

Scheme of Studies

**Faculty of Computing and Artificial Intelligence
Department of Creative Technologies
Bachelor of Science in Data Science
(Applicable from Fall-2023 Intake & Onwards)**

Framework of BSDS Program

Area	Category	Course Code & Title	Cr. Hrs.	%		
Computing	Computing Core	CS111	Programming Fundamentals	3-0-3	~61.4	
		CS111L	Programming Fundamentals Lab	0-1-1		
		CS112	Object Oriented Programming	3-0-3		
		CS112L	Object Oriented Programming Lab	0-1-1		
		CS130	Database Systems	3-0-3		
		CS130L	Database Systems Lab	0-1-1		
		EE123	Digital Logic Design	2-0-2		
		EE123L	Digital Logic Design Lab	0-1-1		
		CS216	Data Structures	3-0-3		
		CS216L	Data Structures Lab	0-1-1		
		CS215	Information Security	2-0-2		
		CS215L	Information Security Lab	0-1-1		
		AI232	Introduction to Artificial Intelligence	2-0-2		
		AI232L	Introduction to Artificial Intelligence Lab	0-1-1		
		CS260	Computer Networks	2-0-2		
		CS260L	Computer Networks Lab	0-1-1		
		SE101	Introduction to Software Engineering	3-0-3		
		CS226	Computer Organization and Assembly Language	2-0-2		
		CS226L	Computer Organization and Assembly Language Lab	0-1-1		
		CS325	Operating Systems	2-0-2		
	CS325L	Operating Systems Lab	0-1-1			
	CS332	Design and Analysis of Algorithms	3-0-3			
	DS497	Final Year Project – I	0-1-1			
	DS498	Final Year Project – II	0-2-2			
	DS499	Final Year Project - III	0-3-3			
		Domain Core	DS210	Introduction to Data Science		2-0-2
			DS210L	Introduction to Data Science Lab		0-1-1
			DS212	Applied Statistics		2-0-2
	DS212L		Applied Statistics Lab	0-1-1		
	DS312		Data Mining	2-0-2		
	DS312L		Data Mining Lab	0-1-1		
	DS360		Data Visualization	2-0-2		
	DS360L		Data Visualization Lab	0-1-1		
		DS300	Data Warehousing & Business Intelligence	2-0-2		

		DS300L	Data Warehousing & Business Intelligence Lab	0-1-1	
		CS426	Parallel and Distributed Computing	2-0-2	
		CS426L	Parallel and Distributed Computing Lab	0-1-1	
	Domain Elective	DSXXX	DS Elective – I	2-0-2	
		DSXXXL	DS Elective – I Lab	0-1-1	
		DSXXX	DS Elective – II	2-0-2	
		DSXXXL	DS Elective – II Lab	0-1-1	
		DSXXX	DS Elective – III	2-0-2	
		DSXXXL	DS Elective – III Lab	0-1-1	
		DSXXX	DS Elective – IV	2-0-2	
		DSXXXL	DS Elective – IV Lab	0-1-1	
		DSXXX	DS Elective – V	2-0-2	
		DSXXXL	DS Elective – V Lab	0-1-1	
		DSXXX	DS Elective – VI	2-0-2	
		DSXXXL	DS Elective – VI Lab	0-1-1	
		DSXXX	DS Elective – VII	2-0-2	
		DSXXXL	DS Elective – VII Lab	0-1-1	
Total	Number of Computing Core Courses: *14			Cr. Hrs. : 46 (30-16)	
	Number of Domain Core Courses: 06			Cr. Hrs. : 18 (12-6)	
	Number of Domain Elective Courses: 07			Cr. Hrs. : 21 (14-7)	
	Number of Computing Courses: 27			Cr. Hrs. : 85 (56-29)	
	* Note: FYP-I, FYP-II, and FYP-III are considered two rather than three courses.				
Non-Computing	Mathematics and Supporting Courses	MA105	Multivariable Calculus	3-0-3	~38.6
		MA201	Linear Algebra	3-0-3	
		MA301	Probability and Statistics	3-0-3	
		EL400	Technical & Business Writing	3-0-3	
	Elective Supporting Courses	XXXXX	Elective Supporting – I	3-0-3	
	General Education Requirement Courses	CS181	Application of Information & Communication Technologies	2-0-2	
		CS181L	Application of Information & Communication Technologies Lab	0-1-1	
		EL170	Functional English	3-0-3	
		EL271	Expository Writing	3-0-3	
		MA216	Quantitative Reasoning -I (Discrete Structures)	3-0-3	
		MA110	Quantitative Reasoning -II (Calculus & Analytical Geometry)	3-0-3	
		HU124	Islamic Studies & Ethics	2-0-2	
		HU405	Ideology and Constitution of Pakistan	2-0-2	
BA152	Social Sciences (Introduction to Management)	2-0-2			

		PH111	Natural Sciences (Applied Physics)	2-0-2	
		PH111L	Natural Sciences (Applied Physics Lab)	0-1-1	
		CS470	Arts & Humanities (Professional Practices)	2-0-2	
		HU411	Civics and Community Engagement	2-0-2	
		BA353	Entrepreneurship	2-0-2	
Total	Number of Mathematics and Supporting Courses: 04		Cr. Hrs. : 12 (12-0)		
	Number of Elective Supporting Courses: 01		Cr. Hrs. : 3 (3-0)		
	Number of General Education Requirement Courses: 12		Cr. Hrs. : 30 (28+2)		
	Number of Computing Courses: 17		Cr. Hrs. : 45 (43-2)		
Grand Total	Total Number of Courses: 44 + Internship				
	Total Cr. Hrs. : 130 (99-31) + Internship (03) = 133				

Semester-Wise Scheme of Studies
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Semester I				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	CS111	Programming Fundamentals	-	3-0-3
2.	CS111L	Programming Fundamentals Lab	-	0-1-1
3.	CS181	Application of Information & Communication Technologies	-	2-0-2
4.	CS181L	Application of Information & Communication Technologies Lab	-	0-1-1
5.	EL170	Functional English	-	3-0-3
6.	HU124	Islamic Studies & Ethics	-	2-0-2
7.	PH111	Applied Physics	-	2-0-2
8.	PH111L	Applied Physics Lab	-	0-1-1
9.	*MA114	Foundational Mathematics (Non-Credit for Pre-Medical students only)	-	3-0-3
Total Cr. Hrs.:				12-3-15
Total Contact Hours: 21				

Semester II				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	CS112	Object Oriented Programming	CS111, CS111L	3-0-3
2.	CS112L	Object Oriented Programming Lab	CS111, CS111L	0-1-1
3.	CS130	Database Systems	-	3-0-3
4.	CS130L	Database Systems Lab	-	0-1-1
5.	EE123	Digital Logic Design	-	2-0-2
6.	EE123L	Digital Logic Design Lab	-	0-1-1
7.	SE101	Introduction to Software Engineering	-	3-0-3
8.	MA216	Discrete Structures	-	3-0-3
9.	*MA118	Pre-Calculus (Non-Credit for Pre-Medical Students only)	-	3-0-3
Total Cr. Hrs.:				14-3-17
Total Contact Hours: 23				

Semester III				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	CS216	Data Structures	CS112, CS112L	3-0-3
2.	CS216L	Data Structures	CS112, CS112L	0-1-1
3.	DS 210	Introduction to Data Science	-	2-0-2
4.	DS 210L	Introduction to Data Science Lab	-	0-1-1
5.	CS260	Computer Networks	-	2-0-2
6.	CS260L	Computer Networks Lab	-	0-1-1
7.	MA110	Calculus & Analytical Geometry	-	3-0-3
8.	MA301	Probability and Statistics	-	3-0-3
Total Cr. Hrs.:				13-3-16
Total Contact Hours: 22				

Semester IV				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	CS226	Computer Organization and Assembly Language	EE123, EE123L	2-0-2
2.	CS226L	Computer Organization and Assembly Language Lab	EE123, EE123L	0-1-1
3.	AI232	Introduction to Artificial Intelligence	-	2-0-2
4.	AI232L	Introduction to Artificial Intelligence Lab	-	0-1-1
5.	DS 212	Applied Statistics	MA301	2-0-2
6.	DS 212L	Applied Statistics Lab	MA301	0-1-1
7.	MA 105	Multivariable Calculus	MA 110	3-0-3
8.	MA 201	Linear Algebra	-	3-0-3
9.	DS XXX	Domain Elective I	-	2-0-2
10.	DS XXXL	Domain Elective I Lab	-	0-1-1
Total Cr. Hrs.:				14-4-18
Total Contact Hours: 26				

Summer
<p>Internship Requirement (03 Credit Hours): In order to graduate, every student must have to complete an internship program (DS 496) of 06 weeks duration, after the completion of their 4th semester, preferably during the summer break. Their performance during the internship will be evaluated and become part of the student's academic record and will be reflected in the transcript. Under exceptional circumstances, a student may be allowed to undertake the internship after 6th semester with the approval of HoD.</p>

Semester V				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	CS325	Operating Systems	-	2-0-2
2.	CS325L	Operating Systems Lab	-	0-1-1
3.	DS312	Data Mining	DS 210, DS 210L	2-0-2
4.	DS312L	Data Mining Lab	DS 210, DS 210L	0-1-1
5.	DS360	Data Visualization	-	2-0-2
6.	DS360L	Data Visualization Lab	-	0-1-1
7.	DSXXX	Domain Elective II	-	2-0-2
8.	DSXXXL	Domain Elective II Lab	-	0-1-1
9.	CS332	Design and Analysis of Algorithms	CS216, CS216L	3-0-3
10.	EL271	Expository Writing	EL170	3-0-3
Total Cr. Hrs.:				14-4-18
Total Contact Hours: 26				

Semester VI				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	DS497	Final Year Project-I	List A	0-1-1
2.	DS300	Data Warehousing & Business Intelligence	-	2-0-2
3.	DS300L	Data Warehousing & Business Intelligence Lab	-	0-1-1
4.	DSXXX	Domain Elective III	-	2-0-2
5.	DSXXXL	Domain Elective III Lab	-	0-1-1
6.	DSXXX	Domain Elective IV	-	2-0-2
7.	DSXXXL	Domain Elective IV Lab	-	0-1-1
8.	DSXXX	Domain Elective V	-	2-0-2
9.	DSXXXL	Domain Elective V Lab	-	0-1-1
10.	BA353	Entrepreneurship	-	2-0-2
11.	EL 400	Technical & Business Writing	-	3-0-3
Total Cr. Hrs.:				13-5-18
Total Contact Hours: 28				

Semester VII				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	DS498	Final Year Project - II	DS 497	0-2-2
2.	CS215	Information Security	-	2-0-2
3.	CS215L	Information Security Lab	-	0-1-1
4.	CS426	Parallel and Distributed Computing	CS325, CS325L	2-0-2
5.	CS426L	Parallel and Distributed Computing Lab	CS325, CS325L	0-1-1
6.	DSXXX	Domain Elective VI	-	2-0-2
7.	DSXXXL	Domain Elective VI Lab	-	0-1-1
8.	DSXXX	Domain Elective VII	-	2-0-2
9.	DSXXXL	Domain Elective VII Lab	-	0-1-1
Total Cr. Hrs.:				8-6-14
Total Contact Hours: 26				

Semester VIII				
S. No.	Course Code	Course Title	Pre-req.	Cr Hrs.
1.	DS499	Final Year Project - III	DS498	0-3-3
2.	HU405	Ideology and Constitution of Pakistan	-	2-0-2
3.	CS470	Professional Practices	-	2-0-2
4.	HU411	Civics and Community Engagement	-	2-0-2
5.	XXXXX	Elective Supporting - I	-	3-0-3
6.	BA152	Introduction to Management	-	2-0-2
Total Cr. Hrs.:				11-3-14
Total Contact Hours: 20				

Program Total Credit Hours: 130 (99-31) + Internship (03) = 133

List-A: Pre-Requisite Courses for Final Year Project - I

S. No.	Course Code	Course Title	Cr Hrs.
1.	CS111	Programming Fundamentals	3-0-3
2.	CS111L	Programming Fundamentals Lab	0-1-1
3.	CS112	Object Oriented Programming	3-0-3
4.	CS112L	Object Oriented Programming Lab	0-1-1
5.	CS216	Data Structures	3-0-3
6.	CS216L	Data Structures Lab	0-1-1
7.	SE101	Introduction to Software Engineering	3-0-3
8.	CS130	Database Systems	3-0-3
9.	CS130L	Database Systems Lab	0-0-1

List of Domain Elective Courses

Note: A student must study 07 domain elective courses, out of which at least 05 courses must be undertaken from the list given below. A student can undertake 02 domain elective courses from other FCAI departments with the permission of respective HoDs.

S. No.	Course Code	Course Title	Cr. Hrs.
1.	DS320	Big Data Analytics	2-0-2
	DS320L	Big Data Analytics Lab	0-1-1
2.	DS255	Fundamentals of Computer Vision	2-0-2
	DS255L	Fundamentals of Computer Vision Lab	0-1-1
3.	DS350	Digital Image Processing	2-0-2
	DS350L	Digital Image Processing Lab	0-1-1
4.	DS340	Business Process Analysis	2-0-2
	DS340L	Business Process Analysis Lab	0-1-1

5.	DS256	HCI & Computer Graphics	2-0-2
	DS256L	HCI & Computer Graphics Lab	0-1-1
6.	DS354	Platforms & Architectures for Data Science	2-0-2
	DS354L	Platforms & Architectures for Data Science Lab	0-1-1
7.	DS451	Text mining	2-0-2
	DS451L	Text mining Lab	0-1-1
8.	DS455	Deep Learning	2-0-2
	DS455L	Deep Learning Lab	0-1-1
9.	DS421	Cloud Computing	2-0-2
	DS421L	Cloud Computing Lab	0-1-1
10.	DS456	Pervasive Computing	2-0-2
	DS456L	Pervasive Computing Lab	0-1-1
11.	DS313	Survival Analysis	2-0-2
	DS313L	Survival Analysis Lab	0-1-1
12.	DS471	Time Series Analysis	2-0-2
	DS471L	Time Series Analysis Lab	0-1-1
13.	DS301	Knowledge Representation & Reasoning	2-0-2
	DS301L	Knowledge Representation & Reasoning Lab	0-1-1
14.	DS351	Natural Language Processing	2-0-2
	DS351L	Natural Language Processing Lab	0-1-1
15.	DS470	Speech Processing	2-0-2
	DS470L	Speech Processing Lab	0-1-1
16.	DS478	Evolutionary Computing	2-0-2
	DS478L	Evolutionary Computing Lab	0-1-1
17.	DS321	Semantic Computing	2-0-2
	DS321L	Semantic Computing Lab	0-1-1
18.	DS417	Spatial Statistics with Geographic Information Systems	2-0-2
	DS417L	Spatial Statistics with Geographic Information Systems Lab	0-1-1

List of Elective Supporting Courses

S. No.	Course Code	Course Title	Pre-req.	Cr. Hrs.
1.	MK101	Principles of Marketing	-	3-0-3
2.	AF142	Financial Accounting	-	3-0-3

List of General Education Courses

S. No.	Course Code	Course Title	Pre-req.	Cr. Hrs.
1.	CS181	Application of Information & Communication Technologies	-	2-0-2
	CS181L	Application of Information & Communication Technologies Lab	-	0-1-1
2.	EL170	Functional English	-	3-0-3

3.	EL271	Expository Writing	EL170	3-0-3
4.	MA216	Quantitative Reasoning -I (Discrete Structures)	-	3-0-3
5.	MA110	Quantitative Reasoning -II (Calculus & Analytical Geometry)	-	3-0-3
6.	HU124	Islamic Studies & Ethics	-	2-0-2
7.	HU405	Ideology and Constitution of Pakistan	-	2-0-2
8.	BA152	Social Sciences (Introduction to Management)	-	2-0-2
9.	PH111	Natural Sciences (Applied Physics)	-	2-0-2
	PH111L	Natural Sciences (Applied Physics Lab)	-	0-1-1
10.	CS470	Arts & Humanities (Professional Practices)	-	2-0-2
11.	HU411	Civics and Community Engagement	-	2-0-2
12.	BA353	Entrepreneurship	-	2-0-2