INDRAPRASTHA INSTITUTE *of*
INFORMATION TECHNOLOGY DELHI

Regulations for the B.Tech. in Computer Science and Artificial Intelligence(CSAI) Program

1.   Preamble

Artificial Intelligence (AI) has become an integral part of technology in our daily lives, driving to office, searching for a restaurant, getting news updates, and recommendations on social media are all using AI. With increase in usage, there is a significant requirement of researchers who can understand AI and build AI technologies. This program will provide students an opportunity to learn both foundational and experimental components of AI and Machine Learning. A student completing this program will be able to undertake industry careers involving innovation and problem solving using Artificial Intelligence (AI) and Machine Learning (ML) technologies and research careers in AI, ML, and, in general, Computer Science areas. Along with courses that provide specialization in AI, students will also have option to explore applied domains such as computer vision, natural language processing, robotics, and autonomous systems as well as other interdisciplinary areas such as neuroscience, edge computing, and Internet of Things.

Overall objectives of the B.Tech. (CSAI) program are to help develop the following attributes in students:

1. Understanding of foundational topics in Computer Science, Artificial Intelligence, and Machine Learning.
2. Understanding of theoretical foundations and limits of artificial intelligence and machine learning.
3. Ability to design and implement algorithms and data structures for efficiently solving new problems.
4. Ability to model and analyze a variety of problems using appropriate mathematical/computational and AI concepts.
5. Ability of apply and develop AI algorithms to transform large amount of data into intelligent decisions and/or behavior.
6. An understanding of the impact of AI based solutions in an economic, societal, and environment context.

In addition, the graduates of this program should also have the following general skills that are common with other B.Tech programs:

7. Ability to function effectively in teams to accomplish a common goal.

8. An understanding of professional and ethical responsibility.

9. Ability to communicate effectively with a wide range of audience.

10. Ability to self learn and engage in life-long learning.

11. Ability to undertake small research tasks and projects.

12. Ability to take an idea and develop into a business plan for an entrepreneurial venture (if desired).

This document specifies the specific regulations for the B.Tech. (CSAI) program – the general regulations for the B.Tech. program are given in a separate document. These regulations are in addition to the regulations of the B.Tech. program.

2.   Program Structure

1. The Foundation program provides the basic knowledge about Computer Science and Artificial Intelligence (CSAI) through a set of core courses, which are compulsory for all students.

2. The set of core courses are shown in the table below (courses mentioned in [ ] are electives and actual courses for these slots are as defined from semester to semester.)

For students of 2020 batch onwards

SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	Sem 6		
Introduction to Programming	Data Structures and Algorithms	Advanced Programming	[Fundamentals of Database Management Systems/Computer Organization/Ethics in AI]*	Machine Learning			
Digital Circuits	Introduction of Intelligent Systems	Operating Systems	[Maths IV/Graph Theory/Statistical Inference/Introduction to Mathematical Logic/Theory of Computation]#	[Computer Architecture/ Computer Networks/ Compilers]*	Ethics in Artificial Intelligence		
Maths I- (Linear Algebra)	Maths II- (Probability & Statistics)	Discrete Mathematics/ Discrete Structures	Algorithm Design and Analysis	Artificial Intelligence	[2 AI Core Courses]		
Introduction to HCI	[Computer Organization/Fundamentals of Database Management Systems]*	Maths III	Statistical Machine Learning	[4 AI Application Electives]			
Communication Skills	[SSH]	Signals & Systems	Optimization bucket [Linear Optimization, Convex Optimization]	Technical Communication + Environmental Sciences			

For students of 2019 batch

SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	Sem 6		
Introduction to Programming	Data Structures and Algorithms	Advanced Programming	[Fundamentals of Database Management Systems/Computer Organization/Ethics in AI]*	Machine Learning			
Digital Circuits	Introduction of Intelligent Systems	Operating Systems	[Maths IV/Graph Theory/Statistical Inference/Introduction to Mathematical Logic/Theory of Computation]#	[Computer Architecture/ Computer Networks/ Compilers]*	Ethics in Artificial Intelligence		
Maths I- (Linear Algebra)	Maths II- (Probability & Statistics)	Discrete Mathematics	Algorithm Design and Analysis	Artificial Intelligence	[2 AI Core Courses]		
Prototyping Interactive Systems	[Computer Organization/Fundamentals of Database Management Systems]*	Maths III	Statistical Machine Learning	[4 AI Application Electives]			
Communication Skills	[SSH]	Signals & Systems	Optimization bucket [Linear Optimization, Convex Optmization]	Technical Communication + Environmental Sciences			

3. List of technical and non-technical courses in the first year

Semester	Technical Courses	Non-Technical Courses
Semester 1	Introduction to Programming Digital Circuits Maths I Prototyping Interactive Systems	Communication Skills
Semester 2	Data Structures and Algorithms Introduction to Intelligent Systems Probability and Statistics Computer Organization/Fundamentals of Database Management Systems	SSH Elective

The Advanced Part of the program

1. The rest of the program consists mostly of *elective courses.* An elective course is one which is not compulsory, and a student may have choices from which to select the courses he/she wants to do. A list of Elective Courses is available as Appendix.

2. Some of the electives may be chosen from various domains like (more can be added later):

- Neuroscience or Cognition
- AI in Heathcare
- Hardware related AI, Edge Computing and AI
- Parallel or Distributed AI for large scale applications
- Human Centered AI
- IoT and AI

3. Besides electives for specialized areas, electives from domain areas (e.g. health, life sciences, finance, economics, E-Governance, sciences, etc.) may also be offered.

4. There will also be a set of Social Sciences and Humanities (SSH) courses offered.

5. List of courses, and further information about the courses is available on the website: https://www.iiitd.ac.in/academics/courses

3. Requirements for Graduation

For a B.Tech. (CSAI) degree, a student must satisfy all the following requirements:

1. Earn a total of 156 (inclusive of 2 credits each of SG/CW credits) credits (equivalent to 39 full courses of 4 credits).

2. Successfully complete all the core courses.

3. Do at least 12 credits of Social Science and Humanities (SSH) Courses including a mandatory SSH course, Ethics in AI. Refer Appendix I for list of courses.

4. Do 2 credits of Community Work and Self Growth each. These are pass/fail credits, which are required to be completed, and will count for fulfilling the credit requirements.

5. Successfully complete all core courses listed in the above table.

6. Earn 8 credits of additional CS core courses(from the courses marked as * in the above table other than Ethics in AI course, which is a SSH course) and 4 credits of Maths Elective Courses (from the courses marked as # in the above table). Refer Appendix I for list of courses.

7. Earn 8 credits of additional AI core courses from list of courses and 16 credits of AI application electives available at Appendix I. These credits should come from 3xx or above level courses.

8. A student may take Online Courses. No more than 8 of these credits can count towards satisfying the credit requirements of the degree.

9. A B.Tech. Project (BTP) is optional and can be started any time after the 2nd Year. A student opting for BTP, may take a total of 8 to 12 credits of BTP spread over minimum

2 semesters, with no more than 8 credits in a semester. A student not completing BTP credits will have to forgo the partial BTP credits earned earlier and it will not be counted towards the credit requirement of 156 credits.

Note: A BTP has to spanned at least over 2 regular consecutive semesters (i.e., Monsoon and Winter) and can spanned at most 3 consecutive semesters. However, in the case of a gap due to semester leave, the student will be allowed to continue the BTP with the consent of the advisor.

A detailed document on the guidelines and processes to complete the BTP is available on [this link](#).

10. A student may take "Independent Project" or "Independent Study" or "Undergraduate Research" courses for 1, 2, or 4 credits in a semester. No more than 8 of these credits can count towards satisfying the credit requirements of the degree.

11. A student can take maximum 2, 2xx level courses in 3rd and 4th year. The 2xx level core courses listed in Semester 5 or later will not count towards this clause.

4. Honors Program

The B.Tech. (CSAI) program has the Honors option, requirements for which are same as specified in the regulations for the B.Tech. program. Namely;

1. The student must earn an additional 12 discipline credits from in-class courses (i.e. must complete at least 168 credits)
2. The student's program must include a B.Tech. Project
3. At graduation time, the student must have a CGPA of 8.0 or more

Appendix I: Tentative list of Electives

A. Additional CS Core Courses: Select 2 out of following courses (*2X4 = 8 credits*) **-** should be done in first 4-semesters

- Computer Architecture

- Computer Organization

- Fundamentals of Database Management Systems

- Computer Networks

- Compilers

B. Additional AI Core Courses: Select 2 out of the following courses (*2 X 4 = 8 credits*)

- Deep Learning

- Advanced Machine Learning

- Reinforcement Learning

- Data Mining

- Big Data Analytics

- Data Science

- Probabilistic Graphical Models

- Human-AI Interaction

- Meta-Learning

- Trustworthy AI Systems

- Theories of Deep Learning

- Bayesian Machine Learning

C. AI Applications Courses: Select 4 out of the following courses (*4 X 4 = 16 credits*)

- Computer Vision

- Natural Language Processing

- Information Retrieval

- Robotics

- Multi-agent Systems

- Collaborative Filtering/Recommender Systems

- Speech Recognition and Understanding

- Semantic Web/Knowledge Graphs

- Decision Making for Multi-Robot Systems

- Algorithmic Techniques for Robot Planning

- Additional Applications Related Courses (Link to all available courses)

D. MTH Elective Courses: Select 1 out of the following: (*1 X 4 = 4 credits*)

- MTH 4

- Scientific Computing

- Graph Theory

- Statistical Inference

- Applied Optimization Methods for Machine Learning Theory of Computation

- Introduction to Mathematical Logic

- Information Theory

- Econometrics-1

- Econometrics-2

E. SSH Courses (3 *X 4 = 12 credits*): (i) Ethical, Social, and Legal (ESL) Aspects in AI, and 2 other SSH courses with recommendation for (a) Game Theory, (b) Critical Thinking.

Change History

- **August 2019 release New Version**

- **January 2021 release (Version 1)**

    (i)   Updated program structure from 2020 batch onwards (Pnt 2.2)
    (ii)   Creation of Optimization bucket in Semester 4.
    (iii) Clarification regarding 32 credits requirements – counting of 3xx level courses. Applicable from 2019 batch. (Pnt 3.7)
    (iv)   Clarification regarding counting of 2xx level courses. (Pnt 3.11)

- **May 2024 release (Version 2)**

    (i)   Point No. 8,. CGPA bar has been removed for doing IP/IS/UR credits. (Ref: 53rd Senate Senate)
    (ii) Additional AI Core Courses added (Ref: 57th Senate Decision)
    (iii) Addition to the core Math courses that include optimization, etc. (Ref: 57th Senate Decision)
    (iv) DM and DS courses will be considered as one course. (Ref: 56th Senate Decision).
    (v)   Clarification added for BTP in line with guidelines.

- **Oct 2025 release (Version 3)**

    i.Added the following courses into respective CSAI buckets:
        a. • CSE667 – Decision Making for Multi-Robot Systems → AI Applications Courses

b. • CSE634 – Algorithmic Techniques for Robot Planning → AI Applications Courses
c. ECE666 / CSE517 – Applied Optimization Methods for Machine Learning → MTH Elective Courses