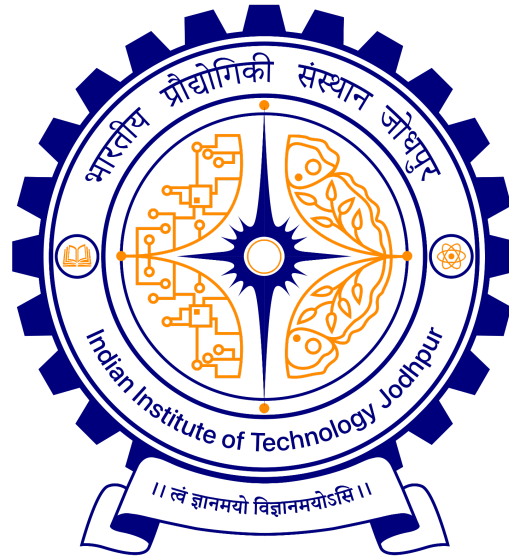


*A new undergraduate program in the Department of Mathematics*

# **B.S. in Mathematics & Computing**



**Department of Mathematics**  
**Indian Institute of Technology Jodhpur 2026-27**

## 1. Introduction and need of the programme

The B.S. in Mathematics and Computing is designed to meet the growing national and global demand for graduates who possess strong mathematical foundations and advanced computational skills. The curriculum combines foundational mathematical areas such as analysis, algebra, probability, combinatorics, and optimization with core computing subjects including algorithms, data structures, machine learning, and database systems. The programme aims to develop graduates who can approach complex problems with mathematical clarity and computational precision.

Across industry and research sectors, there is a growing demand for professionals who possess both strong mathematical foundations and advanced computational capabilities. Fields such as finance, technology, analytics, engineering, and scientific research increasingly require individuals who can design efficient algorithms, construct reliable mathematical models, analyze large-scale data, and develop scalable systems. This evolving landscape underscores the need for a programme that places mathematical thinking at the core of computational problem-solving and prepares students for roles including quant analysts, algorithm engineers, data scientists, optimization specialists, modelling experts, cryptography and security analysts.

The programme contrasts with other B.Tech. degrees in AI&DS and CSE by emphasizing the mathematical foundations and rigor necessary for developing strong analytical and computational skill sets with broad applicability. Combined with dedicated elective verticals in Data Science, Mathematical Computing, and Scientific Computing, this programme will enable students to launch into diverse career paths. Thus the programme aims to nurture graduates who are not only technically skilled but also analytical, ethical, and adaptive - capable of innovating across disciplinary boundaries and contributing meaningfully to the rapidly evolving technological landscape.

## 2. Objectives of the program

The B.S. in Mathematics and Computing aims to fulfill the following objectives:

- *Understanding core concepts:* Develop graduates with strong mathematical foundations and advanced computational skills, emphasizing mathematical thinking as the basis of computational problem-solving.
- *Algorithmic and computational thinking skills:* Translate complex real-world problems into mathematical models for analysis and optimization.
- *Industry readiness:* Prepare students to build and implement robust systems for data-intensive fields including Scientific Computing, Machine Learning, Computational Finance, and Cryptography.
- *Research readiness:* Equip graduates with the expertise required to drive innovation in academic and industrial research.
- *Leadership:* Develop entrepreneurial skills and interdisciplinary competence for leadership roles in industry and academia.

### 3. Graduate Attributes

Graduates of the B.S. in Mathematics and Computing will:

- Demonstrate strong conceptual understanding and analytical proficiency in mathematics and computing.
- Utilize modern computational tools and technologies effectively across diverse multidisciplinary application domains using algorithmic thinking, mathematical rigor and logical reasoning.
- Integrate data-driven and mathematical approaches for informed analysis and decision-making.
- Ability to innovate and contribute towards next generation data driven technology.
- Communicate complex mathematical and computational ideas clearly and collaborate effectively within diverse and interdisciplinary teams.
- Exhibit leadership, professionalism, and initiative in academia, research, and industry.

### 4. Learning Outcomes

The students have:

- Rigorous training in mathematical reasoning across analysis, algebra, probability, linear algebra, and discrete structures.
- The ability to apply the mathematical concepts for designing efficient algorithms to solve application-oriented problems, analyze their complexity, and implement their computational solutions.
- The proficiency in building and analyzing mathematical models for data-driven systems using computational tools including quantum, physical and financial systems.
- The ability to utilize optimization techniques, statistical and machine learning approaches for data-driven decision-making.
- The ability to write technical reports, communicate mathematical and computational ideas effectively, and work ethically in teams.
- The ability to advance technological innovation and national growth by supporting Government-led-initiatives like Make in India, Startup India and Viksit Bharat 2047.

### 5. Eligibility Criteria & Admission Process

Admissions to B.S. Programs are made once a year (in July) through the all-India level Joint Entrance Examination (JEE) Advanced conducted by IITs. The procedures and other requirements for admission are specified in the JEE Information Brochure brought out every year.

### 6. Program Structure

S.N.	Course Type	Course Category	Credits	Minimum Total
1	Institute Core (I)	Engineering (IE)	16	39 (27.6%)
		Science (IS)	17	
		HSS (IH)	06	
2	Programme Core (P)	Programme Compulsory (PC)	66	90 (63.8%)
		Programme Electives (PE)	18	
		(B.Tech.) Project (PP)	6	
3	Open (O)	Electives (OE)	12	12 (8.5%)
Total (Graded)				141 (100%)
4	Essential Audit (Non-taught)	Humanities (NH)	3	12
		Engineering (NE)	3	
		Industry-Academia Summer Internship outside IIT Jodhpur (two summers, minimum 45 days)	4	
		Design Credit	2	
Total for award of Degree (Graded + Non-Graded)				153

## 6.1 Semester-wise Distribution of Credits

Cat	Course	LTP	C	N	G	Cat	Course	LTP	C	N	G
			H	C	C				H	C	C
I Semester (ME/BB)/ II Semester (CS/EE)						II Semester (ME/BB)/ I Semester (CS/EE)					
IE	Engineering Mechanics	3-0-0	3	-	3	IE	Intro. to Machine Learning	3-0-2	5	-	4
IE	Introduction to Computer Science	3-0-2	4	-	4	IS	Chemistry	3-0-0	3	-	3
IS	Physics	3-0-0	3	-	3	IS	Introduction to Bioengineering	2-0-2	4	-	3
IH	HSS I	3-0-0	3	-	3	IS	Chemistry Lab	0-0-2	2	-	1
IS	Physics Lab	0-0-2	2	-	1						
IS	Mathematics I	2-1-0	3	-	3	IS	Mathematics II	2-1-0	3	-	3
IE	Engineering Drawing	0-0-2	2	-	1	IE	Engineering Workshop	0-0-2	1	-	1
NE	Engineering Design I	0-0-2	2	1	-	NE	Engineering Design II	0-0-2	2	1	-
NH	Communication Skill I	0-0-2	2	1	-	IH	HSS II	3-0-0	3		3
NH	Social Connect and responsibilities I	0-0-1	1	0.5	-	NE	Intro. To Profession	0-0-2	2	1	

NH	Performing Arts I /Sports I	0-0-1	1	0.5	-						-
<b>Total</b>				3	18	<b>Total</b>				2	18
<b>III Semester</b>						<b>IV Semester</b>					
PC	Probability, Statistics and Stochastic Processes	3-1-0	4	-	4	PC	Differential Equations	3-0-0	3	-	3
PC	Data Structures and Algorithms	3-0-0	3		3	PC	Principles of Mathematical Analysis	3-0-0	3		3
PC	Discrete Mathematics	3-1-0	4		4	PC	Computational Linear Algebra	3-0-0	3		3
PC	Scientific Computations	3-0-0	3		3	PC	Signals and Systems	3-1-0	4		4
PC	Scientific Computations Lab	0-0-2	2		1	PC	Statistical Computation & Simulation	3-0-0	3		3
PC	CSE Lab I	0-0-2	2		1	PC	Artificial Intelligence	3-0-0	3	-	3
IE	Environment and Sustainability	3-0-0	3		3	PC	Computation and Simulation Lab	0-0-4	4		2
<b>Total</b>					19	<b>Total</b>				-	21
						<b>Summer Internship</b>				2	
<b>V Semester</b>						<b>VI Semester</b>					
PC	Design & Analysis of Algorithms	3-1-0	4		4	PC	Applied Multivariate Analysis	3-0-0	3		3
PC	Optimization for ML	3-0-0	3		3	PC	Number Theory and Cryptography	3-0-0	3		3
PC	Theory of Computation	3-0-0	3		3	PC	Quantum Information	3-0-0	3		3
PC	Deep Learning	3-0-0	3		3	PC	Modern Algebra	3-0-0	3		3
PC	Optimization & DL Lab	0-0-4	4		2	PC	Applied Mathematics Lab	0-0-4	4		2
PE	Program Elective	3-0-0	3	-	3	PE	Program Elective	3-0-0	3		3
NH	Professional Ethics I	1-0-0	1	1	-						
<b>Total</b>				1	18	<b>Total</b>					17
						<b>Summer Internship</b>				2	
<b>VII Semester</b>						<b>VIII Semester</b>					

PP	BS Project 1	0-0-3	-	3	PP	BS Project 2	0-0-3	-	3		
PE	Program Electives	3-0-0	3	-	3	PE	Program Electives	3-0-0	3	-	3
PE	Program Electives	3-0-0	3	-	3	PE	Program Electives	3-0-0	3	-	3
OE	Open Electives	3-0-0	3		3	OE	Open Electives	3-0-0	3		3
OE	Open Electives	3-0-0	3		3	OE	Open Electives	3-0-0	3		3
<b>Total</b>					<b>15</b>	<b>Total</b>				-	<b>15</b>
<b>Total of graded and Non-Graded Credit</b>									<b>6</b>	<b>141</b>	
<b>Non-Graded Design Credits</b>									<b>6</b>	<b>-</b>	
<b>Grand Total</b>									<b>12</b>	<b>153</b>	

## 6.2 List of program elective courses

#	Mathematics	Computing	Statistics & Quantum Computing
1	Introduction to Game Theory (MAL4XXX)	Control Systems (EEL3XXX)	Introduction to Financial Engineering (MAL4XXX)
2	Graph Theory (CS4XXX)	Distributed systems (CS4XXX)	Quantum Computing (QCL4020)
3	Functional Analysis (MAL6XXX)	Introduction to Robotics (RM4XXX)	Multi-objective Optimization (MAL7XXX)
4	Partial Differential Equations (MAL6XXX)	Mathematical Fluid Dynamics (MAL6XXX) (new course)	Statistical Models & Regression (MAL7XXX)
5	Analytic Number Theory (MAL6XXX)	Advanced Algorithms (CS7XXX)	Stochastic Calculus (MAL7XXX)
6	Topology (MAL6XXX)	Computer Vision (CSLXXXX)	Time Series Analysis (MAL7XXX)
7	Numerical Methods for Partial Differential Equations (MAL7XXX)	Computer Graphics (CSLXXXX)	Quantum Inspired Optimization (QCL7XXX)
8		Digital Image Processing (EEL4XXX)	

## 6.3 Minor in Mathematics & Computing

Students aspiring to earn a *Minor in Mathematics and Computing* must successfully complete the courses listed below.

S. No.	Course Name	LTP	Credits
1	Statistical Computation & Simulation	3-0-0	3
2	Computational Linear Algebra	3-0-0	3
3	Computation and Simulation Lab	0-0-4	2
4	Applied Multivariate Analysis	3-0-0	3
5	Modern Algebra	3-0-0	3
6	Applied Mathematics Lab	0-0-4	2
7	Number Theory and Cryptography	3-0-0	3
Total			19

## 7. Targeted Students and their Career Prospects:

- **Targeted Students**

The proposed B.S. program in Mathematics and Computing is designed for students with strong analytical aptitude and demonstrated interest in both mathematical reasoning and computational problem-solving. The program is particularly suited for students who:

- Exhibit high proficiency in mathematics and logical thinking.
- Aspire to integrate rigorous mathematical foundations with algorithmic and programming skills.
- Are inclined toward abstraction, modeling, and theoretical problem-solving aligned with real-world applications and emerging technologies.
- Seek preparation for research-oriented, data-intensive, and algorithm-centric careers.

- **Career Perspectives**

The proposed program prepares graduates for careers in industry, research, higher studies, and emerging strategic sectors requiring strong mathematical and computational expertise.

- *Industry Pathways*

- Graduates will be well-suited for roles such as Data Scientist, Machine Learning Engineer,
- AI Research Engineer, Algorithm Designer, Quantitative Analyst, Operations Research
- Analyst, and Scientific Computing Professional. Opportunities span technology industries, fintech, R&D laboratories, consulting, defense, and other high-technology sectors.
- The rigorous mathematical foundation ensures adaptability to rapidly evolving computational and AI-driven ecosystems.

- *Higher Studies and Research*
  - The program provides strong preparation for M.Tech./MS/Ph.D. programs in Mathematics, Computer Science, Artificial Intelligence, Robotics, and Computational Sciences.
  - Graduates will be equipped for research in algorithms and complexity, distributed systems, optimization and control, statistical learning theory, computational geometry, and cryptography, enhancing their competitiveness for leading national and international graduate programs.
  
- *Emerging and Strategic Domains*

The program aligns with national and global priorities in Artificial Intelligence, autonomous systems, smart infrastructure, climate and sustainability analytics, computational biology, and cybersecurity, addressing the growing demand for mathematically trained computational professionals.

## **8. Industry & Research collaborations:**

The B.S. in Mathematics and Computing programme will be strengthened through strategic collaborations with leading industries, financial institutions, deep-tech companies, and national research organizations to ensure continuous alignment with evolving technological demands and workforce requirements. Partnerships with IT and analytics firms, fintech and quantitative finance institutions, scientific and engineering industries, cybersecurity organizations, and emerging quantum and AI enterprises will provide opportunities for curriculum co-design, industry advisory support, internships, live capstone projects using real-world data, guest lectures, and practitioner-led electives. Collaborative engagements with national laboratories and premier academic institutions will promote undergraduate research in areas such as machine learning, optimization, cryptography, scientific computing, and quantum technologies. Industry-sponsored laboratories in Data Science, Computational Finance, Optimization, and Cybersecurity, along with innovation and incubation support, will further encourage entrepreneurship aligned with national initiatives such as Digital India, Make in India, Startup India, and Atmanirbhar Bharat. These interactions will ensure that graduates develop strong theoretical foundations alongside practical problem-solving skills, enhance employability and research readiness, and contribute effectively to high-impact roles in technology, finance, analytics, scientific computing, and emerging deep-technology sectors.