SCHEME OF STUDIES

BS Computer Science

Department of Computer & Software Technology, University of Swat

Vision and Mission

Vision and Mission University of Swat

Vision: University of Swat aspires to be a premier seat of learning distinctively recognized for transformative education and multi-disciplinary research to serve humanity.

Mission: University of Swat is committed to provide academic and rewarding environment for intellectual growth to promote quality research and education, focused on creative and critical thinking with multi-cultural affinity of glorious human values.

Vision and Mission of the Department of Computer & Software Technology

Vision: Our vision is to provide exceptional education across all levels, cultivating a skilled cadre of computer scientists who can adeptly address the needs of both industry and academia. We aspire to excel in research by establishing strong partnerships with esteemed national and international organizations.

Mission: Our mission is to equip students with critical thinking skills, empowering them to make meaningful contributions to IT industries at national and international levels. We engage students in workshops, seminars, and various research activities to prepare them for the job market.

Program Educational Objectives (PEOs)

PEO 1: Apply computing knowledge and skills to design and develop effective solutions to solve complex real-life problems, fostering a community of skilled computer scientists capable of meeting the evolving demands of both industry and academia.

PEO 2: To develop critical thinking skills in the students, empowering them to analyze complex problem and devise creative solutions.

PEO 3: Manifest life-long learning and inter-personal skills for sustainable career development and professional growth and to demonstrate ethical and moral conduct in professional practices.

Program Learning Outcomes (PLOs)

PLO1 **Academic Education:** To prepare graduates as computing professionals.

PLO2 **Knowledge for Solving Computing Problems:** Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the 16 abstraction and conceptualization of computing models from defined problems and requirements.

PLO3 **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PLO4 **Design/ Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PLO5 **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PLO6 **Individual and Teamwork:** Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.

PLO7 **Communication:** Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PLO8 **Computing Professionalism and Society:** Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PLO9 **Ethics:** Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.

PLO10 **Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

Mapping of PLOs to PEOs

No	Program Learning Outcomes (PLOs)	PEOs		
		PEO-1	PEO-2	PEO-3
1	Academic Education	✔	✔	
2	Knowledge for solving Computing Problems	✔		
3	Problem Analysis	✔	✔	
4	Design/ Development of Solutions	✔	✔	
5	Modern Tool Usage	✔	✔	
6	Individual and Teamwork	✔		✔
7	Communication			✔
8	Computing Professionalism and Society		✔	✔
9	Ethics			✔
10	Life-long Learning	✔	✔	

Bachelor of Science in Computer Science - BSCS

Program Model:

The program is designed to achieve systematically the objectives set out above. It has been structured to suit the needs of the students, the demands of the market and trends. During the first two years of the program the students will be given core understanding of the program. The students will be exposed to the discipline in a systematic, gradual and definite way. Students will also be trained in the skills and techniques which are rooted in the basic sciences like mathematics and physics. These areas will be taken care of in the supporting courses which have been allocated reasonably sufficient space. Students' personal traits and personality polishing will be cared for by the general education courses including communication and writing skills. A host of slots for elective courses have also been proposed to give to the students an opportunity to move towards their areas of interest. During the senior years the students will be given exposure to the more specialized aspects of the discipline. They will also be given training in at least one application domain which will help institutions to prepare human resource well suited to the needs of different segments of the job market. In order to inculcate among them a scientific attitude they will go through a substantial lab work, which will prepare them for the industry and for further research oriented studies. The final year project will mark the crystallization and culmination of the students' four-year learning experience.

The program structure is given as under:

Program Duration	8 semesters spread over 4 years
No of Semesters per year	2 semesters
Total Credit Hours	130

The program structure for Associate Degree (Exit from BSCS) is given as under:

Program Duration	4 semesters spread over 2 years
No of Semesters per year	2 semesters
Total Credit Hours	67

Eligibility:

The eligibility criterion for admission in BS Computer Science is given as under:

FSc (Pre-Medical/Pre-Engineering/Intermediate in Computer Science (ICS) or FA with mathematics or equivalent with 50% marks. Passing of Maths-I and Maths-II is mandatory for Pre-Medical students in the first two semesters.

The eligibility criterion for admission in BS Computer Science for Associate Degree holders or equivalent is given as under: Associate Degree in Computer Science with 3.0 CGPA. The candidate needs to pass the deficient courses offered in the first four semesters of BS Computer Science degree program as per approved curriculum. The number of deficient courses will be decided by the Departmental Semester Committee according to the Associate Degree obtained by the candidate. Courses already passed by the candidate in the Associate Degree will be exempted.

Curriculum Model for BS in Computer Science

The generic structure for computing degree program given before is mapped with the BSCS program in the following tables.

Generic Structure for Computing Disciplines:

Areas	Credit Hours	Courses
Computing Core	46	14
Domain Core	18	6

Domain Elective	21	7
Mathematics & Supporting Courses	12	4
Elective Supporting Courses	3	1
General Education Requirement	30	12
Totals	**130**	**44**

Mapping of BSCS Program on the Generic Structure:

#	Code	Pre- Reqs	Course Title	Dom Cr	Hr
Computing Core (46/130) 14 Courses					
1	CS101		Programming Fundamentals	Core	4 (3-3)
2	CS151	PF	Object Oriented Programming	Core	4 (3-3)
3	CS251		Database Systems	Core	4 (3-3)
4	CS203		Digital Logic Design	Core	3 (2-3)
5	CS201	OOP	Data Structures	Core	4 (3-3)
6	CS303		Information Security	Core	3 (2-3)
7	CS301		Artificial Intelligence	Core	3 (2-3)
8	CS202		Computer Networks	Core	3 (2-3)
9	CS302		Software Engineering	Core	3 (3-0)
10	CS254	DLD	Computer Organization & Assembly Language	Core	3 (2-3)
11	CS252		Operating Systems	Core	3 (2-3)
12	CS253	DS	Analysis of Algorithms	Core	3 (3-0)
13	CS401		Final Year Project – I	Core	2 (0-6)
14	CS451	FYP-I	Final Year Project – II	Core	4 (0-12)
Domain Core (18/130) 6 Courses					
15	CS304		Theory of Automata	Domain Core	3 (3-0)
16	CS452	DB	Advance Database Management Systems	Domain Core	3 (2-3)
17	CS351		HCI & Computer Graphics	Domain Core	3 (2-3)
18	CS305	COAL	Computer Architecture	Domain Core	3 (2-3)
19	CS352	TA	Compiler Construction	Domain Core	3 (2-3)
20	CS405	OS	Parallel & Distributed Computing	Domain Core	3 (2-3)
Domain Elective (21/130) 7 Courses					
21	CS353		Web Technologies	Domain Elective	3 (2-3)
22	CS453		Mobile Application Development	Domain Elective	3 (2-3)

23	CS404		Advanced Programming	Domain Elective	3 (2-3)
24	CS354		Numerical Analysis	Domain Elective	3 (2-3)
25	CS402		Web Engineering	Domain Elective	3 (2-3)
26	CS403		Cyber Security	Domain Elective	3 (2-3)
27	CS454		Software Testing & Quality Assurance	Domain Elective	3 (2-3)
28	CS455		Internet of Things	Domain Elective	3 (3-0)
Mathematics & Supporting Courses (12/130) 4 Courses					
28	MT352	CAG	Multivariable Calculus	Maths	3 (3-0)
29	MT351	CAG	Linear Algebra	Maths	3 (3-0)
30	MT301		Probability & Statistics	Maths	3 (3-0)
31	EW201	FE	Technical & Business Writing	EW	3 (3-0)
Elective Supporting Courses (3/130) 1 Course					
32	SS251		Social Science (Introduction to Marketing)	SS	3 (3-0)
	SS252		Social Science (Financial Accounting)	SS	3 (3-0)
General Education Requirement as per HEC UG Education Policy (30/130) 12 Courses					
33	Gen-Ed-09		Application of Information & Communication Technologies	GER	3 (2-3)
34	Gen-Ed-4		Functional English	GER	3 (3-0)
35	Gen-Ed-5	FE	Expository Writing	GER	3 (3-0)
36	Gen-Ed-6		Quantitative Reasoning – 1 (Discrete Structures)	GER	3 (3-0)
37	Gen-Ed: 6		Quantitative Reasoning – 2 (Calculus and Analytic Geometry)	GER	3 (3-0)
38	Gen-Ed-7		Islamic Studies	GER	2 (2-0)
39	Gen-Ed-08		Ideology and Constitution of Pakistan	GER	2 (2-0)
40	Gen-Ed-3		Social Sciences (Example: Introduction to Management)	GER	2 (2-0)
41	Gen-Ed-2		Natural Sciences (Applied Physics)	GER	3 (2-3)
42	Gen-Ed-01		Arts & Humanities (Professional Practices)	GER	2 (2-0)
43	Gen-Ed-11		Civics and Community Engagement	GER	2 (2-0)
44	Gen-Ed-10		Entrepreneurship	GER	2 (2-0)
Non-Credit Courses (2 Courses)					
45	MH-101		Mathematics I	Maths	3 (3+0)
46	MH-151		Mathematics II	Maths	3 (3+0)

Suggested Scheme of Study/Semester Plan for BSCS

	Code	Pre-Reqs	Course Title	Domain	Hr (Cont hr)	
			Semester 1			
1	ISI-107		Islamic Studies	GER	2	(2-0)
2	CS-109		Introduction to Information and Communication Technologies	GER	3	(2-3)
3	ECO-106		Social Science (Introduction to Economics)	GER	2	(2-0)
4	GE-104		Natural Science (Applied Physics)	GER	3	(2-3)
5	ENG-107		Functional English	GER	3	(3-0)
6	CS101		Programming Fundamentals	Core	4	(3-3)
7	MH-101		Mathematics I	Maths	0	(0-3)
8	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**17**	**(14-9)**
			Semester 2			
1	GE-151		QR 1 (Calculus and Analytic Geometry)	GER	3	(3-0)
2	PS-158		Ideology and Constitution of Pakistan	GER	2	(2-0)
3	PS-159		Civic and community Engagement	GER	2	(2-0)
4	CS151	PF	Object Oriented Programming	Core	4	(3-3)
5	ENG-154	FE	Expository Writing	GER	3	(3-0)
6	GE-152		Arts & Humanities (Professional Practices)	GER	2	(2-0)
7	MH-151		Mathematics II	Maths	0	(0-3)
8	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**16**	**(16-3)**
			Semester 3			
1	CS201	OOPs	Data Structures	Core	4	(3-3)
2	MGT-202		Entrepreneurship	GER	2	(2-0)
3	GE-201		Quantitative Reasoning – 1 (Discrete Structures)	GER	3	(3-0)
4	CS202		Computer Networks	Core	3	(2-3)
5	CS203		Digital Logic Design	Core	3	(2-3)
6	EW201	FE	Technical & Business Writing	EN	3	(3-0)
7	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**18**	**(15-9)**
			Semester 4			
1	CS254	DLD	Computer Organization & Assembly Language	Core	3	(2-3)

2	CS253	DS	Analysis of Algorithms	Core	3	(3-0)
3	CS251		Database Systems	Core	4	(3-3)
4	CS252		Operating Systems	Core	3	(2-3)
5	SS251		Elective Supporting Course (Example: Introduction to Marketing	SS	3	(3-0)
6	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**16**	**(15-9)**
			Semester 5			
1	MT301		Probability & Statistics	Maths	3	(3-0)
2	CS301		Artificial Intelligence	Core	3	(2-3)
3	CS302		Software Engineering	Core	3	(3-0)
4	CS303		Information Security	Core	3	(2-3)
5	CS304		Domain Core 1 (Theory of Automata)	Domain Core	3	(3-0)
6	CS305		Domain Core 2 (Computer Architecture)	Domain Core	3	(2-3)
7	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**18**	**(15-9)**
			Semester 6			
1	MT351	CAG	Linear Algebra	Maths	3	(3-0)
	MT352	CAG	Multivariable Calculus	Maths	3	(3-0)
2	CS351		Domain Core 3 (HCI & Computer Graphics)	Domain Core	3	(2-3)
3	CS352		Domain Core 4 (Compiler Construction)	Domain Core	3	(2-3)
4	CS353		Domain Elective 1 (Example: Web Technologies)	Domain Elective	3	(2-3)
5	CS354		Domain Elective 1 (Example: Numerical Analysis)	Domain Elective	3	(2-3)
6	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**18 (14-12)**	
			Semester 7			
1	CS401		Final Year Project – I	Core	2	(0-6)
2	CS402		Domain Elective 3 (Example: Web Engineering)	Domain Elective	3	(2-3)
3	CS403		Domain Elective 4 (Example: Cyber Security)	Domain Elective	3	(2-3)
4	CS404		Domain Elective 5 (Example: Advanced Programming	Domain Elective	3	(2-3)
5	CS405		Domain Core 5 (Parallel & Distributed Computing)	Domain Core	3	(2-3)
6	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2)
				Total Cr Hrs	**14**	**(8-18)**
			Semester 8			
1	CS451	FYP-I	Final Year Project – II	Core	4	4 (0-12)

2	CS452		Domain Core 6 (Advance Database Management Systems)	Domain Core	3	(2-3)
3	CS453		Domain Elective 6 (Example: Mobile Application Development	Domain Elective	3	(2-3)
4	CS454		Domain Elective 7 (Example: Software Testing & Quality	Domain Elective	3	(2-3)
			Assurance)			
6	CS455		Internet of Things	Domain Elective	3	(3+0)
5	ISL 118		Teaching of the Holy Quran with Translation, Tafseer & Tajweed		0	(0-2) (2+0)
				Total Cr Hrs	**16**	**(9-21)**
				Program Total Cr Hrs		**133**