Bachelor of Technology in Computer Science Engineering

Indian Institute of Technology Mandi

Programme Level	Under Graduate
Year of Commencement	2009
Minimum Duration	4 Years (8 Semesters)
Maximum Duration	6 Years (12 Semesters)

Preamble to the program

Traditionally computer science curricula have drawn from diverse fields. These include (amongst others) the study of digital circuits, devices, and their aggregation into functioning machines; the principles and paradigms of programming and data structures; the mathematical foundations and models of computing and notions of computability; scientific computing and large software applications in technology development and industry; human computer interaction with two way communication via speech, language, images, touch and gestures; logical reasoning and problem solving systems; networks and distributed computing paradigms; handling large databases and dealing with vast amounts of data one the world wide web; machine learning and systems that improve their performance with experience; interactive multimodal systems for entertainment and education.

While it stands to reason the focus and strength of a discipline depends directly upon core curriculum that a computer science graduate should have been exposed to. This expectation can arise out of three sources – industry that the graduate might go to for employment, a post graduate school for research and development, or an entrepreneurial streak in the student.

The Computer Science and Engineering (CSE) BTech curriculum follows the ideas a "theory course" should be preceded by a "practicum module" in which the students are exposed to development with existing systems, where possible. It is hoped that this will lead to greater appreciation of the theoretical issues dealt with in the course, and at the same time encourage the students for more hands-on development work. This is in line with the approach where the students plunge into an area early and catch up with other needed courses later. The curriculum is designed based on the ACM/IEEE Task Force recommendations for CS curricula.

In the current CSE curriculum, theory course Information and Database Systems in 4th semester is preceded by the practicum course Applied Database Practicum in 3rd semester. The practicum course on software engineering, Large Application Practicum is followed by the elective theory course related to Software Engineering. Originally the theory course Introduction to Computing and Distributed Processes is preceded by the practicum course System Practicum. Recently this is revised and now practicum course System Practicum precedes the theory course Introduction to Computing and Distributed Processes.

Objectives of the program

During the last two decades, there has been a major paradigm shift in processing, communication, and storage of information from predominantly analog domain to digital domain for the reasons such as ease of implementation, better efficiency, greater robustness against noise, and enhanced performance and security. This shift has not only resulted in generation of ever increasing volumes of digital data but also an acute need to efficiently process, store, and communicate it. To address this need the focus of CSE curriculum must shift from introducing the traditional elementary courses to represent and process the data to more abstract structures. This will enable the students to better understand and appreciate the current developments at the frontiers of CSE, both in theory and application, and prepare them to contribute to further advancement of such frontiers.

Semester wise distribution of all courses
(Minimum credit requirements for B.Tech. degree 160 credits)

Abbreviations	
IC	Institute Core Subject (Compulsory to all branches of B.Tech.)
DC	Discipline Core Subject (branch specific compulsory courses)
DE	Discipline Elective Subject (branch specific elective courses)
OE	Open Elective (elective open to all branches of B.Tech.)
MTP (total 8 credits)	Major Technical Project (Optional, students may opt for courses instead)

Semester I

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
IC110	Engineering Mathematics	2.5	0.5	0	3
IC152	Computing and Data Science	3	0	2	4
IC160	Electrical Systems Around Us	2.5	0.5	0	3
IC160P	Electrical Systems Lab	0	0	3	2
IC140	Graphics for design	2	0	3	4
IC101P	D& IP – Understanding Products through Reverse Engineering (Lab)/ Reverse Engineering Lab	0	0	3	2
HS107	Exploring Creative Art Forms	1	0	0	1
HSXXX	English 1/HSS Basket Course	3	0	0	3
	Total No of Theory Courses	**6**	**Total Credit**		**22**
	Total No of Labs	**4**			

Semester II

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
IC111	Linear Algebra	2.5	0.5	0	3
IC252	Data Science II	3	0	2	4
IC161	Applied Electronics	3	0	0	3
IC161P	Applied Electronics Lab	0	0	3	2
IC142	Engineering Thermodynamics	3	0	0	3
IC141	Product Realization Technology	2	0	0	2
IC141P	Product Realization Technology Lab	0	0	3	2
HSXXX	HSS Basket Course	3	0	0	3
	Total No of Theory Courses	**6**	**Total Credit**		**22**
	Total No of Labs	**3**			

Semester III

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CS202	Data Structures and Algorithms	3	0	2	4
CS207P	Applied Database Practicum	0	0	3	2
CS208	Mathematical Foundations of Computer Science	3	1	0	4
IC240	Mechanics of Rigid Bodies	1.5	1.5	0	3
IC272	Data Science III	2	0	2	3
ICXXX	Science 1 or Science 2 or Engineering Science Basket	-	-	-	3
HSXXX	HSS Basket Course	3	0	0	3
	Total No of Theory Courses	**6**	**Total Credit**		**22**
	Total No of Labs	**3**			

Semester IV

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CS201	Computer Organization	3	0	0	3
CS201P	Computer Organization Laboratory	0	0	2	1
CS304	Formal Languages and Automata Theory	3	0	0	3
CS309	Information and Database Systems	3	0	2	4
IC201P	Design Practicum	0	0	6	4
IC222P	Physics Practicum/Practicals	0	0	3	2
ICXXX	Science 1 or Science 2 or Engineering Science Basket	-	-	-	3
	Total No of Theory Courses	4	Total Credit		20
	Total No of Labs	4			

Semester V

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CS310	Introduction to Computing and Distributed Processes	3	0	2	4
CS308P	Large Application Practicum	0	0	3	2
ICXXX	Science 1 or Science Basket	-	-	-	3
CSXXX	Discipline Elective	-	-	-	3/4
CSXXX	Discipline Elective	-	-	-	3/4
CSXXX	Discipline Elective / Free Elective	-	-	-	3
HSXXX	HSS Basket Course	3	0	0	3
	Total No of Theory Courses	6	Total Credit		21-23
	Total No of Labs	1			

Semester VI

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CS302	Paradigms of Programming	3	0	2	4
CS307P	System Practicum	0	0	3	2
IC221	Foundations of Electrodynamics	3	0	0	3
CSXXX	Discipline Elective	-	-	-	3 / 4
CSXXX/DP301P	Discipline Elective / Free Elective / ISTP	-	-	-	3 / 4
HSXXX	HSS Basket Course	3	0	0	3
-	Internship	-	-	-	2
	Total No of Theory Courses	3	Total Credit		20-22
	Total No of Labs	2			

Semester VII

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CSXXX	Discipline Elective / Free Elective				3 / 4
CSXXX	Discipline Elective / Free Elective				3 / 4
CSXXX	Discipline Elective / Free Elective				3 / 4
CSXXX	Discipline Elective / Free Elective				3 / 4
HSXXX	HSS Basket Course	3	0	0	3
MTP	MTP-I	0	0	5	3
			Total Credit		18-22

Semester VIII

Core/ Elective	Course Name	Lecture	Tutorial	Practical	Credit
CSXXX	Discipline Elective / Free Elective				3 / 4
CSXXX	Discipline Elective / Free Elective				3 / 4
CSXXX	Discipline Elective / Free Elective				3 / 4
HSXXX	HSS Basket Course				3
MTP	MTP-II	0	0	10	5
			Total Credit		17-21

List of Core courses for B.Tech. Computer Science and Engineering Program
(Total Credits for discipline core = 33)

Course No	Course title	Credit (L-T-P-C)	Semester
CS202	Data Structures and Algorithms	3-0-2-4	III
CS207	Applied Database Practicum	0-0-3-2	
CS208	Mathematical Foundations of Computer Science	3-1-0-4	
CS201	Computer Organization	3-0-0-3	IV
CS201P	Computer Organization Laboratory	0-0-2-1	
CS304	Formal Languages and Automata Theory	3-0-0-3	
CS309	Information and Database Systems	3-0-2-4	
CS310	Introduction to Computing and Distributed Processes	3-0-2-4	V
CS308	Large Application Practicum	0-0-3-2	
CS302	Paradigms of Programming	3-0-2-4	VI
CS307	System Practicum	0-0-3-2	

Discipline Elective (DE) courses for CSE

For B.Tech CSE 2020 batch and onwards		
Course No	Course title	Credit (L-T-P-C)
CS303	Software Engineering	2-0-2-3
CS451	Computer Graphics and Game Design	2-0-2-3
CS456	Distributed Databases	3-0-0-3
CS502	Compiler Design	3-0-2-4
CS507	Computer Architecture	3-0-2-4
CS508	Introduction to Heterogeneous Computing	2-0-0-2
CS514	Data Structures and Algorithms-II	3-0-2-4
CS522	Distributed Algorithms	3-0-0-3
CS523	Verification of Reactive Systems	3-0-0-3
CS541P	IoT Systems and the Cloud	3-0-2-4
CS542	Design patterns for scalable systems	
CS544	Formal Concept Analysis: Theory and Practice	2-0-2-3
CS545	Software Design Pattern	3-0-0-3
CS546	Design of Concurrent Software	3-0-0-3
CS549	Performance analysis of computer networks	3-0-0-3
CS550	Computer Graphics and Geometric Design	2-0-2-3
CS561	Map Reduce and Big Data	3-0-0-3
CS562	Artificial Intelligence	3-0-0-3
CS563	Scalable Data Science	3-1-0-4
CS606	Computational Modeling of Social Systems	3-0-0-3
CS609	Speech Processing	3-0-2-4
CS611	Program Analysis	3-1-0-4
CS660	Data Mining for Decision Making	3-0-0-3
CS662	Mobile Virtual Reality and Artificial Intelligence	3-0-0-3
CS669	Pattern Recognition	3-1-0-4
CS670	Kernel Methods for Pattern Recognition	4-0-04
CS671	Deep Learning and Applications	3-0-1-4
DS201	Data handling and visualization	2-0-2-3
DS301	Mathematical Foundation of Data Science	3-0-0-4
DS303	Statistical Foundations of Data Science	3-0-0-3
DS401	Optimization for Data Science	3-0-0-3
DS403	Introduction to Statistical Learning	3-0-2-3
DS404	Information Security and Privacy	3-0-0-3
EE511	Computer Vision	3-1-0-4
EE522	Matrix Theory for Engineers	3-0-0-3
EE530	Applied Optimization	3-0-0-3
EE534	Probability and Random Processes	4-0-0-4

For B.Tech CSE 2018 & 2019 batches		
Course No	Course title	Credit (L-T-P-C)
CS303	Software Engineering	2-0-0-3
CS403	Algorithm Design and Analysis	3-0-2-4
CS451	Computer Graphics and Game Design	2-0-2-3
CS456	Distributed Databases	3-0-0-3
CS502	Compiler Design	3-0-2-4
CS507	Computer Architecture	3-0-2-4
CS508	Introduction to Heterogeneous Computing	2-0-0-2
CS513	Discrete Mathematics	3-1-0-4
CS514	Data Structures and Algorithms-II	3-0-2-4
CS522	Distributed Algorithms	3-0-0-3
CS523	Verification of Reactive Systems	3-0-0-3
CS541P	IoT Systems and the Cloud	3-0-2-4
CS542	Design patterns for scalable systems	
CS544	Formal Concept Analysis: Theory and Practice	2-0-2-3
CS545	Software Design Pattern	3-0-0-3
CS546	Design of Concurrent Software	3-0-0-3
CS549	Performance analysis of computer networks	3-0-0-3
CS550	Computer Graphics and Geometric Design	2-0-2-3
CS561	Map Reduce and Big Data	3-0-0-3
CS562	Artificial Intelligence	3-0-0-3
CS563	Scalable Data Science	3-1-0-4
CS599	Special Topics in Deep Neural Networks	1-0-0-1
CS606	Computational Modeling of Social Systems	3-0-0-3
CS609	Speech Processing	3-0-2-4
CS611	Program Analysis	3-1-0-4
CS660	Data Mining for Decision Making	3-0-0-3
CS662	Mobile Virtual Reality and Artificial Intelligence	3-0-0-3
CS669	Pattern Recognition	3-1-0-4
CS670	Kernel Methods for Pattern Recognition	4-0-0-4
CS671	Deep Learning and Applications	3-0-1-4
CS672	Advanced Topics in Deep Learning	3-0-2-4
CS699	Special Topics in Deep Learning	1-0-0-1
DS201	Data handling and visualization	2-0-2-3
DS301	Mathematical Foundation of Data Science	3-1-0-4
DS303	Statistical Foundations of Data Science	3-0-0-3
DS401	Optimization for Data Science	3-0-0-3
DS402	Matrix Computations for Data Science	2-0-2-3
DS403	Introduction to Statistical Learning	3-0-2-3
DS404	Information Security and Privacy	3-0-0-3
EE511	Computer Vision	3-1-0-4
EE522	Matrix Theory for Engineers	3-0-0-3
EE530	Applied Optimization	3-0-0-3
EE534	Probability and Random Processes	4-0-0-4
EE608	Digital Image Processing	3-0-2-4