

## Department of Computer Science

### Introduction

In the recent years, the immense growth of numerous industries resulted in an instant need for young and vigorous IT professionals, who could utilize their skills internationally to support the IT industry exports. Future scientific leaders and managers must not only understand how to program and mine for data, but also know when and how to apply a fastidious result to a fastidious problem.

The Department of Computer Science, Government College University Lahore was established in 1999 as an independent Department in the postgraduate block of the GC University. At present, the Computer Science Department has 4 Computer Labs namely Postgraduate Lab, Main Lab, General Lab and ICS Lab, and these Labs comprising of more than 200 computers. The department offers 4 years BS (Honors), 2 years MS and Ph.D in Computer Science degree programmes. The courses offer in these degree programmes are selected through its Departmental Academic Committee and External Academic Committee keeping in view the modern computing needs both for software industry and academic research.

### Undergraduate Study

We are offering an exciting new portfolio of Undergraduate courses designed to ensure that our students have the knowledge and abilities that they will need for their future careers. The BS Programme of Computer Science is integral to the course portfolio, but students will be able to choose their final projects in different fields of IT, depending on their future career aspirations, in areas such as business, digital media, gaming platforms, software engineering and Wireless Networks.

BS (CS) Degree Programme is of 136 credit hours, and spread over 4 years with 2 Semesters in each year. The BS (CS) students are required to complete 136 credit hours followed by a thesis in the last year to complete the BS (CS) degree.

### Undergraduate Admission Criteria

BS (CS) admission criteria is as follows:

Minimum 50% Marks with following combination in Intermediate.

1. FSc Pre-Engineering / Pre-Medical with Additional Mathematics.
2. ICS/General Science with following combinations
  - I. Mathematics, Statistics, Physics
  - II. Mathematics, Computer Science, Physics
  - III. Mathematics, Computer Science, Statistics
  - IV. Mathematics, Statistics, Economics
  - V. Mathematics, Computer Science, Economics
3. A Levels Certificate same combinations as above.
4. Equivalence Certification from IBCC.

Other foreign qualified are eligible only if showing an equivalence certificate issued by IBCC.

### Postgraduate Programme

Master's courses are, academically demanding and we take pride in offering relevant and timely content delivered by subject specialists. With value-added course features and the potential to complete a professional placement during the dissertation module, the courses ensure that our students meet industry, not-for-profit but public sector expectations.

MS (CS) Degree program is of 36 credit hours, and spread over 2 years with 2 Semesters in each year. The MS (CS) students are required to complete 2 core courses (6 credit hours) and 6 elective courses (18 credit hours), along with a thesis (12 credit hours) to complete the MS degree.

### Postgraduate Admission Criteria

The candidate, who has passed his/her (BS Hons) or M.Sc degree in the following disciplines

1. Software Engineering
2. Information Technology
3. Telecommunication
4. Computational Physics
5. Electrical Engineering
6. Computer Engineering
7. Electronics
8. Bioinformatics

In addition to BS(Hons) or M.Sc in Computer Science may seek admission in MS in Computer Science.

The student who will get admission in MS in Computer Science and having any of degrees other than BS(Hons) or MSc in Computer Science mentioned above will have to qualify Deficiency Courses before regular enrollment in MS in Computer Science. The list of deficiency courses is as follows:

1. Programming Fundamentals
2. Operating Systems
3. Software Engineering
4. Theory of Automata
5. Design and Analysis of Algorithms
6. Computer Architecture and Organization
7. Database Management Systems
8. Data Communication and Computer Networks

### Ph.D Programme

The Department of Computer Science is also running Ph.D in Computer Science since 2013 and so far the Department has produced one Ph.D. In order to apply for admission the applicant needs to have an 18 years of education resulting in MS/MPH Computer Science with at least 3.00/4.00 or 1<sup>st</sup> Division. The students also needs to have clear subject GRE (International) or GAT (Subject) conducted by NTS with a minimum score of 60.

Course work of 18 credit hours preferably in the first year is required to be completed and followed by a comprehensive examination for granting candidacy as Ph.D researcher. The students are then required to write their Ph.D Dissertation producing at least one impact factor publication out of their thesis. The duration of Ph.D Programme is 3-8 years.

### Research

The Department' faculty is frequently engaged in research work which establishes it to transfer emerging technological knowledge to the students. Our network of public and private sector collaborators ensures that our research is timely, relevant and has a positive impact on society. Our academics are recognized for their high quality publications and leadership in their subjects. The Department of Computer Science have a main research group which include:

### Formal Software Development Research Group

Formal software development group, Department of Computer Science, GC University Lahore works in the area of formal specification and verification of real-time systems including multi-agent systems.

The research group currently contains 4 Ph.D students supervised by Dr. Syed Asad Raza Kazmi. The group has various published research papers in impact factor and ISI indexed journals in the year 2015 and 2016. Currently the group is working on the formal modeling of self-adaptive real-time systems, formal modeling of multi-agent systems, concurrency issues in distributed systems, etc. Dr. Awais Qasim is the first Ph.D student of the research group, who completed his Ph.D in February 2017 under the supervision of Dr. Syed Asad Raza Kazmi on the title "Formal Modeling of Real-Time Self-Adaptive

Multi-Agent Systems". Dr. Awais Qasim produced 3 impact factor and 6 ISI indexed publications during his Ph.D. This group is lead by PhD and MS faculty members of the Department. The researchers involved in these groups have contributed more than 30 research publications in international and national journals/ conferences.

### Facilities

The Department of Computer Science at the GCU Lahore prides itself on the excellent facilities it offers to both students and the staff. The Department of Computer Science is equipped with the most up-to-date computers, labs and multimedia projectors. The classrooms are fully air conditioned, with a well-stocked library and round the clock internet facilities with an enabling learning environment. A number of computers are available for student use and a number of wireless hotspots to enable students with laptops to access the campus network.

The DCS runs and administrates a network unit which provides optical interconnectivity and internet facilities to the various departments of the Government College University. At present, the network unit possesses high end servers under 2 main projects of HEC namely Pakistan Education and Research Networks (PERN2), and various IT facilities are provided through these servers. Besides the regular teaching to BS (CS) and MS (CS) programs the faculty of computer science is also engaged in teaching of computer related courses both at intermediate level (ICS) and BA/BS (Hons.) level offered by the University.

### Computer Labs

The Department of Computer Science has a diversified collection of sophisticated computers installed at the campus. A computers are available to the student body for unlimited usage. All the computers are networked using Cisco routers and switches. These servers are DELL POWEREDGE 730 Series. The students have extensive exposure to multi-user, multitasking environment supported by various hardware resources and offering different software platforms including WINDOWS 2012 Server, LINUX, NET, ORACLE and state of the art UNIX Architecture etc. inter-connected through Local Area Networking (LAN). They have the advantage of gaining unique experience of free and unlimited access to the facilities of the University Computer Labs, where each computer is attached with online printer and all machines are warranted uninterrupted operations because of individual protection by efficient UPS systems.

The Department staff is always alert to provide timely help to each student. The computing facilities at the University include the following three types of computer Labs, namely, the Main Lab, General Lab and the Post Graduate Labs.

### Microsoft Software Library

A complete range of licensed software development tools and operating systems are available to students and staff members. Students are provided with software free of cost. This facility is provided through the MSDNAA alliance with HEC and Microsoft Co. USA.

### Networking Unit

The GCU Networking Unit at the Department of Computer Science is responsible for providing IT services to the entire University. All Departments are linked to high speed fiber lines. The server room of this network is equipped with high end servers and network devices monitored by dedicated professionals. The Networking Unit is responsible for smooth and secured operational execution of network-based services: internet connectivity, FTP accounts, mail account and Departmental web space.

### Student Societies

Co-Curricular activities are important part of the Department. They play a significant role in grooming students. Student chapters and branches, associated with different research embryonic, organizations such as ACM and IEEE, help students support themselves to latest research vicinities of their interest, through digital libraries, forums and publications. The Department of Computer Science provides funds to these societies that focus on arranging curricular and co-curricular activities. These societies are exclusively supervised by the Department with the help of its students. The Societies work in harmony to arrange different activities throughout semesters.

### Computer Science Society (CSS)

The Computer Science Society of GC University Lahore is actively playing its role for the establishing and betterment of students. It is providing maximum opportunities to its students by conducting market oriented seminars, on campus hiring by companies and conducting valuable trainings. The society arrange a number of events within University and participates in many competitions, seminars, etc outside the University. In last year computer science society has organized lectures from different leading software houses such as Xavor, Strategic Software International, Arbisoft to make student aware with market trends, more over different healthy activities were organized for students like programming competitions, gaming competitions etc.

### ACM Society

GCU-ACM Student Chapter is actively working in collaboration with ACM USA, to promote the awareness of IT among students. This chapter has organized many activities like Industry Visits, Programming Competitions, Seminars, and Mentorship for students. The chapter has provided a platform for those students who want to enhance their knowledge and skill in different areas.

### IEEE Society

The IEEE GCU Student Branch Lahore's current body was formulated in November 2008. It currently holds Seven Office Bearers and 9 Section Representatives. This student branch has been very active and is desired by Lahore Section to remain for next academic year. It has not only participated in a variety of events but also organized them like Project Exhibition, Networking and Programming Quiz Competition and IEEE Members training workshop.

### Scholarships

Two types of scholarships: Merit/Deserving scholarships, are being offered to the students of Department of Computer Science.

In each semester, merit scholarships are awarded to the BSCS students having top 3 positions on SGPA based.

The deserving BSCS/MSCS students having good academic record but in financial constraint are allowed to avail the type of GCU scholarship.



### Future Prospects

The Department of Computer Science at GCU aims to produce a permanent flow of young and talented people in the IT industry and these people should work for better future of coming generations. To achieve this goal, department is providing best facilities and staff members support to all students. The Department is also providing the option to undertake research or development for talented students and faculty members.

### BS (CS)

Year-1		
Semester I		
Course Code	Course Title	Credit Hours
CS-1101	Introduction to Computing	3 (2+1)
CS-1103	Electronics	3
CSMATH-2201	Calculus and Analytical Geometry	3
CS ENG-1101	English Composition and Comprehension	3
CS ISL-2101	Islamic Studies and	2
CS PK-2101	Pakistan Studies	2
Semester II		
Course Code	Course Title	Credit Hours
CS-1102	Programming Fundamentals	4 (3+1)
CS-2033	Digital Logic Design	3
CS MATH-2101	Linear Algebra	3
CS ENG-1201	Communication Skills & Report Writing	3
CS STAT-1101	Probability and Statistics	3
Year-2		
Semester III		
Course Code	Course Title	Credit Hours
CS-1201	Object Oriented Programming	4 (3+1)
CS-1203	Discrete Structures	3
CS-1207	Financial Accounting	3
CS MATH-3101	Multivariate Calculus	3
CS-2107	Cognitive Psychology	3
Semester IV		
Course Code	Course Title	Credit Hours
CS-2101	Data Structures and Algorithms	3
CS-2207	Microprocessor and Assembly Language	3
CS-2201	Visual Programming	3
CS-2208	Logical Paradigms in Computing	4 (3+1)
CS MATH-3201	Differential Equations	3



Year-3		
Semester V		
Course Code	Course Title	Credit Hours
CS-2014	Database Systems	4 (3+1)
CS-3118	Design and Analysis of Algorithms	3
CS-3106	Data Communications and Networks	3
CS-2044	Theory of Automata	3
CS-3109	Operational Research	3
HM-3123	Professional Practices	3
Semester VI		
Course Code	Course Title	Credit Hours
CS-2205	Operating Systems	3
CS-2105	Software Engineering	3
CS-3102	Artificial Intelligence and Neural Networks	3
CS-4202	Compiler Construction	3
CS-41xx	Foreign Languages (French, German, Chinese, Arabic, Persian)	3
Year-4		
Semester VII		
Course Code	Course Title	Credit Hours
CS-4108	Object Oriented Analysis and Design	3
CS-4122	Human Computer Interaction	3
CS-2063	Computer Architecture	3
	Computer Science Elective-I	
	Computer Science Elective-II	
CSB-4018	Project	3
Semester VIII		
Course Code	Course Title	Credit Hours
CS-4215	Information Security	3
CS-4216	Numerical Computing	3
CS-4217	Intellectual Property Rights and Cyber Law	3
	Computer Science Elective-III	3
	Computer Science Elective-IV	3
CSB-4018	Project	3
Elective Subjective		
Course Code	Course Title	Credit Hours
CS-3207	Advanced Software Engineering	3
CS-3208	Data Warehouse & Mining	3 (2+1)
CS-3209	Digital Image Processing	3 (2+1)
CS-3210	Digital Signal Processing	3 (2+1)
CS-3211	Wireless and Mobile Communication	3
CS-3212	Software Agents	3
CS-2234	Web Engineering	3 (2+1)
CS-3213	Embedded Systems	3 (2+1)
CS-2224	Computer Graphics	3 (2+1)
CS-3215	Semantic Web	3
CS-3216	Parallel & Distributed Computing	3
CS-3220	Software Quality Assurance	3
CS-3221	Design of Intelligent Robots	3
CS-3222	Image Processing & Computer Vision	3

Course Code	Course Title	Credit Hours
CS-3223	Software Development Process	3
CS-3224	Natural Language Processing	3
CS-3228	Fundamentals of Data Mining	3

**Note:** The Department has the right to change, withdraw, and swap any of the Elective course anytime without any prior notice.

#### Postgraduate Study

MS (CS) Degree program is of 36 credit hours, and spread over 2 years with 2 Semesters in each year. The MS (CS) students are required to complete 2 core courses (6 credit hours) and 6 elective courses (18 credit hours), followed by a thesis (12 credit hours) to complete the MS degree

#### MSc

##### Year-I (Semester I)

Course Code	Course Title	Credit Hours
CS-7103	Advanced Theory of Computation	3
	Elective Course-I	3
	Elective Course-II	3

##### Semester II

Course Code	Course Title	Credit Hours
CS-7202	Advanced Analysis of Algorithms	3
	Elective Course-III	3
	Elective Course-IV	3

##### Year-2

##### Semester III

Course Code	Course Title	Credit Hours
	Elective Course-V	3
	Elective Course-VI	3
CS-7499	Partial Thesis	6

##### Semester IV

Course Code	Course Title	Credit Hours
CS-7499	Partial Thesis	6

##### Area of Specialization

##### Software Engineering

Course Code	Course Title	Credit Hours
CS-7101	Software Testing & Quality Assurance	3
CS-7104	Data Warehouse & Data Mining	3
CS-7204	Advanced Software Engineering	3
CS-7222	Semantic Web & Intelligent Systems	3
CS-7250	Design Patterns and Refactoring	3
CS-7143	Computer Vision & Image Processing	3

##### System Engineering

Course Code	Course Title	Credit Hours
CS-7211	Digital Signal Processing	3
CS-7201	Advanced Operating Systems	3
CS-7301	Advanced Computer Architecture	3
CS-7601	Parallel Algorithms	3

#### Formal Methods

Course Code	Course Title	Credit Hours
CS-7221	Formal Methods	3
CS-7218	Model Checking	3
CS-7501	Formal Software Development and Verification Methods	3
CS-7140	Graph Theory & its Formal Aspects	3
CS-7141	Process Algebra	3
CS-7253	Theory of Programming Languages	3

#### Networks

Course Code	Course Title	Credit Hours
CS-7105	Advanced Networks	3
CS-7232	Mobile Communication	3
CS-7205	Wireless Networks	3
CS-7206	Intelligent Mobile Systems	3
CS-7219	Mobile Computing	3
CS-7233	Cellular Networks & Communication	3

#### Artificial Intelligence

Course Code	Course Title	Credit Hours
CS-7225	Cybernetics and Cognitive Machines	3
CS-7251	Advanced Natural Language Processing	3
CS-7209	Design of Intelligent Multi-agent Systems	3
CS-7210	Machine Learning	3
CS-7216	Artificial General Intelligence & Machine Consciousness	3

**Note:** Department has the right to change, withdraw, and swap any of the specialized courses anytime without prior notice

### Department of Computer Science

#### In charge Director & Assistant Professor

Dr. Syed Asad Raza Kazmi

#### Assistant Professor

Saeed Ur Rehman Turk

Yahya Khurram

Muhammad Safyan

Muhammad Ilyas Fakhir

Ayesha Atta

Nadeem Zafar

Dr. Awais Qasim

#### Lecturer

Syed Ali Raza

Asma Kanwal

Adnan Khalid

Ijaz Hussain Bukhari

Atif Ishaq Khan

Muhammad Hafeez

Touseef Iftikhar

#### Visiting/Adjunct Faculty

Prof. Saadat Hassan

Prof. Inaam-ul-Haq

Nida Akram

Muhammad Waseem