PROGRAMME: BCA (Bachelor of Computer Applications)

SEMESTER – III

Teaching-Learning & Evaluation Plan (TLEP)

Course Information:

Course Code: 23BCA3C02 **Course Title**: Computer Networks

Credits Units: 03 Contact Hours+ Experiential Hours : 45+45 L-T-P-E : 3-0-0-3

IA: UE Weightage – 50 : 50 Pass Marks (IA & ESE)– 40 (ESE – Min.18) Aggregate Pass Marks: 40%

UE Question Paper Marks: 50 Special Examination Fees: NA

Pre-requisite (if any):

Students should know the ***Fundamentals of Computer Network.***

Course Facilitator (s):

Dr. Nidhya.M.S Associate Professor School of CS & IT

Dr.Preethi D Assistant Professor School of CS & IT

Dr.Sambath Kumar S Assistant Professor School of CS & IT

Dr.Boopathi Raja Assistant Professor School of CS & IT

Outcomes (POs) and Programme Specific Outcomes (PSOs)

Programme Outcomes (POs)	
At the end of the programme, students will be able to	
PO 1	**Computational Knowledge:** Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.
PO 2	**Problem Analysis:** Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
PO 3	**Design / Development of Solutions:** Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand, and propose integrated solutions using emerging technologies.

PO 4	**Conduct Investigations of Complex Computing Problems:** Ability to devise and conduct experiments, interpret data and provide well-informed conclusions.
PO 5	**Modern Tool Usage:** Ability to select modern computing tools, skills and techniques necessary for innovative software solutions.
PO 6	**Professional Ethics:** Ability to apply and commit professional ethics and cyber regulations in a global economic environment.
PO 7	**Life-long Learning:** Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
PO 8	**Project Management:** Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
PO 9	**Communication Efficacy:** Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
PO 10	**Societal & Environmental Concern:** Ability to recognize economic, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.
PO11	**Individual & Team Work:** Ability to work as a member or leader in diverse teams in multidisciplinary environment.
PO12	**Innovation and Entrepreneurship**: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

Program Specific Outcomes (PSO's)

PSO 01	Understand, analyze and develop computer programs and algorithms, develop solutions for specific applications using appropriate data modeling concepts.
PSO 02	Apply standard software engineering practices and strategies in software project development using open- source programming environment to deliver a quality product for business success.
PSO 03	Be acquainted with the contemporary issues, latest trends in technological development and thereby generate new ideas and solutions to existing problems.

Course Objectives:

COB1	To Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
COB2	To Gain the knowledge of basic network devices, Wireless Technology and wireless networking components
COB3	To Acquire the knowledge of Network Layer routing protocols and Application Layer
COB4	To Learn the WAN Technology and Network Operating Systems as well as basic trouble shooting network

Course Outcomes:

At the end of the course, students will be able to

Sl No	**Course Outcome**	**Description**	**Bloom's Taxonomy Level**
1	**CO 1**	Describe the basics of data communication, networking, internet and their importance	**L2**
2	**CO 2**	Explain the concepts of layered architecture, protocols and interworking in computer networks	**L2**
3	**CO 3**	Examine the various networks using the logical addressing by applying subnetting and routing concepts	**L4**
4	**CO 4**	Demonstrate the working of transport and application layer protocols in an IP based networking infrastructure.	**L3**
5	**CO 5**	Assess application layer services, client-server model, HTTP, email, WWW, TELNET.	**L5**

CO-PO/PSO Mapping: (3-Strong Correlation 2- Medium Correlation 1- Low Correlation)

Course Outcome	**Bloom's Taxonomy Level**	**Program Outcomes(PO)**												**Program Specific Outcomes(PSO)**		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	L2	3	1	1	1	1	1	-	-	-	-	-	-	1	2	2
CO2	L3	2	2	2	1	1	2	-	-	-	-	-	-	1	2	2
CO3	L4	2	2	2	1	2	2	2	1	2	1	1	1	1	1	2
CO4	L5	3	3	3	2	3	2	3	1	2	1	2	2	3	2	2

CO5	L5	3	3	2	2	2	2	2	1	2	1	2	2	3	2	2
CO Avg.		2.6	2.2	2	1.4	1.8	1.8	2.3	1	2	1	1.6	1.6	1.8	1.8	2

Course Contents:

SYLLABUS				
Module (Hours)	**Contents**	**Tools Used / Assessment and Activity**	**CO Mapping**	**PO Mapping**
Module 1 (9Hrs)	Data communications : characteristics, components, data representation, data flow. Networks : distributed processing, network criteria, types of connections, types of topologies, categories of networks, Network models : the OSI model, layered architecture, layers in the OSI model, TCP/IP protocol suite.	**Activity:** Online Certification Course – 13 to 15 Hours Linked in Learning.	CO1	PO1, PO2, PO3, PO4, PO5, PO6
Module 2 (9Hrs)	Physical layer : analog and digital, analog signals, digital signals, analog versus digital, data rate limit, transmission impairments, transmission mode, modulation of digital data, telephone modems, modulation of analog signal, FDM, WDM, TDM, guided media, unguided media, switching, networking devices.	**Assessment:** Internal Test **Activity:** Flip Class/ Mini project/ Presentation / Seminar	CO2	PO1, PO2, PO3, PO4, PO5, PO6
Module 3 (9Hrs)	Data link layer : error detection and correction, types of errors, error detection and correction techniques, data link control and protocols, flow and error control, stop-and-wait ARQ, go-back-n ARQ, selective repeat ARQ, multiple access.	**Activity:** Presentation / Report writing, Mini project/ Case studies.	CO3	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
Module 4 (9Hrs)	Network layer : classful addressing, logical addressing, IPv4, subnets, FLSM, VLSM, classless inter domain routing (CIDR), public and private addresses, network address translation (NAT), unicast routing protocols, distance vector routing, RIP, link state routing, OSPF, path vector routing, BGP Transport layer : process-to-process delivery, port addresses, socket address, user datagram protocol (UDP), transmission control protocol (TCP), 3-way handshaking, SCTP, data traffic, traffic descriptors, congestion control.	**Activity:** Presentation / Report writing, Mini project/ Case studies.	CO4	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO11, PO12
Module 5 (9Hrs)	Application layer : domain name system (DNS), Dynamic Host Configuration Protocol (DHCP), remote logging, TELNET, electronic mail, file transfer, WWW, HTTP, HTTPS. Network security : Basic of cryptography, types of Cryptography, symmetric key cryptography, public key cryptography	**Assessment:** Preparatory Exam **Activity:** Presentation / Report writing, Mini project/ Case studies.	CO5	PO1, PO2, PO8, PO9, PO10, PO11

Textbook	
TB	Behrouz A.Forouzan, ”Data Communications and Networking”,McGrawHill,5TH Edition,2017, ISBN-10: 1259064751.

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References	
RB-1	Todd Lammle,"CCNA Cisco Certified Network Associate: Study Guide", 7th Edition, Wiley India, 2011,ISBN:978-0-470-90107-6.
RB-2	Wendell Odom,"CCENT/CCNA ICND1 640-822 Official Cert Guide", 3RD Edition, Pearson, 2013,ISBN-10:1587204258.
RB-3	Rick Graziani, Allan Johnson,"Routing Protocols and Concepts CCNA Exploration Companion Guide", Pearson, 2008,ISBN-13: 978-1-58713-204-9.
RB-4	Cisco Networking Academy,CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 , Pearson, 2010. ISBN-13: 978-1-58713-251-3.

Session-Wise Plan:

Abbreviations & Expansions			
Pedagogy/Activity Planned		**Mode of Delivery**	
P1	Synchronous-PPT	M1	Synchronous - PPT
P2	Blended Learning	M2	Asynchronous/Synchronous
P3	Flip Class/Quiz	M3	Synchronous-Hands On
A1	Activity-1	M4	Synchronous-Discussion
A2	Activity-2		

Web Video Links: WVL		
WVL-1	Module-1	https://www.youtube.com/watch?v=VwN91x5i25g&list=PLBlnK6fEyqRgMCUAG0XRw78_UA8qnv6jEx
WVL-2	Module-2	https://www.youtube.com/watch?v=MzhiVE6OuQA
WVL-3	Module-3	https://www.youtube.com/watch?v=TqWLJMt1dtQ
WVL-4	Module-4	https://purplesec.us/common-network-vulnerabilities/
WVL-5	Module-5	https://www.youtube.com/watch?v=0-eefKkafhs

Web Text Links: WTL

WTL-1	Module-1	https://www.tutorialspoint.com/data_communication_computer_network/computer_network_topologies.htm
WTL-2	Module-2	https://www.tutorialspoint.com/ieee-802-3-and-ethernet
WTL-3	Module-3	https://www.geeksforgeeks.org/structure-and-types-of-ip-address/
WTL-4	Module-4	https://www.digitaldefense.com/blog/what-are-the-most-common-types-of-network-vulnerabilities/
WTL-5	Module-5	https://www.softwaretestinghelp.com/network-troubleshooting-steps-tools/

Blended Learning [P2-Blended Learning with Hands on] :
Interaction - (30 minutes) Teacher Input 20 minutes) Wrap Up (10 minutes)

MOOC Courses (MC):

Sr.No.	Platform	Topic	CO	Link	Duration
MC-1	LinkedIn Learning	Networking foundation	C01	https://www.linkedin.com/learning/networking-foundations-networking-basics/welcome-to-the-network?contextUrn=urn%3Ali%3AlyndaLearningPath%3A56db22d592015a6c9c8dbc4e&u=92695330	1hr 48min

MC-2	LinkedIn Learning	Network WANs	CO1 CO2	https://www.linkedin.com/learning/networking-foundations-network-media-wans/welcome?u=92695330	1hr 59min
MC-3	LinkedIn Learning	IP Addressing	Co1, CO2,CO3 CO4	https://www.linkedin.com/learning/networking-foundations-ip-addressing-2020/welcome-to-this-course?contextUrn=urn%3Ali%3AlyndaLearningPath%3A56db22d592015a6c9c8dbc4e&u=92695330	1 hr 32 min
MC-4	LinkedIn Lea JAIN rning	Cisco Networking	CO1, CO2,CO3 CO4,CO5	https://www.linkedin.com/learning/cisco-networking-foundations/welcome?u=92695330	1 hr 50 min
MC-5	LinkedIn Learning	Network Troubleshooting Need	CO1 CO3 CO4 CO5	https://www.linkedin.com/learning/learning-network-troubleshooting-2021/need-to-troubleshoot-your- network?u=92695330	2hr
MC-6	LinkedIn Learning	Trouble shooting Network Connectivity	CO3 CO4,CO5	https://www.linkedin.com/learning/troubleshooting-network-connectivity/introduction?u=92695330	**1hr 10m**
Total MOOC Course integration with Certification					**12 hours**

Assessment Scheme: IA: UE - 30:70

Sl. No.	Assessment Instrument	Formative/ Summative	Frequency	Weightage (%)	CO
1	Class Participation	**Formative**	Continuous	5	CO1, CO2, CO3, CO4, CO5
2	Activity-1	**Formative**	1	15	CO1, CO2, CO3, CO4, CO5
3	Activity-2		1	15	CO3
4.	Internal Test - 1		1	7.5	CO1, CO2,CO3
5	Internal Test - 2		1	7.5	CO3, CO4, CO5
6.	End Semester Exam	**Summative**	1	50	CO1, CO2, CO3, CO4, CO5
	Total			100	

Session-wise Planning:

Module	Session	Topic	PPT	Readings and References	Pedagogy/ Activity Planned	CO	Mode of Delivery
Module 1	Zero Lecture 1	Computer Network- Need, Scope, Opportunity & Career	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	Blended Learning Approach	P1	CO1	M1
	2	Data communications : characteristics, components	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5Pv	TB1 and RB1	P1		M1

			Own-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true				
	3	Data representation, data flow	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
	4	Networks : distributed processing, network criteria	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
	5	Types of connections, Types of topologies, categories of networks	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
	6	Network models : the OSI model	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=1120	TB1 and RB1	P1		M1

			256263919 55878393& rtpof=true& sd=true				
	7	Layered architecture,	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
	8	layers in the OSI model	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
	9	TCP/IP protocol suite.	https://docs.google.com/presentation/d/14BHhTp-ZBXQ4KUNfL5PvOwn-eSZtQcW2/edit?usp=sharing&ouid=112025626391955878393&rtpof=true&sd=true	TB1 and RB1	P1		M1
Module 2	10	Physical layer : analog and digital,	https://drive.google.com/file/d/1vod0A_QqxhsVjHPOGMLelhcMagFYV-rv/view?usp=sharing	TB1 and RB1	P1	CO2	M1

	11	Analog signals, digital signals, analog versus digital,	https://drive.google.com/file/d/1vod0A_QqxhsVjHPOGMLelhcMagFYV-rv/view?usp=sharing	TB1 and RB1	P1		**M1**
	12	Data rate limit, transmission impairments, transmission mode,	https://drive.google.com/file/d/1vod0A_QqxhsVjHPOGMLelhcMagFYV-rv/view?usp=sharing	TB1 and RB1	P1		M1
	13	Modulation of digital data,	https://drive.google.com/file/d/1mhYmKP5fWTFXFDEOvsIuDjpjUrannfGf/view?usp=sharing	TB1 and RB1	P1		M1
	14	Telephone modems, modulation of analog signal,	https://drive.google.com/file/d/1mhYmKP5fWTFXFDEOvsIuDjpjUrannfGf/view?usp=sharing	TB1 and RB1	P1		M1
	15	FDM, WDM, TDM,	https://docs.google.com/presentation/d/1YlnXySlf0Rpwg5g8snhUEzmoz4v802JW/edit?usp=sharing&ouid=104167089099961783478	TB1 and RB1	P1		M1

			&rtpof=true&sd=true				
	16	Guided media, Unguided media,	https://docs.google.com/presentation/d/1YlnXySlf0Rpwg5g8snhUEzmoz4v802JW/edit?usp=sharing&ouid=104167089099961783478&rtpof=true&sd=true	TB1 and RB1	P1		M1
	17	Switching,	https://docs.google.com/presentation/d/1YlnXySlf0Rpwg5g8snhUEzmoz4v802JW/edit?usp=sharing&ouid=104167089099961783478&rtpof=true&sd=true	TB1 and RB1	P1		M1
	18	Networking devices.	https://docs.google.com/presentation/d/1YlnXySlf0Rpwg5g8snhUEzmoz4v802JW/edit?usp=sharing&ouid=104167089099961783478&rtpof=true&sd=true	TB1 and RB1	P1		M1

Module 3	19	Data link layer : error detection and correction,		TB1 and RB2	P1	CO3	M1
	20-21	Types of errors, error detection and correction techniques,		TB1 and RB2	P1		M1
	22	Data link control and protocols,		TB1 and RB2	P1		M1
	23	Flow and error control,		TB1 and RB2	P1		M1
	24	Stop-and-wait ARQ,					
	25	Go-back-n ARQ,		TB1 and RB2	P1		M1
	26	Selective repeat ARQ,		TB1 and RB2	P1		M1
	27	Multiple access.		TB1 and RB2	P1		M1
Module 4	28	Network layer : classful addressing, logical addressing,	S…	TB1 and RB2	P1	CO4	M1
	29	IPv4, subnets, FLSM, VLSM,	S…	TB1 and RB2	P1		M1
	30	classless inter domain routing (CIDR), public and private addresses,	S…	TB1 and RB3	P1		M1
	31	Distance vector routing, RIP, link state routing,	S…	TB1 and RB3	P1		M1
	32	OSPF, path vector routing,	S…	TB1 and RB3	P1		M1
	33	BGP Transport layer : process-to-process delivery, port addresses, socket address,	https://docs.google.com/presentation/d/1ZyPsjlpO	TB1 and RB3	P1		M1

			WQvocmNyBqScoSbKNijHdblK/edit?usp=drive_link&ouid=113727209617748446348&rtpof=true&sd=true				
	34	User datagram protocol (UDP), Transmission control protocol (TCP),	https://docs.google.com/presentation/d/1VecJn0wfSP9AFd225oaxO9aHDbJFDN5J/edit?usp=drive_link&ouid=113727209617748446348&rtpof=true&sd=true	TB1 and RB1	P1		M1
	35	3-way handshaking, SCTP, Data traffic,	S…	TB1 and RB1	P1		M1
	36	Traffic descriptors, Congestion control.	https://docs.google.com/presentation/d/1smKQu9sD7Ty4THl4X4n5r5BStrq_s_Vy/edit?usp=drive_link&ouid=113727209617748446348&rtpof=true&sd=true	TB1 and RB2	P1		M1
	37	Application layer : domain name system (DNS),	https://docs.google.com/presentation/d/1R4U	TB1 and RB1	P1		M1

Module 5			19oZhBtOooEOoO5a-zuu3dF6fl5U1/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true				
	38	Dynamic Host Configuration Protocol (DHCP),	https://docs.google.com/presentation/d/10WHzE9UdtR4xi9AexAG5-ghLWJqNeXsT/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB2	P1	CO5	M1
	39	Remote logging, TELNET,	https://docs.google.com/presentation/d/1cladAZFgMxbAfWeVtgD0DZcO-of6eTbt/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB4	P1		M1
	40	Electronic mail, file transfer,	https://docs.google.com/presentation/d/1BNlBhQ6PegBse3e6IpHksLDE4AmL1WVR/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB4	P1		M1
	41	WWW, HTTP, HTTPS.	https://docs.google.com/presentation/d/1RfWllFhMt6hTTsNHkoM3X9WUVvYnID8j/edit?usp=drive	TB1 and RB4	P1		M1

			_link&ouid=117524945457729047965&rtpof=true&sd=true				
	42	Network security : Basic of cryptography,	https://docs.google.com/presentation/d/1xYguas_ZotANwDLK5LJOP4mnFevKxI4x/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB4	P1		M1
	43, 44	Types of Cryptography, Symmetric key cryptography,	https://docs.google.com/presentation/d/1ELvYGWzpSM9eIowJhH6ty-1_LZB7jNno/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB4	P1		M1
	45	Public key cryptography	https://docs.google.com/presentation/d/1DOh5fAYO7g9z0Vd6UtHGwkEtO_pq4Llz/edit?usp=drive_link&ouid=117524945457729047965&rtpof=true&sd=true	TB1 and RB4	P1		M1

Assessment Sheet with Rubrics for Grading & Evaluation

Activity-1 MOOC

	USN	Student Name	Certification	On-time Submission	Conclusion with Learning Outcome in Report	Originality of Report (less than 12%)	Total	Conversion
			15 Marks	5 Marks	20 Marks	10 Marks	50 Marks	15 Marks

Activity-2 Mini project

Sr. No.	USN No.	Student Name	On-time Submission	Abstract Submission	Synopsis submission	Identification	Coding and implementation	Report with Conclusion	Originality of Report (less than 12%)	Total	Conversion
			5 Marks	10 Marks	10 Marks	5 Marks	5 Marks	10 Marks	10 Marks	50 Marks	15 Marks