

COURSE STRUCTURE
for
B.TECH. DEGREE
in
COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
(Applicable from the academic session 2024-2025)



Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

*Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly Known as -WBUT)*

Jemua Road, Durgapur, West Bengal, India, 713206

Subject Numbering Scheme:

B	S	C	-	P	H	1	0	1
----------	----------	----------	----------	----------	----------	----------	----------	----------

Semester Wise Break Up of Credit (New Autonomous Structure)

Sem1	Sem2	Sem3	Sem4	Sem5	Sem6	Sem7	Sem8	Total
21	22	25	25	24	25	14	10	166

S. No.	Category	Breakup of Credits (Actual) As per Proposed Autonomous Structure
1.	Humanities and Social Sciences including Management courses	16
2.	Basic Science Courses	21
3.	Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc.	25
4.	Professional core course	55
5.	Professional Elective specialization/branch courses relevant to chosen	15
6.	Indian Knowledge System	0
7.	Multidisciplinary Open Electives Courses	14
8.	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad	20
9.	Mandatory Non Credit Courses – Audit Course	0
Total Credits		166

Semester-wise Credit distribution matrix

Semester	Total Theory	Total Laboratories	Credit Points								Total
			HU	BSC	ESC	PCC	PE	OE	AU	Projects/Seminars	
First	6	4	0	7	13	0	0	0	0	0	21
Second	6	5	4	7	11	0	0	0	0	0	22
Third	6	4	3	4	0	18	0	0	0	0	25
Fourth	6	4	0	3	0	22	0	0	0	0	25
Fifth	6	3	6	0	0	10	3	3	0	2	24
Sixth	6	3	3	0	0	5	6	6	0	5	25
Seventh	4	1	0	0	0	0	6	5	0	3	14
Eighth	0	1	0	0	0	0	0	0	0	10	10
Total	40	25	16	21	24	55	15	14	0	20	166

COURSE CURRICULA**Program Code: 305****Program: B.Tech in CSE(Data Science)****B. Tech., 1stYear (1st Semester)**

<i>Theory</i>							
Sl No	Paper Name	Paper Code	Marks	L	T	P	Credit
1	Mathematics-I	M-101	100	3	0	0	3
2	Chemistry	CH-101	100	3	0	0	3
3	Basic Electronics Engineering	EC-101	100	3	0	0	3
4	Engineering Mechanics	ME-101	100	3	0	0	3
5	Introduction to Computer Hardware and Software	CS-101	100	3	0	0	3
Total Theory			500	15	0	0	15
<i>Practical</i>							
1	Chemistry Lab	CH-191	100	0	0	2	1
2	Basic Electronics Engineering Lab	EC-191	100	0	0	2	1
3	Introduction to Computer Hardware and Software Lab	CS-191	100	0	0	2	2
4	Engineering Graphics	ME-191	100	0	0	4	2
Total Practical			400	0	0	10	5
Total in 1st Semester			900	15	0	10	21
<i>Mandatory Courses</i>							
1	Environmental Science	ENV-101		1	0	0	0

COURSE CURRICULA

Program Code: 305

Program: B.Tech in CSE(Data Science)

Year(Semester): 1stYear (2nd Semester)

<i>Theory</i>							
Sl. No.	Paper Name	Paper Code	Marks	L	T	P	Credit
1	Mathematics-II	M-202	100	3	0	0	3
2	Physics	PH-201	100	3	0	0	3
3	Basic Electrical Engineering	EE-201	100	3	0	0	3
4	English Language and Technical Communication	ENG-201	100	3	0	0	3
5	Programming for problem solving	CS-202	100	3	0	0	3
Total Theory			500	15	0	0	15
<i>Practical</i>							
1	Physics Lab	PH-291	100	0	0	2	1
2	Basic Electrical Engineering Lab	EE-291	100	0	0	2	1
3	Workshop Practices	ME-292	100	0	0	4	2
4	Language Lab	ENG-291	100	0	0	2	1
5	Programming for Problem Solving Lab	CS-292	100	0	0	4	2
Total Practical			500	0	0	14	7
Total of 2nd Semester			1000	15	0	14	22
<i>Extra Curricular Activity</i>							
1	NSS	BS-121	100				0

Total Credit in 1st Year: 43

<p style="text-align: center;">COURSE CURRICULA Program Code: 305 Program: B.Tech in CSE(Data Science) Year(Semester): 2nd Year (3rd Semester)</p>									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
1	Program Core	Major	DS-301	Data Structures and Algorithms	3	0	0	3	3
2	Program Core	Ability Enhancement Courses	DS-302	Principles of Data Science	3	0	0	3	3
3	Program Core	Ability Enhancement Courses	DS-303	Comprehensive Guide to DBMS and Query Optimization	3	0	0	3	3
4	Program Core	Ability Enhancement Courses	DS-304	Computer Organization and Architecture	3	0	0	3	3
5	Basic Science	Ability Enhancement Courses	DS-305	Probability and Statistics for Data Science	3	0	0	3	3
6	Humanities and Social Science	Value Added Courses	DS-306	Effective Technical Communication	3	0	0	3	3
Total Practical					18	1	0	18	18
PRACTICAL/SESSIONAL									
1	Program Core (PC)	Skill Enhancement Courses	DS-391	Data Structures and Algorithms Lab	0	1	2	2	2
2	Program Core (PC)	Skill Enhancement Courses	DS-392	Algorithms for Data Science Lab	0	1	2	2	2
3	Program Core (PC)	Skill Enhancement Courses	DS-393	Comprehensive Guide to DBMS and Query Optimization Lab	0	1	2	2	2
4	Basic Science (BS)	Skill Enhancement Courses	DS-395	Probability and Statistics for Data Science Lab using R	0	0	2	2	1
Total Practical					0	3	8	8	7
Total Theory and Practical					18	4	8	26	25

COURSE CURRICULA**Program Code: 305****Program: B.Tech in CSE(Data Science)****Year(Semester): 2nd Year (4th Semester)**

Sl. No	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
1	Program Core	Ability Enhancement Courses	DS-401	Object Oriented Programming	3	0	0	3	3
2	Program Core	Ability Enhancement Courses	DS-402	Operating System	3	0	0	3	3
3	Program Core	Ability Enhancement Courses	DS-403	Artificial Intelligence	3	0	0	3	3
4	Program Core	Ability Enhancement Courses	DS-404	Big Data Technology	3	0	0	3	3
5	Program Core	Ability Enhancement Courses	DS-405	Automata and Compiler Design	3	0	0	3	3
6	Basic Science	Minor	DS-406	Advance Linear Algebra	3	0	0	3	3
Total Theory					18	0	0	18	18
PRACTICAL/SESSIONAL									
1	Program Core	Skill Enhancement Courses	DS-491	Object Oriented Programming using Java and Python Lab	0	1	2	2	2
2	Program Core	Skill Enhancement Courses	DS-492	Operating System Lab	0	0	3	3	1.5
3	Program Core	Skill Enhancement Courses	DS-493	Artificial Intelligence Lab	0	0	3	3	1.5
4	Program Core	Skill Development and Team Work	DS-494	Big Data Technology and OLAP Lab	0	1	2	2	2
Total Practical					0	2	10	10	7
Total Theory and Practical					18	2	10	28	25

COURSE CURRICULA

Program Code: 305

Program: B.Tech in CSE(Data Science)

Year(Semester): 3rd Year (5th Semester)

Sl. No	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
1	Program Core	Ability Enhancement Courses	DS-501	Machine Learning	3	0	0	3	3
2	Program Core	Ability Enhancement Courses	DS-502	Design and Analysis of Algorithms	3	0	0	3	3
3	Professional Elective – Elective-I	Value Added Courses	DS-503	Internet of Things and Machine Learning	3	0	0	3	3
			DS-504	Mobile Computing and Applications	3	0	0	3	3
			DS-505	Ad-Hoc and Sensor Network	3	0	0	3	3
			DS-506	Digital Signal Processing	3	0	0	3	3
4	Open Elective – Open Elective-I	Minor	DS-513	Social Network Analysis	3	0	0	3	3
			DS-514	IoT and Sensor Data Analysis in Electronics Systems	3	0	0	3	3
			DS-515	IoT and Data Science in Environmental Monitoring	3	0	0	3	3
			DS-516	Data Visualization and Analytics	3	0	0	3	3
			DS-517	Data Science in Sustainable Construction and Resource Management	3	0	0	3	3
5	Humanities and Science	Value Added Courses	DS-523	Entrepreneurship and Start-ups	3	0	0	3	3
6	Humanities and Social Science	Value Added Courses	DS-524	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	2	1	0	3	3
Total Theory					17	1	0	18	18
PRACTICAL/SESSIONAL									

7	Program Core	Skill Enhancement Courses	DS-591	Machine Learning Lab	0	1	2	3	2
8	Program Core	Skill Enhancement Courses	DS-592	Design and Analysis of Algorithms Lab	0	1	2	3	2
9	Project	Skill Enhancement Courses	DS-581	Capstone Project	0	0	4	4	2
Total Practical					0	2	8	10	6
Total Theory and Practical					17	3	8	28	24

COURSE CURRICULA

Program Code: 305

Program: B.Tech in CSE(Data Science)

Year(Semester): 3rd Year (6th Semester)

Sl. No	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
10	Program Core	Ability Enhancement Courses	DS-601	Data Warehousing and Data Mining	3	0	0	3	3
11	Humanities and Social Science	Value Added Courses	DS-602	Engineering Economics	3	0	0	3	3
12	Professional Elective-I Elective-II	Value Added Courses	DS-603	Text Mining and Analytics	3	0	0	3	3
			DS-604	Quantitative Data Analysis	3	0	0	3	3
			DS-605	Advance Deep Learning	3	0	0	3	3
			DS-606	Fundamentals of Quantum Computing	3	0	0	3	3
			DS-607	Information Theory Coding and Data Compression	3	0	0	3	3
13	Professional Elective-I Elective-III	Value Added Courses	DS-613	Quantum Machine Learning	3	0	0	3	3
			DS-614	Computer Network and Information Security	3	0	0	3	3
			DS-615	Generative AI	3	0	0	3	3
			DS-616	Recommendation System	3	0	0	3	3
			DS-617	Distributed System	3	0	0	3	3
13	Open Elective-Open Elective-II	Minor	DS-623	Optimization Techniques for Data Science	3	0	0	3	3
			DS-624	Number Theory	3	0	0	3	3
			DS-625	IoT and Data Analytics for Energy Management System	3	0	0	3	3
			DS-626	Deep Learning	3	0	0	3	3
14	Open Elective-Open Elective-III	Minor	DS-633	Natural Language Processing	3	0	0	3	3
			DS-634	Data Science in Electric Vehicle Infrastructure and Management	3	0	0	3	3
			DS-635	Cloud Security Threat Detection	3	0	0	3	3

			DS-636	Data Science for Power System Optimization and Reliability	3	0	0	3	3
Total Theory					18	0	0	18	18
PRACTICAL/SESSIONAL									
15	Program Core	Skill Enhancement Courses	DS-691	Data Mining Lab	0	1	2	2	2
16	Seminar	Skill Development and Team Work	DS-681	Seminar-I	0	1	2	2	2
17	Project	Skill Development and Team Work	DS-682	Project-I	0	0	6	6	3
Total Practical					0	2	10	10	7
Total Theory and Practical					18	2	10	28	25

COURSE CURRICULA									
Program Code: 305									
Program: B.Tech in CSE(Data Science)									
Year(Semester): 4 th Year (7 th Semester)									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
1	Professional Elective– Elective-IV	Value Added Courses	DS-701	Soft Computing	3	0	0	3	3
			DS-702	Human Computer Interaction	3	0	0	3	3
			DS-703	Cloud Computing	3	0	0	3	3
			DS-704	Computer Vision	3	0	0	3	3
2	Professional Elective– Elective-V	Value Added Courses	DS-711	Quantum Cryptography	3	0	0	3	3
			DS-712	Network Security and Cryptography	3	0	0	3	3
			DS-713	Statistical Modelling	3	0	0	3	3
			DS-714	Pattern Recognition	3	0	0	3	3
3	Open Elective– Open Elective-IV	Minor	DS-721	Responsible AI	3	0	0	3	3
			DS-722	Grid Computing	3	0	0	3	3
			DS-723	Fog Computing	3	0	0	3	3
			DS-724	Approximation Algorithms	3	0	0	3	3
			DS-725	Large Language Model	3	0	0	3	3
4	Open Elective– Open Elective-V	Minor	DS-731	Robotics	2	0	0	2	2
			DS-732	Business Analytics	2	0	0	2	2
			DS-733	Image Processing	2	0	0	2	2
			DS-734	Time Series Analysis	2	0	0	2	2
Total Theory					11	0	0	11	11
PRACTICAL/SESSIONAL									
1	Project	Skill Development and Team Work	DS-781	Project-II	0	0	6	6	3
Total Practical					0	0	6	6	3
Total Theory and Practical					11	0	6	17	14

COURSE CURRICULA									
B. Tech., 4 th Year (8 th Semester)									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
PRACTICAL/SESSIONAL									
1	PROJECT	MAJOR	DS-881	PROJECT	0	0	20	20	10
Total Theory and Practical								20	10