

## B. Tech. in Mathematics and Computing in

### School of Mathematical and Statistical Sciences (SMSS)

#### I. Program Description:

The Bachelor of Technology (B.Tech.) program in Mathematics and Computing is a comprehensive course that integrates the principles of mathematics and computing. This program is designed to equip students with a strong foundation in mathematics, computing, and computational thinking, enabling them to develop and apply analytical and problem-solving skills in a variety of fields in science and engineering. The aim of this program is two-fold, one to provide strong mathematical background for strong logical thinking, and other to prepare students for strong computing skills. The mathematics part will also give them strong foundation which enable them to be leader in the field. The program is design in such way that after important foundational courses, students can choose courses as per their interest in a particular domain.

The program aims to produce graduates who are well-versed in a broad range of mathematical and computational concepts, techniques, and tools. With the help of these skills, students can handle complex real-world problems. It will also enhance the ability of the students looking for solving new challenges in the society. With a focus on both theoretical and practical aspects of mathematics and computing, this program prepares students for a wide range of careers in industries, academia and research & development.

#### II. Credit Structure of the programme.

The typical credit structure of the institute will be followed as shown below.

Division	Sub division	Credits
<b>Institute Core</b>	IC Compulsory	39
	IC Baskets	06
	Humanities and Social Sciences (HSS)	12
	Indian Knowledge System (IKS)	03
<b>Discipline</b>	Discipline Core (DC)	51
	Discipline Electives (DE)	15
<b>Electives</b>	Free Electives (FE)	22
	Major Technical Project (MTP)	08
	Interactive Socio Technical Practicum (ISTP)	04
	<b>TOTAL</b>	<b>160</b>

The credit structure will be followed as per the existing norms of the institute. Out of 160 credits, 52 credits will be dedicated to discipline core courses and 15 credits will be assigned for discipline electives. Total of 67 credits will be maintained for discipline (i.e., DC (52 credits) and DE (19 credits)) courses while the rest of the credits will be kept for IC and other institute level courses (93 credits). The semester wise distributions of all the courses along with credits details are given below:

### B.Tech. in Mathematics & Computing –1st Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	ICXXX	Calculus	2	0	0	2
2	ICXXX	Complex variables and Vector Calculus	2	0	0	2
3	IC140	Engineering Graphics	2	0	3	4
4	IC152	Introduction to Python and Data Science	3	0	2	4
5	IC131	Understanding Biotechnology & its Applications (basket – 1)	3	0	0	3
6	IC241	Data Structure & Algorithms (basket-2)	3	0	0	3
7	YYXXX	IKSMHA Course	3	0	0	3
8	ICXXX	Data Structure & Algorithm Lab	0	0	2	1

Total Credits: 22

### B.Tech. in Mathematics & Computing –2nd Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	ICXXX	Linear Algebra	2	0	0	2
2	ICXXX	ODE & Integral Transforms	2	0	0	2
3	IC161	Applied Electronics	3	0	0	3
4	IC 161P	Applied Electronics Lab	0	0	3	2
5	IC252	Probability and Statistics	3	0	2	4
6	ICXXX	Foundations of Design Practicum	1	0	6	4
7	IC221P	Physics Practicum	0	0	3	2
8	HSXXX	HSS Course	3	0	0	3

Total Credits: 22

### B.Tech. in Mathematics & Computing –3rd Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	IC201P	Design Practicum	0	0	6	3
2	IC272	Machine Learning	2	0	2	3
3	MAXXX	Real and Complex Analysis	2.5	0.5	0	3
4	CS208	Mathematical Foundation of Computer Sciences	3	1	0	4
5	MAXXX	Ordinary Differential Equation	3	1	0	4
6	FE	Free Elective				4

Total Credits: 21

### B. Tech. in Mathematics & Computing – 4th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	MAXXX	Partial Differential Equation	3	1	0	4
2	CS201	Computer Organization	3	0	0	3
3	CS201P	Computer Organization Laboratory	0	0	2	1
4	MAXXX	Numerical Analysis	3	1	0	4
5	MAXXX	Applied Mathematics Programming	3	1	0	4
6	HSXXX	HSS Course				3
7	MAXXX	Discipline Elective Basket -I (Foundation Module)				3

Total Credits: 22

### B.Tech. in Mathematics & Computing – 5th Semester

S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	MAXXX	Matrix Computation & Lab	3	0	2	4
2	CS304	Formal Language and Automata Theory	3	0	0	3
3	CSXXX	Design of Algorithms	3	0	2	4
4	DE	Discipline Elective				3
5	MAXXX	Mathematical Modelling	3	0	0	3

6	HSSXXX	HSS or Management course				3
7	MAXXX	Reverse Engineering				1

Total Credits: 21

<b>B.Tech. in Mathematics &amp; Computing – 6th Semester</b>						
S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	CS207	Applied Databases Practicum	0	0	3	2
2		Discipline Elective Basket-II (Advance Modelling Module)	3	0	0	3
3	MAXXX	Numerics of PDE	3	0	0	3
4	FE	Free Elective	3	0	0	3
5	HSSXX	HSS or Management course				3
6	ISTP	ISTP				4
7	MAXXX	Applied Graph Theory	3			3

Total Credits: 21

<b>B.Tech. in Mathematics &amp; Computing – 7th Semester</b>						
S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	DE	Discipline Elective				3
2	FE	Free Elective				3
3	FE	Free Elective				3
4	MTP-1	MTP-1				4
5	IC 010	Internship				2

Total Credits: 15

<b>B.Tech. in Mathematics &amp; Computing – 8th Semester</b>						
S.No	Code	Course Name	Lecture	Tutorial	Practical	Credit
1	DE	Discipline Elective				3
2	FE	Free Elective				3
3	FE	Free Elective				3
4	FE	Free Elective				3
5	MTP-2	MTP-2				4

Total Credits: 16

### Grand Total: 160 credits for B. Tech. in Mathematics and Computing

Two discipline elective baskets are proposed for two discipline electives to give a flexibility to the students to choose their free electives in a particular direction.

#### Discipline Elective Basket I: Foundation Module

Course Numbers	Course Titles	Credits
MAXXX	Abstract Algebra	3
MAXXX	Functional analysis	4
MAXXX	Measure Theory	4
MAXXX	Topology	4
MAXXX	Number Theory	3

#### Discipline Elective Basket II: Advance Modelling Module

Course Number	Course Titles	Credits
MAXXX	Climate Modelling	
MAXXX	Computational Financial Modelling & Lab	4
MAXXX	Modelling of infectious disease	
MAXXX	Mathematical Image Processing	
MAXXX	Mathematical Control Theory	
MAXXX	Modelling and Simulation	3
MAXXX	Modelling Population Dynamics	3

Students can take other discipline electives from the proposed list of the discipline electives. The list will be revised/modified time to time to include new discipline electives.

**Discipline Electives:** Discipline electives will be provided according to the requirement of the students and the availability of the faculties. The list of discipline electives is attached herewith. More elective courses will be added time to time as required. Overall, the credits distribution is as follows:

Sl. No.	Course No.	Course Name	Credits
1.	MA605	Statistical Data Analysis	3
2.	MAXXX	Mathematical Foundations of Financial Engineering	3
3.	MAXXX	Numerical Methods in Quantitative Finance	3
4.	MAXXX	Computational Fluid Dynamics	3
5.	MAXXX	Financial Engineering	3
6.	MAXXX	Stochastic Calculus for Financial Engineering	3
7.	MAXXX	Semigroup of Bounded Linear Operators	3
8.	MAXXX	Topics in Semigroup Theory	3
9.	MA765	Fractional Differential Equations	4
10.	CS502	Compiler Design	4
11.	CS562	Artificial Intelligence	3
12.	CSXXX	Computer Networks	4
13.	CSXXX	Operating Systems	4
14.	MAXXX	Time Series Analysis	3
15.	MAXXX	Mathematical Method for Signal Processing	4
16.	EE511	Computer Vision	4
17.	EE608	Digital Image Processing	4
18.	MAXXX	Advanced Data Structure and Algorithms	4
19.	MAXXX	Speech Processing	3
20.	CS669	Pattern Recognition	4
21.	MAXXX	Soft Computing	3
22.	BE304	Bioinformatics	4
23.	BE301	Biomechanics	4
24.	BE3XX	Genetic Engineering	4
25.	BE303	Applied Biostatistics	4
26.	CE352	Transportation Engineering	3
27.	CE352P	Transporting Engg. Lab	1
28.	CE251	Hydraulics Engineering	3
29.	CS302	Paradigms of Programming	4
30.	CS309	Information Systems and Databases	4
31.	DS201	Data Handling and Visualization	3
32.	DS302	Computing Systems for Data Processing	4
33.	DSXXX	Times Series Analysis and Applications / Bayesian Data Analysis and Applications	3
34.	DSXXX	Big Data: Management and Analytics	4
35.	EE203	Network Theory	3
36.	EEXXX	Signal & Systems	3
37.	EE301	Control Systems	3
38.	EP302	Computational Methods for Engineering	3
39.	ME2XX	Engineering Thermodynamics	4
40.	ME210	Fluid Mechanics	3
41.	ME303	Heat Transfer	3
42.	ME310	System Dynamics and Control	3
43.	MEXXXP	Fluid Mechanics Lab	1
44.	MEXXXP	Heat Transfer Lab	1
45.	MAXXX	Cellular Automata	3
46.	CS606	Computational Modeling of Social Systems	3

Total- 160 Credits

Discipline Core- 51 Credits

Discipline Elective- 15 Credits (out of which 6 credits would be chosen from two baskets)

Free Electives- 22 Credits

Institute Core & other required courses: 72