Programme/Class: **Bachelor of Science**	Year: **Third**	Semester: **Six**
Subject: **Computer Science**		
Course Code: B070601T	Course Title: **Data Communication and Computer Network**	

Course outcomes:

After the completion of the course the students will be able:

1. To develop understanding of computer networks and communication basics.
2. To understand design issues and services at different layers of reference models.
3. To learn various error detection/correction techniques, routing protocols, congestion control algorithms, and connection establishment/release.
4. To describe and analyze related technical, administrative, and social aspects of networking.

Credits: **4**	**Core Compulsory**
Max. Marks: **25+75**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-0-0**

Unit	Topic	No. of Lectures
I	**Introduction to Signals** Data and Information, Data communication, Characteristics of data communication, Components of data communication, Data Representation, Data Flow, Simplex, Half Duplex, Full Duplex, Analog and Digital Signals, Periodic and Aperiodic signals, Time and Frequency Domain, Composite Signals	7
II	**Basic concepts of Networks:** Components of data communication, standards and organizations, Network Classification, Network Topologies ; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.	8
III	**Physical Layer** : Cabling, Network Interface Card, Transmission Media Devices- Repeater, Hub, Bridge, Switch, Router, Gateway.	7
IV	**Data Link Layer** Designing issues, Framing and Data Link Control, Error detection schemes (parity, checksums, CRCs), Error correction schemes (Hamming codes, binary convolution codes), Data link layer protocols (Simplest, Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Sliding Window), MAC sublayer (Ethernet, ALOHA, CSMA family, Contention-free access/Token Ring).	8
V	**Network Layer** Design issues, Switching, Routing algorithms (Shortest path, Link state, Flooding, Broadcast, Multicast), Packet Scheduling, Internetworking, Internet Protocol (IPv4, IPv6), IP addressing, Internet Control Protocols (IMCP, ARP, DHCP), Mobile IP.	8
VI	**Transport Layer** Transport layer services, Connection establishment and teardown, TCP, UDP, Congestion Control, Quality of Service, Domain Name System, World Wide Web.	8
VII	**Application Layer** : Application layer protocols and services – Domain name system, HTTP, WWW, telnet, FTP, SMTP	7
VIII	**Network Security** : Common Terms, Firewalls, Virtual Private Networks	7

Suggested Readings:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks," Fifth Edition, Pearson, 2014.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson, 2013.
3. Behrouz A. Forouzan, "Data Communications and Networking," Fourth Edition, McGraw-Hill Higher Education, 2007

This course can be opted as an elective by the students of following subjects:
B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

1. **Assessment Type: Class Tests (Max. Marks 14)**

   Suggested Usage:
   Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

   After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.
   After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.
   If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. **Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)**

   Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. **Assessment Type: Assignments (Max Marks: 4)**
   Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes,

Programme/Class: **Bachelor In Science**	Year: **Third**	Semester: **Six**
Subject: **Computer Science**		
Course Code: B070602T	Course Title: **Cyber Security & Cyber Laws**	

Course outcomes: After the completion of the course the students will be able to:

1. Understand types of information, cyber threats, and national/international cyber security standards.
2. Do mathematical modeling and development of security techniques and information system.
3. Develop understanding of legal issues related to cyber security.
4. Apply ethical principles/responsibilities in cyber practices.

Credits: **4**	**Core Compulsory**
Max. Marks: **25+75**	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): **4-0-0**

Unit	Topic	No. of Lectures
I	**Introduction:** Introduction to Information System, Type of information system, Development of information system, CIA model of Information Characteristics, Introduction to Information Security, Need of Information Security, Cyber Security, Business need, Ethical and Professional issues of security.	7
II	Information Security Model, Component of an Information security, Aspect of information security, Security attacks (Active and Passive Attacks), Security mechanism and Security Services (X.800).	8
III	Information Security Techniques, Introduction to Cryptography: Terminology, cryptanalysis, Security of algorithms, Substitution Cipher and Transposition Cipher, Single XOR , One-way Pad,	7
IV	Cryptographic Protocols-I: Arbitrated and Adjudicated Protocol, One- Way Hash function,	8
V	Cryptographic Protocols-II: Public key cryptography, Digital Signature, Digital Watermarking Technique: Characteristics and Types.	7
VI	Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies- Sample Security Policies.	8
VII	**Cyber Laws I:** Information Security Standards, IT act 2000 Provisions, Introduction to digital laws,	7
VIII	**Cyber Laws II:** cyber laws, intellectual property rights, copyright laws, patent laws, software license.	8

Suggested Readings:

1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security," Sixth Edition, Cengage Learning, 2017.
2. Douglas J. Landoll, "Information Security Policies, Procedure, and Standards: A Practitioner's Reference," CRC Press, 2016.
3. Harold F. Tipton, and Micki Krause, "Hand book of information security management," Sixth Edition, Archtech Publication, 2007.
4. William Stallings, "Cryptography and Network Security: Principles and Practice," Sixth Edition, Pearson, 2014.

This course can be opted as an elective by the students of following subjects:
B. Sc in Electronics, Physics, mathematics, Engineering, B.Sc. Vocational, BCA and MCA

Suggested Continuous Evaluation Methods:

1. **Assessment Type: Class Tests (Max. Marks 14)**

   Suggested Usage:
   Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

   After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.
   After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.
   If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. **Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)**

   Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. **Assessment Type: Assignments (Max Marks: 4)**

Programme/Class: **Bachelor of Science**	Year: **Third**	Semester: **Six**
Subject: **Computer Science**		
Course Code: B070603P	Course Title: Lab on Computer Networks	

Course outcomes:

CO1	Understand and explain the concept of Data Communication and networks, layered architecture and their applications.
CO2	Analyze and Set up protocol designing issues for Communication networks.
CO3	Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
CO4	Apply various network layer techniques for designing subnets and supernets and analyze packet flow on basis of routing protocols.
CO5	Estimate the congestion control mechanism to improve quality of service of networking application

Credits: **2**	**Core Compulsory**
Max. Marks: **25+75**	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): **0-0-4**	

Software Lab based on Computer Networks:

Implement the concepts of Computer Networks such as:

1. Simulate Checksum Algorithm.
2. Simulate CRC Algorithm
3. Simulate Stop & Wait Protocol.
4. Simulate Go-Back-N Protocol.
5. Simulate Selective Repeat Protocol.

and so on....

Common Guidelines for Course Code: B070504P and Course Code: B070604P

Research Project Guidelines for V and VI Semester

1. Objectives of the Project

- To facilitate the student to independently formulate and solve a social, philosophical, commercial, or technological problem and present the results in written and oral form.
- To render students to the real life problems.
- To provide opportunities to students to interact with people and present them confidently.

2. Types of Project

The students are expected to work on:

(1) Application Oriented Project or
(2) Research Oriented Project.

However, it is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. It is upon the student to carry the same project of V semester to VI semester OR choose a new project for VI semester. Use the latest versions of the software packages for the development of the project.

3. Software and Broad Ideas of Application

- **Languages** - C, C++, Java, VC++, C#, R,Python
- **Scripting Languages** - PHP,JSP, SHELL Scripts (Unix), TcL/TK
- **.NET Platform** - F#,C#. Net, Visual C#. Net, ASP.Net
- **Middle Ware(Component) Technologies** - COM/DCOM, Active-X, EJB
- **Front-End/GUI Tools** - .Net Technologies, Java
- **Back-End/DBMS** - Oracle, SQL Plus, MY SQL, SQL Server
- **UNIX Internals** - Device Drivers, RPC, Threads, Socket programming
- **Real time Operating Systems/Embedded Skills** - LINUX, Raspberry Pi, Arduino.
- **Application and Research Areas** - Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E-Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming

4. Eligibility of the Guide

Guide should be a regular teacher of the University/College/Higher Education Institute. Student can also do the project under the guidance of regular teacher of Institute of National Importance .

5. Introduction to the Project

The student should include the details in the project diary, in which they will record the progress of their project throughout the course. The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

6. Structure and Format of the Project

Chapter 1 to 4 should be submitted in Semester V in spiral binding and these chapters have also to be included in Semester VI report if same project is carried from V to VI semester. If different projects are taken than complete project report is to be submitted in each semester. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the project in V and VI semester independently.

(i) Title Page:

Sample format of Title page is given below. Students should follow the given format.

(All the text should be in Times New Roman)

<TITLE OF THE PROJECT>
(NOT EXCEEDING 2 LINES, 24 BOLD, ALL CAPS)

A Project Report (12 Bold)

Submited in partial fulfilliment of the
Requirement of the award of the Degree of (Size- 12)

BACHELOR OF SCINCE (14 BOLD, CAPS)

By (12 Bold)

Name of The Student (Size 15, title case)
Roll Number (Size- 15)

COLLEGE LOGO

DEPARTMENT NAME
FACULTY NAME (12 BOLD, CAPS)
UNIVERSITY/COLLEGE NAME (14 BOLD, CAPS)
Affiliated to University Name) (12, Title case, bold, talic)

CITY, PIN CODE(12 bold, CAPS)
UTTAR PRADESH (12 bold, CAPS)
YEAR (12 bold)

(ii) Original Copy of the Approval Proforma of the Project Proposal:

Sample Proforma of Project Proposal is given below. Students should follow the given format.

PROFORMA FOR THE APPROVAL OF PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be rejected)

Roll no:……..

1. Name of the Student
……

2. Title of the Project
……

3. Name of the Guide
……

4. Teaching experience of the Guide
……

Signature of the Student
Date……

Signature of the Guide
Date:……

Signature of the Project Coordinator
Date……

(iii) Certificate of Authenticated work:

Sample format of Certificate of Authenticated work is given below. Students should follow the given format. Also, HEIs/Institutes/Colleges are required to give plagiarism report for the project work.

UNIVERSITY/COLLEGE NAME (14 BOLD, CAPS)
***(Affiliated to University Name)* (13, bold, italic)**
CITY NAME-PINCODE (13 bold, CAPS)

DEPARTMENT NAME (14 BOLD, CAPS)

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, "**Title ofThe Project**", is bonaficd work of **NAME OF THE STUDENT** bearing **Roll No.** submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in COMPUTER SCIENCE from **University Name**. (12, times new roman, justified)

Name of Internal Guide (12 bold) Name of Coordinator

(Don't write names of lecturers or HOD)

External Examiner

Date: College Seal

(iv) **Certificate from other Institute of National Importance** (to be issued by the HEI and the photocopy of the certificate is to be attach)

(v) **Abstract**

This should be one/two short paragraphs (100-150 words total), summarizing the project work. It will not be a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to determine if the project is of interest to them and, it should present results of which they may wish to know more details.

(Project Abstract page format)

Abstract (20bold, caps, centered)

Content goes here (12, justified)

Note: Entire document should be with 1.5 line spacing and all paragraphs should start with 1 tab space.

(vi) **Acknowledgements**

This should express student's gratitude to those who have helped in the preparation of project.

ACKNOWLEDGEMENT (20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, Justified.

(vii) **Declaration**

(Declaration page format)

DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, "**Title of the Project'** done at **[name of place where projects is done]** has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other universiny.

The project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE** to be submitted as **[V OR VI]** semester project as part of our curriculum.

Name and Signature of the Student

(viii) **Table of Contents**

The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below.

TABLE OF CONTENTS (20bold, caps, centered)

Should be generated automatically using word processing software.

(ix) **List of Tables**

List of all the tables in the project along with their page numbers.

List of Tables (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

(x) List of Figures

List of all the figures, graphs, charts etc. in the project along with their page numbers.

> **List of Figures (20 bold, centered, Title Case)**
>
> Should be generated automatically using word processing software.

Chapter 1: Introduction

The introduction has several parts as given below:

- Background: A brief detail of background and framework of project and its relation to work done in the area.
- Objectives: Point wise statement of the aims and objectives of the project
- Purpose, Scope and Applicability: The description of Purpose, Scope, and Applicability are given below:
  - Purpose: Describe the topic of the project on the basis of why this project is being done. How this project improve the existing system.
  - Scope: Describe methodology, assumptions and limitations.
  - Applicability: State the application of project.
- Achievements: Explain what kind of purpose is achieved after completion of project.
- Organization of Report: Summarize remaining chapters of the project report.

> (Project Introduction page format)
>
> **Chapter 1**
>
> **Introduction (20 Bold, centered)**
>
> Content or text (12, justified)
>
> Note: Introduction has to cover brief description of the project with minimum 4 pages.

Chapter 2: Literature Review OR Survey of Technologies

In this chapter survey of technologies for application oriented project should demonstrate the student awareness and understanding of available technologies OR literature survey is required for research oriented project. The student should give the detail of all the related literature/technologies that are necessary to complete the project. The student should present a comparative study of all those technologies/literature.

Chapter 3: Requirements and Analysis (For Application Oriented) OR [Title of Research Working Chapter]

Chapter 4: System Design (For Application Oriented) OR [Chapter related to Research Work]

Chapter 5: Implementation and Testing

- **Implementation Approaches:** Define the plan of implementation, and the standards or standard data sets used in the implementation.
- **Coding Details and Code Efficiency:** Students not need include full source code, instead, include only the important codes (design of new data structure, algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way. The student can explain the function of the code with a shot of the output screen of that program code. The student should explain how the code is efficient and how the students have handled code optimization.
- **Testing Approach**
- **Modifications and Improvements**

Chapter 6: Results and Discussion

- **Test Reports:** Student should provide the test results and reports based on the test cases to show that it works fine in different conditions of input.
- **User Documentation:** In this section, working of the software should be explained; also explain its different functions with screen shots. The user document should be like a manual.

Chapter 7: Conclusions and Future Work

The conclusions shall be summarized with in 2 or 3 pages. This chapter mainly focuses on:

- Limitations of the Proposed System OR Research
- Future Scope describes new areas of investigation and parts of the current work that was not completed due to time constraints and/or problems encountered.

(xi) References

In this, students acknowledge the work of others that they have used or adapted in their own work. Student can follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports.

Eg.

Lipson, Charles (2011). Cite right : A quick guide to citation styles; MLA, APA, Chicago, the sciences, professions, and more (2nd ed.). Chicago [u.a.]: University of Chicago Press. p. 187. ISBN 9780226484648.

(xii) Glossary

If any acronyms, abbreviations, symbols, or uncommon terms is used in the project report then their meaning should be explained where they first occur.

(xiii) Appendices

Appendix include some further details like results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

7. Evaluation

- During the project work, its progress will be monitored, on fortnightly/monthly basis, by the internal guide.
- 2 copies of Project Report to be submitted to department (1 copy to be retained by department, 1 copy for student)
- End Examination shall be based on Project Report, Presentation, Viva, and Demonstration of the software**.**
- Project carries 3 Credit Points.

Duration (for 1 group):

Evaluation in V and VI semester separately		
Type of evaluation	**Total time**	**Max. Marks**
Presentation	10 minutes	25
Viva	10 minutes	20
Demonstration	5 minutes	20
Report checking	5 minutes	35
Total Time/Max. Marks	**30 minutes**	**100**

Format of Certificate of Evaluation

Certificate of Evaluation (14 point, Times, Bold)

This is to certify that the undersigned have assessed and evaluated the project work titled "……." submitted by the following student(s).
1.
2.
3.

The project report has been accepted/ rejected for the partial fulfillment of B.Sc. progarmme.

Signature of the examiner
Name of the examiner

Stamp of the Department

8. Project Viva Voice

Student may be asked to write code for some segment of the problem during VIVA to check his coding capabilities. The project can be done in group of at most two or three students. A big project can be modularized and different modules can be assigned as separate project to different students.

9. Plagiarism