

Item No. 3

**Approval /Adaptation of 2016-17 curriculum of HEC
for BS (CS), BS (IT)
&
Curriculum of BS (Artificial Intelligence) and BS
(Cyber Security) Programs, March 2020**

3. Curriculum for BS (Computer Science) and BS (Information Technology)

3.1 BS Computer Science

Computer science is the study of the theory, experimentation, and engineering that form the basis for the design and use of computers. It is the scientific and practical approach to computation and its applications and the systematic study of the feasibility, structure, expression, and mechanization of the methodical procedures (or algorithms) that underlie the acquisition, representation, processing, storage, communication of, and access to information [ref WordNet Princeton definition].

Computer Science is the application of a systematic, disciplined and quantifiable approach to the design, development, operation, and maintenance of software systems. It is in fact the practice of designing and implementing large, reliable, efficient and economical software by applying the principles and practices of engineering. The program aims to train students in all aspects of software life cycle from specification through analysis and design to testing, maintenance and evaluation of software product.

Coverage of ACM Knowledge Areas

Computer Science curriculum is designed keeping in view following identified knowledge areas of ACM [ref # ACM 2013 curriculum report]. It has been tried to reasonably cover all knowledge areas without compromising the flexibility needed for a national model curriculum.

- AL - Algorithms and Complexity
- AR - Architecture and Organization
- CN - Computational Science
- DS - Discrete Structures
- GV - Graphics and Visual Computing
- HCI - Human-Computer Interaction
- IAS - Information Assurance and Security
- IM - Information Management
- IS - Intelligent Systems

- NC - Networking and Communications
- OS - Operating Systems
- PBD - Platform-based Development
- PD - Parallel and Distributed Computing
- PL - Programming Languages
- SDF - Software Development Fundamentals
- SE - Software Engineering
- SF - Systems Fundamentals
- SP - Social Issues and Professional Issues

3.2 Proposed Curriculum for BS (Computer Science)

Areas covered in BS Program

Course Group	Credit hours	% age
General Education	19	15%
University Electives	12	9%
Mathematics & Science	12	9%
Foundation		
Computing – Core	39	30%
Common courses	82	63%
Domain CS		
Domain CS Core	24	18%
Domain CS Electives	15	12%
Domain CS Supporting	9	7%
Domain courses	48	37%
TOTAL	130	100%

Courses common for all computing BS programs – 82 Credits

Computing Core Courses Course Title	Credit hours
Programming Fundamentals	3-1
Object Oriented Programming	3-1
Data Structures & Algorithms	3-1
Discrete Structures	3-0
Operating Systems	3-1
Database Systems	3-1
Software Engineering	3-0
Computer Networks	3-1
Information Security	3-0
Final Year Project	0-6
Total	39 (27-12)

General Education Courses

Course Title	Credit hours
English Composition & Comprehension	3
Technical & Business Writing	3
Communication & Presentation Skills	3
Professional Practices	3
Intro to Info. & Comm. Technologies	2-1
Pakistan Studies	2
Islamic Studies/ Ethics	2
Total	18-1

University Elective Courses

Course Title	Credit hours
Foreign Language	2-0

Social Service	1-0
Management Related	3-0
Social Science Related	3-0
Economy Related	3-0
Total	12-0

Mathematics and Science Foundation

Courses

Course Title	Credit hours
Calculus & Analytical Geometry	3-0
Probability & Statistics	3-0
Linear Algebra	3-0
Applied Physics	3-0
Total	12-0

Domain Courses for BS (Computer Science)

Computer Science CORE (Compulsory) courses

Course Title	Credit hours
Compiler Construction	3-0
Comp. Organization & Assembly Language	3-1
Digital Logic Design	3-1
Design & Analysis of Algorithms	3-0
Parallel & Distributed Computing	3-0
Artificial Intelligence	3-1
Theory of Automata	3-0
Total	24 (21-3)

Computer Science SUPPORTING courses (ANY 3 from following list)

Coverage of relevant pre-requisite must be ensured while offering any of the following courses from this category

Course Title	Credit hours
Differential Equations	3-0
Multi-variate Calculus	3-0
Graph Theory	3-0
Theory of Programming Languages	3-0
Numerical Computing	3-0
Total (Any three of the above)	9-0

Computer Science ELECTIVE courses

Course Title	Credit hours
CS Elective – 1	3
CS Elective – 2	3
CS Elective – 3	3
CS Elective – 4	3
CS Elective – 5	3
Total	15

3.3 Proposed Study Plan for BS (Computer Science)

4-Years Program (8 Regular Semesters of 18 weeks each)

Semester-1

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-1101	-	Introduction to ICT	2	1	3
BCS-1102	-	Programming Fundamentals	3	1	4
MAT-1115	-	Calculus and Analytical Geometry	3	0	3
PHY-1118	-	Applied Physics	3	0	3
ENG-1107	-	English Composition & Comprehension	3	0	3
		Total:	15	1	16

Semester-2

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-1201	BCS-1102	Object Oriented Programming	3	1	4
BCS-1202	PHY-1118	Digital Logic Design	3	1	4
ENG-1207	ENG-1107	Communication Skills	3	0	3
STA-1220		Statistics and Probability	3	0	3
PSY-1219		Psychology	3	0	3
		Total:	15	2	17

Semester-3

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-2301	BCS-1201	Data Structure and Algorithms	3	1	4
BCS-2302		Computer Architecture and Organization	3	1	4
BCS-2303		Discrete Structures	3	0	3
BCS-2304		Information Security	3	0	3
MAT-2315		Differential Equations	3	0	3
		Total:	15	2	17

Semester-4

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-2401	BCS-2301	Design and Analysis of Algorithms	3	0	3
BCS-2402		Theory of Automata	3	0	3
BCS-2403	BCS-2301	Database Systems	3	1	4
MSG-2404		Micro Processor and Assembly Language	2	1	3
ARA-2401		Arabic	3	0	3
		Total:	14	2	16

Semester-5

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-3501	BCS-2402	Compiler Construction	3	0	3
BCS-3502		Numerical Computing	3	0	3
BCS-3503	BCS-2301	Operating Systems	3	1	4
BCS-3504		Software Engineering	3	0	3
MAT-3515		Multivariate Calculus	3	0	3
		Total:	15	1	16

Semester-6

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-3601	BCS-2303	Artificial Intelligence	3	1	4
BCS-3602		Computer Networks	3	1	4
BCS-3603		Human Computer Interaction	3	0	3
BCS-3604		Data Mining	3	0	3
ENG-3607		Technical and Business Writing	3	0	3
		Total:	15	2	17

Semester 7

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-4701		Fuzzy Logic	3	0	3
BCS-4702		Digital Image Processing	3	0	3
BCS-4703		Final Year Project	0	3	3
ISL-4712		Islamic Studies	2	0	2
BCS-4705	BCS-3503	Parallel & Distributed computing	3	0	3
PS-4717		Pakistan Studies	2	0	2
		Total:	14	3	16

Semester-8

Code	Pre-Req	Title	Lec. Hrs	Lab. Hrs	Credit Hours
BCS-4801		Software Project Management	3	0	3
MGS-4802		Financial Accounting	3	0	3
BCS-4803		Final Year Project	0	3	3
HUM-4804		Professional Practices	3	0	3
HRM-4809		Human Resource Management	3	0	3
		Total:	11	3	15