributed Programming	2	0	2	3
COD490	B.Tech. Project	0	0	12	6
COD492	B.Tech. Project Part-I	0	0	12	6
	Total Credits				***55***

Departmental Electives

COD300	Design Project	0	0	4	2
COD310	Mini Project	0	0	6	3
COL333	Principles of Artificial Intelligence*	3	0	2	4
COL341	Machine Learning	3	0	2	4
COL362	Introduction to Database Management Systems*	3	0	2	4
COP315	Embedded System Design Project	0	1	6	4
COD494**	B.Tech. Project Part-II	0	0	16	8
COR310	Professional Practices (CS)	1	0	2	2
COS310	Independent Study (CS)	0	3	0	3
COL703***	Logic for Computer Science	3	0	2	4
COL707	Introduction to Ethical Issues in Computer Science	3	0	2	4
COL718	Architecture of High Performance Computers	3	0	2	4
COL719	Synthesis of Digital Systems	3	0	2	4
COL720	Real Time Systems	3	0	2	4
COL722	Introduction to Compressed Sensing	3	0	0	3
COL724	Advanced Computer Networks	3	0	2	4
COL726	Numerical Algorithms	3	0	2	4
COL727	Rapid Mixing in Markov Chains	3	0	0	3
COL728	Compiler Design	3	0	3	4.5
COL729	Compiler Optimization	3	0	3	4.5
COL730	Parallel Programming	3	0	2	4
COL731	Advanced Compiler Techniques for Optimization, Safety and Security	3	0	2	4
COL732	Virtualization and Cloud Computing	3	0	2	4
COL733	Cloud Computing Technology Fundamentals	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL749	Computational Social Choice	3	0	0	3
COL750	Foundations of Automatic Verification	3	0	2	4
COL751	Algorithmic Graph Theory	3	0	0	3
COL752	Geometric Algorithms	3	0	2	4
COL753	Complexity Theory	3	0	0	3
COL754	Approximation Algorithms	3	0	0	3
COL755	Algorithmic Game Theory	3	0	0	3
COL756	Mathematical Programming	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL758	Advanced Algorithms	3	0	2	4
COL759	Cryptography & Computer Security	3	0	0	3
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL765	Logic and Functional Programming	3	0	2	4
COL768	Wireless Networks	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL772	Natural Language Processing	3	0	2	4
COL774	Machine Learning	3	0	2	4
COL775	Deep Learning	3	0	2	4
COL776	Learning Probabilistic Graphical Models	3	0	2	4
COL777	Deep Reinforcement Learning	3	0	2	4
COL778	Principles of Autonomous Systems	3	0	2	4
COL780	Computer Vision	3	0	2	4
COL781	Computer Graphics	3	0	3	4.5
COL783	Digital Image Analysis	3	0	3	4.5
COL785	Virtual and Augmented Reality	3	0	2	4
COL786	Advanced Functional Brain Imaging	3	0	2	4
COL787	Online Algorithms and Competitive Analysis	3	0	0	3
COL788	Advanced Topics in Embedded Computing	3	0	0	3
COL828	Advanced Computer Vision	3	0	2	4
COL860	Special Topics in Parallel Computation	3	0	0	3
COL861	Special Topics in Hardware Systems	3	0	0	3
COL862	Special Topics in Software Systems	3	0	0	3
COL863	Special Topics in Theoretical Computer Science	3	0	0	3
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL865	Special Topics in Computer Applications	3	0	0	3
COL866	Special Topics in Algorithms	3	0	0	3
COL867	Special Topics in High Speed Networks	3	0	0	3
COL868	Special Topics in Database Systems	3	0	0	3

COL869	Special Topics in Concurrency	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
COL871	Special Topics in Programming Languages	3	0	0	3
COL872	Special Topics in Cryptography	3	0	0	3
COL873	Special Topics in Natural Language Processing	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COL886	Special Topics in Operating Systems	3	0	0	3
COV877	Special Module on Visual Computing	1	0	0	1
COV878	Special Module in Machine Learning	1	0	0	1
COV879	Special Module in Financial Algorithms	2	0	0	2
COV880	Special Module in Parallel Computation	1	0	0	1
COV881	Special Module in Hardware Systems	1	0	0	1
COV882	Special Module in Software Systems	1	0	0	1
COV883	Special Module in Theoretical Computer Science	1	0	0	1
COV884	Special Module in Artificial Intelligence	1	0	0	1
COV885	Special Module in Computer Applications	1	0	0	1
COV886	Special Module in Algorithms	1	0	0	1
COV887	Special Module in High Speed Networks	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1
SIL765	Networks & System Security	3	0	2	4
SIL769	Internet Traffic -Measurement, Modeling & Analysis	3	0	2	4
SIL801	Special Topics in Multimedia System	3	0	0	3
SIL802	Special Topics in Web Based Computing	3	0	0	3
SIV813	Applications of Computer in Medicines	1	0	0	1
SIV861	Information and Comm Technologies for Development	1	0	0	1
SIV864	Special Module on Media Processing & Communication	1	0	0	1
SIV895	Special Module on Intelligent Information Processing	1	0	0	1

* *One of COL333 or COL362 will be considered as DC and other will be considered as DE*

** *DC for CS1 students with specialization, DE for other CS1 students but with at most 4 credits counted towards DE.*

*** *DC for CS1 students with specialization.*

B.Tech. in Computer Science and Engineering

CS1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**COL202**	**COL215**	**COL106**	**PYL102**	**MTL106**											
	Discrete Mathematical Structures	Digital Logic & System Design	Data Structures & Algorithms	Principles of Electronic Materials	Probability and Stochastic Processes											
	3 1 0 4	3 0 4 5	3 0 4 5	3 0 0 3	3 1 0 4						15	2	8	21.0	0	25.0
IV	**COL226**	**COL216**	**ELL205**	**CVL100**	**HUL2XX**	**COP290**										
	Programming Languages	Computer Architecture	Signals and Systems	Environmental Science		Design Practices										
	3 0 4 5	3 0 2 4	3 1 0 4	2 0 0 2	3 1 0 4	0 0 6 3					14	2	12	22.0	0	28.0
V	**COL333 / DE 1**	**COL334**	**COL351**	**SBL100**	**HUL2XX**	**COD3XX**										
	Principles of Artificial Intelligence	Computer Networks	Analysis and Design of Algorithms	Introductory Biology for Engineers		Design Project (Non-graded)										
	3 0 2 4	3 0 2 4	3 1 0 4	3 0 2 4	3 1 0 4	0 0 4 2					15	2	10	22.0	2	27.0
VI	**COL362 / DE1**	**COL331**	**COL352**	**MTLXXX**	**HUL2XX**	**COL380**										
	Introduction to Database Management Systems	Operating Systems	Intro. to Automata & Theory of Computation	Programme-Linked Course in Mathematics		Intro. to Parallel & Distributed Programming										
	3 0 2 4	3 0 4 5	3 0 0 3	3 0 0 3	3 1 0 4	2 0 2 3					17	1	8	22.0	0	26.0
VII	**DE 2 (3)**	**OC 1 (3)**	**COD490 / 492**													
			B.Tech. Project Part-I													
	3 0 0 3	3 0 0 3	0 0 12 6								6	0	12	12.0	0	18.0
VIII	**OC 2 (4)**	**OC 3 (3)**	**DE 3 (4)**	**HUL3XX**												
	3 1 0 4	3 0 0 3	3 0 2 4	3 0 0 3							12	1	2	14.0	0	15.0

Total = 150.0

Programme Code: **CS5**

Dual Degree Programme: Bachelor of Technology and Master of Technology in Computer Science and Engineering

Department of Computer Science and Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	14
Departmental Courses	
Departmental Core	49
Departmental Electives	11
Open Category Courses	10
Total B.Tech. Credit Requirement	**142**
Non Graded Units	**11**
M. Tech. Part	
Programme Core Courses	32
Programme Elective Courses	14
Total M.Tech. Credit Requirement	**46**
Grand Total Credit Requirement	**188**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

ELL205	Signals and Systems	3	1	0	4
MTL103*	Optimization Methods and Applications	3	0	0	3
MTL104*	Linear Algebra and Applications	3	0	0	3
MTL105*	Algebra	3	0	0	3
MTL106	Probability and Stochastic Processes	3	1	0	4
PYL102#	Principles of Electronic Materials	3	0	0	3
PYL103#	Physics of Nanomaterials	3	0	0	3
	Total Credits				***14***

*One of these three courses
one of these two courses

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

COL106	Data Structures and Algorithms	3	0	4	5
COL202	Discrete Mathematical Structures	3	1	0	4
COL215	Digital Logic and System Design	3	0	4	5
COL216	Computer Architecture	3	0	2	4
COL226	Programming Languages	3	0	4	5
COP290	Design Practices	0	0	6	3
COL331	Operating Systems	3	0	4	5
COL333	Principles of Artificial Intelligence*	3	0	2	4
COL334	Computer Networks	3	0	2	4
COL351	Analysis and Design of Algorithms	3	1	0	4
COL352	Introduction to Automata and Theory of Computation	3	0	0	3
COL380	Introduction to Parallel and Distributed Programming	2	0	2	3
	Total Credits				***49***

Departmental Electives

COD300	Design Project	0	0	4	2
COD310	Mini Project	0	0	6	3
COL333	Principles of Artificial Intelligence*	3	0	2	4
COL341	Machine Learning	3	0	2	4
COL362	Introduction to Database Management Systems*	3	0	2	4
COP315	Embedded System Design Project	0	1	6	4
COR310	Professional Practices (CS)	1	0	2	2
COS310	Independent Study (CS)	0	3	0	3
COL707	Introduction to Ethical Issues in Computer Science	3	0	2	4
COL718	Architecture of High Performance Computers	3	0	2	4
COL719	Synthesis of Digital Systems	3	0	2	4
COL720	Real Time Systems	3	0	2	4
COL722	Introduction to Compressed Sensing	3	0	0	3
COL724	Advanced Computer Networks	3	0	2	4
COL727	Rapid Mixing in Markov Chains	3	0	0	3
COL728	Compiler Design	3	0	3	4.5
COL729	Compiler Optimization	3	0	3	4.5
COL730	Parallel Programming	3	0	2	4
COL731	Advanced Compiler Techniques for Optimization, Safety and Security	3	0	2	4
COL732	Virtualization and Cloud Computing	3	0	2	4
COL733	Cloud Computing Technology Fundamentals	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL749	Computational Social Choice	3	0	0	3
COL750	Foundations of Automatic Verification	3	0	2	4
COL751	Algorithmic Graph Theory	3	0	0	3
COL752	Geometric Algorithms	3	0	2	4
COL753	Complexity Theory	3	0	0	3
COL754	Approximation Algorithms	3	0	0	3
COL755	Algorithmic Game Theory	3	0	0	3
COL756	Mathematical Programming	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL758	Advanced Algorithms	3	0	2	4
COL759	Cryptography & Computer Security	3	0	0	3
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL765	Logic and Functional Programming	3	0	2	4
COL768	Wireless Networks	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL772	Natural Language Processing	3	0	2	4
COL774	Machine Learning	3	0	2	4
COL775	Deep Learning	3	0	2	4
COL776	Learning Probabilistic Graphical Models	3	0	2	4
COL777	Deep Reinforcement Learning	3	0	2	4
COL778	Principles of Autonomous Systems	3	0	2	4
COL780	Computer Vision	3	0	2	4
COL781	Computer Graphics	3	0	3	4.5
COL783	Digital Image Analysis	3	0	3	4.5
COL785	Virtual and Augmented Reality	3	0	2	4
COL786	Advanced Functional Brain Imaging	3	0	2	4
COL788	Advanced Topics in Embedded Computing	3	0	0	3
COL787	Online Algorithms and Competitive Analysis	3	0	0	3
COL828	Advanced Computer Vision	3	0	2	4
COL829	Advanced Computer Graphics	3	0	2	4
COL851	Special Topics in Operating Systems	3	0	0	3
COL852	Special Topics in Compiler Design	3	0	0	4
COL860	Special Topics in Parallel Computation	3	0	0	3
COL861	Special Topics in Hardware Systems	3	0	0	3
COL862	Special Topics in Software Systems	3	0	0	3
COL863	Special Topics in Theoretical Computer Science	3	0	0	3
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL865	Special Topics in Computer Applications	3	0	0	3
COL866	Special Topics in Algorithms	3	0	0	3
COL867	Special Topics in High Speed Networks	3	0	0	3

COL868	Special Topics in Database Systems	3	0	0	3
COL869	Special Topics in Concurrency	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
COL871	Special Topics in Programming Languages	3	0	0	3
COL872	Special Topics in Cryptography	3	0	0	3
COL873	Special Topics in Natural Language Processing	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COV877	Special Module on Visual Computing	1	0	0	1
COV878	Special Module in Machine Learning	1	0	0	1
COV879	Special Module in Financial Algorithms	2	0	0	2
COV880	Special Module in Parallel Computation	1	0	0	1
COV881	Special Module in Hardware Systems	1	0	0	1
COV882	Special Module in Software Systems	1	0	0	1
COV883	Special Module in Theoretical Computer Science	1	0	0	1
COV884	Special Module in Artificial Intelligence	1	0	0	1
COV885	Special Module in Computer Applications	1	0	0	1
COV886	Special Module in Algorithms	1	0	0	1
COV887	Special Module in High Speed Networks	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1
SIL765	Networks & System Security	3	0	2	4
SIL769	Internet Traffic -Measurement, Modeling & Analysis	3	0	2	4
SIL801	Special Topics in Multimedia System	3	0	0	3
SIL802	Special Topics in Web Based Computing	3	0	0	3
SIV813	Applications of Computer in Medicines	1	0	0	1
SIV861	Information and Comm Technologies for Development	1	0	0	1
SIV864	Special Module on Media Processing & Communication	1	0	0	1
SIV895	Special Module on Intelligent Information Processing	1	0	0	1

Program Core

COL703	Logic for Computer Science	3	0	2	4
COL726	Numerical Algorithms	3	0	2	4
COD891	Minor Project	0	0	6	3
COD892	M.Tech. Project Part–I	0	0	14	7
COD893	M.Tech. Project Part–II	0	0	28	14
	Total Credits				***32***

Program Electives

COD745	Minor Project	0	0	6	3
COL707	Introduction to Ethical Issues in Computer Science	3	0	2	4
COL718	Architecture of High Performance Computers	3	0	2	4
COL719	Synthesis of Digital Systems	3	0	2	4
COL720	Real Time Systems	3	0	2	4
COL724	Advanced Computer Networks	3	0	2	4
COL727	Rapid Mixing in Markov Chains	3	0	0	3
COL728	Compiler Design	3	0	3	4.5
COL729	Compiler Optimization	3	0	3	4.5
COL730	Parallel Programming	3	0	2	4
COL731	Advanced Compiler Techniques for Optimization, Safety and Security	3	0	2	4
COL732	Virtualization and Cloud Computing	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL749	Computational Social Choice	3	0	0	3
COL750	Foundations of Automatic Verification	3	0	2	4
COL751	Algorithmic Graph Theory	3	0	0	3
COL752	Geometric Algorithms	3	0	2	4
COL753	Complexity Theory	3	0	0	3
COL754	Approximation Algorithms	3	0	0	3
COL755	Algorithmic Game Theory	3	0	0	3
COL756	Mathematical Programming	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL758	Advanced Algorithms	3	0	2	4
COL759	Cryptography & Computer Security	3	0	0	3
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL768	Wireless Networks	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL772	Natural Language Processing	3	0	2	4
COL774	Machine Learning	3	0	2	4
COL775	Deep Learning	3	0	2	4
COL776	Learning Probabilistic Graphical Models	3	0	2	4
COL777	Deep Reinforcement Learning	3	0	2	4
COL778	Principles of Autonomous Systems	3	0	2	4
COL785	Virtual and Augmented Reality	3	0	2	4
COL780	Computer Vision	3	0	2	4
COL781	Computer Graphics	3	0	3	4.5
COL783	Digital Image Analysis	3	0	3	4.5
COL787	Online Algorithms and Competitive Analysis	3	0	0	3
COL788	Advanced Topics in Embedded Computing	3	0	0	3
COS799	Independent Study	0	3	0	3
COL812	System Level Design and Modelling	3	0	0	3
COL818	Principles of Multiprocessor Systems	3	0	2	4
COL819	Advanced Distributed Systems	3	0	2	4
COL821	Reconfigurable Computing	3	0	0	3
COL828	Advanced Computer Vision	3	0	2	4
COL830	Distributed Computing	3	0	0	3
COL831	Semantics of Programming Languages	3	0	0	3
COL832	Proofs and Types	3	0	0	3
COL859	Advanced Computer Graphics	3	0	2	4
COL860	Special Topics in Parallel Computation	3	0	0	3
COL861	Special Topics in Hardware Systems	3	0	0	3
COL862	Special Topics in Software Systems	3	0	0	3
COL863	Special Topics in Theoretical Computer Science	3	0	0	3
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL865	Special Topics in Computer Applications	3	0	0	3
COL866	Special Topics in Algorithms	3	0	0	3
COL867	Special Topics in High Speed Networks	3	0	0	3
COL868	Special Topics in Database Systems	3	0	0	3
COL869	Special Topics in Concurrency	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
COL871	Special Topics in Programming Languages	3	0	0	3
COL872	Special Topics in Cryptography	3	0	0	3
COL873	Special Topics in Natural Language Processing	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COL886	Special Topics in Operating Systems	3	0	0	3
COV877	Special Module on Visual Computing	1	0	0	1
COV878	Special Module in Machine Learning	1	0	0	1
COV879	Special Module in Financial Algorithms	2	0	0	2
COV880	Special Module in Parallel Computation	1	0	0	1
COV881	Special Module in Hardware Systems	1	0	0	1
COV882	Special Module in Software Systems	1	0	0	1
COV883	Special Module in Theoretical Computer Science	1	0	0	1
COV884	Special Module in Artificial Intelligence	1	0	0	1
COV885	Special Module in Computer Applications	1	0	0	1
COV886	Special Module in Algorithms	1	0	0	1
COV887	Special Module in High Speed Networks	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1
SIL765	Networks & System Security	3	0	2	4
SIL769	Internet Traffic -Measurement, Modeling & Analysis	3	0	2	4
SIL801	Special Topics in Multimedia System	3	0	0	3
SIL802	Special Topics in Web Based Computing	3	0	0	3
SIV813	Applications of Computer in Medicines	1	0	0	1
SIV861	Information and Comm Technologies for Development	1	0	0	1
SIV864	Special Module on Media Processing & Communication	1	0	0	1
SIV871	Special Module in Computational Neuroscience	1	0	0	1
SIV895	Special Module on Intelligent Information Processing	1	0	0	1

Dual Degree Programme: B.Tech. and M.Tech. in Computer Science and Engineering

CS5

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**COL202** Discrete Mathematical Structures 3 1 0 4	**COL215** Digital Logic & System Design 3 0 4 5	**COL106** Data Structures & Algorithms 3 0 4 5	**PYLXXX** Programme-linked Courses in Physics 3 0 0 3	**MTL106** Probability and Stochastic Processes 3 1 0 4						15	2	8	21.0	0	25.0
IV	**COL226** Programming Languages 3 0 4 5	**COL216** Computer Architecture 3 0 2 4	**ELL205** Signals and Systems 3 1 0 4	**CVL100** Environmental Science 2 0 0 2	**HUL2XX** 3 1 0 4	**COP290** Design Practices 0 0 6 3					14	2	12	22.0	0	28.0
V	**COL333 / DE 1** Principles of Artificial Intelligence 3 0 2 4	**COL334** Computer Networks 3 0 2 4	**COL351** Analysis and Design of Algorithms 3 1 0 4	**SBL100** Introductory Biology for Engineers 3 0 2 4	**HUL2XX** 3 1 0 4						15	2	6	20.0	0	23.0
VI	**COL362 / DE1** Introduction to Database Management Systems 3 0 2 4	**COL331** Operating Systems 3 0 4 5	**COL352** Intro. to Automata & Theory of Computation 3 0 0 3	**MTLXXX** Programme-linked Course in Mathematics 3 0 0 3	**HUL2XX** 3 1 0 4	**COL380** Intro. to Parallel & Distributed Programming 2 0 2 3					17	1	8	22.0	0	26.0
VII	**DE 2 (3)** 3 0 0 3	**DE 3(4)** 3 0 2 4	**COL703** Logic for Computer Science 3 0 2 4	**OC 1 (3)** 3 0 0 3		**PE 1 (3)** 3 0 0 3					15	0	4	17.0	0	19.0
VIII	**COD891** Minor Project 0 0 6 3	**COL726** Numerical Algorithms 3 0 2 4	**HUL3XX** 3 0 0 3	**PE 2 (3)** 3 0 0 3	**PE 3 (3)** 3 0 0 3	**OC (2)** 3 0 0 3					15	0	8	19.0	0	23.0
IX	**PE 4 (3)** 3 0 0 3	**PE 5 (3)** 3 0 0 3	**COD892** M.Tech. Project Part-I 0 0 14 7	**OC (3)** 3 0 0 3							9	0	14	16.0	0	23.0
X			**COD893** M.Tech. Project Part-II 0 0 28 14								0	0	28	14.0	0	28.0

Total = 188.0

Bachelor of Design (B.Des.)

Department of Design

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Engineering Arts and Science (EAS)	02
Graded Units	149
Programme-linked Courses	15
Departmental Courses	
Departmental Core	123
Departmental Electives	15
Open Category Courses	09
Total Graded Credit requirement	**158**
Non Graded Units	**09**

Institute Core: Engineering Arts and Sciences

CVL100	Environmental Science	2	0	0	2
	Total Credits				***02***

Non Graded Units

NEN110	Professional Ethics and Social Responsibility-1	0	0	0.5	0.25
NLN100	Language and Writing Skills-1	0	0	2	1
NEN111	Professional Ethics and Social Responsibility-2	0	0	0.5	0.25
NLN101	Language and Writing Skills-2	0	0	2	1
DSR227	Social Immersion	0	0	4	2
DSR324	Industry Internship	0	0	4	2
DSR422	Design Degree Show	0	0	4	2

Departmental Core

DDL110	Understanding Design and Design Movements	2	0	2	3
DDL111	Visualization Techniques	1	0	4	3
DDL112	Design Process	1	0	2	2
DDP113	Computer Aided Visualization	0.5	0	3	2
DDP114	Materials & Processes for Model Making	0	0	4	2
DDL115	Design Thinking & Design Critique	1	0	2	2
DDL116	Fundamentals of Design	1	0	4	3
DDL121	Product Visualization Techniques	1	0	4	3
DDL122	Exploratory Design Methods	1	0	2	2
DDL123	Applied Ergonomics	1	0	2	2
DDL124	Design with Contemporary Technologies	1	0	2	2
DDL125	Elements of Design	1	0	4	3
DDD120	Design Project-1	0	0	6	3
DDL126	Typography and Layout	1	0	4	3
DDL211	Materials and Prototyping	1	0	4	3
DDL212	Advanced Visualization Techniques	1	0	4	3
DDL213	CAD and Digital Prototyping	1	0	4	3
DDL214	Engineering for Designers	1	0	2	2
DDL215	Design for Future	1	0	2	2
DDP216	Art and Craft Practicum	0	0	2	1
DDL217	Photography, Illustration and Moving Images	2	0	2	3
DDL321	Model Making	2	0	2	3
DDL222	Design Research Methods	1	0	2	2
DDL223	Cognitive Ergonomics	2	0	2	3
DDD320	Design Project-2 (Simple Product Design)	0	0	8	4
DDL224	Storytelling and Film Making	2	0	2	3
DDL225	Market Research and Trend Analysis	1	0	2	2
DDL226	System Oriented Design	1	0	2	2
DDL311	Branding-Identity and Packaging Design	1	0	4	3
DDL312	Design for Developing Nations	1	0	4	3
DDL313	Creativity & Sustainability in Nature	1	0	4	3
DDD310	Design Project-3 (Collaborative Design Project)	0	0	8	4
DDL314	Designing for Society & Culture	1	0	4	3
DDL315	Design for UI/UX	1	0	4	3
DDL228	Exhibition and Space Design	1	0	4	3
DDD410	Design Project-4 (Dissertation Project/Thesis)	0	0	12	6
DDL411	Design Management and IPR	1	0	2	2
DDD510	Design Project-5 Dissertation (Dissertation Project/Thesis, Continued)	0	0	18	9
DDD620	Design Project-6 (Industry/Research Project)	0	0	26	13

Departmental Electives

DDL725	Information Design & Data Visualization	2	0	2	3
DDL768	Design Research Methodology	2	0	2	3
DDL713	Advanced Typography	2	0	2	3
DDL715	Animation Design	2	0	2	3
DDL716	Storybook Design	2	0	2	3
DDL717	Publication Design	2	0	2	3
DDL718	Product Design and Development	2	0	2	3
DDL782	Design for Usability	2	0	2	3
DDR832	Design for User Experience	3	0	0	3
DDR862	Design in Indian Context	3	0	0	3
DDL722	Design Entrepreneurship	1	0	2	2
DDL732	Design for Product Lifecycle	2	0	2	3
DDL724	Qualitative and Quantitative Methods in Design	2	0	2	3
DDR812	Media Studies	2	0	2	3
DDR772	Transportation Design	2	0	2	3
BML741	Medical Device Design	2	0	4	4
HUL714	Inclusive Innovation	3	0	2	4
VEL700	Human Values and Technology	2	1	0	3
DDL732	Exhibition Design	0	0	2	1
DDL733	Health Care Design	2	0	2	3
DDL734	Design of Assistive Technologies	2	0	2	3
DDL735	AI/ML/DS Driven Design	2	0	2	3
DDL810	Special Topics in Design	2	0	2	3
DDL742	Universal Design	2	0	2	3
DDL743	Professional Practice in Design	1	0	4	3
DDL744	Professional Workshops in Design	1	0	2	2
DDL745	Invited Design Seminars	1	0	0	1
DDL752	Design for Industry 4.0	2	0	2	3
DDL753	Design of Sustainable Habitats	2	0	2	3
DDD830	Self-initiated Design Project	0	0	6	3
DDR852	Strategic Design Management	2	0	2	3

Open Electives

DDR852	Strategic Design Management	3	3	0	0
HSL726	Culture and Cognition	3	3	0	0
HUL774	Visual Methods in Social Research	3	3	0	0
HUL341	Meaning in Natural Language	3	3	0	0
HUL773	Media, Culture and Society	3	3	0	0
HSL863	Emotion and Cognition	3	3	0	0
HUL756	Philosophy and Film	3	3	0	0
HUL354	Art and Technology	3	3	0	0
HUV735	Narrative Matters	1	0	0	1
HUL334	From Text to Film	3	3	0	0
HSL853	Art and Aesthetics	3	3	0	0
HSV771	Ethnographic Research Methods	1	0	0	1
HSL734	Themes in Modern Indian Thought	3	3	0	0
HSL262	Social Psychological Approaches to Health & Wellbeing	3	1	0	4
HSL384	Codex to Hypertext	3	3	0	0
HUL256	Critical Thinking	3	1	0	4
HSL763	Cognitive Psychology	3	3	0	0
HSL768	Judgment and Decision Making	3	3	0	0

Note:

1. Department of Design is in discussion with the concerned departments for their approval for open elective courses.
2. These can be the first list of electives, more courses would be added to the list.

Bachelor of Design

DD1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	L	T	P	Credits	Non-graded Units	Contact Hours
I	**DDL110** Understanding Design & Design Movements 2 0 2 3	**DDL111** Visualization Techniques 1 0 4 3	**DDL112** Design Process 1 0 2 2	**DDP113** Computer Aided Visualization 0.5 0 3 2	**DDP114** Materials & Processes for Model Making 0 0 4 2	**DDL115** Design Thinking & Design Critique 1 0 2 2	**DDL116** Fundamentals of Design 1 0 4 3	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	6.5	0	24	17.0	1.25	30.5
II	**DDL121** Product Visualization Techniques 1 0 4 3	**DDL122** Exploratory Design Methods 1 0 2 2	**DDL123** Applied Ergonomics 1 0 2 2	**DDL124** Design with Contemporary Technologies 1 0 2 2	**DDL125** Elements of design 1 0 4 3	**DDD 120** Design Project-1 0 0 6 3	**DDL126** Typography and Layout 1 0 4 3	**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1	6	0	27	18.0	1.25	33.0
III	**DDL 211** Materials and Prototyping 1 0 4 3	**DDL212** Advanced Visualization Techniques 1 0 4 3	**DDL213** CAD and Digital Prototyping 1 0 4 3	**DDL214** Engineering for Designers 1 0 2 2	**DDL215** Design for Future 1 0 2 2	**DDP216** Art and Craft Practicum 0 0 2 1	**DDL217** Photography, Illustration and Moving Images 2 0 2 3			7	0	20	17.0	0	27.0
IV	**DDL 321** Model Making 2 0 2 3	**DDL222** Design Research Methods 1 0 2 2	**DDL223** Cognitive Ergonomics 2 0 2 3	**DDD320** Design Project-2 (Simple Product Design) 0 0 8 4	**DDL224** Storytelling and Film making 2 0 2 3	**DDL225** Market research and Trend Analysis 1 0 2 2	**DDL226** System Oriented Design 1 0 2 2	**CLV100** Environmental Science 2 0 2 0		11	0	20	21.0	0	31.0
Summer Vacation (DDR227) Social Immersion (Non-graded) 0-0-4-2 (Contact Hrs. 4)															
V	**DDL 311** Branding-Identity and Packaging Design 1 0 4 3	**DDL312** Design for Developing Nations 1 0 4 3	**DDL313** Creativity & Sustainability in Nature 1 0 4 3	**DDD310** Design Project-3 (Collaborative Design Project) 0 0 8 4	**DDL314** Designing for Society & Culture 1 0 4 3	**DDL315** Design for UI/UX 1 0 4 3	Programme Elective-1 2 0 2 3			7	0	30	22.0	0	37.0
VI	**DDL 228** Exhibition and Space Design 1 0 4 3	**DDD410** Design Project 4 Dissertation Project / Thesis 0 0 12 6	Programme Elective-2 2 0 2 3	Programme Elective-2 2 0 2 3	Open Elective-1 3 0 0 3	Open Elective-2 3 0 0 3				11	0	20	21.0	0	31.0
Summer Vacation (DDR324) Industry Internship (Non-graded) 0-0-4-2 (Contact Hrs. 4)															
VII	**DDL 411** Design Management and IPR 1 0 2 2	**DDD510** Design Project 5 Dissertation Project / Thesis (Continued) 0 0 18 9	Open Elective-3 3 0 0 3	Programme Elective-4 2 0 2 3	Programme Elective-5 2 0 2 3					8	0	24	20.0	0	32.0
VIII	**DSD 620** Design Project 6 (Industry / Research Project) 0 0 26 13	**DDR422** Design Degree Show (Non-Graded Unit) 0 0 4 2								0	0	30	13.0	0	30.0

Total = 158.0

Bachelor of Technology in Electrical Engineering

Department of Electrical Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	15
Departmental Courses	
Departmental Core	60
Departmental Electives	10
Open Category Courses	10
Total Graded Credit requirement	**153**
Non Graded Units	**11**

Institute Core: Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Introduction to Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Programme-Linked Basic / Engineering Arts / Sciences Core

COL106	Data Structures and Algorithms	3	0	4	5
MTL106	Probability and Stochastic Processes	3	1	0	4
MCL142	Thermal Science for Electrical Engineers	3	0	0	3
PYL102	Principles of Electronic Materials	3	0	0	3
	Total Credits				***15***

Departmental Core

ELL201	Digital Electronics	3	0	3	4.5
ELL202	Circuit Theory	3	1	0	4
ELL203	Electromechanics	3	1	0	4
ELP203	Electromechanics Laboratory	0	0	3	1.5
ELL205	Signals and Systems	3	1	0	4
ELL211	Physical Electronics	3	0	0	3
ELL212	Engineering Electromagnetics	3	1	0	4
ELP212	Electromagnetics Laboratory	0	0	3	1.5
ELL225	Control Engineering-I	3	1	0	4
ELP225	Control Engineering Laboratory	0	0	3	1.5
ELL302	Power Electronics	3	0	0	3
ELP302	Power Electronics Laboratory	0	0	3	1.5
ELL303	Power Engineering-I	3	1	0	4
ELP303	Power Engineering Laboratory	0	0	3	1.5
ELL304	Analog Electronic Circuits	3	1	3	5.5
ELL305	Computer Architecture	3	0	0	3
ELP305	Design and System Laboratory	0	0	3	1.5
ELL311	Communication Engineering	3	1	0	4
ELP311	Communication Engineering Laboratory	0	0	2	1
ELD411	B.Tech. Project-I	0	0	6	3
	Total Credits				***60***

Departmental Electives

ELL301	Electrical and Electronics Instrumentation	3	0	0	3
ELL312	Semiconductor process technology	3	0	0	3
ELL313	Antennas and Propagation	3	0	0	3
ELL315	Introduction to Analog Integrated Circuits	3	0	0	3
ELL316	Introduction to VLSI Design	3	0	0	3
ELL318	Digital Hardware Design	3	0	0	3
ELL319	Digital Signal Processing	3	0	2	4
ELL332	Electric Drives	3	0	0	3
ELL333	Multivariable Control	3	0	0	3
ELL365	Embedded Systems	3	0	0	3
ELL400	Power Systems Protection	3	0	0	3
ELL401	Advanced Electromechanics	3	0	0	3
ELL402	Computer Communication	3	0	0	3
ELL405	Operating Systems	3	0	0	3
ELL406	Robotics and Automation	3	0	0	3
ELL407	Power Quality	3	0	2	4
ELL409	Machine Intelligence and Learning	3	0	2	4
ELL410	Multicore Systems	3	0	0	3
ELL411	Digital Communications	3	0	2	4
ELL703	Optimal Control Theory	3	0	0	3
ELL710	Coding Theory	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL716	Telecommunication Switching and Transmission	3	0	0	3
ELL 724	Multichannel Signal Processing	3	0	0	3
ELL725	Wireless Communications	3	0	0	3
ELL730	I.C. Technology	3	0	0	3
ELL738	Micro and Nano Photonics	3	0	0	3
ELL740	Compact Modeling of Semiconductor Devices	3	0	2	4
ELP740	On-wafer Device Characterization Laboratory	0	0	6	3
ELL758	Power Quality	3	0	0	3
ELL765	Smart Grid Technology	3	0	0	3
ELS310	Independent Study (EL)	0	3	0	3

B.Tech. in Electrical Engineering

EE1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**ELL202**	**COL106**	**ELL203**	**ELL211**	**ELL205**	**HUL 2XX**										
	Circuit Theory	Data Structures & Algorithms	Electromechanics	Physical Electronics	Signals and Systems											
	3 1 0 4	3 0 4 5	3 1 0 4	3 0 0 3	3 1 0 4	3 1 0 4					18	4	4	24.0	0	26.0
IV	**ELL201**	**ELL212**	**SBL100**	**MTL106**	**ELL225**	**ELP203**										
	Digital Electronics	Engineering Electromagnetics	Introductory Biology for Engineers	Probability and Stochastic Processes	Control Engineering-I	Electromechanics Laboratory										
	3 0 3 4.5	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 3 1.5					15	3	8	22.0	0	26.0
V	**ELL304**	**ELL311**	**CVL100**	**ELL302**	**ELL305**	**ELP212**	**ELP225**									
	Analog Electronic Circuits	Communication Engineering	Environmental Science	Power Electronics	Computer Architecture	Electromagnetics Laboratory	Control Engineering Lab									
	3 1 3 5.5	3 1 0 4	2 0 0 2	3 0 0 3	3 0 0 3	0 0 3 1.5	0 0 3 1.5				14	2	9	20.5	0	25.0
VI	**MCL142**	**HUL2XX**	**PYL102**	**ELL303**	**DE 1**	**ELP311**	**ELP305**	**ELP302**								
	Thermal Science for Electrical Engineers		Principles of Electronic Materials	Power Engineering-I		Communication Engineering Laboratory	Design and System Laboratory	Power Electronics Laboratory								
	3 0 0 3	3 1 0 4	3 0 0 3	3 1 0 4	3 0 2 4	0 0 2 1	0 0 3 1.5	0 0 3 1.5			15	2	10	22.0	0	27.0
VII		**HUL2XX**	**DE 2**	**OC1**	**ELD411**	**ELP303**										
					B.Tech. Project	Power Engineering Laboratory										
		3 1 0 4	3 0 0 3	3 0 2 4	0 0 6 3	0 0 3 1.5					9	1	11	15.5	0	21.0
VIII	**DE 3**	**OC2**	**OC3**	**HUL3XX**												
	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3							12	0	0	12.0	0	12.0

Total = 153.0

Programme Code: **EE3**

Bachelor of Technology in Electrical Engineering Power and Automation

Department of Electrical Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	15
Departmental Courses	
Departmental Core	60
Departmental Electives	10
Open Category Courses	10
Total Graded Credit requirement	**152**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Programme-Linked Basic / Engineering Arts / Sciences Core

COL106	Data Structures and Algorithms	3	0	4	5
MTL106	Probability and Stochastic Processes	3	1	0	4
MCL142	Thermal Science for Electrical Engineers	3	0	0	3
PYL102	Principles of Electronic Materials	3	0	0	3
	Total Credits				***15***

Departmental Core

ELL201	Digital Electronics	3	0	3	4.5
ELL202	Circuit Theory	3	1	0	4
ELL203	Electromechanics	3	1	0	4
ELP203	Electromechanics Laboratory	0	0	3	1.5
ELL205	Signals and Systems	3	1	0	4
ELL225	Control Engineering-I	3	1	0	4
ELP225	Control Engineering Laboratory	0	0	3	1.5
ELL231	Power Electronics and Energy Devices	3	0	0	3
ELL302	Power Electronics	3	0	0	3
ELP302	Power Electronics Laboratory	0	0	3	1.5
ELL303	Power Engineering-I	3	1	0	4
ELP303	Power Engineering Laboratory	0	0	3	1.5
ELL304	Analog Electronic Circuits	3	1	3	5.5
ELL305	Computer Architecture	3	0	0	3
ELP305	Design and System Laboratory	0	0	3	1.5
ELL332	Electric Drives	3	0	0	3
ELP332	Electric Drives Laboratory	0	0	3	1.5
ELL363	Power Engineering-II	3	0	0	3
ELL365	Embedded Systems	3	0	0	3
ELD431	B.Tech. Project-I	0	0	6	3
	Total Credits				***60***

Departmental Electives

ELL301	Electrical and Electronics Instrumentation	3	0	0	3
ELL311	Communication Engineering	3	1	0	4
ELL319	Digital Signal Processing	3	0	2	4
ELL333	Multivariable Control	3	0	0	3
ELL334	DSP Based Control of Drives	3	0	2	4
ELL400	Power Systems Protection	3	0	0	3
ELL401	Advanced Electromechanics	3	0	0	3
ELL405	Operating Systems	3	0	0	3
ELL406	Robotics and Automation	3	0	0	3
ELL407	Power Quality	3	0	2	4
ELL409	Machine Intelligence and Learning	3	0	2	4
ELL410	Multicore Systems	3	0	0	3
ELL417	Renewable Energy System	3	0	0	3
ELL431	Power System Optimization	3	0	0	3
ELL436	Digital Control	3	0	0	3
ELL437	Switch Mode Power Conversion	3	0	0	3
ELL453	Power System Dynamics and Control	3	0	0	3
ELL703	Optimal Control Theory	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL 724	Multichannel Signal Processing	3	0	0	3
ELL730	I.C. Technology	3	0	0	3
ELP740	On-wafer Device Characterization Laboratory	0	0	6	3
ELL758	Power Quality	3	0	0	3
ELL765	Smart Grid Technology	3	0	0	3
ELS330	Independent Study (EP)	0	3	0	3

B.Tech. in Electrical Engineering Power and Automation

EE3

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**ELL202**	**COL106**	**ELL203**	**SBL100**	**ELL205**											
	Circuit Theory	Data Structures & Algorithms	Electromechanics	Introductory Biology for Engineers	Signals and Systems											
	3 1 0 4	3 0 4 5	3 1 0 4	3 0 2 4	3 1 0 4						15	3	6	21.0	0	24.0
IV	**ELL201**	**ELL231**	**CVL100**	**MTL106**	**ELL225**	**ELP203**	**HUL2XX**									
	Digital Electronics	Power Electronics and Energy Devices	Environmental Science	Probability and Stochastic Processes	Control Engineering-I	Electromechanics Laboratory										
	3 0 3 4.5	3 0 0 3	2 0 0 2	3 1 0 4	3 1 0 4	0 0 3 1.5	3 1 0 4				17	3	6	23.0	0	26.0
V	**ELL304**	**DE 1**	**ELL302**	**HUL2XX**	**ELL305**	**ELP225**										
	Analog Electronic Circuits		Power Electronics		Computer Architecture	Control Engineering-I										
	3 1 3 5.5	3 0 2 4	3 0 0 3	3 1 0 4	3 0 0 3	0 0 3 1.5					15	2	8	21.0	0	25.0
VI	**MCL142**	**ELL365**	**PYL102**	**ELL303**	**ELL332**	**ELP305**	**ELP302**									
	Thermal Science for Electrical Engineers	Embedded Systems	Principles of Electronic Materials	Power Engineering-I	Electric Drives	Design and System Laboratory	Power Electronics Laboratory									
	3 0 0 3	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 3	0 0 3 1.5	0 0 3 1.5				15	1	6	19.0	0	22.0
VII		**HUL2XX**	**ELL363**	**OC1**	**ELD431**	**ELP303**	**ELP332**									
			Power Engineering-II		B.Tech. Project-I	Power Engineering Laboratory	Electric Drives Laboratory									
		3 1 0 4	3 0 0 3	3 0 2 4	0 0 6 3	0 0 3 1.5	0 0 3 1.5				9	1	14	17.0	0	24.0
VIII	**DE 2**	**DE 3**	**OC2**	**OC3**	**HUL3XX**											
	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3						15	0	2	15.0	0	15.0

Total = 153.0

Bachelor of Technology in Energy Engineering

Department of Energy Science and Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	12
Departmental Courses	
Departmental Core	67
Departmental Electives	10
Open Category Courses	10
Total Graded Credit requirement	**157**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Programme-Linked Basic / Engineering Arts / Sciences Core

MCL140	Engineering Thermodynamics	3	1	0	4
MCL242	Heat Transfer	3	1	0	4
MLL100	Introduction to Materials Science and Engg.	3	0	2	4
	Total Credits				***12***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

APL105	Mechanics of Solids and Fluids	3	1	0	4
ESL100	Energy Resources and Utilization	3	1	0	4
ESL260	Network Analysis	2	1	0	3
ESL220	Semiconductors for Energy Systems	3	0	0	3
ESL261	Analog and Digital Electronics	3	0	0	3
ESL200	Fundamentals of Energy Engineering	3	1	2	5
ESL262	Electrical Machines	3	0	0	3
ESL280	Introduction to Plasma Concepts	3	0	2	4
ESL263	Power Electronics and Drives for Energy Engg.	3	0	0	3
ESL370	Control Systems and Automation	3	0	0	3
ESL341	Energy Storage	3	0	0	3
ESL371	Design of Energy Systems	3	1	0	4
ESL361	Power Systems and Smart Grid Operations	3	0	0	3
ESL373	Computational Methods for Energy Systems	3	0	2	4
ESL352	Hydrogen Economy	3	0	0	3
ESP260	Electrical Energy Laboratory	0	0	3	1.5
ESP300	Energy Innovation Laboratory	0	0	3	1.5
ESL372	Intelligent Techniques for Energy System Analysis	3	0	0	3
ESL390	Energy Economics	3	0	0	3
ESD400	B.Tech Project-I	0	0	6	3
ESL400	Energy Efficiency	3	0	0	3
	Total Credits				***67***

Departmental Electives

ESL300	Self-organizing Dynamical Systems	3	0	0	3
ESL320	Building Integrated Photovoltaics	3	0	0	3
ESL330	Energy, Ecology and Environment	3	1	0	4
ESL331	Hydrodynamic Machines	3	1	0	4
ESL342	Nanotechnology in Energy Conversion and Storage	3	0	0	3
ESL351	Fundamentals of Internal Combustion Engines	3	0	0	3
ESL360	Direct Energy Conversion Methods	3	1	0	4
ESL374	Smart Devices for Energy Harvesting	3	0	0	3
ESL375	IoT for Energy Systems	3	0	0	3
ESL376	Smart Buildings	3	0	0	3
ESL377	Optimization of Energy System	3	0	0	3
ESL380	Basics of Nuclear Fission and Fusion	3	1	0	4
ESL381	Plasma Science	3	1	0	4
ESL382	Plasma Sources and Diagnostics	3	0	0	3
ESL410	Waste to Energy	3	0	0	3
ESL420	Industry Relevant Photovoltaic Technologies	3	0	0	3
ESL450	Hybrid Vehicles	3	0	0	3
ESL480	Plasma Chemistry	3	0	0	3
ESL481	Plasma Based Technologies for Smart Materials	3	0	0	3
ESL490	Wind and Tidal Wave Energy	3	0	0	3
ESL721	Pulse Width Modulation Techniques and AC Motor Drives	3	0	0	3
ESL732	Bioconversion and Processing of Waste	3	0	0	3
ESL738	Power System Planning and Operation	3	0	0	3
ESL739	Bioenergy: Resources, Technologies and Applications	3	0	0	3
ESL742	Economics and Financing of Renewable Energy Systems	3	0	0	3
ESL746	Hydrogen Energy	3	0	0	3
ESL749	Developing Energy Efficiency and Renewable Energy Projects	2	0	2	3
ESL750	Economics and Planning of Energy Systems	3	0	0	3
ESL753	Solar Thermal Technologies and Applications	3	0	0	3
ESL755	Solar Photovoltaic Devices and Systems	3	0	0	3
ESL756	Energy Policy and Planning	3	0	0	3
ESL762	Computational Fluid Dynamics for Energy Systems	3	0	2	4
ESL768	Wind and Small Hydro Energy Systems	3	0	0	3
ESL769	Design of Wind Turbines	2	0	2	3
ESL774	Quantitative Methods and Planning for Energy Systems	3	0	0	3
ESL775	Liquid Sprays for Energy Sector and Industrial Applications	3	0	0	3
ESL776	Industrial Energy and Environment Analysis	3	0	0	3
ESL781	Alternative Fuels for Aircraft and Rocket Propulsion	3	0	0	3
ESL784	Cogeneration and Energy Efficiency	3	0	0	3
ESL791	Renewable Energy Integration and Power Systems	3	0	0	3
ESL796	Operation and Control of Electrical Energy Systems	3	0	0	3
ESL798	Distributed and Decentralized Energy Systems	3	0	0	3
ESL845	Net Zero Energy Buildings	3	0	0	3
ESL855	Solar Photovoltaic Power Generation	3	0	0	3
ESD406	B.Tech. Project-II	0	0	18	9

B.Tech. in Energy Engineering

ES1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MCL140** Engineering Thermodynamics 3 1 0 4	**HUL2XX** 3 1 0 4	**ESL100** Energy Resource and Utilization 3 1 0 4	**ESL260** Network Analysis 2 1 0 3	**ESL220** Semiconductors for Energy Systems 3 0 0 3	**ESL261** Analog and Digital Electronics 3 0 0 3					17	4	0	21.0	0	21.0
IV	**MLL100** Introduction to Materials Science and Engineering 3 0 2 4	**APL105** Mechanics of Solids and Fluids 3 1 0 4	**ESL200** Fundamentals of Energy Engineering 3 1 2 5	**ESL262** Electrical Machines 3 0 0 3	**SBL100** Introductory Biology for Engineers 3 0 2 4			**HUL2XX** 3 1 0 4			18	3	6	24.0	0	27.0
V	**CVL100** Environmental Science 2 0 0 2	**ESL280** Introduction to Plasma Concepts 3 0 2 4	**ESL263** Power Electronics and Drives for Energy Engg. 3 0 0 3	**ESL370** Control System and Automation 3 0 0 3	**ESL341** Energy Storage 3 0 0 3			**MCL242** Heat and Mass Transfer 3 1 0 4			17	1	2	19.0	0	20.0
VI	**ESL371** Design of Energy Systems 3 1 0 4	**ESL361** Power Systems and Smart Grid Operations 3 0 0 3	**ESL373** Computational Methods for Energy Systems 3 0 2 4	**ESL352** Hydrogen Economy 3 0 0 3			**HUL2XX** 3 1 0 4	**ESP260** Electrical Energy Laboratory 0 0 3 1.5	**ESP300** Energy Innovation Laboratory 0 0 3 1.5		15	2	8	21.0	0	25.0
VII	**ESL372** Intelligent Techniques for Energy System Analysis 3 0 0 3	**ESL390** Energy Economics 3 0 0 3	**ESL400** Energy Efficiency 3 0 0 3		**DE-1** 3 0 0 3	**HUL2XX** 3 0 0 3			**ESD400** B.Tech. Project–I 0 0 6 3		15	0	6	18.0	0	21.0
VIII	**OC1** 3 0 0 3	**OC2** 3 0 0 3		**OC3** 3 1/0 0/2 4	**DE-2** 3 0 0 3 **ESD406** B.Tech. Project–II (DE) 0 0 14 7	**DE-3** 3 1/0 0/2 4					15 9	2/1/0 1	0/2/4 14/16	17.0	0	17.0/18.0/20.0 24.0/25.0

Total = 157.0

Bachelor of Technology in Materials Engineering

Department of Materials Science and Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	11
Departmental Courses	
Departmental Core	64
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**155**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MTL107	Numerical Methods and Computations	3	0	0	3
APL104	Solid Mechanics	3	1	0	4
CLL110	Transport Phenomena	3	1	0	4
	Total Credits				***11***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

MLL100	Introduction to Materials Science & Engg.	3	0	2	4
MLL102	Structure of Materials	2	1	0	3
MLL103	Intro to Thermodynamics of Materials	3	1	0	4
MLL104	Characterization of Materials-I	3	0	3	4.5
MLL202	Phase Equilibria and Transformations	2	1	0	3
MLL212	Math. Methods in Materials Engineering	2	1	0	3
MLL242	Introduction to Polymeric Materials	3	0	2	4
MLL251	Mechanical Behavior of Materials	3	1	0	4
MLL253	Electronic, Optical and Magnetic Properties of Materials	3	0	0	3
MLL371	Materials Processing	2	0	2	3
MLL213	Materials Modelling	1	0	4	3
MLL262	Principles of metal extraction	3	1	0	4
MLL452	Corrosion and Degradation of Materials	3	0	2	4
MLL372	Materials Selection and Design	3	0	0	3
MLL264	Glass and Ceramics	2	0	0	2
MLS302	Research Practice for Beginners	0	0	2	1
MLP352	Mechanical Behavior of Materials Lab.	0	0	3	1.5
MLP354	Functional Materials Lab.	0	0	3	1.5
MLP473	Materials Selection and Design Lab.	0	0	3	1.5
MLL181	Materials and Sustainable Developments	3	0	0	3
MLD411	B.Tech. Project-I	0	0	8	4
	Total Credits				***64***

Departmental Electives

MLS300	Independent study	3	0	0	3
MLL361	Iron and Steel Making	2	0	0	2
MLP362	Metallography Lab	0	0	4	2
MLL363	Metal Casting Technology	2	0	2	3
MLD412	B.Tech. Project Part-II	0	0	12	6
MLD413	Major project in Polymeric Materials	0	0	12	6
MLD414	Major project in Metallurgy	0	0	12	6
MLL203	Characterization of Materials-II	3	0	0	3
MLL341	Engineering Biomaterials	2	0	0	2
MLL342	Physical Chemistry of Polymers	3	0	0	3
MLL343	Polymer and Elastomer Technology	3	0	0	3
MLL344	Rheology and Processing of Polymers	3	0	2	4
MLL345	Polymer Matrix Composites	2	0	0	2
MLL364	Welding Metallurgy	2	0	2	3
MLL365	Powder Metallurgy	3	0	0	3
MLL366	Heat Treatment and Surface Engineering	2	0	2	3
MLL714	Fracture Mechanics	3	0	0	3
MLL715	Advanced Engineering Materials	3	0	0	3
MLL716	Engineering Failure Analysis & Prevention	3	0	0	3
MLL717	Engineering Plastics and Specialty Polymers	3	0	0	3
MLL729	Polymer Blends and Composites	3	0	0	3
MLL730	Diffusion & Kinetics	3	0	0	3
MLL732	Porous Materials	3	0	0	3
MLL733	Polymer Reaction Engineering	3	0	0	3
MLL734	Texture and Grain Boundary Engineering in metals and alloys	3	0	0	3
MLL735	Polymer Product & Mould Design	3	0	0	3
MLL736	Tribology and Surface Engg. of Materials	3	0	0	3
MLL738	Electronic Devices and Characterization	3	0	0	3
MLL740	Nanostructures and Nanomaterials	3	0	0	3
MLL742	Micro and nanofabrication in Materials Engg.	3	0	0	3
MLL744	Materials for Additive Manufacturing	3	0	0	3
MLL746	Crystals, Symmetry, and Tensors	3	2	0	5
MLL729	Polymer Blends and Composites	3	0	0	3
MLL733	Polymer Reaction Engineering	3	0	0	3
MLL735	Polymer Product and Mould Design	2	0	2	3
MLL741	Biodegradable Polymeric Materials	3	0	0	3
PYL704	Science and Technology of Thin Films	3	0	0	3
MLL748	Solid State Diffusion and Kinetics	3	0	0	3
MLL750	Imperfections in Materials and Applications	3	0	0	3
MLL752	Creep and Superplasticity of Materials	3	0	0	3
MLL760	Materials Simulation Methods Using High Performance Computing	2	0	2	3
PHL704	Science and Technology of thin films	3	0	0	3
CML723	Principles and practices of NMR and Optical Spectroscopy	3	0	0	3
APL736	Multiscale Modelling of Crystalline Materials	3	0	2	4
CML734	Chemistry of Nanostructured Materials	3	0	0	3
ELL212	Electromagnetics	3	1	0	4

B.Tech. in Materials Engineering

MS1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**APL104**	**SBL100**	**MLL100**	**MLL103**		**HUL2XX (I)**										
	Solid Mechanics	Intro. to Biology for Engineers	Intro. to Materials Science & Engineering	Intro. to Thermodynamics of Materials												
	3 1 0 4	3 0 2 4	3 0 2 4	3 1 0 4		3 1 0 4					15	3	4	20.0	0	22.0
IV	**MLL102**	**MLL104**	**MLL202**	**MLL212**	**MLL242**	**MTL107**										
	Structure of Materials	Characterization of Materials-I	Phase Equilibria and Transformations	Mathematical Methods in Materials Engg.	Introduction to Polymeric Materials	Numerical Methods and Computation										
	2 1 0 3	3 0 3 4.5	2 1 0 3	2 1 0 3	3 0 2 4	3 0 0 3					15	3	5	20.5	0	23.0
V	**CLL110**	**MLL251**	**MLL253**	**MLL371**	**MLL213**	**CVL100**	**DE I**									
	Transport Phenomena	Mechanical Behavior of Materials	Electronic, Optical & Magnetic Props. of Mat.	Materials Processing	Materials Modelling	Environmental Science	Departmental Elective-I									
	3 1 0 4	3 1 0 4	3 0 0 3	2 0 2 3	1 0 4 3	2 0 0 2	3 0 0 3				17	2	6	22.0	0	25.0
VI	**DE 2**	**MLL452**	**MLL372**	**MLL264**	**MLS302**	**MLP352**	**MLP 354**	**HUL2XX (II)**								
		Corrosion and Degradation of Materials	Materials Selection and Design	Glass and Ceramics	Research Practice for Beginners	Mechanical Behavior of Materials Lab	Functional Materials Lab									
	3 0 0 3	3 0 2 4	3 0 0 3	2 0 0 2	0 0 2 1	0 0 3 1.5	0 0 3 1.5	3 1 0 4			14	1	10	20.0	0	25.0
VII	**MLP473**	**MLL181**	**MLD411**	**MLL262**	**DE 3**	**OC1**	**HUL2XX (III)**									
	Materials Selection and Design Lab	Materials and Sustainable Development	B.Tech. Project-I	Principles of Metal Extraction												
	0 0 3 1.5	3 0 0 3	0 0 8 4	3 1 0 4	3 0 0 3	3 0 0 3	3 1 0 4				15	2	11	22.5	0	28.0
VIII	**DE 4**	**OC2**	**OC3**	**HUL3XX**												
	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 3							12	1	0	13.0	0	13.0

Total = 155.0

Bachelor of Technology in Mechanical Engineering

Department of Mechanical Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	11
Departmental Courses	
Departmental Core	64
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**155**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
MTL107	Numerical Methods and Computations	3	0	0	3
MTL108	Introduction to Statistics	3	1	0	4
	Total Credits				***11***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

APL104	Solid Mechanics	3	1	0	4
APL106	Fluid Mechanics	3	1	0	4
MCL111	Kinematics and Dynamics of Machines	3	0	2	4
MCL131	Manufacturing Processes-I	3	0	0	3
MCL140	Engineering Thermodynamics	3	1	0	4
MCL201	Mechanical Engineering Drawing	2	0	3	3.5
MCL211	Design of Machines	3	0	2	4
MCL212	Control Theory and Applications	3	0	2	4
MCL231	Manufacturing Processes-II	3	0	0	3
MCP231	Manufacturing Laboratory-I	0	0	2	1
MCL241	Energy Systems and Technologies	3	0.5	1	4
MCL242	Heat and Mass Transfer	3	1	0	4
MCL261	Introduction to Operations Research	3	0	0	3
MCP301	Mechanical Engineering Laboratory-I	0	0	3	1.5
MCL311	CAD and Finite Element Analysis	3	0	2	4
MCP331	Manufacturing Laboratory-II	0	0	2	1
MCL361	Manufacturing System Design	3	0	0	3
MCP401	Mechanical Engineering Laboratory-II	0	0	4	2
MCD411	B.Tech. Project	0	0	8	4
MCL431	CAM and Automation	2	0	2	3
	Total Credits				***64***

Departmental Electives

MCD310	Mini Project	0	0	6	3
MCL104	Solid Mechanics	3	1	0	4
MCL106	Fluid Mechanics	3	1	0	4
MCL314	Acoustics and Noise Control	3	0	2	4
MCL316	Vibration Engineering	3	0	0	3
MCL318	Introduction to Orbital Mechanics	3	0	0	3
MCL321	Automotive Systems	3	0	2	4
MCL322	Power Train Design	3	0	0	3
MCL330	Special Topics Production Engineering	3	0	0	3
MCL334	Industrial Automation	3	0	2	4
MCL336	Advances in Welding	3	0	2	4
MCL337	Advanced Machining Processes	3	0	0	3
MCL338	Mechatronic Applications in Manufacturing	3	0	2	4
MCL341	Gas Dynamics and Propulsion	3	0	2	4
MCL343	Introduction to Combustion	3	0	0	3
MCL344	Refrigeration and Air-conditioning	3	0	2	4
MCL345	Reciprocating Internal Combustion Engines	3	0	2	4
MCL346	Turbomachinery	3	0	2	4
MCL347	Intermediate Heat Transfer	3	0	0	3
MCL348	Thermal Management of Electronics	3	0	0	3
MCL350	Mechanical Engineering Product Synthesis	1	0	2	2
MCL363	Investment Planning	3	0	0	3
MCL364	Value Engineering	3	0	2	4
MCL366	OR Methods in Policy and Governance	3	0	0	3
MCL368	Quality and Reliability Engineering	3	0	0	3
MCL370	Special Topics in Industrial Engineering	3	0	0	3
MCL380	Special Topics in Mechanical Engineering	3	0	0	3
MCV390	Refrigeration and Air Conditioning Product Design	1	0	0	1
MCD412	B.Tech. Project-II	0	0	14	7
MCL421	Automotive Structural Design	2	0	2	3
MCL422	Design of Brake Systems	2	0	2	3
MCL441	Modelling and Experiments in Heat Transfer	2	0	4	4
MCL442	ThermoFluid Analysis of Biosystems	3	0	0	3
MCL443	Electrochemical Energy Systems	3	0	0	3
MCL705	Experimental Methods	3	0	2	4
MCL707	Thermal Turbomachines	3	0	0	3
MCL711	Fracture Mechanics in Design	2	0	2	3
MCL712	Engineering Acoustics	3	0	0	3
MCL713	Active Noise Control	3	0	0	3
MCL714	Orthopedic Biomechanics and Implant Design	2	0	2	3
MCL715	Design for Noise, Vibration and Harshness	2	0	2	3
MCL716	Mechatronics Product Design	2	0	2	3
MCL717	Machine Tool Design	2	0	2	3
MCL718	Design for Manufacture and Assembly	2	0	2	3
MCL721	Automotive Prime Movers	3	0	0	3
MCL722	Mechanical Design of Prime Mover Elements	3	0	0	3
MCL723	Vehicle Dynamics	2	0	2	3
MCL724	Biomechanics of Trauma in Automotive Design	3	0	0	3
MCL725	Design Electronic Assist Systems in Automobiles	3	0	0	3
MCL726	Design of Steering Systems	3	0	0	3
MCL729	Nanomechanics	2	0	2	3
MCL730	Designing with Advanced Materials	3	0	2	4
MCL731	Analytical Dynamics	3	0	0	3
MCL732	Air Pollution: Sources and Apportionment	3	0	0	3
MCL736*	Automotive Design	3	0	2	4
MCL738	Dynamics of Multibody Systems	2	0	2	3
MCL743	Plant Equipment Design	3	0	0	3
MCL747	Design of Precision Machines	2	0	2	3
MCL749	Mechatronics Product Design	3	0	2	4
MCL750	Product Design and Manufacturing	1	0	4	3
MCL753	Manufacturing Informatics	3	0	2	4
MCL755	Service System Design	3	0	0	3
MCL756	Supply Chain Management	3	0	0	3
MCL759	Entrepreneurship	3	0	0	3
MCL760	Project Management	3	0	0	3
MCL775	Special Topics in IE	3	0	0	3
MCL776	Advances in Metal Forming	3	0	0	3
MCL777	Machine Tool Design	3	0	2	4
MCL788	Surface Engineering	3	0	2	4
MCL795	Laser Processing of Materials	3	0	2	4
MCL797	Freedom and Constraints in Design	3	0	0	3
MCL798	Medical Robotics	2	0	2	3
MCL814*	Convective Heat Transfer	3	0	0	3
MCL818*	Heating, Ventilating and Air-conditioning	3	0	2	3
MCL839*	Rotor Dynamics	2	0	2	3
MCL865*	Advanced Operations Research	3	0	0	3

*with permission of course coordinator only

B. Tech. in Mechanical Engineering

ME1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MLL100**	**APL106**	**APL104**	**MCL140**	**MCL111**											
	Introduction to Materials Science and Engineering	Fluid Mechanics	Solid Mechanics	Engineering Thermodynamics	Kinematics and Dynamics of Machines											
	3 0 2 4	3 1 0 4	3 1 0 4	3 1 0 4	3 0 2 4						15	3	4	20.0	0	22.0
IV	**SBL100**	**MCL131**	**MCL241**	**MTL108**	**MCL201**	**HUL2XX**										
	Introductory Biology for Engineers	Manufacturing Processes-I	Energy Systems and Technologies	Introduction to Statistics	Mechanical Engineering Drawing											
	3 0 2 4	3 0 0 3	3 0.5 1 4	3 1 0 4	2 0 3 3.5	3 1 0 4					17	3	6	22.5	0	25.5
V	**MCL261**	**MCL231**	**MCL242**	**MTL107**	**MCL211**	**MCP231**	**HUL2XX**									
	Introduction to Operations Research	Manufacturing Processes-II	Heat and Mass Transfer	Numerical Methods and Computations	Design of Machines	Manufacturing Laboratory-I										
	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 4	3 0 2 4	0 0 2 1	3 1 0 4				18	2	4	22.0	0	24.0
VI	**MCL361**	**MCL212**	**MCL311**	**MCP301**	**MCP331**	**CVL100**	**HUL2XX**									
	Manufacturing System Design	Control Theory and Applications	CAD and Finite Element Analysis	Mechanical Engineering Lab-I	Manufacturing Laboratory-II	Environmental Science										
	3 0 0 3	3 0 2 4	3 0 2 4	0 0 3 1.5	0 0 2 1	2 0 0 2	3 1 0 4				14	1	9	19.5	0	24.0
VII	**MCL431**	**MCD411**	**DE 1 (3)**	**OC 1 (3)**	**MCP401**	**DE 2 (3)**										
	CAM and Automation	B.Tech. Project			Mechanical Engineering Lab-II											
	2 0 2 3	0 0 8 4	3 0 0 3	3 0 0 3	0 0 4 2	3 0 0 3					11	0	14	18.0	0	25.0
VIII	**DE 3 (3)**	**OC 2 (3)**	**OC 3 (4)**	**DE 4 (3)**	**HUL3XX**											
	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 3	3 0 0 3						15	1	0	16.0	0	16.0

Total = 155.0

Programme Code: **ME2**

Bachelor of Technology in Production and Industrial Engineering

Department of Mechanical Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	11
Departmental Courses	
Departmental Core	66
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**157**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
MTL107	Numerical Methods and Computations	3	0	0	3
MTL108	Introduction to Statistics	3	1	0	4
	Total Credits				***11***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

APL104	Solid Mechanics	3	1	0	4
MCL111	Kinematics and Dynamics of Machines	3	0	2	4
MCL132	Metal Forming and Press Tools	3	0	0	3
MCL133	Near Net Shape Manufacturing	3	0	0	3
MCL134	Metrology and Quality Assurance	3	0	1	3.5
MCL135	Welding and Allied Processes	3	0	0	3
MCL136	Material Removal Processes	3	0	0	3
MCL141	Thermal Science for Manufacturing	3	1	0	4
MCL201	Mechanical Engineering Drawing	2	0	3	3.5
MCL211	Design of Machines	3	0	2	4
MCL212	Control Theory and Applications	3	0	2	4
MCP232	Production Engineering Laboratory-I	0	0	2	1
MCL261	Introduction to Operations Research	3	0	0	3
MCP261	Industrial Engineering Laboratory-I	0	0	2	1
MCL262	Stochastic Modelling and Simulation	3	0	0	3
MCL311	CAD and Finite Element Analysis	3	0	2	4
MCL331	Micro and Nano Manufacturing	3	0	0	3
MCP332	Production Engineering Laboratory-II	0	0	2	1
MCL361	Manufacturing System Design	3	0	0	3
MCP361	Industrial Engineering Laboratory-II	0	0	2	1
MCD411	B.Tech. Project	0	0	8	4
MCL431	CAM and Automation	2	0	2	3
	Total Credits				***66***

Departmental Electives

MCD310	Mini Project	0	0	6	3
MCL104	Solid Mechanics	3	1	0	4
MCL314	Acoustics and Noise Control	3	0	2	4
MCL316	Vibration Engineering	3	0	0	3
MCL318	Introduction to Orbital Mechanics	3	0	0	3
MCL321	Automotive Systems	3	0	2	4
MCL322	Power Train Design	3	0	0	3
MCL330	Special Topics Production Engineering	3	0	0	3
MCL334	Industrial Automation	3	0	2	4
MCL336	Advances in Welding	3	0	2	4
MCL337	Advanced Machining Processes	3	0	0	3
MCL338	Mechatronic Applications in Manufacturing	3	0	2	4
MCL341	Gas Dynamics and Propulsion	3	0	2	4
MCL343	Introduction to Combustion	3	0	0	3
MCL344	Refrigeration and Air-conditioning	3	0	2	4
MCL345	Reciprocating Internal Combustion Engines	3	0	2	4
MCL346	Turbomachinery	3	0	2	4
MCL347	Intermediate Heat Transfer	3	0	0	3
MCL348	Thermal Management of Electronics	3	0	0	3
MCL350	Mechanical Engineering Product Synthesis	1	0	2	2
MCL363	Investment Planning	3	0	0	3
MCL364	Value Engineering	3	0	2	4
MCL366	OR Methods in Policy and Governance	3	0	0	3
MCL368	Quality and Reliability Engineering	3	0	0	3
MCL370	Special Topics in Industrial Engineering	3	0	0	3
MCL380	Special Topics in Mechanical Engineering	3	0	0	3
MCV390	Refrigeration and Air Conditioning Product Design	1	0	0	1
MCD412	B.Tech. Project-II	0	0	14	7
MCL421	Automotive Structural Design	2	0	2	3
MCL422	Design of Brake Systems	2	0	2	3
MCL441	Modelling and Experiments in Heat Transfer	2	0	4	4
MCL442	Thermofluid Analysis of Biosystems	3	0	0	3
MCL443	Electrochemical Energy Systems	3	0	0	3
MCL705	Experimental Methods	3	0	2	4
MCL711	Fracture Mechanics in Design	2	0	2	3
MCL712	Engineering Acoustics	3	0	0	3
MCL713	Active Noise Control	3	0	0	3
MCL714	Orthopedic Biomechanics and Implant Design	2	0	2	3
MCL715	Design for Noise, Vibration and Harshness	2	0	2	3
MCL716	Mechatronics Product Design	2	0	2	3
MCL763	Network Models for Public Systems	3	0	0	3
MCL717	Machine Tool Design	2	0	2	3
MCL718	Design for Manufacture and Assembly	2	0	2	3
MCL721	Automotive Prime Movers	3	0	0	3
MCL722	Mechanical Design of Prime Mover Elements	3	0	0	3
MCL723	Vehicle Dynamics	2	0	2	3
MCL724	Biomechanics of Trauma in Automotive Design	3	0	0	3
MCL725	Design Electronic Assist Systems in Automobiles	3	0	0	3
MCL726	Design of Steering Systems	3	0	0	3
MCL729	Nanomechanics	2	0	2	3
MCL730	Designing with advanced materials	3	0	2	4
MCL731	Analytical Dynamics	3	0	0	3
MCL732	Air Pollution: Sources and Apportionment	3	0	0	3
MCL736*	Automotive Design	3	0	2	4
MCL738	Dynamics of Multibody Systems	2	0	2	3
MCL743	Plant Equipment Design	3	0	0	3
MCL747	Design of Precision Machines	2	0	2	3
MCL749	Mechatronics Product Design	3	0	2	4
MCL750	Product Design and Manufacturing	1	0	4	3
MCL753	Manufacturing Informatics	3	0	2	4
MCL755	Service System Design	3	0	0	3
MCL756	Supply Chain Management	3	0	0	3
MCL759	Entrepreneurship	3	0	0	3
MCL760	Project Management	3	0	0	3
MCL775	Special Topics in IE	3	0	0	3
MCL776	Advances in Metal Forming	3	0	0	3
MCL777	Machine Tool Design	3	0	2	4
MCL788	Surface Engineering	3	0	2	4
MCL795	Laser Processing of Materials	3	0	2	4
MCL797	Freedom and Constraints in Design	3	0	0	3
MCL798	Medical Robotics	2	0	2	3
MCL814*	Convective Heat Transfer	3	0	0	3
MCL818*	Heating, Ventilating and Air-conditioning	3	0	2	3
MCL839*	Rotor Dynamics	2	0	2	3
MCL865*	Advanced Operations Research	3	0	0	3

*with permission of course coordinator only

B. Tech. in Production and Industrial Engineering

ME2

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MLL100** Introduction to Materials Science and Engineering 3 0 2 4	**APL 104** Solid Mechanics 3 1 0 4	**MCL141** Thermal Science for Manufacturing 3 1 0 4	**MCL111** Kinematics and Dynamics of Machines 3 0 2 4	**HUL2XX** 3 1 0 4						15	3	4	20.0	0	22.0
IV	**SBL100** Introductory Biology for Engineers 3 0 2 4	**MCL132** Metal Forming and Press Tools 3 0 0 3	**MCL133** Near Net Shape Manufacturing 3 0 0 3	**MTL108** Introduction to Statistics 3 1 0 4	**MCL201** Mechanical Engineering Drawing 2 0 3 3.5	**HUL2XX** 3 1 0 4					17	2	5	21.5	0	24.0
V	**MCL261** Introduction to Operations Research 3 0 0 3	**MCL134** Metrology and Quality Assurance 3 0 1 3.5	**MCL135** Welding and Allied Processes 3 0 0 3	**MTL107** Numerical Methods and Computations 3 0 0 3	**MCL211** Design of Machines 3 0 2 4	**MCP232** Production Engineering Laboratory-I 0 0 2 1	**MCL262** Stochastic Modelling and Simulation 3 0 0 3				18	0	5	20.5	0	23.0
VI	**MCL361** Manufacturing System Design 3 0 0 3	**MCL212** Control Theory and Applications 3 0 2 4	**MCL311** CAD and Finite Element Analysis 3 0 2 4	**MCP261** Industrial Engineering Laboratory-I 0 0 2 1	**MCP332** Production Engineering Laboratory-II 0 0 2 1	**MCL136** Material Removal Processes 3 0 0 3	**MCL331** Micro and Nano Manufacturing 3 0 0 3	**CVL100** Environmental Science 2 0 0 2			17	0	8	21.0	0	25.0
VII	**MCL431** CAM and Automation 2 0 2 3	**MCD411** B.Tech. Project 0 0 8 4	**MCP361** Industrial Engineering Laboratory-II 0 0 2 1	**OC 1 (3)** 3 0 0 3	**HUL2XX** 3 1 0 4	**DE 1 (3)** 3 0 0 3					11	1	12	18.0	0	24.0
VIII	**DE 2 (3)** 3 0 0 3	**OC 2 (3)** 3 0 0 3	**OC 3 (4)** 3 1 0 4	**DE 3 (3)** 3 0 0 3	**HUL3XX** 3 0 0 3	**DE 4 (3)** 3 0 0 3					18	1	0	19.0	0	19.0

Total = 157.0

Bachelor of Technology in Mathematics and Computing

Department of Mathematics

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	12.5
Departmental Courses	
Departmental Core	63.5
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**156**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic/Engineering Arts/Sciences Core

COL106	Data Structures and Algorithms	3	0	4	5
ELL201	Digital Electronics	3	0	3	4.5
PYL102	Principles of Electronic Materials	3	0	0	3
	Total Credits				***12.5***

Departmental Core

ELL305	Computer Architecture	3	0	0	3
ELP305	Design and System Laboratory	0	0	3	1.5
MTL102	Differential Equations	3	0	0	3
MTL103	Optimization Methods and Applications	3	0	0	3
MTL104	Linear Algebra and Applications	3	0	0	3
MTL105	Algebra	3	0	0	3
MTL106	Probability and Stochastic Processes	3	1	0	4
MTL107	Numerical Methods and Computations	3	0	0	3
MTL122	Real and Complex Analysis	3	1	0	4
MTL180	Discrete Mathematical Structures	3	1	0	4
MTP290	Computing Laboratory	0	0	4	2
MTL342	Analysis and Design of Algorithms	3	1	0	4
MTL390	Statistical Methods	3	1	0	4
MTD411	B.Tech. Project	0	0	8	4
MTL421	Functional Analysis	3	0	0	3
MTL445	Computational Methods for Differential Equations	3	0	2	4
MTL458	Operating Systems	3	0	2	4
MTL782	Data Mining	3	0	2	4
MTL783	Theory of Computation	3	0	0	3
	Total Credits				***63.5***

Departmental Electives

COL334	Computer Networks	3	0	2	4
COL728	Compiler Design	3	0	3	4.5
ELL365	Embedded Systems	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL786	Multimedia Systems	3	0	0	3
ELL789	Intelligent Systems	3	0	0	3
ELL792	Computer Graphics	3	0	0	3
ELL793	Computer Vision	3	0	0	3
ELL884	Deep Learning for Natural Language Processing	3	0	0	3
MTL145	Number Theory	3	0	0	3
MTL146	Combinatorics	3	0	0	3
MTL260	Boundary Value Problems	3	0	0	3
MTL265	Mathematical Programming Techniques	3	0	0	3
MTL270	Measure Integral and Probability	3	0	0	3
MTD350	Mini Project	0	0	6	3
MTL415	Parallel Algorithms	3	0	0	3
MTL704	Numerical Optimization	3	0	0	3
MTL717	Fuzzy Sets and Applications	3	0	0	3
MTL720	Neurocomputing and Applications	3	0	0	3
MTL725	Stochastic Processes and its Applications	3	0	0	3
MTL728	Category Theory	3	0	0	3
MTL729	Computational Algebra and its Applications	3	0	0	3
MTL730	Cryptography	3	0	0	3
MTL731	Introduction to Chaotic Dynamical Systems	3	0	0	3
MTL732	Financial Mathematics	3	0	0	3
MTL733	Stochastic of Finance	3	0	0	3
MTL734	Introductory Actuarial Mathematics	3	0	0	3
MTL735	Advanced Number Theory	3	0	0	3
MTL736	Analytic Number Theory	3	0	0	3
MTL738	Commutative Algebra	3	0	0	3
MTL739	Representation of Finite Groups	3	0	0	3
MTL741	Fractal Geometry	3	0	0	3
MTL742	Operator Theory	3	0	0	3
MTL743	Fourier Analysis	3	0	0	3
MTL744	Mathematical Theory of Coding	3	0	0	3
MTL745	Advanced Matrix Theory	3	0	0	3
MTL747	Mathematical Logic	3	0	0	3
MTL751	Symbolic Dynamics	3	0	0	3
MTL754	Principles of Computer Graphics	3	0	0	3
MTL755	Algebraic Geometry	3	0	0	3
MTL756	Lie Algebras and Lie Groups	3	0	0	3
MTL757	Introduction to Algebraic Topology	3	0	0	3
MTL760	Advanced Algorithms	3	0	0	3
MTL761	Basic Ergodic Theory	3	0	0	3
MTL762	Probability Theory	3	0	0	3
MTL763	Introduction to Game Theory	3	0	0	3
MTL766	Multivariate Statistical Methods	3	0	0	3
MTL768	Graph Theory	3	0	0	3
MTL773	Wavelets and Applications	3	0	0	3
MTL776	Graph Algorithms	3	0	0	3
MTL780	Parameterized Algorithms for NP-hard Problems	3	0	0	3
MTL781	Finite Element Theory and Applications	3	0	0	3
MTL785	Natural Language Processing	3	0	0	3
MTL792	Modern Methods in Partial Differential equations	3	0	0	3
MTL793	Numerical Methods for Hyperbolic PDEs	3	0	0	3
MTL794	Advanced Probability Theory	3	0	0	3
MTL795	Numerical Method for Partial Differential Equations	3	1	0	4
MTL799	Mathematical Analysis in Learning Theory	3	0	0	3
MTV791	Special Module in Dynamical System	1	0	0	1
MTL811	Mathematical Foundation of Artificial Intelligence	3	0	0	3
MTL843	Mathematical Modeling of Credit Risk	3	0	0	3
MTL851	Applied Numerical Analysis	3	0	0	3
MTL854	Interpolation and Approximation	3	0	0	3
MTL855	Multiple Decision Procedures in Ranking and Selection	3	0	0	3
MTL860	Linear Algebra	3	0	0	3
MTL863	Algebraic Number Theory	3	0	0	3
MTV874	Analysis	3	0	0	3
MTL882	Applied Analysis	3	0	0	3
MTL883	Physical Fluid Mechanics	3	0	0	3
MTL888	Boundary Elements Methods with Computer Implementation	3	0	0	3

B. Tech. in Mathematics and Computing

MT1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**COL106** Data Structures & Algorithms 3 0 4 5	**MTL180** Discrete Mathematical Structures 3 1 0 4	**PYL102** Principles of Electronic Materials 3 0 0 3	**CVL100** Environmental Science 2 0 0 2	**MTL104** Linear Algebra and Applications 3 0 0 3	**HUL2XX** 3 1 0 4					17	2	4	21.0	0	23.0
IV	**MTL122** Real and Complex Analysis 3 1 0 4	**ELL201** Digital Electronics 3 0 3 4.5	**MTL103** Optimization Methods and Applications 3 0 0 3	**SBL100** Introduction to Biology for Engineers 3 0 2 4	**MTP290** Computing Laboratory 0 0 4 2	**HUL2XX** 3 1 0 4					15	2	9	21.5	0	26.0
V	**MTL106** Probability and Stochastic Processes 3 1 0 4	**ELL305** Computer Architecture 3 0 0 3	**MTL105** Algebra 3 0 0 3	**MTL107** Numerical Methods and Computation 3 0 0 3	**MTL342** Analysis and Design of Algorithms 3 1 0 4	**HUL2XX** 3 1 0 4					18	3	0	21.0	0	21.0
VI	**MTL102** Differential Equations 3 0 0 3	**MTL782** Data Mining 3 0 2 4	**MTL390** Statistical Methods 3 1 0 4	**MTL411** Functional Analysis 3 0 0 3	**DE 1** 3 0 0 3	**ELP305** Design and System Laboratory 0 0 3 1.5					15	1	5	18.5	0	21.0
VII	**MTL712** Computational Methods for Differential Equations 3 0 2 4	**MTL783** Theory of Computation 3 0 0 3	**DE 2** 3 0 0 3	**MTL458** Operating Systems 3 0 2 4	**OC 1** 3 0 0 3	**HUL3XX** 3 0 0 3					18	0	4	20.0	0	22.0
VIII	**OC 2** 3 1 0 4	**OC 3** 3 0 0 3	**DE 3** 3 0 0 3	**DE 4** 3 0 0 3	**MTD421** B.Tech. Project 0 0 8 4						12	1	8	17.0	0	21.0

Total = 156.0

Programme Code: **MT6**

Dual Degree Programme: Bachelor of Technology and Master of Technology in Mathematics and Computing

Department of Mathematics

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	12.5
Departmental Courses	
Departmental Core	59.5
Departmental Electives	6
Open Category Courses	12
Total B.Tech. Credit requirement	**148**
Non Graded Units	**11**
M.Tech. Part	
Programme Core Courses	24
Programme Electives Courses	18
Total M.Tech. Requirement	**42**
Total Graded Requirement	**190**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

COL106	Data Structures and Algorithms	3	0	4	5
ELL201	Digital Electronics	3	0	3	4.5
PYL102	Principles of Electronic Materials	3	0	0	3
	Total Credits				***12.5***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

ELL305	Computer Architecture	3	0	0	3
ELP305	Design and System Laboratory	0	0	3	1.5
MTL102	Differential Equations	3	0	0	3
MTL103	Optimization Methods and Applications	3	0	0	3
MTL104	Linear Algebra and Applications	3	0	0	3
MTL105	Algebra	3	0	0	3
MTL106	Probability and Stochastic Processes	3	1	0	4
MTL107	Numerical Methods and Computations	3	0	0	3
MTL122	Real and Complex Analysis	3	1	0	4
MTL180	Discrete Mathematical Structures	3	1	0	4
MTP290	Computing Laboratory	0	0	4	2
MTL342	Analysis and Design of Algorithms	3	1	0	4
MTL783	Theory of Computation	3	0	0	3
MTL390	Statistical Methods	3	1	0	4
MTL411	Functional Analysis	3	0	0	3
MTL445	Computational Methods for Differential Equations	3	0	2	4
MTL458	Operating Systems	3	0	2	4
MTL712	Computational Methods for Differential Equations	3	0	2	4
MTL782	Data Mining	3	0	2	4
	Total Credits				***63.5***

Departmental Electives

COL334	Computer Networks	3	0	2	4
ELL365	Embedded Systems	3	0	0	3
MTL145	Number Theory	3	0	0	3
MTL146	Combinatorics	3	0	0	3
MTL260	Boundary Value Problems	3	0	0	3
MTL265	Mathematical Programming Techniques	3	0	0	3
MTL270	Measure Integral and Probability	3	0	0	3
MTD350	Mini Project	0	0	6	3
MTL415	Parallel Algorithms	3	0	0	3
MTL736	Analytic Number Theory	3	0	0	3
MTL768	Graph Theory	3	0	0	3
MTL773	Wavelets and Applications	3	0	0	3
MTL780	Parameterized Algorithms for NP-hard Problems	3	0	0	3
MTL799	Mathematical Analysis in Learning Theory	3	0	0	3

Program Core

MTL766	Multivariate Statistical Methods	3	0	0	3
MTL781	Finite Elements and Applications	3	0	0	3
MTD851	Major Project Part-I (MT)	0	0	12	6
MTD852	Major Project Part-II (MT)	0	0	24	12
MTD853*	Major Project Part-I	0	0	8	4
MTD854*	Major Project Part-II	0	0	28	14
	Total Credits				***22***

***MTD853 and MTD854 together are alternatives to MTD851 and MTD852**

Program Electives

COL728	Compiler Design	3	0	3	4.5
ELL715	Digital Image Processing	3	0	2	4
ELL786	Multimedia Systems	3	0	0	3
ELL789	Intelligent Systems	3	0	0	3
ELL792	Computer Graphics	3	0	0	3
ELL793	Computer Vision	3	0	0	3
ELL884	Deep Learning for Natural Language Processing	3	0	0	3
MTL704	Numerical Optimization	3	0	0	3
MTL717	Fuzzy Sets and Applications	3	0	0	3
MTL720	Neurocomputing and Applications	3	0	0	3
MTL725	Stochastic Processes and its Applications	3	0	0	3
MTL728	Category Theory	3	0	0	3
MTL729	Computational Algebra and its Applications	3	0	0	3
MTL730	Cryptography	3	0	0	3
MTL731	Introduction to Chaotic Dynamical Systems	3	0	0	3
MTL732	Financial Mathematics	3	0	0	3
MTL733	Stochastic of Finance	3	0	0	3
MTL734	Introductory Actuarial Mathematics	3	0	0	3
MTL735	Advanced Number Theory	3	0	0	3
MTL736	Analytic Number Theory	3	0	0	3
MTL738	Commutative Algebra	3	0	0	3
MTL739	Representation of Finite Groups	3	0	0	3
MTL741	Fractal Geometry	3	0	0	3
MTL742	Operator Theory	3	0	0	3
MTL743	Fourier Analysis	3	0	0	3
MTL744	Mathematical Theory of Coding	3	0	0	3
MTL745	Advanced Matrix Theory	3	0	0	3
MTL747	Mathematical Logic	3	0	0	3
MTL751	Symbolic Dynamics	3	0	0	3
MTL754	Principles of Computer Graphics	3	0	0	3
MTL755	Algebraic Geometry	3	0	0	3
MTL756	Lie Algebras and Lie Groups	3	0	0	3
MTL757	Introduction to Algebraic Topology	3	0	0	3

MTL760	Advanced Algorithms	3	0	0	3
MTL761	Basic Ergodic Theory	3	0	0	3
MTL762	Probability Theory	3	0	0	3
MTL776	Graph Algorithms	3	0	0	3
MTL763	Introduction to Game Theory	3	0	0	3
MTL780	Parameterized Algorithms for NP-hard Problems	3	0	0	3
MTL785	Natural Language Processing	3	0	0	3
MTL792	Modern Methods in Partial Differential equations	3	0	0	3
MTL793	Numerical Methods for Hyperbolic PDEs	3	0	0	3
MTL794	Advanced Probability Theory	3	0	0	3
MTL795	Numerical Method for Partial Differential Equations	3	1	0	4
MTV791	Special Module in Dynamical System	1	0	0	1
MTL811	Mathematical Foundation of Artificial Intelligence	3	0	0	3
MTL843	Mathematical Modeling of Credit Risk	3	0	0	3
MTL851	Applied Numerical Analysis	3	0	0	3
MTL854	Interpolation and Approximation	3	0	0	3
MTL855	Multiple Decision Procedures in Ranking and Selection	3	0	0	3
MTL860	Linear Algebra	3	0	0	3
MTL863	Algebraic Number Theory	3	0	0	3
MTV874	Analysis	3	0	0	3
MTL882	Applied Analysis	3	0	0	3
MTL883	Physical Fluid Mechanics	3	0	0	3
MTL888	Boundary Elements Methods with Computer Implementation	3	0	0	3

Dual Degree Programme: B. Tech. and M. Tech. in Mathematics and Computing

MT6

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101** Introduction to Electrical Engineering 3 1 0 4	**ELP101** Introduction to Electrical Engineering (Lab.) 0 0 2 1	**MCP100** Introduction to Engineering Visualization 0 0 4 2	**PYL101** Electromagnetism & Quantum Mechanics 3 1 0 4	**MTL100** Calculus 3 1 0 4	**PYP100** Physics Laboratory 0 0 4 2	**MCP101** Product Realization through Manufacturing 0 0 4 2	**NIN100** Introduction to Engineering (Non-graded) 0 0 2 1	**NEN110** Professional Ethics and Social Responsibility-1 (Non-graded) 0 0 0.5 0.25	**NLN100** Language and Writing Skills-1 (Non-graded) 0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100** Engineering Mechanics 3 1 0 4	**COL100** Introduction to Computer Science 3 0 2 4	**CML101** Introduction to Chemistry 3 1 0 4	**MTL101** Linear Algebra and Differential Equations 3 1 0 4	**CMP100** Chemistry Laboratory 0 0 4 2			**NEN111** Professional Ethics and Social Responsibility-2 (Non-graded) 0 0 0.5 0.25	**NLN101** Language and Writing Skills-2 (Non-graded) 0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**COL106** Data Structures & Algorithms 3 0 4 5	**MTL180** Discrete Mathematical Structures 3 1 0 4	**PYL102** Principles of Electronic Materials 3 0 0 3	**CVL100** Environmental Science 2 0 0 2	**MTL104** Linear Algebra and Applications 3 0 0 3	**HUL2XX** 3 1 0 4					17	2	4	21.0	0	25.0
IV	**MTL122** Real and Complex Analysis 3 1 0 4	**ELL201** Digital Electronics 3 0 3 4.5	**MTL103** Optimization Methods and Applications 3 0 0 3	**SBL100** Introduction to Biology for Engineers 3 0 2 4	**MTP290** Computing Laboratory 0 0 4 2	**HUL2XX** 3 1 0 4					15	2	9	21.5	0	26.0
V	**MTL106** Probability and Stochastic Processes 3 1 0 4	**ELL305** Computer Architecture 3 0 0 3	**MTL105** Algebra 3 0 0 3	**MTL107** Numerical Methods and Computation 3 0 0 3	**MTL342** Analysis and Design of Algorithms 3 1 0 4	**HUL2XX** 3 1 0 4					18	3	0	21.0	0	21.0
VI	**MTL102** Differential Equations 3 0 0 3	**MTL782** Data Mining 3 0 2 4	**MTL390** Statistical Methods 3 1 0 4	**MTL411** Functional Analysis 3 0 0 3	**DE 1** 3 0 0 3	**ELP305** Design and System Lab. 0 0 3 1.5					15	1	5	18.5	0	21.0
VII	**MTL712** Computational Methods for Differential Equations 3 0 2 4	**MTL783** Theory of Computation 3 0 0 3	**DE 2** 3 0 0 3	**MTL458** Operating Systems 3 0 2 4	**OC 1** 3 0 0 3	**HUL3XX** 3 0 0 3					18	0	4	20.0	0	22.0
VIII	**OC 2** 3 0 0 3	**OE 1** 3 0 0 3	**PE 1** 3 0 0 3	**PE 2** 3 0 0 3	**PE 3** 3 0 0 3	**PE 4** 3 0 0 3					18	0	0	18.0	0	18.0
IX	**MTD851** 0 0 12 6	**MTL781** Finite Elements Theory and Applications 3 0 0 3	**MTL766** Multivariate Statistical Methods 3 0 0 3	**PE 5** 3 0 0 3	**PE 6** 3 0 0 3	**OE 2** 3 0 0 3					15	0	12	21.0	0	27.0
X	**MTD852** 0 0 24 12										0	0	24	12.0	0	24.0

Total = 190.0

Bachelor of Technology in Engineering Physics

Department of Physics

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	14.5
Departmental Courses	
Departmental Core	58
Departmental Electives	12
Open Category Courses	10
Total Graded Credit requirement	**152.5**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

CML102	Chemical Synthesis of Functional Materials	3	0	0	3
ELL201	Digital Electronics	3	0	3	4.5
ELL205	Signals and Systems	3	1	0	4
ESL350	Energy Conservation and Management	3	0	0	3
	Total Credits				***14.5***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

PYP111	Engineering Physics Laboratory-I	0	0	6	3
PYL121	Mathematical Physics-I	3	1	0	4
PYL122	Quantum Mechanics	3	1	0	4
PYL123	Optics and Photonics-I	3	1	0	4
PYL125	Solid State Physics-I	3	1	0	4
PYL127	Classical Mechanics & Relativity	3	1	0	4
PYL202	Statistical Physics	3	1	0	4
PYL204	Computational Physics	3	1	0	4
PYL205	Electrodynamics	3	1	0	4
PYL206	Mathematical Physics-II	3	1	0	4
PYL208	Solid State Physics-II	3	0	0	3
PYL209	Optics and Photonics-II	3	0	0	3
PYP212	Engineering Physics Laboratory-II	0	0	6	3
PYP223	Engineering Physics Laboratory-III	0	0	6	3
PYP224	Engineering Physics Laboratory-IV	0	0	6	3
PYD411	Project-I	0	0	8	4
	Total Credits				***58***

Departmental Electives

PYS300	Independent Study	0	3	0	3
PYL301	Vacuum Technology & Surface Science	3	0	0	3
PYL302	Nuclear Science and Engineering	3	0	0	3
PYL303	Materials Science and Engineering	3	0	0	3
PYL304	Superconductivity and Applications	3	0	0	3
PYL305	Engineering Applications of Plasmas	3	0	0	3
PYL306	Microelectronic Devices	3	0	0	3
PYL307	Elements of Material Processing	3	0	0	3
PYL311	Lasers	3	0	0	3
PYL312	Semiconductor Optoelectronics	3	0	0	3
PYL313	Fourier Optics and Holography	3	0	0	3
PYL321	Low Dimensional Physics	3	0	0	3
PYL322	Nanoscale Fabrication	3	0	0	3
PYL323	Nanoscale Microscopy	2	0	0	2
PYL324	Spectroscopy of Nanomaterials	2	0	0	2
PYL331	Applied Quantum Mechanics	3	0	0	3
PYL332	General Theory of Relativity & Cosmology	3	0	0	3
PYL411	Quantum Electronics	3	0	0	3
PYD412	Project-II	0	0	16	8
PYL412	Ultrafast Laser Systems and Applications	3	0	0	3
PYL413	Fiber and Integrated Optics	3	0	0	3
PYD414	Project-III	0	0	8	4
PYL414	Engineering Optics	3	0	0	3
PYV418	Selected Topics in Photonics	2	0	0	2
PYV419	Special Topics in Photonics	1	0	0	1
PYL421	Functional Nanostructures	3	0	0	3
PYL422	Spintronics	3	0	0	3
PYL423	Nanoscale Energy Materials & Devices	3	0	0	3
PYV428	Selected Topics in Nanotechnology	2	0	0	2
PYV429	Special Topics in Nanotechnology	1	0	0	1
PYL431	Relativistic Quantum Mechanics	2	0	0	2
PYL432	Quantum Electrodynamics	3	0	0	3
PYL433	Introduction to Gauge Field Theories	2	0	0	2
PYL434	Particle Accelerators	2	0	0	2
PYL435	Advanced Computational Physics	2	1	0	3
PYV438	Selected Topics in Theoretical Physics	2	0	0	2
PYV439	Special Topics in Theoretical Physics	1	0	0	1
PYL701	Physical Foundations of Materials Science	3	0	0	3
PYL702	Physics of Semiconductor Devices	3	0	0	3
PYL707	Characterization Techniques for Materials	3	0	0	3
PYL711	Introduction to Nonlinear Dynamics	3	1	0	4
PYL723	Vacuum Science and Cryogenics	3	0	0	3
PYL726	Semiconductor Device Technology	3	0	0	3
PYL730	Plasma Theory and Simulations	3	0	0	3
PYL740	Advanced Theory of Condensed Matter	3	0	0	3
PYL741	Field Theory and Quantum Electrodynamics	3	0	0	3
PYL742	General Relativity	3	0	0	3
PYL743	Group Theory and its Applications	3	0	0	3
PYL744	High Energy Physics	3	0	0	3
PYL745	Advanced Statistical Mechanics	3	0	0	3
PYL746	Non-equilibrium Statistical Mechanics	3	0	0	3
PYL748	Quantum Optics	3	0	0	3
PYL749	Quantum Information and Computation	3	0	0	3
PYL750	Topology in Condensed Matter Physics	3	0	0	3
PYL753	Optical Systems Design	3	0	0	3
PYL756	Fourier optics and holography	3	0	0	3
PYL759	Computational optical imaging	3	0	0	3
PYL760	Biomedical optics and Bio-photonics	3	0	0	3
PYL800	Numerical and Computational Methods	3	0	0	3

B. Tech. in Engineering Physics

PH1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.25	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.25	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**PYL127**	**PYL121**	**PYL123**	**PYL125**	**HUL2XX**	**PYP111**										
	Classical Mechanics & Relativity	Mathematical Physics-I	Optics & Photonics-I	Solid State Physics-I		Engineering Physics Laboratory-I										
	3 1 0 4	3 1 0 4	3 1 0 4	3 1 0 4	3 1 0 4	0 0 6 3					15	5	6	23.0	0	26.0
IV	**PYL122**	**PYL208**	**PYL206**	**ELL201**	**ESL350**	**PYP212**										
	Quantum Mechanics	Solid State Physics-II	Mathematical Physics-II	Digital Electronics	Energy Conservation and Management	Engineering Physics Laboratory-II										
	3 1 0 4	3 0 0 3	3 1 0 4	3 0 3 4.5	3 0 0 3	0 0 6 3					15	2	9	21.5	0	26.0
V	**PYL209**	**PYL205**	**ELL205**	**HUL2XX**	**CML102**	**PYP223**										
	Optics & Photonics-II	Electrodynamics	Signals and Systems		Chemical Synthesis of Functional Materials	Engineering Physics Laboratory-III										
	3 0 0 3	3 1 0 4	3 1 0 4	3 1 0 4	3 0 0 3	0 0 6 3					15	3	6	21.0	0	24.0
VI	**PYL202**	**PYL204**	**DE 1**	**HUL2XX**	**SBL100**	**PYP224**										
	Statistical Physics	Computational Physics			Introductory Biology for Engineers	Engineering Physics Laboratory-IV										
	3 1 0 4	3 1 0 4	3 0 0 3	3 1 0 4	3 0 2 4	0 0 6 3					15	3	8	22.0	0	26.0
VII	**DE 2**	**OC 1**	**HUL3XX**	**PYD411**	**CVL100**											
				Project-I	Environmental Science											
	3 0 0 3	3 0 0 3	3 0 0 3	0 0 8 4	2 0 0 2						11	0	8	15.0	0	19.0
VIII	**DE 3**	**DE 4**	**OC 2**	**OC 3**												
	3 0 0 3	3 0 0 3	3 1 0 4	3 0 0 3							12	1	0	13.0	0	13.0

Total = 152.5

Bachelor of Technology in Textile Technology

Department of Textile and Fibre Engineering

The overall Credit Structure

Course Category	Credits
Institute Core Courses	
Basic Sciences (BS)	24
Engineering Arts and Science (EAS)	19
Humanities and Social Sciences (HuSS)	15
Programme-linked Courses	12
Departmental Courses	
Departmental Core	52
Departmental Electives	16
Open Category Courses	10
Total Graded Credit requirement	**148**
Non Graded Units	**11**

Institute Core : Basic Sciences

CML101	Introduction to Chemistry	3	1	0	4
CMP100	Chemistry Laboratory	0	0	4	2
MTL100	Calculus	3	1	0	4
MTL101	Linear Algebra and Differential Equations	3	1	0	4
PYL101	Electromagnetism & Quantum Mechanics	3	1	0	4
PYP100	Physics Laboratory	0	0	4	2
SBL100	Introductory Biology for Engineers	3	0	2	4
	Total Credits				***24***

Institute Core: Engineering Arts and Sciences

APL100	Engineering Mechanics	3	1	0	4
COL100	Introduction to Computer Science	3	0	2	4
CVL100	Environmental Science	2	0	0	2
ELL101	Introduction to Electrical Engineering	3	1	0	4
ELP101	Introduction to Electrical Engineering (Lab)	0	0	2	1
MCP100	Introduction to Engineering Visualization	0	0	4	2
MCP101	Product Realization through Manufacturing	0	0	4	2
	Total Credits				***19***

Programme-Linked Basic / Engineering Arts / Sciences Core

MLL100	Introduction to Materials Science and Engineering	3	0	2	4
APL103	Experimental Methods	3	0	2	4
APL 105	Mechanics of Solids and Fluids	3	1	0	4
	Total Credits				***12***

Humanities and Social Sciences

Courses from Humanities, Social Sciences and Management offered under this category ***15***

Departmental Core

TXL130	Polymer Chemistry	3	0	0	3
TXL111	Textile Fibres	2	0	2	3
TXL211	Structure and Physical Properties of Fibres	3	0	0	3
TXL212	Manufactured Fibre Technology	3	0	0	3
TXP212	Manufactured Fibre Technology Lab	0	0	2	1
TXL221	Yarn Manufacture-I	3	0	0	3
TXP221	Yarn Manufacture Laboratory-I	0	0	2	1
TXL222	Yarn Manufacture-II	3	0	0	3
TXP222	Yarn Manufacture Laboratory-II	0	0	2	1
TXL231	Fabric Manufacture-I	3	0	0	3
TXP231	Fabric Manufacture Laboratory-I	0	0	2	1
TXL232	Fabric Manufacture-II	3	0	0	3
TXP232	Fabric Manufacture Laboratory-II	0	0	2	1
TXL241	Technology of Textile Preparation & Finishing	3	0	0	3
TXP241	Technology of Textile Preparation & Finishing Lab	0	0	3	1.5
TXL242	Technology of Textile Coloration	3	0	0	3
TXP242	Technology of Textile Coloration Lab	0	0	3	1.5
TXL361	Evaluation of Textile Materials	3	0	0	3
TXP361	Evaluation of Textiles Lab	0	0	2	1
TXL371	Theory of Textile Structures	3	1	0	4
TXL372	Speciality Yarns and Fabrics	2	0	0	2
TXD401	Major Project Part-I	0	0	8	4
	Total Credits				***52***

Departmental Electives

TXD301	Mini Project	0	0	6	3
TXR301	Professional Practices	0	1	2	2
TXS301	Independent Studies	0	3	0	3
TXL321	Multi and Long Fibre Spinning	3	0	0	3
TXL331	Woven Textile Design	3	0	0	3
TXL381	Costing and its Application in Textiles	3	1	0	4
TXL382	Applied Statistics for Textile Engineers	3	0	0	3
TXD402	Major Project Part-II	0	0	16	8
TXL700	Modelling and Simulation in Fibrous Assemblies	2	0	2	3
TXL710	High Performance and Specialty Fiber	3	0	0	3
TXL719	Functional & Smart Textiles	3	0	0	3
TXL724	Textured Yarn Technology	3	0	0	3
TXL734	Nonwoven Processes and Products	3	0	0	3
TXL740	Science & App. of Nanotechnology in Textiles	3	0	0	3
TXL741	Environment Management in Textile and Allied Industries	3	0	0	3
TXL750	Science of Clothing Comfort	3	0	0	3
TXL752	Design of Functional Clothing	3	0	0	3
TXL766	Design and Manuf. of Textile Structural Composites	3	0	0	3
TXL773	Medical Textiles	3	0	0	3
TXL774	Process Control in Yarn & Fabric Manufacturing	3	0	0	3
TXL775	Technical Textiles	3	0	0	3
TXL776	Design & Manuf. of Text. Reinforced Composites	3	0	0	3
TXL777	Product Design and Development	3	0	0	3
TXL780	Principles of Characterization of Functional and Technical Textiles	3	0	0	3
TXL781	Project Appraisal and Finance	3	0	0	3
TXL782	Production and Operations Management in Textile Industry	3	0	0	3
TXL783	Design of Experiments and Statistical Techniques	3	0	0	3
TXL785	Heat and Mass Transport in Fibrous Materials	3	0	0	3
TXL786	Technology of Textile Coating and Lamination	2	0	2	3
TXV701	Process Cont. and Econ. in Manmade Fibre Prod.	1	0	0	1
TXV702	Management of Textile Business	1	0	0	1
TXV703	Special Module in Textile Product Mgmt.	1	0	0	1
TXV704	Special Module in Yarn Manufacture	1	0	0	1
TXV705	Special Module in Fabric Manufacture	1	0	0	1
TXV706	Special Module in Fibre Science	1	0	0	1
TXV707	Special Module in Textile Chemical Processing	1	0	0	1

B.Tech. in Textile Technology

TT1

Semester	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course-7	Course-8	Course-9	Course-10	L	T	P	Credits	Non-graded Units	Contact Hours
I	**ELL101**	**ELP101**	**MCP100**	**PYL101**	**MTL100**	**PYP100**	**MCP101**	**NIN100**	**NEN110**	**NLN100**						
	Introduction to Electrical Engineering	Introduction to Electrical Engineering (Lab.)	Introduction to Engineering Visualization	Electromagnetism & Quantum Mechanics	Calculus	Physics Laboratory	Product Realization through Manufacturing	Introduction to Engineering (Non-graded)	Professional Ethics and Social Responsibility-1 (Non-graded)	Language and Writing Skills-1 (Non-graded)						
	3 1 0 4	0 0 2 1	0 0 4 2	3 1 0 4	3 1 0 4	0 0 4 2	0 0 4 2	0 0 2 1	0 0 0.5 0.5	0 0 2 1	9	3	14	19.0	2.25	31.0
II	**APL100**	**COL100**	**CML101**	**MTL101**	**CMP100**			**NEN111**	**NLN101**							
	Engineering Mechanics	Introduction to Computer Science	Introduction to Chemistry	Linear Algebra and Differential Equations	Chemistry Laboratory			Professional Ethics and Social Responsibility-2 (Non-graded)	Language and Writing Skills-2 (Non-graded)							
	3 1 0 4	3 0 2 4	3 1 0 4	3 1 0 4	0 0 4 2			0 0 0.5 0.5	0 0 2 1		12	3	6	18.0	1.25	24.0
Note: Courses 1-6 above are attended in the given order by half of all first year students. The other half of First year students attend the Courses 1-6 of II semester first.																
III	**MLL100**	**TXL111**	**TXL130**	**APL103**	**CVL100**	**HUL2XX**										
	Introduction to Materials Science and Engineering	Textile Fibres	Polymer Chemistry	Experimental Methods	Environmental Science											
	3 0 2 4	2 0 2 3	3 0 0 3	3 0 2 4	2 0 0 2	3 1 0 4					16	1	6	20.0	0	23.0
IV	**TXL211**	**TXL231**	**TXL241**	**SBL100**	**TXL221**	**TXP231**	**TXP221**	**TXP241**	**APL105**							
	Structure and Physical Properties of Fibres	Fabric Manufacture–I	Technology of Textile Preparation & Finishing	Introductory Biology for Engineers	Yarn Manufacture–I	Fabric Manufacture Laboratory–I	Yarn Manufacture Laboratory–I	Technology for Textile Prep. and Finishing Lab	Mechanics of Solids and Fluids							
	3 0 0 3	3 0 0 3	3 0 0 3	3 0 2 4	3 0 0 3	0 0 2 1	0 0 2 1	0 0 3 1.5	3 1 0 4		18	1	9	23.5	0	28.0
V	**TXL222**	**TXL232**	**TXL242**	**TXL212**	**HUL2XX**	**TXP222**	**TXP232**	**TXP242**								
	Yarn Manufacture–II	Fabric Manufacture–II	Technology of Textile Coloration	Manufactured Fibre Technology		Yarn Manufacture Laboratory–II	Fabric Manufacture Laboratory–II	Technology of Textile Coloration Lab								
	3 0 0 3	3 0 0 3	3 0 0 3	3 0 0 3	3 1 0 4	0 0 2 1	0 0 2 1	0 0 3 1.5			15	1	7	19.5	0	23.0
VI	**TXL361**	**TXL371**	**TXL372**	**DE 1 (3)**	**HUL2XX**	**TXP212**	**TXP361**									
	Evaluation of Textile Materials	Theory of Textile Structures	Speciality Yarns and Fabrics			Manufactured Fibre Technology Lab	Evaluation of Textiles Lab									
	3 0 0 3	3 1 0 4	2 0 0 2	3 0 0 3	3 1 0 4	0 0 2 1	0 0 2 1				14	2	4	18.0	0	20.0
VII	**DE 3 (3)**	**DE 4 (3)**	**TXD411**	**HUL3XX**	**DE 2 (3)**											
			B.Tech. Project													
	3 0 0 3	3 0 0 3	0 0 8 4	3 0 0 3	3 0 0 3						12	0	8	16.0	0	20.0
VIII	**DE 5 (4)**	**OC 1 (3)**	**OC 2(3)**	**OC 3 (4)**												
	3 0 2 4	3 0 0 3	3 0 0 3	3 0 2 4							12	0	4	14.0	0	16.0

Total = 148.0

3. CAPABILITY-LINKED OPTIONS FOR UNDERGRADUATE STUDENTS

As described in Common Rules, Section 1.8, students can make use of additional credits in two blocks of 20 credits to opt for

(a) Minor/Interdisciplinary Area Specialization (b) Departmental Specialization

A student based on his/her performance and interest can choose either one on both. Successful completion of minor area credits and/or Interdisciplinary/Departmental Specialization will be indicated on the degree.

When a student opts for such a specialization and/or a minor area, he/she can use 10 open category (OC) credits (mandatory degree requirement) towards the specialization and/or minor area requirements. For example, a student registered for B.Tech (Chemical Engg.) and opting for minor area in Computer Science, can opt for courses prescribed for the minor area, as part of mandatory 10 credits requirements under OC. He/she will need to do additional 10 credits for completing the Minor area requirements.

A set of pre-defined courses of total 20 credits in a focus area comprises a Departmental Specialization if the courses belong to the parent Department of an undergraduate programme, or a Minor/Interdisciplinary Area Specialization if the courses belong to a different Department/Centre/School. Additional conditions and details are given in this section.

If any course of a Minor/Interdisciplinary area overlaps with any core course (DC or PC category courses) or elective course (DE or PE category courses) of the student's programme, then credits from this course will not count towards the minor area credit requirements, though this course may contribute towards satisfying the requirement of the Minor/Interdisciplinary area. In such a case, the requirement of 20 credits must be completed by taking other courses of the Minor Area or Departmental/Interdisciplinary specialization. A student interested in opting for a Capability-linked option can register for the same online, on a first-come first served basis, after he/she completes at least 2 courses, preferably the core courses (wherever applicable) of the Minor Area/Interdisciplinary/Departmental Specialization being applied for.

The maximum number of credits per semester may be relaxed upto 28 by Dean, Acaemics for those students who apply for capability-linked option through proper channel.

Minor Area in Atmospheric Sciences (Centre for Atmospheric Sciences)

Minor Area Core

ASL320	Climate Change: Impacts, Adaptation and Mitigation	3	0	2	4
ASL340	Fundamentals of Weather and Climate	3	0	0	3
ASL350	Introduction to Oceanography	3	0	0	3
ASL360	The Earth's Atmosphere: Physical Principles	3	0	0	3
ASL370	Indian Monsoon, Global Warming and Climate Change	3	0	0	3
ASL380	Climate Modelling	3	0	0	3
	Total Credits				***6***

Minor Area Electives

ASL375	Climate of the Past: Lessons for the Future	3	0	0	3
ASL385	Fundamentals of Air Pollution Science	3	0	0	3
ASD390	Minor Area Project	0	0	10	5
ASL733	Physics of the Atmosphere	3	0	0	3
ASL734	Dynamics of the Atmosphere	3	0	0	3
ASL735	Atmospheric Chemistry and Air Pollution	3	0	0	3
ASL736	Science of Climate Change	3	0	0	3
ASL737	Physical and Dynamical Oceanography	3	0	0	3
ASL750	Boundary Layer Meteorology	3	0	0	3
ASL751	Dispersion of Air Pollutants	3	0	0	3
ASL752	Mesoscale Meteorology	3	0	0	3
ASL753	Atmospheric Aerosols	3	0	0	3
ASL754	Cloud Physics	3	0	0	3
ASL755	Remote Sensing of the Atmosphere and Ocean	3	0	0	3
ASL756	Synoptic Meteorology	3	0	0	3
ASL757	Tropical Weather and Climate	3	0	0	3
ASL758	General Circulation of the Atmosphere	3	0	0	3
ASL759	Land-Atmosphere Interactions	3	0	0	3
ASL760	Renewable Energy Meteorology	3	0	0	3
ASL761	Earth System Modelling	3	0	0	3
ASL762	Air-Sea Interaction	3	0	0	3
ASL763	Coastal Ocean and Estuarine Processes	3	0	0	3
ASL765	Impacts of Climate Change and Air Pollution on Human Health	3	0	0	3
ASP766	Atmospheric Measurements and Analysis Hands-on	1	0	4	3
ASV892	An Introduction to Renewable Energy Meteorology	1	0	0	1
ASL822	Climate Variability	3	0	0	3
ASL823	Geophysical Fluid Dynamics	3	0	0	3

Minor Area in Biological Sciences (Kusuma School of Biological Sciences)

Minor Area Core

SBL201	High-Dimensional Biology	3	0	0	3
SBP200	Introduction to Practical Modern Biology	0	0	4	2
SBL733	Introduction and Techniquies: Immunometabolism	3	0	0	3
	Total Credits				***5***

Minor Area Electives

SBD301	Mini Project	0	0	6	3
SBL701	Biometry	3	0	0	3
SBL702	Systems Biology	3	0	0	3
SBL704	Human Virology	3	0	0	3
SBL707	Bacterial Pathogenesis	3	0	0	3
SBL708	Epigenetics in Health and Disease	3	0	0	3
SBL705	Biology of Proteins	3	0	0	3
SBL703	Advanced Cell Biology	3	0	0	3
SBL706	Biologics	3	0	0	3
SBL709	Marine Bioprospecting	3	0	0	3
SBL710	Chemical Biology	3	0	0	3
SBL711	Cell Signalling	3	0	0	3
SBL712	Dynamics of Infection Biology	3	0	0	3
SBL713	Introduction to structural Biology	3	0	0	3
SBL714	Plant Biology and Human Health	3	0	0	3
SBL720	Genome and Healthcare	3	0	0	3
SBL721	Techniques in Biomolecular Interactions	3	0	0	3
SBL722	Stem Cell Biology	3	0	0	3
SBL723	Principles of Neural Excitability and Communication	3	0	0	3
SBL724	Decoding Protein Modifications in Biology	3	0	0	3

SBL725	Endocytosis and Intracellular Trafficking	3	0	0	3
SBL726	Biological Motors	3	0	0	3
SBL727	Advanced Developmental Biology	3	0	0	3
SBL728	Biological Physics	3	0	0	3
SBL729	Emerging Trends in Tumor Biology	3	0	0	3
SBL732	Concepts in Three-Dimensional Cell Culture	3	0	0	3
SBL750	Quantitative Biology	3	0	0	3
SBL751	Chemical and Molecular Foundation of Cell	3	0	0	3
SBL801	Signal Transduction and Drug Target Identification	3	0	0	3
SBL802	Macromolecular Structure and Data Processing	3	0	0	3
SBV898	Techniques in Mammalian Cell Culture	3	0	0	3
SBV899	Assays in Drug Development	1	0	0	1

Minor Area in Business Management (Department of Management Studies)

Minor Area Core (All four courses leading to 12 credits)

MSL301	Organizational & People Management	3	0	0	3
MSL302	Managerial Accounting & Financial Management	3	0	0	3
MSL303	Marketing Management	3	0	0	3
MSL304	Managing Operations	3	0	0	3
	Total Credits				***12***

Minor Area Electives (9 credits required)

MDL802	Entrepreneurial Finance	3	0	0	3
MDL803	Fixed Income Securities	3	0	0	3
MDL804	Behavioral Finance	1.5	0	0	1.5
MDL805	Financial Technology	1.5	0	0	1.5
MSL310	Financial Institutions and Markets	3	0	0	3
MSL311	Emerging Trends in Finance	3	0	0	3
MSL704	Science & Technology Policy Systems	3	0	0	3
MSL709	Business Research Methods	1.5	0	0	1.5
MSL710	Creative Problem Solving	3	0	0	3
MSL711	Strategic Management	3	0	0	3
MSL712	Ethics & Values Based Leadership	1.5	0	0	1.5
MSL713	Information Systems Management	3	0	0	3
MSL714	Organizational Dynamics and Environment	3	0	0	3
MSL715	Quality and Environment Management Systems	3	0	0	3
MSL716	Fundamentals of Management Systems	3	0	0	3
MSL717	Business Systems Analysis & Design	3	0	0	3
MSL719	Statistics for Management	3	0	0	3
MSL720	Macroeconomic Environment of Business	3	0	0	3
MSL721	Econometrics	3	0	0	3
MSL724	Business Communication	1.5	0	0	1.5
MSL725	Business Negotiations	1.5	0	0	1.5
MSL727	Interpersonal Behavior & Team Dynamics	1.5	0	0	1.5
MSL729	Individual Behavior in Organization	1.5	0	0	1.5
MSL730	Managing With Power	1.5	0	0	1.5
MSL731	Developing Self Awareness	1.5	0	0	1.5
MSL733	Organization Theory	1.5	0	0	1.5
MSL734	Management of Small & Medium Scale Industrial Enterprises	3	0	0	3
MSL740	Quantitative Methods in Management	3	0	0	3
MSL780	Managerial Economics	1.5	0	0	1.5
MSL781	Macroeconomic Dynamics	3	0	0	3
MSL801	Technology Forecasting & Assessment	3	0	0	3
MSL802	Management of Intellectual Property Rights	3	0	0	3
MSL804	Procurement Management	3	0	0	3
MSL805	Services Operations Management	3	0	0	3
MSL806	Mergers & Acquisitions	3	0	0	3
MSL807	Selected Topics in Strategic Management	1	0	0	1
MSL808	Systems Thinking	3	0	0	3
MSL809	Cyber Security: Managing Risks	3	0	0	3
MSL810	Advanced Data Mining for Business Decisions	1.5	0	0	1.5
MSL811	Management Control Systems	3	0	0	3
MSL812	Flexible Systems Management	3	0	0	3
MSL813	Systems Methodology for Management	3	0	0	3
MSL814	Data Visualization	1.5	0	0	1.5
MSL815	Decision Support and Expert Systems	3	0	0	3
MSL816	Total Quality Management	3	0	0	3
MSL817	Systems Waste & Sustainability	3	0	0	3
MSL818	Industrial Waste Management	3	0	0	3
MSL819	Business Process Re-engineering	3	0	0	3
MSL820	Global Business Environment	3	0	0	3
MSL821	Strategy Execution Excellence	3	0	0	3
MSL822	International Business	3	0	0	3
MSL823	Strategic Change & Flexibility	3	0	0	3
MSL824	Policy Dynamics & Learning Organization	3	0	0	3
MSL825	Strategies in Functional Management	3	0	0	3
MSL826	Business Ethics	3	0	0	3
MSL827	International Competitiveness	3	0	0	3
MSL828	Global Strategic Management	3	0	0	3
MSL829	Current & Emerging Issues in Strategic Management	3	0	0	3
MSL830	Organizational Structure and Processes	3	0	0	3
MSL831	Management of Change	3	0	0	3
MSL832	Managing Innovation for Organizational Effectiveness	3	0	0	3
MSL833	Organizational Development	3	0	0	3
MSL834	Managing Diversity at Workplace	1.5	0	0	1.5
MSL835	Labor Legislation and Industrial Relations	3	0	0	3
MSL836	International Human Resources Management	1.5	0	0	1.5
MSL839	Current & Emerging Issues in Organizational Management	3	0	0	3
MSL840	Manufacturing Strategy	3	0	0	3
MSL841	Supply Chain Analytics	3	0	0	3
MSL842	Supply Chain Modeling	3	0	0	3
MSL843	Supply Chain Logistics Management	3	0	0	3
MSL844	Systems Reliability, Safety and Maintenance Management	3	0	0	3
MSL845	Total Project Systems Management	3	0	0	3
MSL846	Total Productivity Management	3	0	0	3
MSL847	Advanced Methods for Management Research	3	0	0	3
MSL848	Applied Operations Research	3	0	0	3
MSL849	Current & Emerging Issues in Manufacturing Management	3	0	0	3
MSL850	Management of Information Technology	3	0	0	3
MSL851	Strategic Alliance	1.5	0	0	1.5
MSL852	Network System: Applications and Management	3	0	0	3
MSL853	Software Project Management	3	0	0	3
MSL854	Big Data Analytics & Data Science	1.5	0	0	1.5
MSL855	Electronic Commerce	3	0	0	3
MSL856	Business Intelligence	3	0	0	3
MSL858	Business Process Management with IT	1.5	0	0	1.5
MSL859	Current and Emerging Issues in IT Mgmt.	3	0	0	3
MSL861	Market Research	3	0	0	3
MSL862	Product Management	3	0	0	3
MSL863	Advertising and Sales Promotion Mgmt.	3	0	0	3
MSL864	Corporate Communication	3	0	0	3
MSL865	Sales Management	3	0	0	3
MSL866	International Marketing	3	0	0	3
MSL867	Industrial Marketing Management	3	0	0	3
MSL868	Digital Research Methods	1.5	0	0	1.5
MSL869	Current & Emerging Issues in Marketing	3	0	0	3
MSL870	Corporate Governance	1.5	0	0	1.5
MSL871	Banking and Financial Services	1.5	0	0	1.5
MSL872	Working Capital Management	3	0	0	3
MSL873	Security Analysis & Portfolio Management	3	0	0	3
MSL874	Indian Financial System	1.5	0	0	1.5
MSL875	International Financial Management	3	0	0	3
MSL876	Economics of Digital Business	1.5	0	0	1.5
MSL877	Electronic Government	1.5	0	0	1.5
MSL878	Electronic Payments	1.5	0	0	1.5
MSL879	Current & Emerging Issues in Finance	3	0	0	3
MSL880	Selected Topics in Management Methodology	3	0	0	3
MSL881	Management of Public Sector Enterprises in India	3	0	0	3
MSL882	Enterprise Cloud Computing	1.5	0	0	1.5
MSL883	ICTs, Development and Business	1.5	0	0	1.5
MSL884	Information System Strategy	3	0	0	3
MSL885	Digital Marketing-Analytics & Optimization	3	0	0	3
MSL886	IT Consulting & Practice	3	0	0	3
MSL887	Mobile Commerce	3	0	0	3
MSL888	Data Warehousing for Business Decision	1.5	0	0	1.5
MSL889	Current & Emerging Issues in Public Sector Management	3	0	0	3

MSL891	Data Analytics using SPSS	1.5	0	0	1.5
MSL892	Predictive Analytics	1.5	0	0	1.5
MSL895	Advanced Data Analysis for Management	3	0	0	3
MSL896	International Economic Policy	3	0	0	3
MSL897	Consultancy Process & Skills	3	0	0	3
MSL898	Consultancy Professional Practice	3	0	0	3
MSL899	Current & Emerging Issues in Consultancy Management	3	0	0	3
MTL732	Financial Mathematics	4	3	1	0
MSV826	Frontiers in OB & HR Management	1	0	0	1
MSV827	Frontiers in Finance	1	0	0	1
MSV828	Frontiers in Information Systems Mgmt.	1	0	0	1
MSV832	Frontiers in Strategic Management	1	0	0	1
MSV820	Contemporary Issues in IT Management	1	0	0	1
MSV821	Contemporary Issues in Operations Mgmt.	1	0	0	1
MSV816	Contemporary Issue in Management	1	0	0	1
MSV801	Selected Topics in OB & HR Management	1	0	0	1
MSV802	Selected Topics in Finance	1	0	0	1
MSV803	Selected Topics in IT Management	1	0	0	1
MSV804	Selected Topics in Operations Management	1	0	0	1
MSV805	Selected Topics in Economics	1	0	0	1
MSV806	Selected Topics in Marketing Management	1	0	0	1
MSL890	Financial Engineering	3	0	0	3
MSL310	Financial Institutions and Markets	3	0	0	3
MSL718	Management of Blockchain Technology	1.5	0	0	1.5
MSL782	Business Cycles and Global Economy	1.5	0	0	1.5
MSL783	Global Economic Development	1.5	0	0	1.5
MSL784	Sovereign Debt and Default	3	0	0	3

Minor Area in Entrepreneurship (Department of Management Studies)

Minor Area Core : 5 Courses (Total of 12 Credits)

MSL305	New Venture Creation	2	0	2	3
MSL306	Ideation and Prototyping	2	0	2	3
MSL307	Venture Financing & Teaming	2	0	2	3
MSD308	Product Viability & Market Traction	0	0	3	1.5
MSD309	Business Plan & Funding	0	0	3	1.5

Minor Area Electives : 3 Courses (Total of 9 Credits) from the following lists

MSL301	Organization & People Management	3	0	0	3
MSL302	Managerial Accounting & Financial Management	3	0	0	3
MSL303	Marketing Management	3	0	0	3
MSL304	Managing Operations	3	0	0	3
MSL310	Financial Institutions and Markets	3	0	0	3
MSL311	Emerging Trends in Finance	3	0	0	3
MSL401	Entrepreneurial Design Thinking	3	0	0	3
MSL402	Social Innovation & Entrepreneurship	3	0	0	3
MSL403	Entrepreneurial Market Strategies	3	0	0	3
MSL404	Entrepreneurial Business Development	3	0	0	3
MSL405	Financial Accounting & Compliance for Startups	3	0	0	3
MSL406	Company Law, Governance, IPR & Legal Issues for Startups	3	0	0	3
MSL407	Corporate Innovation & Entrepreneurship	3	0	0	3
MSL408	Startup Performance Management	3	0	0	3
MSL409	Entrepreneurship and Life Balance	3	0	0	3
MSL706	Business Law	3	0	0	3
MSL720	Macroeconomic Environment of Business	3	0	0	3
MSL721	Econometrics	3	0	0	3
MSL734	Management of Small & Medium Scale Industrial Enterprises	3	0	0	3

Minor Area in Economics (Department of Humanities and Social Sciences)

Minor Area Core (Minimum of 8 credits)

HUL211	Introduction to Economics	3	1	0	4
HUL212	Microeconomics	3	1	0	4
HUL213	Macroeconomics	3	1	0	4
HUL217	History of Economic Thought	3	1	0	4

Minor Area Electives

HUL286	Social Science Approaches to Development	3	1	0	4
HUL311	Applied Game Theory	3	0	0	3
HUL312	Distribution and Growth	3	0	0	3
HUL314	International Economics	3	0	0	3
HUL315	Econometric Methods	3	0	0	3
HUL316	Indian Economic Problems and Policies	3	0	0	3
HUL318	Public Finance and Public Economics	3	0	0	3
HUL319	Comparative Development Paths: Asia and the world	3	0	0	3
HUL320	Selected Topics in Economics	3	0	0	3
HUL372	Agrarian India: Past and Present	3	0	0	3
HSD700	Minor Project	0	0	6	3
HSL711	Macro Development Economics	3	0	0	3
HSL712	Microeconomics	3	0	0	3
HSL713	Macroeconomics	3	0	0	3
HSL714	International Economics	3	0	0	3
HUL715	Time Series Econometrics and Forecasting	3	0	0	3
HSL716	Industrial Economics	3	0	0	3
HSL717	Perspectives on Indian Economy	3	0	0	3
HUL718	Political Economy of Development	3	0	0	3
HSL719	Advanced Econometrics	3	0	0	3
HSL720	Development Economics	3	0	0	3
HUL731	Perspectives on Development	3	0	0	3
HUL735	Research Methods in Economics	1	0	2	2
HUL736	Planning and Economic Development	3	0	0	3
HUL737	Advanced Growth Theory	3	0	0	3
HUL738	International Economics	2	1	0	3
HUL755	Fascism: Philosophical Perspectives	3	0	0	3
HUL756	Time Series Econometrics and Forecasting	3	0	0	3
HUL762	Industrial Economics	3	0	0	3
HSL781	Potential and Perils of the Digital Welfare	3	0	0	3
HSL811	Advanced Economic Growth Theory	3	0	0	3
HSL813	Foundations of Decision Theory	3	0	0	3
HSL814	Research Methods in Economics	1	0	2	2
HSL815	Theory of Market Design	3	0	0	3
HSL816	Game Theory	3	0	0	3
HSL817	Health Economics	3	0	0	3
HSL818	Labor Economics	3	0	0	3
HSL820	Advanced Topics in Economics	3	0	0	3

Minor Area in Computational Mechanics (Department of Applied Mechanics)

Minor Area Core

APL300	Computational Mechanics	3	0	2	4
APL705	Finite Element Method	3	0	2	4

Minor Area Electives

APD311	Project	0	0	8	4
APL300	Computational Mechanics	3	0	2	4
APL310	Constitutive Modelling	3	0	2	4
APL340	Chaos	3	0	2	4
APL360	Engineering Fluid Flows	3	1	0	4
APL380	Biomechanics	3	0	0	3
APL410	Computational Fluid Dynamics	3	0	2	4
APL440	Parallel Processing in Computational Mechanics	3	0	2	4
APL705	Finite Element Method	3	0	2	4
APL710	Computer Aided Design	3	0	2	4
APL736	Multiscale Modelling of Crystalline Materials	3	0	2	4

Minor Area in Design (Department of Design)

Minor Area Core (10 credits)

DSP721	Design and Innovation Methods	1	0	4	3
DSL751	Form and Aesthetics	2	0	2	3
DSD799	Design Project	1	0	6	4
	Total Credits				***10***

Minor Area Electives (Minimum of 10 credits)

DSL782	Design for Usability	2	0	2	3

DSR832	Design for User Experience	3	0	0	3
DSR862	Design in Indian Context	3	0	0	3
DSR852	Strategic Design Management	2	0	2	3
DSR822	Design for Sustainability	2	0	2	3
DSR772	Transportation Design	2	0	2	3
DSL810	Special Topics in Design I	3	0	0	3
DSL820	Special Topics in Design II	3	0	0	3
DSV820	Special Modules in Design	1	0	0	1
DSP722	Applied Ergonomics	1	0	2	2
DSP712	Exhibitions and Environmental Design	2	0	2	3
DSR812	Media Studies	2	0	2	3
DSR762	Vehicle Design	2	0	2	3
COP315	Embedded System Design Project	1	0	6	4
MCL749	Mechatronics Product Design	3	0	2	4
MCL750	Product Design and Manufacturing	1	0	4	3
TXL777	Product Design and Development	3	0	0	3
APL710	Computer Aided Design	3	0	2	4
APL190	Design Engineering	3	0	2	4
HUL704	Inclusive Innovation	3	0	2	4
BML741	Medical Device Design	2	0	2	4
BMD742	Minor Biodesign Project	0	0	8	4
APL775	Design Methods	3	0	0	3
MCL744	Design for Manufacture and Assembly	3	0	2	4

Minor Area Non Departmental Electives in Material Science

Minor Area Electives

MCL336	Advances in Wedding	3	0	2	4
MCL769	Metal Forming Analysis	3	0	2	4
MCL780	Casting Technology	3	0	2	4
MCL787	Welding Science and Technology	3	0	2	4
MCL791	Processing and Mechanics of Composites	3	0	2	4
MLL720	Polymer Processing	3	0	0	3

Minor Area in Computer Science (Department of Computer Science and Engineering)

Note : A student needs to do a minimum of three courses out of Minor Area Core and remaining courses from Minor Area Electives.

Minor Area Core

COL106	Data Structures and Algorithms	3	0	4	5
COL202	Discrete Mathematical Structures	3	1	0	4
COL215	Digital Logic and System Design	3	0	4	5
COL216	Computer Architecture	3	0	2	4
COL226	Programming Languages	3	0	4	5
COP290	Design Practices	0	0	6	3
COL331	Operating Systems	3	0	4	5
COL333	Principles of Artificial Intelligence*	3	0	2	4
COL334	Computer Networks	3	0	2	4
COL351	Analysis and Design of Algorithms	3	1	0	4
COL352	Introduction to Automata and Theory of Computation	3	0	0	3
COL362	Introduction to Database Mgmt Systems*	3	0	2	4
COL380	Introduction to Parallel and Distributed Programming	2	0	2	3
	Total Credits (any three above courses)				***12-15***

Minor Area Electives

COD300	Design Project (Non-Graded)	0	0	4	2
COD310	Mini Project	0	0	6	3
COP315	Embedded System Design Project	0	1	6	4
COL341	Machine Learning	3	0	2	4
COL718	Architecture of High Performance Computers	3	0	2	4
COL719	Synthesis of Digital Systems	3	0	2	4
COL722	Introduction to Compressed Sensing	3	0	0	3
COL724	Advanced Computer Networks	3	0	2	4
COL726	Numerical Algorithms	3	0	2	4
COL727	Rapid Mising in Markov Chains	3	0	0	3
COL728	Compiler Design	3	0	3	4.5
COL729	Compiler Optimization	3	0	3	4.5
COL730	Parallel Programming	3	0	2	4
COL732	Virtualization and Cloud Computing	3	0	2	4
COL733	Cloud Computing Technology Fundamentals	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL750	Foundations of Automatic Verification	3	0	2	4
COL751	Algorithmic Graph Theory	3	0	0	3
COL752	Geometric Algorithms	3	0	2	4
COL753	Complexity Theory	3	0	0	3
COL754	Approximation Algorithms	3	0	0	3
COL756	Mathematical Programming	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL758	Advanced Algorithms	3	0	2	4
COL759	Cryptography & Computer Security	3	0	0	3
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL765	Introduction to Logic and Functional Programming	3	0	2	4
COL768	Wireless Networks	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL772	Natural Language Processing	3	0	2	4
COL774	Machine Learning	3	0	2	4
COL776	Learning Probabilistic Graphical Models	3	0	2	4
COL780	Computer Vision	3	0	2	4
COL781	Computer Graphics	3	0	3	4.5
COL783	Digital Image Analysis	3	0	3	4.5
COL786	Advanced Functional Brain Imaging	3	0	2	4
COL788	Advanced Topics in Embedded Computing	3	0	0	3
COL812	System Level Design and Modelling	3	0	0	3
COL818	Principles of Multiprocessor Systems	3	0	2	4
COL819	Advanced Distributed Systems	3	0	2	4
COP820	Processor Design Laboratory	0	0	8	4
COL821	Reconfigurable Computing	3	0	0	3
COL829	Advanced Computer Graphics	3	0	2	4
COL830	Distributed Computing	3	0	0	3
COL831	Semantics of Programming Languages	3	0	0	3
COL832	Proofs and Types	3	0	0	3
COL851	Special Topics in Operating Systems	3	0	0	3
COL852	Special Topics in Compilers	3	0	0	3
COL860	Special Topics in Parallel Computation	3	0	0	3
COL861	Special Topics in Hardware Systems	3	0	0	3
COL862	Special Topics in Software Systems	3	0	0	3
COL863	Special Topics in Theoretical Computer Science	3	0	0	3
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL865	Special Topics in Computer Applications	3	0	0	3
COL866	Special Topics in Algorithms	3	0	0	3
COL867	Special Topics in High Speed Networks	3	0	0	3
COL868	Special Topics in Database Systems	3	0	0	3
COL869	Special Topics in Concurrency	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
COL871	Special Topics in Programming Languages	3	0	0	3
COL872	Special Topics in Cryptography	3	0	0	3
COL873	Special Topics in Natural Language Processing	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COL886	Special Topics in Operating Systems	3	0	0	3
COD891	Minor Project	0	0	6	3
COD892	M.Tech. Project Part-I	0	0	14	7
COD893	M.Tech. Project Part-II	0	0	28	14
COR310	Professional Practices (CS)	1	0	2	2
COS310	Independent Study (CS)	0	3	0	3
COV877	Special Module on Visual Computing	1	0	0	1
COV878	Special Module in Machine Learning	1	0	0	1
COV879	Special Module in Financial Algorithms	2	0	0	2
COV880	Special Module in Parallel Computation	1	0	0	1
COV881	Special Module in Hardware Systems	1	0	0	1
COV882	Special Module in Software Systems	1	0	0	1
COV883	Special Module in Theoretical Computer Science	1	0	0	1
COV884	Special Module in Artificial Intelligence	1	0	0	1

COV885	Special Module in Computer Applications	1	0	0	1
COV886	Special Module in Algorithms	1	0	0	1
COV887	Special Module in High Speed Networks	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1

Minor Area in Cogeneration and Energy Efficiency (Department of Energy Science and Engineering)

Minor Area Core

ESL748	Economics of Energy Conservation	3	0	0	3
ESL784	Cogeneration and Energy Efficiency	3	0	0	3
ESL785	Energy Analysis	3	0	0	3
	Total Credits				***9***

Minor Area Electives

ESL714	Power Plant Engineering	3	0	0	3
ESL718	Power Generation, Transmission and Distribution	3	0	0	3
ESL722	Integrated Energy Systems	3	0	0	3
ESL726	Waste Heat Recovery	3	0	0	3
ESL776	Industrial Energy and Environmental Analysis	3	0	0	3
ESL875	Alternative Fuels for Transportation	3	0	0	3
ESL786	Exergy Analysis	3	0	0	3

Minor Area in Renewable Energy (Department of Energy Science and Engineering)

Minor Area Electives

ESP713	Energy Laboratories	0	0	6	3
ESL731	Biomass - A Renewable Resource	3	0	0	3
ESL732	Bioconversion and Processing of Waste	3	0	0	3
ESL742	Economics and Financing of Renewable Energy Systems	3	0	0	3
ESL755	Solar Photovoltaic Devices and Systems	3	0	0	3
ESL768	Wind Energy and Hydro Power Systems	3	0	0	3
ESL770	Solar Energy Utilization	3	0	0	3
ESL840	Solar Architecture	3	0	0	3
ESL875	Alternative Fuels for Transportation	3	0	0	3
ESL880	Solar Thermal Power Generation	3	0	0	3

Minor Area in Technologies for Sustainable Rural Development (Centre for Rural Development and Technology)

Minor Area Core (Any three of the following courses)

RDL700	Biomass Production	3	0	0	3
RDL705	Rural Resources and Livelihoods	3	0	0	3
RDL722	Rural Energy Systems	3	0	0	3
RDL724	Technologies for Water and Waste Mgmt.	2	0	2	3
RDL730	Technology Alternatives for Rural Development	3	0	0	3
RDL760	Food Quality and Safety	3	0	0	3
	Total Credits				***9***

Minor Area Electives

RDL701	Rural Industrialization Policies, Programmes and Cases	3	0	0	3
RDL710	Rural India and Planning for Development	3	0	0	3
RDL726	Herbal, Medicinal and Aromatic Plants	3	0	0	3
RDL740	Technology for Utilization of Wastelands and Weeds	3	0	0	3
RDL801	Successful Forms of Grassroot Organizations	3	0	0	3
RDL807	Women, Technology and Development	2	0	2	3
RDD750	Minor Project	0	0	6	3
RDP750	Biomass Lab	0	0	6	3
RDL702	Karigar & Traditional Industries	3	0	2	4
RDL725	Ecological Perspective of Growth & Development	3	0	0	3
RDL727	Conservation and Recycling Practice in Rural Area	3	0	2	4
RDL761	Value Chain in Agro-Food Processing	2	0	2	3
RDL770	Rural Value Chain and Technologies for Holistic Development	2	0	2	3

Minor Area / Departmental Specialization in Biopharmaceuticals and Fine Chemicals (Department of Chemical Engineering)

Minor Area / Specialization Core

CLD415	Major Project in Biopharmaceuticals and Fine Chemicals	0	0	10	5
	Total Credits				***5***

Minor Area / Specialization Electives

CLL296	Nano-engineering of Soft Materials	3	0	0	3
CLL730	Structure, Transport and Reactions in BioNano Systems	3	0	0	3
CLL742	Experimental Characterization of BioMacromolecules	3	0	0	3
CLL767	Structures and Properties of Polymers	3	0	0	3
CLL775	Polymerization Process Modeling	3	0	0	3
CLL778	Interfacial Behaviour and Transport of Biomolecules	3	0	0	3
CLL779	Molecular Biotechnology and in-vitro Diagnostics	3	0	0	3
CLL780	Bioprocessing and Bioseparations	3	0	0	3
CLL781	Process Operations Scheduling	3	0	0	3
CLL786	Fine Chemicals Technology	3	0	0	3
CLL791	Chemical Product and Process Integration	3	0	0	3
CLL792	Chemical Product Development and Commercialization	3	0	0	3
CLL793	Membrane Science and Engineering	3	0	0	3
SBL705	Biology of Proteins	3	0	0	3

Minor Area / Departmental Specialization in Complex Fluids and Materials (Department of Chemical Engineering)

Minor Area / Specialization Core

CLD413	Major Project in Complex Fluids	0	0	10	5
	Total Credits				***5***

Minor Area / Specialization Electives

CLL296	Nano-engineering of Soft Materials	3	0	0	3
CLL766	Interfacial Engineering	3	0	0	3
CLL767	Structures and Properties of Polymers	3	0	0	3
CLL770	Introduction to Microfluidics & Microfabrication	3	0	0	3
CLL771	Introduction to Complex Fluids	3	0	0	3
CLL772	Transport Phenomena in Complex Fluids	3	0	0	3
CLL773	Thermodynamics of Complex Fluids	3	0	0	3
CLL774	Simulation Techniques for Complex Fluids	3	0	0	3
CLL775	Polymerization Process Modeling	3	0	0	3
CLL776	Granular Materials	3	0	0	3
CLL777	Complex Fluids Technology	3	0	0	3

Minor Area / Departmental Specialization in Energy and Environment (Department of Chemical Engineering)

Minor Area / Specialization Core

CLD412	Major Project in Energy and Environment	0	0	10	5
	Total Credits				***5***

Minor Area / Specialization Electives

CLL704	Natural Gas Processing	3	0	0	3
CLL705	Petroleum Reservoir Engineering	3	0	0	3
CLL706	Petroleum Production Engineering	3	0	0	3
CLL720	Principles of Electrochemical Engineering	3	0	0	3
CLL721	Electrochemical Methods	3	0	0	3
CLL722	Electrochemical Conversion and Storage Devices	3	0	0	3
CLL723	Hydrogen Energy and Fuel Cell Technology	3	0	0	3
CLL724	Environmental Engineering and Waste Management	3	0	0	3
CLL725	Air Pollution Control Engineering	3	0	0	3
CLL726	Molecular Modeling of Catalytic Reactions	3	0	0	3
CLL727	Heterogeneous Catalysis and Catalytic Reactors	3	0	0	3

CLL728	Biomass Conversion and Utilization	3	0	0	3
CLL729	Colloids and Aerosols	3	0	0	3
CLL733	Industrial Multiphase Reactors	3	0	0	3
CLL734	Process Intensification and Novel Reactors	3	0	0	3
CLL735	Design of Multicomponent Separation Processes	3	0	0	3
CLL736	Experimental Characterization of Multiphase Reactors	3	0	0	3
CLL743	Petrochemicals Technology	3	0	0	3
CLL768	Fundamentals of Computational Fluid Dynamics	2	0	2	3
CLL769	Applications of Computational Fluid Dynamics	2	0	2	3
CLL793	Membrane Science and Engineering	3	0	0	3
CLL794	Petroleum Refinery Engineering	3	0	0	3

Minor Area / Departmental Specialization in Process Engineering, Modelling and Optimization (Department of Chemical Engineering)

Minor Area / Specialization Core

CLD414	Major Project in Process Engineering, Modeling and Optimization	0	0	10	5
	Total Credits				***5***

Minor Area / Specialization Electives

CLL390	Process Utilities and Pipeline Design	3	0	0	3
CLL475	Safety and Hazards in Process Industries	3	0	0	3
CLL477	Materials of Construction	3	0	0	3
CLL707	Population Balance Modeling	3	0	0	3
CLL733	Industrial Multiphase Reactors	3	0	0	3
CLL734	Process Intensification and Novel Reactors	3	0	0	3
CLL735	Design of Multicomponent Separation Processes	3	0	0	3
CLL736	Experimental Characterization of Multiphase Reactors	3	0	0	3
CLL760	Crystal Engineering and Design	3	0	0	3
CLL761	Chemical Engineering Mathematics	3	0	0	3
CLL762	Advanced Computational Techniques in Chemical Engineering	2	0	2	3
CLL768	Fundamentals of Computational Fluid Dynamics	2	0	2	3
CLL769	Applications of Computational Fluid Dynamics	2	0	2	3
CLL781	Process Operations Scheduling	3	0	0	3
CLL782	Process Optimization	3	0	0	3
CLL783	Advanced Process Control	3	0	0	3
CLL784	Process Modeling and Simulation	3	0	0	3
CLL785	Evolutionary Optimization	3	0	0	3
CLL787	Statistical Methods for Chemical Engg.	3	0	0	3
CLL788	Process Data Analytics	3	0	0	3
CLL789	Applied Time Series Analysis for Chemical Engineering	3	0	0	3
CLL791	Chemical Product and Process Integration	3	0	0	3
CLL792	Chemical Product Development and Commercialization	3	0	0	3
CLL793	Membrane Science and Engineering	3	0	0	3

Minor Area / Departmental Specialization in Nano-science and Technology (Department of Physics)

Minor Area / Specialization Core

PYL122	Quantum Mechanics	3	1	0	4
PYL201	Fundamentals of Dielectrics & Semiconductors	3	1	0	4
	Total Credits				***8***

Minor Area / Specialization Electives

PYL321	Low Dimensional Physics	3	0	0	3
PYL322	Nanoscale Fabrication	3	0	0	3
PYL323	Nanoscale Microscopy	2	0	0	2
PYL324	Spectroscopy of Nanomaterials	2	0	0	2
PYL421	Functional Nanostructures	3	0	0	3
PYL422	Spintronics	3	0	0	3
PYL423	Nanoscale Energy Materials & Devices	3	0	0	3
PYV428	Selected Topics in Nanotechnology	2	0	0	2
PYV429	Special Topics in Nanotechnology	1	0	0	1
PYD414	Project-III	0	0	8	4

Minor Area / Departmental Specialization in Photonics Technology (Department of Physics)

Minor Area / Specialization Core

PYL122	Quantum Mechanics	3	1	0	4
PYL115	Applied Optics	3	1	0	4
	Total Credits				***8***

Minor Area / Specialization Electives

PYL311	Lasers	3	0	0	3
PYL312	Semiconductor Optoelectronics	3	0	0	3
PYL313	Fourier Optics and Holography	3	0	0	3
PYL411	Quantum Electronics	3	0	0	3
PYL412	Ultrafast Laser Systems and Applications	3	0	0	3
PYL413	Fiber and Integrated Optics	3	0	0	3
PYD414	Project-III	0	0	8	4
PYL414	Engineering Optics	3	0	0	3
PYV418	Selected Topics in Photonics	2	0	0	2
PYV419	Special Topics in Photonics	1	0	0	1

Minor Area / Departmental Specialization in Quantum Technologies (Department of Physics)

Minor Area / Specialization Core

PYL122	Quantum Mechanics	3	1	0	4
PYL125	Solid State Physics-I	3	1	0	4
	OR				
PYL209	Optics and Photonics-II	3	0	0	3
PYL750	Topology in Condensed Matter Physics	3	0	0	3
	Total Credits				***7/8***

Minor Area / Specialization Electives

PYL331	Applied Quantum Mechanics	3	0	0	3
PYL321	Low Dimensional Physics	3	0	0	3
PYL703	Electronic properties of Materials	3	0	0	3
PYL728	Quantum Heterostructures	2	0	0	2
PYL422	Spintronics	3	0	0	3
PYL740	Advanced Condensed matter theory	3	0	0	3
PYV4XX	Selected topics in Quantum Materials and Devices	2	0	0	2
PYV4XX	Special topics in Quantum Mechanics with Applications to Nanotechnology and Information Science	1	0	0	1
PYL411	Quantum Electronics	3	0	0	3
PYL414	Engineering Optics	3	0	0	3
PYL748	Quantum Optics	3	0	0	3
PYL749	Quantum information and computation	3	0	0	3
PYL793	Photonic Devices	3	0	0	3
PYL757	Statistical and Quantum Optics	3	0	0	3
PYL758	Advanced Quantum Optics and Applications	3	0	0	3
PYL762	Statistical Optics and Optical Coherence Theory	3	0	0	3
PYV4XX	Selected topics in Cold Atoms and Quantum Technologies	2	0	0	2
PYD414	Project-III	0	0	8	4

Minor Area / Departmental Specialization in Theoretical and Computational Techniques in Physics (Department of Physics)

Minor Area / Specialization Core

PYL122	Quantum Mechanics	3	1	0	4
PYL204	Computational Physics	3	1	0	4
	Total Credits				***8***

Minor Area / Specialization Electives

PYL332	General Theory of Relativity & Cosmology	3	0	0	3
PYD414	Project-III	0	0	8	4
PYL432	Quantum Electrodynamics	3	0	0	3
PYL433	Gauge Field Theory	3	0	0	3

PYV435	Monte Carlo and Molecular Dynamics Simulation	2	1	0	3
PYL745	Advanced Statistical Mechanics	3	0	0	3
PYL749	Quantum Information and Computing	3	0	0	3
PYL739	Computational Techniques for Solid State Materials	3	0	0	3
PYL743	Group Theory	3	0	0	3
PYV431	Relativistic Quantum Mechanics	2	0	0	2
PYV438	Selected Topics in Theoretical and Computational Physics	2	0	0	2
PYV439	Special Topics in Theoretical and Computational Physics	1	0	0	1

Interdisciplinary Specialization in Biodesign

Specialization Core

BML741	Medical Device Design	2	0	4	4
BMD742	Minor Biodesign Project	0	0	8	4
	Total Credits				***8***

Specialization Electives

APL380	Biomechanics	3	0	0	3
BML300	Healthcare Engineering	2	0	2	3
BML401	Healthcare Entrepreneurship	2	0	2	3
BML700	Intro. to Basic Medical Sciences for Engineers	3	0	0	3
BML710	Industrial Biomaterial Technology	3	0	0	3
BML720	Medical Imaging	3	0	0	3
BML735	Biomedical Signal and Image Processing	2	0	2	3
BML737	Application of Mathematics in Biomedical Engineering	2	0	0	2
BML743	Special Topics in Biodesign	3	0	0	3
BML750	Point of Care Medical Diagnostic Devices	3	0	0	3
BML770	Fundamentals of Biomechanics	3	0	0	3
BML771	Orthopaedic Device Design	2	0	0	2
BML772	Biofabrication	3	0	0	3
BML810	Tissue Engineering	3	0	0	3
BML820	Biomaterials	3	0	0	3
BML830	Biosensor Technology	3	0	2	4
CLL779	Molecular Biotechnology and in-vitro Diagnostics	3	0	0	3
MCL442	Thermofluid Analysis of Biosystems	3	0	0	3
TXL773	Medical Textiles	3	0	0	3

Interdisciplinary Specialization in Robotics

Specialization Core

Core 1

MCL111+	Kinematics and Dynamics of Machines	3	0	2	4
MCL212#	Control Theory and Applications	3	0	2	4
ELL225#	Control Engineering-I	3	1	0	4
COP315*	Embedded System Design Project	0	1	6	4
ELL365*	Embedded Systems	3	0	0	3

Students of **ME1/ME2 to take only one of these courses as core.*
*#Students of **CS1/CS5** to take only one of these courses as core.*
*+Core for **EE1/EE3** students only.*
***Other Students** can select any one of the Core 1 courses mentioned above.*

Core 2

JRL301	*Robotics Technology*	*3*	*0*	*0*	*3*

Core 3

JRD301	*Mini Project in Robotics*	*0*	*0*	*14*	*7*
	Total Credits				***13/14***

Since the course may have Pre-requisite(s), plan in advance.
A student is required to complete (one of the core 1 course), (core 2 course) and (core 3 course).

Specialization Electives

COL106	Data Structures	3	0	2	4
COL333	Principles of Artificial Intelligence	3	0	2	4
COL341	Machine Learning	3	0	2	4
COL351	Analysis and Design of Algorithms	3	1	0	4
COL671	Artificial Intelligence	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL752	Geometric Algorithms	3	0	0	3
COL774	Machine Learning	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL780	Computer Vision	3	0	2	4
COL783	Digital Image Analysis	3	0	3	4.5
COL785	Virtual and Augmented Reality	3	0	2	4
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
ELL406	Robotics and Automation	3	0	0	3
ELL409	Machine Intelligence and Learning	3	0	2	4
ELL703	Optimal Control Theory	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL767	Mechatronics	3	0	0	3
ELL787	Embedded Systems and Applications	3	0	0	3
ELL791	Neural Systems and Learning Machines	3	0	2	4
ELL793	Computer Vision	3	0	0	3
ELL798	Agent Technology	3	0	0	3
MTL342	Analysis and Design of Algorithms	3	1	0	4
MTL509	Numerical Analysis	3	1	0	4
MTL729	Computational Algebra and its Applications	3	0	0	3
MTL744	Mathematical Theory of Coding	3	0	0	3
MTL811	Mathematical Foundation of Artificial Intelligence	3	0	0	3
MTL851	Applied Numerical Analysis	3	0	0	3
MCL731	Analytical Dynamics	3	0	0	3
MCL738	Dynamics of Multibody Systems	2	0	2	3
MCL745	Robotics	3	0	2	4
MCL749	Mechatronics Product Design	3	0	2	4
MCL797	Freedom and Constraints in Design	3	0	0	3
MCL798	Medical Robotics	2	0	2	3
MCL837	Advanced Mechanisms	2	0	2	3
MCL845	Advanced Robotics	2	0	2	3

Departmental Specialization in Applications and Information Technology (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COL333	Principles of Artificial Intelligence*	3	0	2	4
COL362	Introduction to Database Mgmt. Systems*	3	0	2	4
COL707	Introduction to Ethical Issues in Computer Science	3	0	2	4
COL722	Introduction to Compressed Sensing	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL765	Introduction to Logic and Functional Programming	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL786	Advanced Functional Brain Imaging	3	0	2	4
COL865	Special Topics in Computer Applications	3	0	0	3
COL869	Special Topics in Concurrency	3	0	0	3
COV885	Special Module in Computer Applications	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1
SIL769	Internet Traffic-Measurement, Modeling & Analysis	3	0	2	4
SIL801	Special Topics in Multimedia System	3	0	0	3
SIL802	Special Topics in Web Based Computing	3	0	0	3
SIV813	Applications of Computer in Medicines	1	0	0	1
SIV861	Information and Comm Technologies for Development	1	0	0	1
SIV864	Special Module on Media Processing & Communication	1	0	0	1
SIV871	Special Module in Computational Neuroscience	1	0	0	1
SIV889	Special Module in Human Computer Interaction	1	0	0	1

SIV895	Special Module on Intelligent Information Processing	1	0	0	1

Departmental Specialization in Architecture and Embedded Systems (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COP315	Embedded System Design Project	0	1	6	4
COL718	Architecture of High Performance Computers	3	0	2	4
COL719	Synthesis of Digital Systems	3	0	2	4
COL788	Advanced Topics in Embedded Computing	3	0	0	3
COL812	System Level Design and Modelling	3	0	0	3
COL818	Principles of Multiprocessor Systems	3	0	2	4
COP820	Processor Design Laboratory	0	0	8	4
COL821	Reconfigurable Computing	3	0	0	3
COL861	Special Topics in Hardware Systems	3	0	0	3
COV881	Special Module in Hardware Systems	1	0	0	1

Departmental Specialization in Data Analytics and Artificial Intelligence (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COL333	Principles of Artificial Intelligence*	3	0	2	4
COL341	Machine Learning	3	0	2	4
COL362	Introduction to Database Mgmt. Systems*	3	0	2	4
COL760	Advanced Data Management	3	0	2	4
COL761	Data Mining	3	0	2	4
COL762	Database Implementation	3	0	2	4
COL764	Information Retrieval and Web Search	3	0	2	4
COL765	Introduction to Logic and Functional Programming	3	0	2	4
COL770	Advanced Artificial Intelligence	3	0	2	4
COL772	Natural Language Processing	3	0	2	4
COL774	Machine Learning	3	0	2	4
COL775	Deep Learning	3	0	2	4
COL776	Learning Probabilistic Graphical Models	3	0	2	4
COL777	Deep Reinforcement Learning	3	0	2	4
COL778	Principles of Autonomous Systems	3	0	2	4
COL786	Advanced Functional Brain Imaging	3	0	2	4
COL864	Special Topics in Artificial Intelligence	3	0	0	3
COL868	Special Topics in Database Systems	3	0	0	3
COL869	Special Topics in Concurrency	3	0	0	3
COL870	Special Topics in Machine Learning	3	0	0	3
COL873	Special Topics in Natural Language Processing	3	0	0	3
COV878	Special Module in Machine Learning	1	0	0	1
COV884	Special Module in Artificial Intelligence	1	0	0	1
COV888	Special Module in Database Systems	1	0	0	1
COV889	Special Module in Concurrency	1	0	0	1

Departmental Specialization in Graphics and Vision (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COL780	Computer Vision	3	0	2	4
COL781	Computer Graphics	3	0	3	4.5
COL783	Digital Image Analysis	3	0	3	4.5
COL785	Virtual and Augmented Reality	3	0	2	4
COL829	Advanced Computer Graphics	3	0	2	4
COV877	Special Module on Visual Computing	1	0	0	1
SIL801	Special Topics in Multimedia System	3	0	0	3

Departmental Specialization in Software Systems (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COL724	Advanced Computer Networks	3	0	2	4
COL728	Compiler Design	3	0	3	4.5
COL729	Compiler Optimization	3	0	3	4.5
COL730	Parallel Programming	3	0	2	4
COL731	Advanced Compiler Techniques for Optimization, Safety and Security	3	0	2	4
COL732	Virtualization and Cloud Computing	3	0	2	4
COL733	Cloud Computing Technology Fundamentals	3	0	2	4
COL740	Software Engineering	3	0	2	4
COL768	Wireless Networks	3	0	2	4
COL819	Advanced Distributed Systems	3	0	2	4
COL851	Special Topics in Operating Systems	3	0	0	3
COL852	Special Topics in Compilers	3	0	0	3
COL860	Special Topics in Parallel Computation	3	0	0	3
COL862	Special Topics in Software Systems	3	0	0	3
COL867	Special Topics in High Speed Networks	3	0	0	3
COL871	Special Topics in Programming Languages	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COL886	Special Topics in Operating Systems	3	0	0	3
COV876	Special Module on Automated Reasoning Methods for Program Analysis	1	0	0	1
COV880	Special Module in Parallel Computation	1	0	0	1
COV882	Special Module in Software Systems	1	0	0	1
COV887	Special Module in High Speed Networks	1	0	0	1
SIL765	Networks & System Security	3	0	2	4
SIL769	Internet Traffic -Measurement, Modeling & Analysis	3	0	2	4

Departmental Specialization in Theoretical Computer Science (Department of Computer Science and Engineering)

Specialization Core

COD494	B.Tech. Project Part-II	0	0	16	8
COL703	Logic for Computer Science	3	0	2	4
	Total Credits				***12***

Specialization Electives

COL726	Numerical Algorithms	3	0	2	4
COL727	Rapid Mixing in Markov Chains	3	0	0	3
COL730	Parallel Programming	3	0	2	4
COL749	Computational Social Choice	3	0	0	3
COL750	Foundations of Automatic Verification	3	0	2	4
COL751	Algorithmic Graph Theory	3	0	0	3
COL752	Geometric Algorithms	3	0	0	3
COL753	Complexity Theory	3	0	0	3
COL754	Approximation Algorithms	3	0	0	3
COL755	Algorithmic Game Theory	3	0	0	3
COL756	Mathematical Programming	3	0	0	3
COL757	Model Centric Algorithm Design	3	0	2	4
COL758	Advanced Algorithms	3	0	2	4
COL759	Cryptography & Computer Security	3	0	0	3

COL787	Online Algorithms and Competitive Analysis	3	0	0	3
COL830	Distributed Computing	3	0	0	3
COL831	Semantics of Programming Languages	3	0	0	3
COL832	Proofs and Types	3	0	0	3
COL860	Special Topics in Parallel Computation	3	0	0	3
COL863	Special Topics in Theoretical Computer Science	3	0	0	3
COL866	Special Topics in Algorithms	3	0	0	3
COL872	Special Topics in Cryptography	3	0	0	3
COL874	Special Topics in Compilers and Language Implementation	3	0	0	3
COL876	Special Topics in Formal Methods	3	0	0	3
COV879	Special Module in Financial Algorithms	2	0	0	2
COV883	Special Module in Theoretical Computer Science	1	0	0	1
COV886	Special Module in Algorithms	1	0	0	1

Departmental Specialization in Environmental Engineering (Department of Civil Engineering)

Specialization Core

CVD412	B.Tech. Project Part-II	0	0	12	6
CVL313	Air and Noise Pollution	3	0	0	3
CVL721	Solid Waste Engineering	3	0	0	3
CVL724	Environmental Systems Analysis	3	0	2	4
	Total Credits				***16***

Specialization Electives (8 Credits)

CVL311	Industrial Waste Management	3	0	0	3
CVL312	Environmental Assessment Methodologies	3	0	0	3
CVL727	Environmental Risk Assessment	3	0	0	3
CVL820	Environmental Impact Assessment	3	0	0	3
CVL822	Emerging Technologies for Environmental Management	3	0	0	3
CVL823	Thermal Techniques for Waste Mgmt.	3	0	0	3
CVL824	Life Cycle Analysis & Design for Environment	3	0	0	3

Departmental Specialization in Geotechnical Engineering (Department of Civil Engineering)

Specialization Core

CVD412	B.Tech. Project Part-II	0	0	12	6
CVL421	Ground Engineering	3	0	0	3
CVL422	Rock Engineering	3	0	0	3
CVL423	Soil Dynamics	3	0	0	3
CVP424	Environmental Geotechniques and Geosynthetics	3	0	0	3
	Total Credits				***18***

Specialization Electives (6 Credits)

CVL431	Design of Foundations & Retaining Structures	3	0	0	3
CVL432	Stability of Slopes	2	0	0	2
CVL433	FEM in Geotechnical Engineering	3	0	0	3
CVL434	Geotechnical Design Studio	0	0	4	2
CVL435	Underground Structures	2	0	0	2

Departmental Specialization in Structural Engineering (Department of Civil Engineering)

Specialization Core

CVD412	B.Tech. Project Part-II	0	0	12	6
CVL441	Structural Design	3	0	0	3
CVL442	Structural Analysis-III	3	0	0	3
CVL443	Prestressed Concrete & Industrial Structures	3	0	0	3
CVL758	Solid Mechanics in Structural Engineering	3	0	0	3
	Total Credits				***18***

Specialization Electives (6 Credits)

CVL763	Analytical and Numerical Methods for Struct. Engineering	2	1	0	3
CVL765	Concrete Mechanics	3	0	0	3
CVL766	Design of Bridge Structures	3	0	0	3
CVL768	Design of Masonry Structures	3	0	0	3
CVL769	Design of Tall Buildings	3	0	0	3
CVL770	Prestressed and Composite Structures	3	0	0	3
CVL771	Advanced Concrete Technology	3	0	0	3
CVL857	Structural Safety and Reliability	3	0	0	3
CVL858	Theory of Plates and Shells	3	0	0	3
CVL859	Theory of Structural Stability	3	0	0	3
CVL862	Design of Offshore Structures	3	0	0	3
CVL866	Wind Resistant Design of Structures	3	0	0	3

Departmental Specialization in Transportation Engineering (Department of Civil Engineering)

Specialization Core

CVD412	B.Tech. Project Part-II	0	0	12	6
CVL740	Pavement Materials and Design of Pavements	2	0	2	3
CVL741	Urban and Regional Transportation Planning	2	0	2	3
CVL742	Traffic Engineering	3	0	2	4
	Total Credits				***16***

Specialization Electives (8 Credits)

CVL361	Introduction to Railway Engineering	3	0	0	3
CVL461	Logistics and Freight Transport	3	0	0	3
CVL462	Introduction to Intelligent Transportation Systems	3	0	0	3
CVL743	Airport Planning and Design	3	0	0	3
CVL744	Transportation Infrastructure Design	3	0	0	3
CVL746	Public Transportation Systems	3	0	0	3
CVL841	Advanced Transportation Modelling	2	0	2	3
CVL842	Geometric Design of Roads	2	0	2	3
CVL847	Transportation Economics	3	0	0	3

Departmental Specialization in Water Resources Engineering (Department of Civil Engineering)

Specialization Core

CVL382	Groundwater	2	0	0	2
CVL481	Water Resources Management	3	0	0	3
CVL482	Water Power Engineering	2	0	2	3
CVL483	Groundwater & Surface-water Pollution	2	0	0	2
CVD412	B.Tech. Project Part-II	0	0	12	6
	Total Credits				***16***

Specialization Electives (8 Credits)

CVL284	Fundamentals of Geographic Information Systems	2	0	2	3
CVL383	Water Resources Systems	2	0	0	2
CVL384	Urban Hydrology	2	0	0	2
CVL385	Frequency Analysis in Hydrology	2	0	0	2
CVL386	Fundamentals of Remote Sensing	2	0	2	3
CVP484	Computational Aspects in Water Resources	1	0	4	3
CVL485	River Mechanics	2	0	2	3
CVL486	Geo-informatics	2	0	2	3
CVL837	Mechanics of Sediment Transport	3	0	0	3

Departmental Specialization in Automotive Design (Department of Mechanical Engineering)

Specialization Core

MCD412	B.Tech. Project-II	0	0	14	7
MCL321	Automotive Systems	3	0	2	4
	Total Credits				***11***

Specialization Electives

MCL322	Power Train Design	3	0	0	3
MCL421	Automotive Structural Design	2	0	2	3
MCL422	Design of Brake Systems	2	0	2	3
MCL721	Automotive Prime Movers	3	0	0	3
MCL722	Mechanical Design of Prime Mover Elements	3	0	0	3
MCL723	Vehicle Dynamics	2	0	2	3
MCL724	Biomechanics of Trauma in Automotive Design	3	0	0	3
MCL725	Design Electronic Assist Systems in Automobiles	3	0	0	3
MCL726	Design of Steering Systems	3	0	0	3

Departmental Specialization in Technical and Innovative Textiles (Department of Textile and Fibre Engineering)

Specialization Electives

TXD402	Major Project Part-II	0	0	16	8
TXL710	High Performance and Specialty Fibres	3	0	0	3
TXL719	Functional and Smart Textiles	3	0	0	3
TXL734	Nonwoven Processes and Products	3	0	0	3
TXL740	Science & App. of Nanotechnology in Textiles	3	0	0	3
TXL752	Design of Functional Clothing	3	0	0	3
TXL773	Medical Textiles	3	0	0	3
TXL775	Technical Textiles	3	0	0	3
TXL776	Design & Manuf. of Text. Reinforced Composites	3	0	0	3
TXL780	Principles of Characterization of Functional and Technical Textiles	3	0	0	3

Departmental Specialization in Textile Business Management (Department of Textile and Fibre Engineering)

Specialization Electives

MCL756	Supply Chain Management	3	0	0	3
MCL760	Project Management	3	0	0	3
TXD402	Major Project Part-II	0	0	16	8
TXL381	Costing and its Application in Textiles	3	1	0	4
TXL781	Costing, Project Formulation and Appraisal	3	0	0	3
TXL782	Production and Operations Management in Textile Industry	3	0	0	3
TXL783	Design of Experiments and Statistical Techniques	3	0	0	3
TXV702	Management of Textile Business	1	0	0	1

Departmental Specialization in Appliance Engineering (Department of Electrical Engineering)

Specialization Electives

ELD451	BTP Part-II	0	0	16	8
ELL319	Digital Signal Processing	3	0	2	4
ELL365	Embedded Systems	3	0	0	3
ELL450	Special Topics in AE–I	3	0	0	3
ELL754	Permanent Magnet Machines	3	0	0	3
ELL756	Special Electrical Machines	3	0	0	3
ELL762	Intelligent Motor Controllers	3	0	0	3
ELL766	Appliance System	3	0	0	3
ELL767	Mechatronics	3	0	0	3
ELV750	Special Modules in AE–I	1	0	0	1

Departmental Specialization in Cognitive and Intelligent Systems (Department of Electrical Engg.)

Specialization Electives

ELD457	BTP Part-II	0	0	16	8
ELL409	Machine Intelligence and Learning	3	0	2	4
ELL457	Special Topics in C&IS–I	3	0	0	3
ELL704	Advanced Robotics	3	0	0	3
ELL707	Systems Biology	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL741	Neuromorphic Engineering	3	0	0	3
ELL762	Intelligent Motor Controllers	3	0	0	3
ELL779	Forecasting Techniques for Power Systems	3	0	0	3
ELL784	Introduction to Machine Learning	3	0	0	3
ELL786	Multimedia Systems	3	0	0	3
ELL788	Computational Cognition and Perception	3	0	0	3
ELL789	Intelligent Systems	3	0	0	3
ELL791	Neural Systems and Learning Machines	3	0	2	4
ELL793	Computer Vision	3	0	0	3
ELL794	Human-Computer Interface	3	0	0	3
ELL795	Swarm Intelligence	3	0	0	3
ELL796	Signals and Systems in Biology	3	0	0	3
ELL798	Agent Technology	3	0	0	3
ELL799	Natural Computing	3	0	0	3
ELL880	Special Topics in Computers-I	3	0	0	3
ELL881	Special Topics in Computers-II	3	0	0	3
ELL884	Deep Learning for Natural Language Processing	3	0	0	3
ELL888	Advanced Machine Learning	3	0	0	3
ELL890	Computational Neuroscience	3	0	0	3
ELL891	Advances in Deep Learning	3	0	0	3
ELL893	Cyber-Physical Systems	3	0	0	3
ELV780	Special Modules in Computers	1	0	0	1
ELV781	Special Module in Information Processing-I	1	0	0	1
ELV832	Special Module in Machine Learning	1	0	0	1

Departmental Specialization in Communication Systems and Networking (Dept. of Electrical Engg.)

Specialization Electives

ELD458	BTP Part-II	0	0	16	8
ELL411	Digital Communications	3	0	2	4
ELL458	Special Topics in CS&N–I	3	0	0	3
ELL713	Microwave theory and techniques	3	0	0	3
ELL714	Basic Information Theory	3	0	0	3
ELL716	Telecom Switiching and Transmission	3	0	0	3
ELL717	Optical Communication Systems	3	0	0	3
ELL723	Broadband Communication Systems	3	0	0	3
ELL725	Wireless Communications	3	0	0	3
ELL785	Computer Communication Networks	3	0	0	3
ELV720	Special Modules in CS&N–I	1	0	0	1

Departmental Specialization in Electric Transportation (Department of Electrical Engineering)

Specialization Electives

ELD454	BTP Part-II	0	0	16	8
ELL334	DSP Based Control of Drives	3	0	2	4
ELL450	Special Topics in AE–I	3	0	0	3
ELL454	Special Topics in ET–I	3	0	0	3
ELL750	Modeling of Electrical Machines	3	0	0	3
ELL754	Permanent Magnet Machines	3	0	0	3
ELL755	Variable Reluctance Machines	3	0	0	3
ELL764	Electric Vehicles	3	0	0	3
ELV753	Special Modules in ET–I	1	0	0	1

Departmental Specialization in Energy-Efficient Technologies (Department of Electrical Engineering)

Specialization Electives

ELD453	BTP Part-II	0	0	16	8
ELL408	Low Power Circuit Design	3	0	0	3
ELL453	Special Topics in EET–I	3	0	0	3
ELL721	Introduction to Telecommunication Systems	3	0	0	3
ELL743	Photovoltaics	3	0	0	3
ELL757	Energy Efficient Motors	3	0	0	3
ELL763	Advanced Electrical Drives	3	0	0	3
ELL765	Smart Grid Technology	3	0	0	3
ELL797	Energy Efficient Computing	3	0	0	3
ELV752	Special Modules in EET–I	1	0	0	1

Departmental Specialization in Information Processing (Department of Electrical Engineering)

Specialization Electives

ELD459	BTP Part-II	0	0	16	8
ELL459	Special Topics in IP–I	3	0	0	3
ELL460	Special Topics in IP–II	3	0	0	3
ELL714	Basic Information Theory	3	0	0	3
ELL715	Digital Image Processing	3	0	2	4
ELL718	Statistical Signal Processing	3	0	0	3
ELL719	Detection and Estimation Theory	3	0	0	3
ELL720	Advanced Digital Signal Processing	3	0	0	3
ELL724	Multichannel Signal Processing	3	0	0	3
ELL784	Introduction to Machine Learning	3	0	0	3

ELL786	Multimedia Systems	3	0	0	3
ELL793	Computer Vision	3	0	0	3
ELL794	Human-Computer Interface	3	0	0	3
ELL884	Deep Learning for Natural Language Processing	3	0	0	3
ELV781	Special Modules in IP–I	1	0	0	1
CRL707	Human and Machine Speech Communications	3	0	0	3

Departmental Specialization in Nano-electronic and Photonic Systems (Department of Electrical Engg.)

Specialization Electives

ELD456	BTP Part-II	0	0	16	8
ELL456	Special Topics in NE&PS–I	3	0	0	3
ELL730	IC Technology	3	0	0	3
ELL732	Micro and Nanoelectronics	3	0	0	3
ELL737	Flexible Electronics	3	0	0	3
ELL738	Micro and Nano Photonics	3	0	0	3
ELL739	Advanced Semiconductor Devices	3	0	0	3
ELL740	Compact Modeling of Semiconductor Devices	3	0	2	4
ELP740	On-wafer Device Characterization Laboratory	0	0	6	3
ELL741	Neuromorphic Engineering	3	0	0	3
ELL742	Introduction to MEMS Design	3	0	0	3
ELL743	Photovoltaics	3	0	0	3
ELL744	Electronic and Photonic Nanomaterials	3	0	0	3
ELL745	Quantum Electronics	3	0	0	3
ELV731	Special Modules in NE&PS–I	1	0	0	1

Departmental Specialization in Smart Grid and Renewable Energy (Department of Electrical Engg.)

Specialization Electives

ELD452	BTP Part-II	0	0	16	8
ELL402	Computer Communications	3	0	0	3
ELL417	Renewable Energy Systems	3	0	0	3
ELL765	Smart Grid Technology	3	0	0	3
ELL770	Power System Analysis	3	0	0	3
ELL771	Special Topics in SG&RE–I	3	0	0	3
ELL772	Planning and Operation of Smart Grid	3	0	0	3
ELL773	High Voltage DC Transmission	3	0	0	3
ELL774	Flexible AC Transmission Systems	3	0	0	3
ELL775	Power System Dynamics	3	0	0	3
ELL789	Intelligent Systems	3	0	0	3
ELV451	Special Modules in SG&RE–I	1	0	0	1

Departmental Specialization in Systems and Control (Department of Electrical Engineering)

Specialization Electives

ELD450	BTP Part-II	0	0	16	8
ELL436	Digital Control	3	0	0	3
ELL700	Linear Systems Theory	3	0	0	3
ELL702	Nonlinear Systems	3	0	0	3
ELL703	Optimal Control Theory	3	0	0	3
ELL704	Advanced Robotics	3	0	0	3
ELL705	Stochastic Filtering and Identification	3	0	0	3
ELL707	Systems Biology	3	0	0	3
ELL708	Selected Topics in Systems and Control	3	0	0	3
ELL762	Intelligent Motor Controllers	3	0	0	3
ELV700	Special Modules in Systems and Control	1	0	0	1

Departmental Specialization in VLSI and Embedded Systems (Department of Electrical Engineering)

Specialization Electives

ELD455	BTP Part-II	0	0	16	8
ELL365	Embedded Systems	3	0	0	3
ELL455	Special Topics in V&ES–I	3	0	0	3
ELL720	Advanced Digital Signal Processing	3	0	0	3
ELL730	IC Technology	3	0	0	3
ELL731	Mixed Signal Circuit Design	3	0	0	3
ELL733	Digital ASIC Design	3	0	2	4
ELL734	MOS VLSI Design	3	0	0	3
ELL735	Analog Integrated Circuits	3	0	0	3
ELL736	Solid State Imaging Sensors	3	0	0	3
ELL740	Compact Modeling of Semiconductor Devices	3	0	2	4
ELP740	On-wafer Device Characterization Laboratory	0	0	6	3
ELL741	Neuromorphic Engineering	3	0	0	3
ELL747	Active and Passive Filter Design	3	0	0	3
ELL748	System-on-Chip Design and Test	3	0	0	3
ELL749	Semiconductor Memory Design	3	0	0	3
ELL833	CMOS RF IC Design	3	0	0	3
ELV730	Special Modules in V&ES–I	1	0	0	1

Departmental Specialization in Polymeric Materials (Department of Materials Science and Engineering)

Specialization Core

MLL342	Physical Chemistry of Polymers	3	0	0	3
MLL343	Polymer and Elastomer Technology	3	0	0	3
MLL344	Rheology and Processing of Polymers	3	0	2	4
	Total Credits				***10***

Specialization Electives

MLL345	Polymer Matrix Composites	2	0	0	2
MLL341	Engineering Biomaterials	2	0	0	2
MLD413	Major Project in Polymeric Materials	0	0	12	6
PTL711	Engineering Plastics and Specialty Polymers	3	0	0	3
MLL729	Polymer Blends and Composites	3	0	0	3
MLL741	Biodegradable Polymeric Materials	3	0	0	3
MLL733	Polymer Reaction Engineering	3	0	0	3
MLL735	Polymer Product and Mould Design	2	0	2	3

Departmental Specialization in Metallurgy (Department of Materials Science and Engineering)

Specialization Core

MLL361	Iron and Steel Making	2	0	0	2
MLP362	Metallography Lab	0	0	4	2
MLL363	Metal Casting Technology	2	0	2	3
MLL364	Welding Metallurgy	2	0	2	3
	Total Credits				***10***

Specialization Electives

MLL345	Polymer Matrix Composites	2	0	0	2
MLD414	Major Project in Metallurgy	0	0	12	6
MLL365	Powder Metallurgy	3	0	0	3
MLP366	Heat treatment and Surface Engineering	2	0	2	3
MLL720	Diffusion and Kinetics	3	0	0	3
MLL732	Porous Materials	3	0	0	3
MLL734	Texture and Grain Boundary Engineering in Metals and Alloys	3	0	0	3
MLL736	Tribology and Surface Engineering of Materials	3	0	0	3
MLL713	Phase transformations	3	0	0	3
MLL714	Fracture Mechanics	3	0	0	3
MLL701	Structure and Characterization of Materials	3	0	0	3
MLL715	Advanced Engineering Materials	3	0	0	3
MLL716	Engineering Failure Analysis and Prevention	3	0	0	3
MLP704	Materials Processing and Characterization Lab	1	1	4	4
MLV705	Special topics in Materials	1	0	0	1
MCL780	Casting Technology	3	0	2	4
MCL778	Design and Metallurgy of Welded Joints	3	0	2	4
APL756	Multiscale Modelling of Crystalline Materials	3	0	2	4
MCL791	Processing and Mechanics of Composite Materials	3	0	2	4
ITL717	Corrosion and its Control	3	0	0	3
ITL703	Fundamentals of Tribology	3	0	2	4

4. NON-GRADED CORE FOR UNDERGRADUATE STUDENTS

In order to synergize formal academics with informal outside-class-room learning experience, mechanisms for earning non-graded units have been introduced in the undergraduate curriculum in 2013. In order to earn these units, a student will need to involve himself/herself in activities beyond the classroom engagements. For earning 1 unit a student will typically need to work for 2-3 hours per week (28-42 hours per semester) in on-campus activities. In case of project/design/internship activities, the student engagement expected is typically 20 days of work per non-graded unit. A student would not be allowed to earn credits as well as non-graded units for the same effort. It is important that the efforts towards earning non-graded units should be distinct from that spent on earning credits. Also, the effort for earning different components of the non-graded units should be distinct, i.e., the same effort would not be evaluated for more than one non-graded component.

Non-graded core of the undergraduate curriculum comprises of the following components:

S.No.	Components	Minimum NGUs for Graduation	Maximum Countable Towards Total of 11 NGUs
1	Introduction to Engineering and Programme	1	1
2	Language and Writing Skills	2	2
3	Communication Skills/Seminar	1	1
4	NCC/NSO/NSS	1	2
5	Professional Ethics and Social Responsibility	1	2
6	Design and Practical Experience	3	5
	Total	***11***	

These 11 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 11 units over the duration of the programme with special consideration and requirements for each component as detailed in the following sections. Each component would be constituted by one or more non-graded courses, and a student will need to get an 'S' grade in these courses to earn the respective non-graded unit(s). Incomplete status in such courses will be indicated by a 'Z' grade. The student would be required either to repeat the course/activity or continue with the project/internship until such time that the evaluating faculty member/committee is satisfied with the effort to award an 'S' grade. No partial/ fractional units can be awarded. For example, if a particular activity carries 2 units, a student cannot be awarded 1 unit or fractional units for incomplete work, but would need to repeat / complete the work to the satisfaction of the evaluating faculty member/committee to become eligible for award of 2 units.

For components 3-6 in the above table, a special portal called the NGU portal is used for necessary approvals and posting of "S" grades. This portal can be accessed at *https://ngu.iitd.ac.in/index*

4.1 Introduction to Engineering and Programme

This non-graded component is aimed at orienting and exciting students in the subject of engineering in general and their respective disciplines in particular. The objectives of the component are:

- Exposing students to "Engineering" as a profession that creates wealth for nations, and as a vehicle for economic growth.
- Exposing students to Science/Engineering as a medium through which one can address problems facing the society including some of the grand challenges.
- Excite students by enabling them to appreciate the role and enormous impact of research in science/ engineering on our day to day lives.
- Enlighten students about the various career options available to them.
- Make students aware of the issues involved in engineering a product, and help them appreciate why the process of design and innovation leading to products and systems is both personally satisfying and professionally rewarding.
- Excite students about potential role models and successful alumni in engineering profession.
- Motivate students to take up some co-curricular activities on their own during their stay in the Institute.

The activities to realize the above-mentioned objectives as part of this non-graded component include:

- Understanding engineering through product dissection and reverse engineering. (The products given to students to dissect could be physical in form or in the form of videos).
- Screening of videos that bring out the strong relation between science/engineering and societal needs.
- Conducting design and innovation contests among students.
- Solving science / engineering design thinking exercises in the class.
- Lectures by successful industrialists, alumni and entrepreneurs about their journey.
- Exposure to successful research cases from the Institute and the impact of the same.
- Exposure to successful products/innovations from the Institute which have reached people/industry/society.
- Some interesting demonstrations in laboratories.
- Hands-on exercises in laboratories.
- Industry visits.
- Visits to on-going exhibitions in the city.
- Do-it-yourself projects in teams.
- Lectures by faculty, visitors, alumni on some exciting topics.

This non-graded unit is administered in the form of one non-graded course of one unit:

- NIN100 Introduction to Engineering and Programme in the first semester of the undergraduate programme.

The course coordinator of NIN100 would be identified by the Dean Academics. Apart from the main coordinator, each department offering a UG programme, will identify a departmental coordinator for this course. The departmental coordinator will engage with students of their respective departments and will cover 30-35% of the course.

It is necessary to get a satisfactory (S) grade in this course for completing the degree requirements. Attendance would be one of the main criteria for evaluation. Apart from this, active participation and quiz-based evaluation etc. would also be used as a basis to decide 'S' or 'Z' grade. The grades of NIN100 would be moderated by Dean Academics

4.2 Language and Writing Skills

All students are required to participate in Task-Based language classes in the first two semesters. The language needs of a particular batch of the students will be assessed through an online test before the classes begin in the first semester. Then the exercises for different classes will be tailored to the language needs of those students. In general, these exercises are designed to enhance linguistic capabilities in comprehension, both reading and listening, as well as improve the ability to structure and compose ideas in spoken and written communication. Many of them will be structured in the form of competitive games. Wherever necessary principles of English Grammar will be discussed along with the nuances of technical writing. With respect to its content, some of the textual material and lectures will focus on the relationship between Engineering, Humanities and Social Sciences.

The two semesters of Language and Writing Skills is administered in the form of two courses, each of one unit: NLN100 Language and Writing Skills–I in the first semester and NLN101 Language and Writing Skills–II in the second semester. These courses are coordinated by faculty from the Department of Humanities and Social Sciences and an S grade in both NLN100 and NLN101 is generally a prerequisite to register for most undergraduate courses offered by the department of HSS. Assessment of a student towards S grade in each of these courses would typically be on the basis of attendance, participation and performance in the exercises. A student could also be prescribed self-learning exercises or additional practice sessions during vacations as requirement for securing S grade. Student's involvement, during regular semester, would typically be two hours per week. The grades of these courses are moderated by the Dean Academics.

4.3 NCC/ NSO/ NSS

A student is required to choose one of NCC/NSO/NSS during the first semester, and complete the requirements preferably within the first four registered semesters. Students will be required to earn a minimum of 1 non-graded unit from one of these activities, by completing at least 40 hours of work. Students can earn upto 2 units by putting in 80 hours of work. The faculty coordinators of NCC / NSO / NSS decide and announce the policies on earning non-graded units in these activities from time to time.

4.4 Professional Ethics and Social Responsibility

There is increasing consensus worldwide that engineering ethics should be incorporated into the engineering curriculum to provide students with an exposure to the kind of professional ethical dilemmas they might face on an individual basis as well as in the larger context of ethical aspects of technology development. Workshops, discussion/ debates, use of theatre-in-education, case-study based approaches, etc. are often used for illustration and discussion of engineering ethics. Such inputs could be provided in a stand-alone manner, integrated into existing courses or both. The objective of this non-graded component is to sensitize students about Professional Ethics and Social Responsibility (PESR) through a combination of the above-mentioned approaches, supplemented by discussion fora and supplementary materials, to help students to become ethical professionals. A student is required to complete minimum of 1 non-graded unit in this component through activities divided into 3 core courses. The courses NEN110 and NEN111 together correspond to 0.5 non-graded unit and the course NEN300 also corresponds to 0.5 unit. Besides, the students can earn an additional unit through one of the two alternatives NEN212/NEN213 as discussed below. Thus, the courses under PESR are:

i) NEN110 Professional Ethics and Social Responsibility – I (core)

ii) NEN111 Professional Ethics and Social Responsibility – II (core)

iii) One of the following two courses: (optional)

   a. NEN212 PESR Workshops

   b. NEN213 PESR Projects

iv) NEN300 Case Studies in Professional Ethics (core)

Core Requirements

NEN110 and NEN111 are compulsory for all students, and these courses involve interactive sessions of a group of students with a resource person in the first and second semesters respectively. The student will earn 0.5 unit by getting S grade in both these courses.

In NEN300 Case Studies in Professional Ethics, every student will work on at least two case studies related to professional ethics, followed by discussions on the same, moderated by a resource person. The details on how to select the case studies and the mode of discussions and their evaluation would be decided by the concerned resource person. The student will earn 0.5 unit by getting an S grade in this course.

Activities for Additional NGU

The students can choose to earn 1 more NGU under PESR by participating in any one out of a large variety of activities relevant to the core themes of PESR. With the considerable amount of flexibility allowed in the choice of activities, each student desirous of earning this unit should be able to identify an activity of interest to him / her under the purview of PESR. These activities have been divided into two broad categories, viz., (a) PESR workshops (b) PESR projects, each of which corresponds to a separate course number NEN212 and NEN213 respectively. After a student has got 'S' grades in NEN110 and NEN111, the student can register for NEN212 / NEN213. 'S' grade in any of these two courses will get the student 1 NGU.

NEN212 PESR Workshops

Under NEN212 (PESR Workshops), students can participate in one workshop of 5 days duration if the workshop is held in person. These workshops are generally organized on campus by NRCVEE soon after major examinations at the end of every semester. Alternatively, online workshops can be held with about 40 hours of engagement through 2-3 hour sessions during the semester or during vacation period. These workshops are organized by NRCVEE and would be conducted by resource persons from within or outside the Institute. These workshops could be pertaining to any of the themes relevant to PESR and the in-person ones could be held during mid-semester break / summer / winter vacation. The students must follow the procedure announced by the faculty coordinator to register for a workshop. The 'S' grade for attending a workshop will be awarded only if the student attends all sessions of the workshop on all the days for its full duration.

NEN213 PESR Projects

Under NEN213 (PESR Projects), the students can take up projects under the guidance of one or more faculty members to make positive contribution to campus life. This could include promoting wholesome practices on campus such as:

- ethical practices particularly among students through specially directed efforts;
- peer assistance for the students in need of help academically or otherwise;
- sustainable practices on campus like resource conservation, waste management, use of renewable resources and the like;
- working on technology for a social cause etc.

This work could be done during a semester or mid-semester break or summer / winter vacation. The student must submit a project proposal on the NGU portal, with explicit statement of deliverables, through his / her faculty supervisor(s), for approval by the PESR coordinator. If the work is taken up in a team, each student's share of work must be defined in the proposal. It is expected that each student puts in at least 40 hours of effort in the project. On completion of the project, the students should submit a completion request online along with a report of the work done, again through the faculty supervisor, who should certify that each student has completed his / her share of the deliverables and each student has put in at least 40 hours of work into the project.

If a student gets selected in one of the nation building initiatives organized by reputed organizations, the student can identify a faculty supervisor who can be informed of the work done as part of these initiatives. On successful completion of the work, the student can apply on the NGU portal for earning NEN213 units through the faculty supervisor, who can certify the completion of the concerned activity.

Table 4.2 summarizes the requirements of the non-graded component on Professional Ethics and Social Responsibility.

Table 4.2 : Summary of Requirements of the Non-Graded Component on Professional Ethics and Social Responsibility

S. No.	Course	Period of Activity	Description	Requirement for 'S' grade	No. of units
A	**Core Requirement**				
1.	NEN110 Professional Ethics and Social Responsibility–I	1st Semester	3-4 sessions of 2 hours each with a resource person. Theme of the sessions to be announced by the faculty coordinator	Participation in all the sessions held	0.25 (both courses together)
2.	NEN111 Professional Ethics and Social Responsibility–II	2nd Semester	3-4 sessions of 2 hours with a resource person. Theme of the sessions to be announced by the faculty coordinator	Participation in all the sessions held	
3.	NEN300 Case Studies in Professional Ethics	After 6th semester: during vacation or 7th/8th semesters	Work on two case studies on professional ethics; participate in discussions moderated by a resource person.	Participation in all the sessions held along with presentation of case studies	0.5
B	**Practical Activities for Additional NGU**				
4.	NEN212: PESR Workshops	**If in-person:** Mid-semester breaks / summer / winter vacations. **If online:** can be held during the semester as well	Participation in intense ON-CAMPUS workshops approved by Dean Academics, of 5 days duration if in-person and 40 hours duration if online conducted by professional resource persons, with special emphasis on themes related to PESR.	'S' grade to be awarded only for attending the workshop for full duration.	1

5.	NEN213: PESR Projects	Summer / winter vacation / mid-semester break or during a semester.	Taking up on-campus projects under the guidance of a faculty mentor, related to any of the topics relevant to PESR, such as (but not limited to) **A.** Promoting ethical practices on campus in various spheres particularly related to student life on campus. **B.** Strengthening the existing systems and designing and implementing new ones for an active student community participation in addressing the academic as well as other problems of student community. **C.** Developing socially relevant technologies **D.** Promoting Sustainable Practices in hostels, academic area, residential areas etc., involving activities pertaining to conservation of water / electricity / paper / other resources, waste management, promoting use of bicycles, etc.	Prior approval of project proposal by PESR coordinator explicitly specifying deliverables and work share of each student in case of group projects; Completion of the project deliverables identified in the proposal - It must involve at least 40 hours of work by each student along with submission of a report on the NGU portal.	1

4.5 Communication Skills / Seminar

The objective of this non-graded component is to provide the students with an opportunity to develop their skills in preparing write-ups, making presentations, and reading / listening to others' write-ups / presentations. A student would be required to earn 1 non-graded unit under this component between 5th and 8th semesters through any of the following:

(i) Attending one of the topic specific seminar courses (XXQ301, XXQ302, etc.) introduced by the parent Department of a student (for example ELQ301 – Seminar on Embedded Systems – 1 unit) or attending a seminar course (XYQ301, XYQ302 etc.) offered by any other Department / Centre / School. These courses would be non-credit electives, offered in each semester. These seminar sessions would be held for two hours per week. Many such courses could run in parallel.

(ii) Participating in optional seminars which may be part of regular courses; for example regular 'L' courses can have an optional seminar component (e.g. ELL711 Optical Communications can have optional seminar component of 1 unit). This would, like any other seminar course, need to have seminar sessions of 2 hours duration every week for a whole semester. In such a case, a student should register for XXQ30y, and the course coordinator would send recommendations for 'S' grades to the Dean Academics, duly moderated by the Moderation Committee of the concerned Department / Centre / School.

(iii) By participating in special workshops on Communication Skills approved by Dean Academics. The faculty coordinator in charge of the workshop would submit a list of students who completed the activity with 100% attendance in all sessions on all days of the workshop for award of 'S' grade in NQN301.

(iv) By submitting documentary evidence of excellence in debating and / or writing as certified by faculty in-charge of these activities, to the Dean, Academics. In all such cases, the student should submit documentary evidence online, as detailed below:

- A student who wins first, second or third position in any event / competition conducted at inter-hostel level, by BRCA or by BSP or by BSW would qualify for this option. The event / competition must

be either a debate / declamation / extempore. Since many such events do not have certificates issued, the student must submit a letter signed by the warden or the president of the respective board (in case of BRCA, president of the club would also suffice) stating the date, time, venue of the event / competition along with the number of participants and position secured. In case number of participants is less than 20, the event shall not be counted.

- A student who performs as a compere for any of the Institute functions (only those listed in the Institute calendar). The student will need to produce a signed letter from the faculty in-charge of the Institute function stating the student's role as compere. The letter must include the date, time, venue and duration of the event. Any event lasting less than 1 hour will not be counted.
- A student winning a technical paper presentation award during TRYST will need to submit a copy of the certificate and the abstract of the paper presented. Technical publications in Journals or Conferences would also be considered, provided (i) the number of authors of the paper does not exceed 2 and (ii) the faculty member supervising the work certifies that the paper was written by the concerned student.

A minimum of three such documents certified by the faculty in charge of the Board / Club / Activity as mentioned above would qualify a student to earn one unit of Communication Skills / Seminar. In each case, before recommending the award of non-graded units for the above activities, the faculty in charge of the Board / Club / Activity should keep in mind that a student engagement / effort (including preparations and the actual event) of about 40 hours would be necessary for the award of one non-graded unit.

In cases of options (i), and (ii) above, the faculty member in charge of the course should ensure that the student has 100% attendance in the seminars and has done a satisfactory task of his / her contribution to the course: the write-up, presentation, etc. before awarding an 'S' grade. These grades would be moderated by the respective Department / Centre / School. In case of unavoidable absence of up to 3 seminar sessions, appropriate compensation mechanism should be announced by the faculty member at the beginning of the course. For absence beyond 3 sessions, S grade cannot be awarded.

An Institute level Coordinator for Communication Skills / Seminar, appointed by the Dean Academics, would serve as the course coordinator of NQN301. An Institute level committee would moderate the non-graded units for Communication Skills / Seminar recommended for activities other than the courses XXQ30y.

4.6 Design / Practical Experience

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 / 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. This approach signifies a shift from problem based learning (acquisition of knowledge) to project based learning (application of knowledge), in which 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 three non-graded units of DPE to complete the degree requirements. To earn one unit of DPE, a student is expected to put in 28-42 hours of effort or 20 working days depending on the type of activity. To earn two units of DPE, a student needs to put in 56-84 hours of effort or 40 working days depending on the nature of activity. These units can be earned in multiple ways during the semester as well as during vacation and mid-semester breaks:

- Courses with design focus without any regular graded credits, which are designated to give design / practical experience units.
- Courses (core or elective) with optional design / practical experience component.
- Summer / semester internships by students in R&D / Industry / Universities in India or abroad.

- Summer / winter / semester projects under the guidance of faculty of the Institute.
- Participation in design /innovation projects by Innovation Center / CAIC, etc.
- One time activity such as design /practical experience workshop /course /event during semester / vacation /mid-semester breaks, etc.

DPE activities are not restricted to design of physical products but can also include system level design and experience. For example a team of students who under the supervision of faculty in collaboration with an NGO, would like to design a new financial inclusion system for marginalized section of population too can earn design / practical experience units.

The operational modalities of implementing the above-mentioned activities so that students can earn the required non-graded units, are presented in the following paragraphs.

4.6.1 Management of Non-graded DPE Units

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

a) The Departmental DPE Committee would coordinate with Office of Career Services (OCS) to identify and vet industries for internships.

b) The committee would also examine other types of internships (in 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 decide on 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. DPE Committee will moderate all Design units awarded to students of that Department. The Departmental DPE Coordinator also has 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 an Institute DPE Coordinator for Design / 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 including the activities carried out by students in Departments / Centers / Schools not offering UG programmes. This committee would also review and modify policies as well as modalities for administering DPE units.

4.6.2 Activities Covered Under Design / Practical Experience

4.6.2.1 Specialized Courses Related to Design / Practical Experience (Maximum 2 Units)

Departments / Centres / Schools may offer a basket of courses that will not have any credits associated with them but will have only Design / Practical Experience units linked to them. In other words, on successful completion of such courses the students will earn only DPE units but no graded credits. These courses offered by Departments / Centers / Schools can be of one unit (28-42 hours of student effort) or two units (56-84 hours of student effort). Faculty 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 in case of Departments offering undergraduate programmes. For other Departments / Centres / Schools, the moderation would be done by the Institute level DPE committee.

4.6.2.2 Semester / Summer / Winter Projects Under the Guidance of Institute 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. Students who successfully complete SURA / DISA projects will also be eligible for DPE units. Besides, students may also opt for working on

semester / summer / winter projects involving design/practical experience activity under the guidance of faculty of the institute. In order to be evaluated for DPE Units in such cases, a student should register for XXD35y Minor Design Project floated by the parent Department XX of the student. In case the project is interdisciplinary or it is offered by faculty of other Departments / Centres / Schools, the faculty supervisor of the project may advise the students to register for NDN35y Minor Design Project. In either case, the project would be evaluated by the faculty supervisor.

The courses XXD351 – XXD355 would be Minor Design Projects with 1 non-graded DPE unit, and XXD356 – XXD358 would be Minor Design Projects with 2 non-graded units each. Courses NDN351 – 358 would also follow a similar definition.

4.6.2.3 Regular Courses with Optional Design / Practical Experience Component (Maximum 2 Units)

Course coordinators of regular core and elective courses can also offer optional design component in their courses. A proposal for this should be sent to the Departmental DPE committee prior to the commencement of the course by the Course Coordinator. This would be notified to students by the Departmental DPE committee and also announced to the students by the course coordinator. 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 the optional DPE component. The course coordinator will recommend these DPE units on successful completion of the assigned work. This would be moderated by the Departmental Committee for DPE. In case the course is offered by Departments / Centres / 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. In order to be evaluated for DPE Units, a student should register for XXD35y Minor Design Project or NDN35y Minor Design Project as the case may be.

4.6.2.4 Summer Internships (Maximum 2 Units)

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 cannot be earned in parts. For example, 1 NGU cannot be claimed for 20 working days of internship. This would be administered by the Departmental Committee for DPE with the help of the Office of Carrer Services (OCS). Students are required to get approval for taking up internship in the concerned Institute through the NGU portal prior to proceeding for the internship if they wish to claim NGU for the internship. The Departmental DPE Committee would also be responsible for appointing a faculty supervisor for the internship. 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. Rules governing administration of internships are given in section 4.6.3. In case an internship pertains to areas of expertise outside those of the parent Department, the DPE Committee may co-opt faculty members from other Departments / Centres / Schools for evaluating / supervising such internships.

4.6.2.5 One-Semester Internship (Maximum 5 Units)

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 break in coursework for a semester to initiate or work for his / her start up. These are the only two activities upon successful completion of which students would be eligible for 5 DPE units. 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 / startup activity only after the Departmental Committee for DPE approves the same. DPE units for the activity would be awarded by the Departmental DPE Committee after evaluation at the end of the internship / startup period. In case an internship / startup pertains to areas of expertise outside those of the parent Department, the DPE Committee may co-opt faculty members from other Departments / Centres / Schools for evaluating / supervising such activities. Details of the procedure are given in section 8.6.3 on internships.

A semester in which a student earns DPE units through semester-long internship or start-up as discussed above would be counted as a registered semester for graduation requirements. In case the DPE committee does not approve the award of 5 units for such activity, the semester would not be counted as a registered semester.

4.6.2.6 One Time Design / Practical Experience Module (1 Unit)

One time DPE modules can be offered by Institute faculty as well as working professionals who would like to engage students in a workshop / course related to design / practical experience. A proposal for such a module should be sent by faculty member coordinating the course through the concerned Department / Centre / School to the Institute DPE Committee for approval. 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 in the semester.

Table 4.3 summarizes the information presented in section 4.6.2. Detailed rules pertaining to internships and their administration are given in section 4.6.3.

Table 4.3 : Implementation and Evaluation Plan for Design / Practical Experience Units

Activity	Norms for the Activity	Criteria for awarding Units	No. of Units	
			Min	Max
Courses with design focus (which are primarily design courses or have significant design component)	Courses offered as per Institute procedure	Registration by the student in the respective course; Evaluation by course coordinator; Moderation by DPE committee of Department / Institute	1	2
Courses with optional design/practical experience component	Course Coordinator provides intimation to Departmental / Institute DPE Committee about offering optional design units prior to commencement of the course	Student to raise request on the NGU portal for prior permission, forwarded by course coordinator; Prior Approval by DPE coordinator; Evaluation by course coordinator; Moderation by DPE committee of Department / Institute	1	2
4-week project with Institute Faculty during winter/ summer (20 working days)	Notification of projects by DPE Committee of Student's Department / Institute	Student to raise request online for prior permission; Prior approval by DPE Committee of Student's Department; Evaluation by Faculty Supervisor of the project; Completion approval request by student forwarded through supervisor; Moderation by DPE committee of Department / Institute	1	1
8-week project with Institute Faculty including SURA, DISA, etc. (40 working days)	Notification of projects by DPE Committee of Student's Department / Institute OR Announcement and selection by appropriate Institute bodies	Student to raise request online for prior permission; Prior approval by DPE Committee of Student's Department; Evaluation by Faculty Mentor of the project / appropriate committee; Completion approval request by student forwarded through supervisor; Moderation by DPE committee of Department / Institute	2	2
Internship during summer with Industry / R&D / University (40 working days)	Arranged by OCS or self-arranged by the student	Student to raise request online for prior permission; Prior approval by DPE Committee of Student's Department; Monitoring by Internship supervisor; Completion approval request by student forwarded through supervisor; Evaluation and Moderation by DPE committee of Department / Institute	2	2

One semester internship (100 working days) or One semester break for own start-ups (singly or jointly)	Arranged by OCS or self-arranged by the student	Student to raise request online for prior permission; Prior approval of Institute DPE Committee on recommendation from DPE committee of Student's Department; Monitoring by Internship supervisor; Completion approval request by student forwarded through supervisor; Evaluation and Moderation by DPE committee of Department / Institute	5	5
Participation in design / project activity under the supervision of faculty during semester	Notification of projects by DPE Committee of Student's Department / Institute or the Student to approach the faculty	Student to raise request online for prior permission; Prior approval by DPE Committee of Student's Department; Evaluation by Faculty Mentor of the project; Completion approval request by student forwarded through supervisor; Moderation by DPE committee of Department / Institute	1	2
Participation in design / practical / experience workshop / course / event organized by industry / other institutions or visitors including visiting faculty	Proposal for activity to be recommended by faculty coordinator or Department DPE Committee and approved by Institute DPE Committee	Registration by the student in the activity; Evaluation by Faculty Coordinator and Visiting Faculty offering the course if any; Moderation by DPE committee of Department / Institute	1	1
Participation in design / innovation activities of clubs (eg. Robotics, IGEM, etc.)	Notification by the Faculty in-charge of the corresponding activity	Student to raise request online for prior permission; Prior approval by DPE Committee of Student's Department; Evaluation by faculty in-charge of activity / clubs; Completion approval request by student forwarded through supervisor; Moderation by Institute DPE committee	1	2

- A student cannot register for more than 3 non-graded DPE units per summer semester or 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.

4.6.3 Rules Governing Internship

i) Internships for DPE 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 DPE units.

b. Semester-long internship of 100 days duration, in which a student can earn 5 DPE units.

No other format of internship would be considered for the award of DPE units. DPE 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 DPE Committee. DPE units would not be awarded against partial completion of the internship duration.

ii) A student can choose from one of the following options in order to complete the requirements of Non-Graded component of Design / Practical Experience:

a. One semester internship, accounting for 5 DPE units.

b. One summer internship, accounting for 2 DPE units and 1 to 3 DPE units from other activities at the Institute

c. Two summer internships, accounting for a total of 4 DPE units, and if desired, 1 DPE unit from other activities at the Institute

d. No internships: all DPE units can be earned through design / project activities at the Institute

iii) A student can do at most two internships for DPE units, during his/her stay at the Institute. If any student does more than two internships, DPE units will be awarded for the first two registered internships only.

iv) 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.

v) 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 departmental DPE committee in advance. In the case of non-industry internships, the work should be research / development / practice oriented, and not classroom course work.

vi) In all cases, for award of DPE units, after completion of the internship, the work must be evaluated by the DPE committee of the student's Department. In case the work is found wanting in any respect, the student(s) will be advised to do more work and reappear before the committee. In any case, partial award of DPE units would not be allowed.

vii) For self-arranged internships, any documentation regarding the bona fide status of students (while applying for training) will be provided by UG section.

4.6.3.1 Registration Procedure for Internships

Summer Internships:

i) At the beginning of first semester of each academic year, the data of all students who have earned at least 30 credits would be automatically enrolled by the OCS for internship in the subsequent summer.

ii) At the beginning of the internship in the following summer, the student must have completed 50 credits to be eligible.

iii) OCS sends out information to the students about the companies offering summer internships. Interested students can apply for the same.

iv) The students can also arrange for the internships on their own.

v) If a student is selected for an internship through OCS, he/she is bound to accept the internship. If the student does not take up or complete the internship, he/she will be debarred from all further OCS activities including further internship opportunities and placement procedure. This is to discourage non-serious students from depriving other students of the opportunity, and damaging the reputation of IIT Delhi with the companies offering internships through OCS.

vi) The OCS would handle correspondences and training certificates of all internships arranged by the OCS.

vii) OCS will try and arrange internships for as many students as it can. However, it may not be possible for the OCS to arrange internships for all the students who participate in the process.

viii) The OCS typically starts the process of selections for internships in August and ends in February- March. The exact dates would be notified by the OCS each year.

ix) To claim DPE units for summer internships, a student is required to initiate activity XXT200 or XXT300 on the NGU portal prior to the commencement of the internship. A student should register in XXT200 if it is his/her first summer internship and XXT300 if it is second summer internship. The approval of initiation request will be as per the rules and regulations of the academic unit, which holds for both OCS arranged as well as self-arranged internships.

x) At the end of summer internship, a student is required to submit training report and training certificate to the department DPE coordinator. Further, student will also need to raise the completion request for the registered activity XXT200/300. DPE units will be awarded after the due evaluation procedure of the respective academic unit.

Semester Internship:

i) Semester internship, as mentioned in section 4.6.2.5, is permitted in the seventh registered semester or later, for students with at least 75 earned credits.

ii) A student needs to submit a request on the NGU portal for prior approval of semester internship. The request for internship will be evaluated by the DPE committee of the student's parent Department and approved by the Institute DPE committee upon recommendation of the former.

iii) Process of monitoring / mentoring the internship is described in section 4.6.2.5. Upon completion, the student should submit a request on the NGU portal for approval of the completion of the internship through the supervisor and Departmental DPE committee to the Institute DPE committee. The grade for semester internship is awarded by the Institute DPE committee.

The list of courses offered in connection with non-graded units listed in sections 4.1-8.6 along with the respective pre-requisites is summarized in Table 4.4.

Table 4.4 : Summary of courses for non-graded unit

S. No.	Course Number	Course Name and / or Description	Pre-requisite(s)	No. of Units
Introduction to Engineering & Programme: 01 units				
1	NIN100	Introduction to Engineering and Programme in the first semester	—	1
Language and Writing Skills: 02 units				
2	NLN100	Language and Writing Skills–I in I semester	—	1
3	NLN101	Language and Writing Skills–II in II semester	NLN100	1
NCC / NSO / NSS: Minimum 01 unit – Maximum 02 units				
4	NCN100	NCC	—	2
5	NCN103	NCC	—	1
6	NPN100	NSO	—	2
7	NPN103	NSO	—	1
8	NSN100	NSS	—	2
9	NSN102	NSS	—	1
Professional Ethics and Social Responsibility: Minimum 01 unit – Maximum 02 units				
10	NEN110	Professional Ethics and Social Responsibility – I in first semester – 6-8 hours	—	0.25 (for both together)
11	NEN111	Professional Ethics and Social Responsibility – II in second semester – 6-8 hours	NEN110	
12	NEN212	PESR Workshops: 5 days or 40 hours	NEN111	(Any one of the two) 1
13	NEN213	PESR projects: 40 hours of work followed		
14	NEN300	Case Studies in Professional Ethics (6 hours of class engagement + preparation of case studies)	NEN111	0.5

Communication Skills / Seminar: 01 units				
15	XXQ301, XXQ302, etc.	Topic specific Seminar courses introduced by parent Department	EC 50	(Any one) 1
16	XYQ301, XYQ302, etc.	Additional Seminar courses introduced by any other Department / Centre / School	EC 50	
17	NQN301	Seminar component of regular courses OR Three extracurricular activities involving communication skills	EC 50	
Design / Practical Experience: Minimum 03 units – Maximum 05 units				
18	XXD351	Minor Design Project – 1	EC 30	1
19	XXD352	Minor Design Project – 2	EC 30	1
20	XXD353	Minor Design Project – 3	EC 30	1
21	XXD354	Minor Design Project – 4	EC 30	1
22	XXD355	Minor Design Project – 5	EC 30	1
23	XXD356	Minor Design Project – 6	EC 30	2
24	XXD357	Minor Design Project – 7	EC 30	2
25	XXD358	Minor Design Project – 8	EC 30	2
26	NDN351	Minor Design Project – 1	EC 30	1
27	NDN352	Minor Design Project – 2	EC 30	1
28	NDN353	Minor Design Project – 3	EC 30	1
29	NDN354	Minor Design Project – 4	EC 30	1
30	NDN355	Minor Design Project – 5	EC 30	1
31	NDN356	Minor Design Project – 6	EC 30	2
32	NDN357	Minor Design Project – 7	EC 30	2
33	NDN358	Minor Design Project – 8	EC 30	2
34	XXT200	Summer Internship – 1	EC 30	2
35	XXT300	Summer Internship – 2	XXT200	2
36	XXT400	Semester Internship	EC 75	5

In all above course descriptions, XX and XY stand for the two-letter prefix corresponding to course numbers of academic units (Table 1 of Chapter 1): example, XXD351 corresponding to Department of Textile Technology would be TXD351.

4.7 Overlapping Activities

Many of the activities listed under a given component in sections 4.1-9.6 could also qualify as valid activities under other non-graded components: for example, a technical project done as part of NEN213 may qualify to be submitted for DPE units under XXD35y, etc. Some of the technical projects may also qualify as valid activities under Minor / Mini / Major projects towards earning graded credits. In this regard, the following would be strictly followed: In case a project is evaluated for graded credits or for any other non-graded activity, it would not be allowed to be re-submitted for any other non-graded unit. While submitting the completion request of the project online, a student should submit an undertaking to this effect, approved online by the faculty supervisor of the project.

a) In the summer when student has registered for Summer Internship (either through OCS or self-arranged); they cannot be registered for any course or other institute activity.

b) Additional work which is not evaluated for such projects, either done prior to such projects or done after the completion of such projects, could be considered. In such a case, prior written permission must be taken from the concerned committee (PESR, DPE, etc.), explicitly describing components of work being submitted for the other graded / non-graded evaluations and for the current submission separately. In this regard, note the following examples:

   The workshops organised by NSS and under NEN212 would be generally distinct. Under NEN212, workshops would have minimum duration of 5 days and would be designated as “PESR WORKSHOP”. Workshops organized by NSS would not be counted for NEN212 and vice-versa.

INDIAN INSTITUTE OF TECHNOLOGY DELHI

THE HONOUR CODE

I ....., Entry No..... do hereby undertake that as a student at IIT Delhi :

1) I will not give or receive aid in examinations; that I will not give or receive unpermitted aid in class work, in preparation of reports, or in any other work that is to be used by the instructor as the basis of grading; and

2) I will do my share and take an active part in seeing to it that others as well as myself uphold the spirit and letter of the Honour Code.

I realise that some examples of misconduct which are regarded as being in violation of the Honour Code include :

- ☞ Copying from another's examination paper or allowing another to copy from one's own paper;
- ☞ Unpermitted collaboration;
- ☞ Plagiarism;
- ☞ Revising and resubmitting a marked quiz or examination paper for re-grading without the instructor's knowledge and consent;
- ☞ Giving or receiving unpermitted aid on take home examinations;
- ☞ Representing as one's own work, the work of another, including information available on the internet;
- ☞ Giving or receiving aid on an academic assignment under circumstances in which a reasonable person should have known that such aid was not permitted; and
- ☞ Committing a cyber-offence, such as, breaking passwords and accounts, sharing passwords, electronic copying, planting viruses, etc.

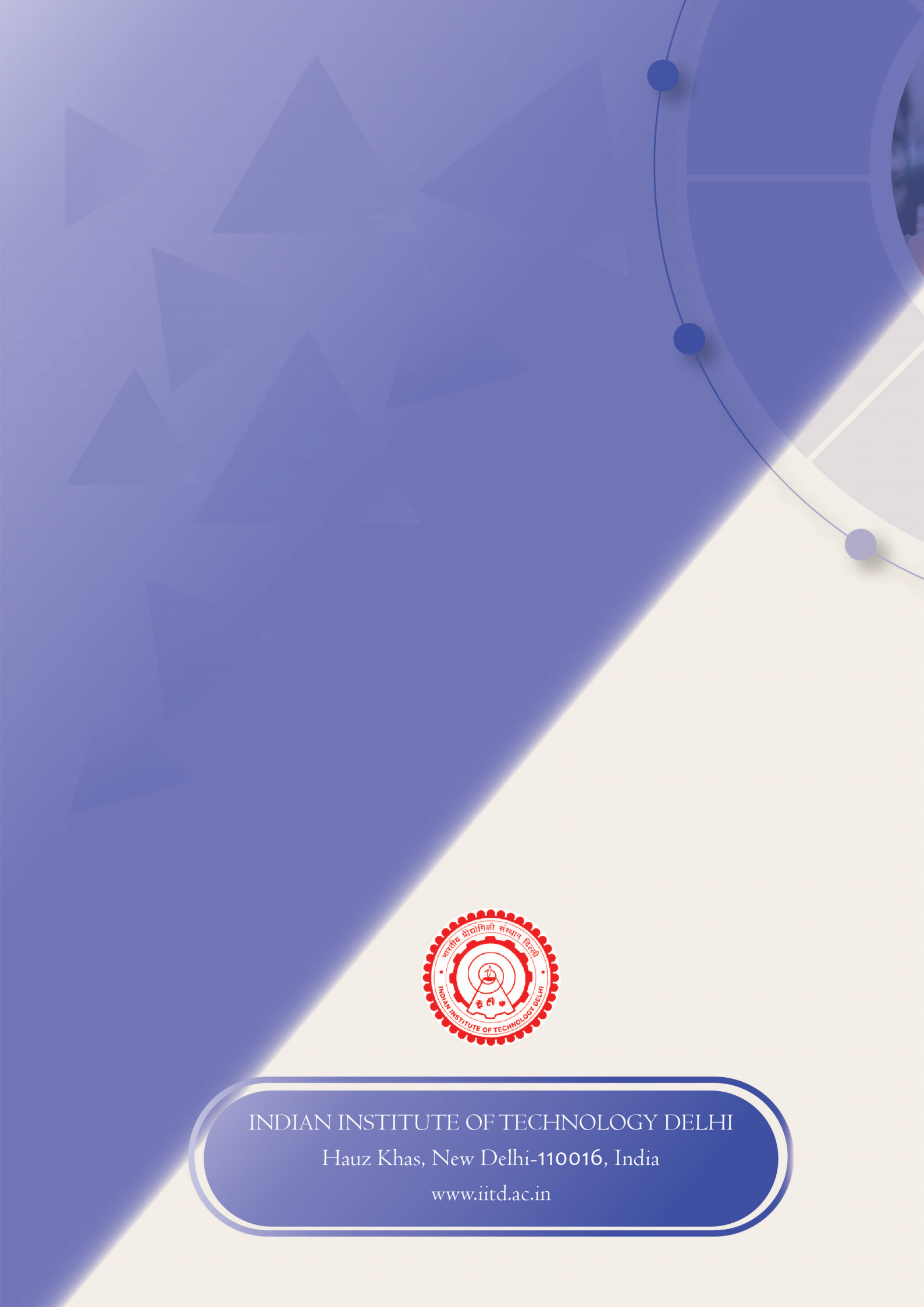
I accept that any act of mine that can be considered to be an Honour Code violation will invite disciplinary action.

Date.....

Student's Signature.....

Name.....

Entry No.....



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