# Department of Computer Science and Engineering
## Indian Institute of Technology Bombay

## CSE UG Curriculum
## applicable from the batch of 2007

This document lists the semester-wise structure of the B.Tech program and the requirements of the B.Tech (Honors), Dual Degree, and B.Tech (Minor) programs.

Courses may have pre-requisites and co-requisites. Some core courses are identified as floating courses. Floating courses are associated with either even or odd semesters. In the document, floating courses are identified with a '*'. Students may take them anytime subject to prerequisite and co-requisite requirements. They will be offered every year in the designated semester. Prerequisites/Corequisites are listed separately in course syllabi.

### *Summary of the course structure*

Breakup of Over all credits structure for the B.Tech. Programme

| Department Credits | Institute Credits# | Total Credits |
|:---:|:---:|:---:|
| 147 | 106 | 253 |

12  Core CSE theory courses, excluding CS 101.

11  Core CSE laboratory courses

6   Electives

#Though this document also includes institute courses, their placements and credits breakup, these may change from time to time. Please refer to ASC/academic office pages for latest information.

| Semester 1 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| MA 105 | Calculus | 3 | 1 | 0 | 8 | Inst.Core |
| CH 103 | Chemistry I | 2 | 1 | 0 | 6 | Inst.Core |
| CS 101 | Comp.Programing and Utilization | 2 | 0 | 2 | 6 | Inst.Core |
| HS 101 | Economics | 3 | 0 | 0 | 6 | Inst.Core |
| CH 117 | Chemistry Lab | 0 | 0 | 3 | 3 | Inst.Core |
| ME 113 | Workshop Practice | 1 | 0 | 3 | 5 | Inst.Core |

| | | Semester Credits | | | Cumulative Credits | | |
|---|---|---|---|---|---|---|---|
| | | Department | Institute | Total | Department | Institute | Total |
| | | 0 | 34 | 34 | 0 | 34 | 34 |

| Semester 2 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| MA106+ MA 108 | Linear Algebra and Ordinary Differential Equations | 3 | 1 | 0 | 8 | Inst.Core |
| PH 105 | Modern Physics | 2 | 1 | 0 | 6 | Dept.Option |
| IC 102 | Data Analysis and Interpretation | 2 | 1 | 0 | 6 | Inst.Core |
| CS 152 | Abstractions and Paradigms in Programming | 3 | 0 | 0 | 6 | DIC |
| PH 117 | Physics Lab | 0 | 0 | 3 | 3 | Inst.Core |
| CS 154 | Abstractions and Paradigms in Programming Lab | 0 | 0 | 3 | 3 | DIC |
| ME 119 | Engineering Graphics and Drawing | 0.5 | 1 | 3 | 5 | Inst.Core |

| | | Semester Credits | | | Cumulative Credits | | |
|---|---|---|---|---|---|---|---|
| | | Department | Institute | Total | Department | Institute | Total |
| | | 9 | 28 | 37 | 9 | 62 | 62 |

| Semester 3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. | |
| EE 101 | Introduction to Electrical and Electric Circuits | 3 | 1 | 0 | 8 | Inst.Core | |
| ES 200 | Environmental Studies | | | | 3 | Inst.Core | |
| HS 200 | Environmental Studies :Science and Engineering | | | | 3 | Inst.Core | |
| CS 207 | Discrete Structures | 3 | 0 | 0 | 6 | Dept.Core | |
| CS 213 | Data Structures and Algorithms | 3 | 0 | 0 | 6 | Dept.Core | |
| IC 211 | Experimentation and Measurement  Lab | 0 | 0.5 | 3 | 4 | Inst.Core | |
| CS 293 | Data Structures and Algorithms Lab | 0 | 0 | 3 | 3 | Dept.Core | |

| | Semester Credits | | Cumulative Credits | | | |
|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 15 | 18 | 33 | 24 | 80 | 104 |

| Semester  4 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. | |
| MA 214 | Numerical Analysis | 3 | 1 | 0 | 8 | Inst.Core | |
| CS208 | Automata Theory and Logic * | 3 | 0 | 0 | 6 | Dept.Core | |
| CS 218 | Design and Analysis of Algorithms * | 3 | 0 | 0 | 6 | Dept.Core | |
| CS 210 | Logic Design | 3 | 0 | 0 | 6 | Dept.Core | |
| CS 296 | Software Systems Lab | 2 | 0 | 2 | 6 | Dept.Core | |
| CS 288 | Logic Design Lab | 0 | 0 | 3 | 3 | Dept.Core | |

| | Semester Credits | | Cumulative Credits | | | |
|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 27 | 8 | 35 | 51 | 88 | 139 |

| Semester 5 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| HS 301 | Literature/Philosophy/Psychology/Sociology | 3 | 0 | 0 | 6 | Inst.Core |
| CS 305 | Computer Architecture * | 3 | 0 | 0 | 6 | Dept.Core |
| CS 347 | Operating Systems * | 3 | 0 | 0 | 6 | Dept.Core |
| CS 317 | Database and Information Systems * | 3 | 0 | 0 | 6 | Dept.Core |
| CS 387 | Database and Information Systems Lab * | 0 | 0 | 3 | 3 | Dept.Core |
| CS 341 | Computer Architecture Lab * | 0 | 0 | 3 | 3 | Dept.Core |
| CS 377 | Operating Systems Lab * | 0 | 0 | 3 | 3 | Dept.Core |

| | Semester Credits | | | Cumulative Credits | | |
|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 27 | 6 | 33 | 78 | 94 | 172 |

| Semester 6 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| CS 344 | Artificial Intelligence * | 3 | 0 | 0 | 6 | Dept.Core |
| CS 302 | Implementation of Programming Languages * | 3 | 1 | 0 | 8 | Dept.Core |
| CS 348 | Computer Networks* | 3 | 0 | 0 | 6 | Dept.Core |
| CS 386 | Artificial Intelligence Lab * | 0 | 0 | 3 | 3 | Dept.Core |
| CS 306 | Implementation of Programming Languages Lab * | 0 | 0 | 3 | 3 | Dept.Core |
| CS 378 | Computer Networks Lab * | 0 | 0 | 3 | 3 | Dept.Core |
| CS 308 | Embedded Systems Lab. | 0 | 0 | 4 | 4 | Dept.Core |

| | Semester Credits | | | Cumulative Credits | | |
|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 33 | 0 | 33 | 111 | 94 | 205 |

| Semester 7 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| | Elective 1 | 3 | 0 | 0 | 6 | |
| | Elective 2 | 3 | 0 | 0 | 6 | |
| | Elective 3 | 3 | 0 | 0 | 6 | |
| | Institute Elective 1 | 3 | 0 | 0 | 6 | |

| | Semester Credits | | | Cumulative Credits | | | |
|---|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 18 | 6 | 24 | 129 | 100 | 229 |

| Semester 8 | | | | | | |
|---|---|---|---|---|---|---|
| Number | Course Title | L | T | P | C | Inst./Dept. |
| | Elective 4 | 3 | 0 | 0 | 6 | |
| | Elective 5 | 3 | 0 | 0 | 6 | |
| | Elective 6 | 3 | 0 | 0 | 6 | |
| | Institute Elective 1 | 3 | 0 | 0 | 6 | |

| | Semester Credits | | | Cumulative Credits | | | |
|---|---|---|---|---|---|---|---|
| | Department | Institute | Total | Department | Institute | Total |
| | 18 | 6 | 24 | 147 | 106 | 253 |

## List of Electives

Some of the elective courses are listed here. As per  Institute rules all PG courses are available as electives to those UG students whose CPI is 6.5 and above. The list will be updated from time to time.


CS 408 Graph Theory
CS 451 Distributed Systems
CS 407 Digital Signal Processing
CS 462 Analytical Models of Computing Systems
CS 467 Functional and Logic Programming
CS 449 Topics in Artificial Intelligence Programming
CS 336 Computer Aided Geometric Deign
CS 475 Computer Graphics
CS 415 Numerical Computation
CS 444 Database Management Systems
CS 468 Computational Models in Pattern Recognition and Learning
CS 460 Natural Language Processing
CS 470 Modelling and Simulation
CS 474 Cognitive Psychology
CS 346  Software Engineering
CS 352  Machine Learning
CS 406  Cryptography and Network Security
CS 414  Introduction to Wireless Networks
CS 329  Principles of Programming Languages
CS 435 Linear Optimization
CS 497 Btech Project I  -- number needs to be changed ---
CS 498 BTech Project II  --- number needs to be changed ---
CS 490 R&D project I

### 3.  Requirements for B.Tech. Honours

A student should earn 30 additional credits over the minimum B.Tech. Requirements, to be eligible for the B.Tech. (Honours) degree. Of these, 12 credits have to be earned through elective CSE courses. The remaining 18 credits can be earned in any of the following ways:

- CSE Elective courses.

- A 6 credit B.Tech project I

- A 12 credit B.Tech Project II.

   - B.Tech. Project II will be available to a student only if the student gets a minimum BB grade in B.Tech. Project I.

   - B.Tech.  Project II must be a continuation of B.Tech. Project I  under  the supervision of the same faculty.


## 4. Requirements of the DD Programme

A dual degree student is required to earn the following additional credits beyond the requirements of the B.Tech Degree

- 54 credits through CSE elective courses, of which 24 credits must be through graduate-level courses

- A two-stage DD project of 72 credits

In the entire DD programme, a student can do at most 3 R &D Projects as electives.


## 5. Requirements of the Minor Programme

If and when such students earn 30 credits through CSE courses meant for minors, they will qualify for a minor in CSE. Since Data Structures is a pre-requisite for almost all CSE courses, the department will make two offerings of the course every year: A regular offering for CSE students in third semester and a separate offering for minor students.
A minor student can do up to one R&D project.



CSE students who fail a course in a regular offering will be allowed to clear the course by registering for an equivalent course meant for minor students.