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

The first year course structure (cf. Page 4 and Page 5) is unanimously accepted and approved in the first BoS meeting held in the Department of a) Physics, b) Chemistry, c) Mathematics, d) English, e) Electrical Engineering, f) Electronics and Communication Engineering, g) Computer Science and Engineering, h) Mechanical Engineering

After honouring the First year course structure passed by the BoS of above mentioned Departments, the BoS of CSE (Data Science) in its first meeting (held in the Department of CSE (Data Science) on 6th November, 2024) has unanimously accepted and approved the four year course structure of CSE (Data Science).

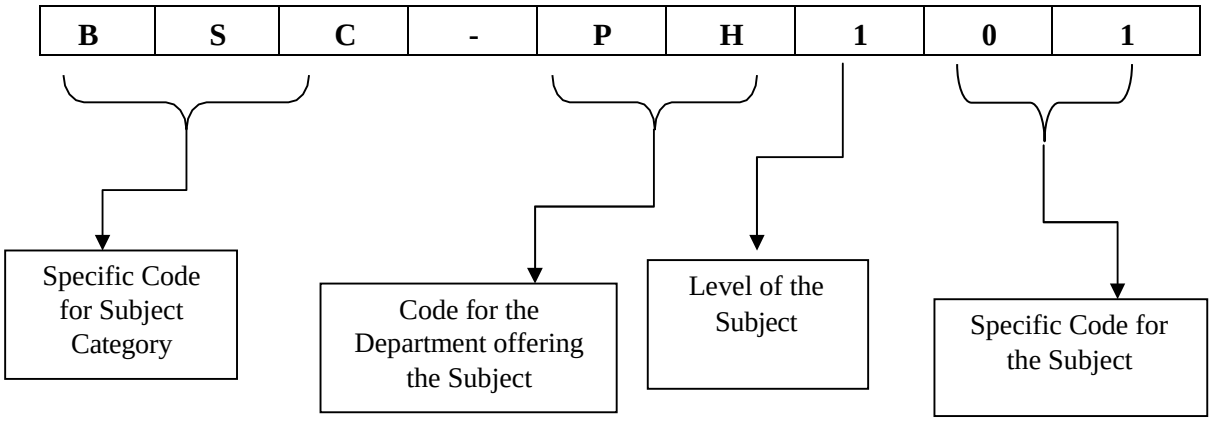
Dr. B. C. Roy Engineering College Durgapur

Head of the Department
Computer Science & Engineering (DS)
Dr. B. C. Roy Engineering College
Durgapur

Dr. Chandan Bandyopadhyay

Signature of the BoS Chairman

Subject Numbering Scheme:



Semester Wise Break Up of Credit (New Autonomous Structure)

Sem1	Sem2	Sem3	Sem4	Sem5	Sem6	Sem7	Sem8	Total
20	22	28	28	27	22	18	10	175

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.	24
4.	Professional core course	61
5.	Professional Elective specialization/branch courses relevant to chosen	15
6.	Indian Knowledge System	0
7.	Multidisciplinary Open Electives Courses	17
8.	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad	21
9.	Mandatory Non Credit Courses – Audit Course	0
Total Credits		**175**

Semester wise Credit Distributions Matrix

Semester	Total Theory	Total Laboratories	Credit Points								
			HU	BSC	ESC	PCC	PE	OE	AU	Projects	Total
First	6	4	0	7	13	0	0	0	0	0	20
Second	6	5	4	7	11	0	0	0	0	0	22
Third	7	4	3	7	0	18	0	0	0	0	28
Fourth	7	4	6	0	0	20	0	0	0	2	28
Fifth	7	4	3	0	0	18	3	3	0	0	27
Sixth	5	3	0	0	0	5	6	6	0	5	22
Seventh	5	1	0	0	0	0	6	8	0	4	18
Eighth	0	1	0	0	0	0	0	0	0	10	10
Total	43	26	16	21	24	61	15	17	0	21	175

COURSE CURRICULA
B. Tech., 1st Year (1st Semester)

Theory							
Sl No	**Paper Name**	**Paper Code**	**Marks**	**L**	**T**	**P**	**Credit**
1	**Mathematics-I**	**BSC-M 101**	**100**	**3**	**0**	**0**	**3**
2	**Chemistry**	**BSC- CH 101**	**100**	**3**	**0**	**0**	**3**
3	**Basic Electronics Engineering**	**ESC- EC 101**	**100**	**3**	**0**	**0**	**3**
4	**Engineering Mechanics**	**ESC-ME 101**	**100**	**3**	**0**	**0**	**3**
5	**Introduction to Computer Hardware and Software**	**ESC-CS 101**	**100**	**3**	**0**	**0**	**3**
	Total Theory		**500**	**15**	**0**	**0**	**15**
Practical							
1	**Chemistry Lab**	**BSC-CH 191**	**100**	**0**	**0**	**2**	**1**
2	**Basic Electronics Engineering Lab**	**ESC-EC 191**	**100**	**0**	**0**	**2**	**1**
3	**Introduction to Computer Hardware and Software Lab**	**ESC-CS 191**	**100**	**0**	**0**	**2**	**1**
4	**Engineering Graphics**	**ESC-ME 191**	**100**	**0**	**0**	**4**	**2**
	Total Practical		**400**	**0**	**0**	**10**	**5**
	Total in 1st Semester		**900**	**15**	**0**	**10**	**20**
Mandatory Courses							
1	**Environmental Science**	**MC-ES 101**		**1**	**0**	**0**	**0**

COURSE CURRICULA

B. Tech., 1st Year (2nd Semester)

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

Total Credit in 1st Year: 42

COURSE CURRICULA B. Tech., 2nd Year (3rd Semester)									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per Week**				**Credits**
					L	**T**	**P**	**Total**	
THEORY									
1	Program Core (PC)	Major	PCC-DS 301	Data Structures and Algorithms	3	0	0	3	3
2	Program Core (PC)	Ability Enhancement Courses	PCC-DS 302	Principles of Data Science	3	0	0	3	3
3	Program Core (PC)	Ability Enhancement Courses	PCC-DS 303	Operating System	3	0	0	3	3
4	Program Core (PC)	Ability Enhancement Courses	PCC-DS 304	Computer Organization and Architecture	3	0	0	3	3
5	Basic Science (BS)	Ability Enhancement Courses	BSC-M 301	Probability and Statistics for Data Science	3	0	0	3	3
6	Humanities and Social Science (HS)	Value Added Courses	HSMC 301	Effective Technical Communication	3	0	0	3	3
7	Humanities and Social Science (HS)	Value Added Courses	HSMC 302	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	2	1	0	3	3
	Total Practical				20	1	0	21	21
PRACTICAL/SESSIONAL									
1	Program Core (PC)	Skill Enhancement Courses	PCC-DS 391	Data Structures and Algorithms Lab	0	1	2	2	2
2	Program Core (PC)	Skill Enhancement Courses	PCC-DS 392	Algorithms for Data Science Lab	0	1	2	2	2
3	Program Core (PC)	Skill Enhancement Courses	PCC-DS 393	Operating System Lab	0	1	2	2	2
4	Basic Science (BS)	Skill Enhancement Courses	BSC-M 391	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					**20**	**4**	**8**	**29**	**28**

COURSE CURRICULA B. Tech., 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 (PC)	Ability Enhancement Courses	PCC-DS 401	Object Oriented Programming	3	0	0	3	3
2	Program Core (PC)	Ability Enhancement Courses	PCC-DS 402	Comprehensive Guide to DBMS and Query Optimization	3	0	0	3	3
3	Program Core (PC)	Ability Enhancement Courses	PCC-DS 403	Artificial Intelligence	3	0	0	3	3
4	Program Core (PC)	Ability Enhancement Courses	PCC-DS 404	Big Data Technology	3	0	0	3	3
5	Program Core (PC)	Ability Enhancement Courses	PCC-DS 405	Automata and Compiler Designing	3	0	0	3	3
6	Basic Science (BS)	Minor	BSC-M 401	Advance Linear Algebra	3	0	0	3	3
7	Humanities and Social Science (HS)	Value Added Courses	HSMC 402	Engineering Economics	3	0	0	3	3
	Total Theory				21	0	0	21	21
PRACTICAL/SESSIONAL									
1	Program Core (PC)	Skill Enhancement Courses	PCC-DS 491	Object Oriented Programming using Java and Python Lab	0	1	2	2	2
2	Program Core (PC)	Skill Enhancement Courses	PCC-DS 492	Comprehensive Guide to DBMS and Query Optimization Lab	0	0	3	3	1.5
3	Program Core (PC)	Skill Enhancement Courses	PCC-DS 493	Artificial Intelligence Lab	0	0	3	3	1.5
4	Program Core (PC)	Skill Development and Team Work	PCC-DS 494	Big Data Technology and OLAP Lab	0	1	2	2	2
	Total Practical				0	1	10	10	7
Total Theory and Practical					**21**	**1**	**10**	**31**	**28**

COURSE CURRICULA B. Tech., 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 (PC)	Ability Enhancement Courses	PCC-DS 501	Data Visualization and Analytics	3	0	0	3	3
2	Program Core (PC)	Ability Enhancement Courses	PCC-DS 502	Data Warehouse and Data Mining	3	0	0	3	3
3	Program Core (PC)	Ability Enhancement Courses	PCC-DS 503	Machine Learning	3	0	0	3	3
4	Program Core (PC)	Ability Enhancement Courses	PCC-DS 504	Design and Analysis of Algorithms	2	0	0	2	2
5	Professional Elective (PE) Elective-I	Value Added Courses	PEC-DS 501A	Internet of Things and Machine Learning	3	0	0	3	3
			PEC-DS 501B	Mobile Computing and Application	3	0	0	3	3
			PEC-DS 501C	Ad-Hoc and Sensor Network	3	0	0	3	3
			PEC-DS 501D	Digital Signal Processing	3	0	0	3	3
			PEC-DS 501E	Deep Learning	3	0	0	3	3
6	Open Elective (OE) Open Elective-I	Minor	OEC-DS 501A	Predictive Maintenance in Electronics	3	0	0	3	3
			OEC-DS 501B	IoT and Sensor Data Analysis in Electronics Systems	3	0	0	3	3
			OEC-DS 501C	IoT and Data Science in Environmental Monitoring	3	0	0	3	3
			OEC-DS 501D	Data Science in Sustainable Construction and Resource Management	3	0	0	3	3
7	Humanities and Science (HS)	Value Added Courses	HSMC 501	Entrepreneurship and Start-ups	3	0	0	3	3
	Total Theory				20	0	0	20	20
PRACTICAL/SESSIONAL									
1	Program Core (PC)	Skill Enhancement Courses	PROJ 581	Capstone Project	0	0	4	4	2
2	Program	Skill	PCC-DS 592	Data Mining Lab	0	0	3	3	1.5

	Core (PC)	Enhancement Courses							
3	Program Core (PC)	Skill Enhancement Courses	PCC-DS 593	Machine Learning Lab	0	1	2	3	2
4	Program Core (PC)	Skill Enhancement Courses	PCC-DS 594	Design and Analysis of Algorithms Lab	0	0	3	3	1.5
	Total Practical				0	2	10	8	7
Total Theory and Practical					**20**	**2**	**10**	**28**	**27**

COURSE CURRICULA B. Tech., 3rd Year (6th Semester)									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per Week				**Credits**
					L	**T**	**P**	**Total**	
THEORY									
1	Program Core (PC)	Ability Enhancement Courses	PCC-DS 601	Computer Networks	3	0	0	3	3
2	Professional Elective (PE) Elective-II	Value Added Courses	PEC-DS 602A	Text Minning and Analytics	3	0	0	3	3
			PEC-DS 602B	Quantitative Data Analysis	3	0	0	3	3
			PEC-DS 602C	Computer Vision	3	0	0	3	3
			PEC-DS 602D	Advance Deep Learning	3	0	0	3	3
			PE-DS 602E	Quantum Computing	3	0	0	3	3
			PEC-DS 602F	Information Theory Coding and Data Compression	3	0	0	3	3
3	Professional Elective (PE) Elective-III	Value Added Courses	PEC-DS 603A	Quantum Machine Learning	3	0	0	3	3
			PEC- DS 603B	Information Security	3	0	0	3	3
			PEC- DS 603C	Generative AI	3	0	0	3	3
			PEC- DS 603D	Multi-agent Intelligence System	3	0	0	3	3
			PEC-DS 603E	Recommendation System	3	0	0	3	3
			PEC-DS 603F	Distributed System	3	0	0	3	3
4	Open Elective (OE) Open Elective-II	Minor	OEC-DS 601A	Optimization Techniques for Data Science	3	0	0	3	3
			OEC-DS 601B	Number Theory	3	0	0	3	3
			OEC-DS 601C	Text Analytics	3	0	0	3	3
5	Open Elective (OE) Open Elective-III	Minor	OEC-DS 602A	IoT and Data Analysis for Energy Management System	3	0	0	3	3
			OEC-DS 602B	Data Science in Electric Vehicle Infrastructure and Management	3	0	0	3	3
			OEC-DS 602C	Cloud Security Threat Detection	3	0	0	3	3
			OEC-DS 602D	Data Science for Power System Optimization and Reliability	3	0	0	3	3
	Total Theory				15	0	0	15	15
PRACTICAL/SESSIONAL									

1	Program Core (PC)	Skill Enhancement Courses	PCC-DS 691	Computer Networks Lab	0	1	2	2	2
2	Seminar	Skill Development and Team Work	DS(SMNR) 681	Seminar-I	0	1	2	2	2
3	Project	Skill Development and Team Work	DS(PROJ) 681	Project-I	0	0	6	6	3
	Total Practical				0	2	10	10	7
Total Theory and Practical					**15**	**2**	**10**	**25**	**22**

COURSE CURRICULA B. Tech., 4th Year (7th Semester)										
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per Week				Credits
					L	T	P	Total	
THEORY									
1	Professional Elective (PE) Elective-IV	Value Added Courses	PEC-DS 701A	Soft Computing	3	0	0	3	3
			PEC-DS 701B	Human Computer Interaction	3	0	0	3	3
			PEC-DS 701C	Cloud Computing	3	0	0	3	3
			PEC-DS 701D	Image Processing	3	0	0	3	3
2	Professional Elective (PE) Elective-V	Value Added Courses	PEC-DS 702A	Quantum Cryptography	3	0	0	3	3
			PEC-DS 702B	Network Security and Cryptography	3	0	0	3	3
			PEC-DS 702C	Statistical Modelling	3	0	0	3	3
			PEC-DS 702E	Pattern Recognition	3	0	0	3	3
3	Open Elective (OE) Open Elective-IV	Minor	OEC-DS 701A	Approximation Algorithms	3	0	0	3	3
			OEC-DS 702B	Network Security and Cryptography	3	0	0	3	3
			OEC-DS 702C	Business Analytics	3	0	0	3	3
			OEC-DS 702D	Graph Analytics	3	0	0	3	3
4	Open Elective (OE) Open Elective-V	Minor	OEC-DS 702A	Responsible AI	3	0	0	3	3
			OEC-DS 702B	Grid Computing	3	0	0	3	3
			OEC-DS 702C	Fog Computing	3	0	0	3	3
5	Open Elective (OE) Open Elective-VI	Minor	OEC-DS 703A	Robotics	2	0	0	2	2
			OEC-DS 703B	Biometrics	2	0	0	2	2
			OEC-DS 703C	Bioinformatics	2	0	0	2	2
	Total Theory				14	0	0	14	14
PRACTICAL/SESSIONAL									
1	Project	Skill Development and Team Work	DS(PROJ) 781	Project-II	0	0	8	8	4
	Total Practical				0	0	8	8	4
Total Theory and Practical					**14**	**0**	**10**	**22**	**18**

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