St Aloysius College (Autonomous)

Mangaluru

Re-accredited by NAAC "A" Grade

NATIONAL EDUCATION POLICY - 2020 (NEP-2020)

Curriculum Structure

for

Bachelor of Computer Applications (BCA) Programme

(Basic and Honours Degree)

and

Open Elective Courses in Computer Science

ಸಂತ ಅಲೋಶಿಯಸ್ ಕಾಲೇಜು (ಸ್ವಾಯತ್ತ)
ಮಂಗಳೂರು– 575 003
www.staloysius.edu.in

ESTD : 1880

ST ALOYSIUS COLLEGE(AUTONOMOUS)
MANGALURU – 575 003
Phone: 0824-2449700, 2449701
Fax: 0824-2449705
Email: principal@staloysius.edu.in

Re-accredited by NAAC with 'A' Grade with CGPA 3.62/4
Recognised by UGC as "College with Potential for Excellence"
Conferred "College with "STAR STATUS" by DBT, Government of India.
Centre for Research Capacity Building under UGC-STRIDE

Date: 17-08-2022

NOTIFICATION

Sub: Syllabus of **B.C.A.** under NEP Regulations, 2021.
(As per Mangalore University guidelines)

Ref: 1. Decision of the Academic Council meeting held on 18-12-2021 vide Agenda No: 6.4 (2021-22)
2. Decision of the Academic Council meeting held on 09-07-2022 vide Agenda No: 14
3. Office Notification dated 21-02-2022
4. Office Notification dated 17-08-2022

Pursuant to the above, the Syllabus of **B.C.A.** under NEP Regulations, 2021 which was approved by the Academic Council at its meeting held on 18-12-2021 & 09-07-2022 is hereby notified for implementation with effect from the academic year **2021-22**.

PRINCIPAL

ST. ALOYSIUS COLLEGE MANGALURU 575 003 (AUTONOMOUS)

REGISTRAR

To:

1. The Chairman/Dean/HOD.
2. The Registrar Office
3. Library

Preface

The BoS committee members are thankful to the Government of Karnataka for initiating the process of implementation of NEP-2020 and Authorities of the Mangalore University for implementing the concern syllabus for the academic year 2021- 22 onwards in St Aloysius College(Autonomous). It is our privilege to be part of this process through a respected BoS committee for finalizing syllabus of the UG Four Year BCA (Honors) Programme.

The BoS committee is committed to frame the remaining part of the syllabus for the BCA Programme and will be working further to fulfill all academic input requirements in implementing the curriculum in letter and spirit of NEP 2020.

Preamble

Computer Application (CA) has been evolving as an important branch of science and technology in last two decade and it has carved out a space for itself like computer science and engineering. Computer application spans theory and more application and it requires thinking both in abstract terms and in concrete terms.

The ever -evolving discipline of computer application has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers and its applications, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data Science, Computational Science, and Software Engineering.

Universities and other HEIs introduced programmes of computer application. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavour has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge.

In India, it was initially introduced at the Master (postgraduate) level as MCA and M.Tech. Later on, engineering programmes such as B.Tech and B.E in Computer Science & Engineering and in Information Technology were introduced in various engineering College/Institutions to cater to the growing demand for trained engineering manpower in IT industries. Parallelly, BCA, BSc and MSc programmes with specialization in Computer Science were introduced to train manpower in this highly demanding area.

BCA (Basic / Hons) are aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in CS or MCA leading to research as well as R&D, can be employable at IT industries, or can pursue a teaching profession or can adopt a business management career.

BCA (Basic / Hons) aims at laying a strong foundation of computer application at an early stage of the career. There are several employment opportunities and after successful completion of BCA, graduating students can fetch employment directly in companies as programmer, Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The Program outcomes in BCA are aimed at allowing flexibility and innovation in design and

development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in BCA courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages.

All students must, therefore, have access to a computer with a modern programming language installed. The computer science framework does not prescribe a specific language. The teacher and students will decide which modern programming languages students will learn. More importantly, students will learn to adapt to changes in programming languages and learn new languages as they are developed.

The present Curriculum Framework for BCA degrees is intended to facilitate the students to achieve the following.

- To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation
- To develop the ability to use this knowledge to analyse new situations in the application domain
- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- To learn skills and tools like mathematics, statistics and electronics to find the solution, interpret the results and make predictions for the future developments
- To formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate

The objectives of the Programme are:

1. The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software
2. It helps students analyze the requirements for system development and exposes students to business software and information systems
3. This course provides students with options to specialize in legacy application software, system software or mobile applications
4. To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem- solving skills through programming
7. To prepare students who wish to go on to further studies in computer science and related subjects.
8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

Program Outcomes: **BCA** (3 Years) **Degree**

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
5. **Application Systems Knowledge**: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.
8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.
9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.
11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional Program Outcomes: **BCA Degree** (Hons)

The Bachelor of Computer Application (BCA (Hons.)) program enables students to attain following additional attributes besides the afore-mentioned attributes, by the time of graduation:

1. Apply standard Software Engineering practices and strategies in real -time software project development
2. Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.
3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems
4. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.
5. The ability to work independently on a substantial software project and as an effective team member.

C5. Model Programme Structure for Bachelor of Computer Applications (Basic/Hons.) with Computer Applications as Programme Core Subject with Practical

Sem.	Discipline Core (DSC) (Credits)	DisciplineElective (DSE) / Open Elective (OE) (Credits)	Ability Enhancement Compulsory Courses (AECC), Languages (Credits) (L+T+P)		Skill Enhancement Courses (SEC)			Total Credits
					Skill based (Credits) (L+T+P)	Value based (Credits) (L+T+P)		
I	CA C-1 (3+2) CA C-2 (3+2) CA C-3 (3)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)		SEC-1: Digital Fluency (2) (1+0+2)	Yoga (1) (0+0+2)	Health & Wellness (1) (0+0+2)	26
II	CA C-4 (3+2) CA C-5 (3+2) CA C-6 (3)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)	Environmental Studies (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	26
Exit option with Certificatein Computer Applications (with the completion of courses equivalent to a minimum of 48 credits)								
III	CA C-7 (3+2) CA C-8 (3+2) CA C-9 (3)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs each)		SEC-2: Artificial Intelligence or some other SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/C ultural (1) (0+0+2)	26
IV	CA C-10 (3+2) CA C-11 (3+2) CA C-12 (3)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs each)	Constitution of India (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/C ultural (1) (0+0+2)	26
Exit option with Diploma in Computer Applications (with the completion of courses equivalent to a minimum of 96 credits)								
V	CA C-13 (3+2) CA C-14 (3+2) CA C-15 (3)	CA E-1 (3) Vocational-1 (3)			SEC-3: Cyber Security or some other SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/C ultural (1) (0+0+2)	23
VI	CA C-16 (3+2) CA C-17 (3+2) CA C-18 (3)	CA E-2 (3) Vocational-2 (3) Internship (2)			SEC-4: Professional Communication (2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
Exit Option with Bachelor of Computer Applications Degree, BCA Degree (with completion of courses equivalent to a minimum of 140 credits)								
VII	CA C-19(3+2) CA C-20(3+2) CA C-21 (3)	CA E-3 (3) Vocational-3 (3) Res.methodology (3)						22
VIII	CA C-22 (3) CA C-23 (3) CA C-24 (3)	CA E-4 (3) Vocational-4 (3) Research Project(6)*						21
Award of Bachelor of Computer Applications with Honours, BCA (Hons.) Degree (with completion of courses equal to a minimum of 180 credits)								

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

Curriculum for BCA

Sem	Core Courses	Hour / Week		DS Elective Courses	Hous/ Week
		Theory	Lab		
1	i. Fundamentals of Computers	3			
	ii. Programming in C	3			
	iii. Mathematical Foundation	3			
	iv. LAB: Information Technology		4		
	v. LAB: C Programming		4		
2	i. Discrete Mathematical Structures	3			
	ii. Data Structures using C	3			
	iii. Object Oriented Concepts using JAVA	3			
	iv. LAB: Data Structure		4		
	v. LAB: JAVA Lab		4		
3	i. Data Base Management Systems	3			
	ii. C# and DOT NET Framework	3			
	iii. Operating Systems Concepts	3			
	iv. LAB: DBMS		4		
	v. LAB: C# and DOT NET Framework		4		
4	i. Python Programming	3			
	ii. Computer Multimedia and Animation	3			
	iii. Computer Communication and Networks	3			
	iv. LAB: Multimedia and Animation		4		
	v. LAB: Python programming		4		
5	i. Internet Technologies	3		(a) Cyber Law and Cyber Security	3
	ii. Statistical Computing and R Programming	3		(b) Cloud Computing	3
	iii. Software Engineering	3		(c) Business Intelligence	3
	iv. LAB: R Programming		4		
	v. LAB: JAVA Script, HTML and CSS		4		
	vi. Vocational 1	3			
6	i. Artificial Intelligence and Applications	3		(a) Fundamentals of Data Science	3
	ii. PHP and MySQL	3		(b) Mobile Application Development	3
	iii. LAB: PHP and MySQL		4	(c) Embedded Systems	
	iv. PROJECT		12		
	v. Vocational 2	3			3
7	i. Analysis and Design of Algorithms	3		(a) Data Compression	3
	ii. Data Mining and Knowledge Management	3		(b) IoT	3
				(c) Data Analytics	3
	iii. LAB: Algorithms		4		
	iv. LAB: Data Mining and Knowledge Management		4		
	v. Vocational 3				
8	i. Automata Theory and Compiler Design	3		(a) Open-Source Programming	3
	ii. Cryptography and Network Security	3		(b) Storage Area Networks	3
	ii. LAB: Compiler Lab		4	(c) Pattern Recognition	3
	vi. PROJECT		12	(a) Machine Learning	3
	v. Vocational 4	3			

TABLE I: COURSE STRUCTURE FOR BCA

Semester	Course Code	Title of the Paper	Credit	Total Credit of OE, Languages, CAE, Voc, AECC, SEC	Total Credit
I	CAC01	Fundamentals of Computers	3	13	26
	CAC02	Programming in C	3		
	CAC03	Mathematical Foundation	3		
	CAC01P	LAB: Information Technology Lab	2		
	CAC02P	LAB: C Programming Lab	2		
II	CAC04	Data Structures using C	3	13	26
	CAC05	Object Oriented Concepts using JAVA	3		
	CAC06	Discrete Mathematical Structures	3		
	CAC04 P	LAB: Data Structure	2		
	CAC05 P	LAB: JAVA	2		
III	CAC07	Data Base Management Systems	3	13	26
	CAC08	C# and DOT NET Framework	3		
	CAC09	Operating System Concepts	3		
	CAC07P	LAB: DBMS	2		
	CAC08P	LAB: C# and DOT NET Framework	2		
IV	CAC10	Python Programming	3	13	26
	CAC11	Computer Multimedia and Animation	3		
	CAC12	Computer Communication and Networks	3		
	CAC10P	LAB: Python programming	2		
	CAC11P	LAB: Multimedia and Animation	2		
V	CAC13	Internet Technologies	3	10	23
	CAC14	Statistical Computing and R Programming	3		
	CAC15	Software Engineering	3		
	CAC13P	LAB: JAVA Script, HTML and CSS	2		
	CAC14P	LAB: R Programming	2		
VI	CAC16	PHP and MySQL	3	10	23
	CAC17	Artificial Intelligence and Applications	3		
	CAC16P	LAB: PHP and MySQL	2		
	CA-P1	Project Work	5		
VII	CAC18	Analysis and Design of Algorithms	3	11	21
	CAC19	Data Mining and Knowledge Management	3		
	CAC18P	LAB: Algorithms	2		
	CAC19P	LAB: Data Mining	2		
	CAI01	Internship	2		
VIII	CAC20	Automata Theory and Compiler Design	3	6	20
	CAC21	Cryptography and Network Security	3		
	CAC20P	LAB: Compiler Lab	2		
	CAP02	Project Work	6		

TABLE II: CS COURSE DETAILS FOR BCA

Course-Type	Course Code as referred above	Compulsory/ Elective	List of compulsory courses and list of option of elective courses. (A suggestive list)
CA	CAC01, CAC02, CAC03, CAC04, CAC05, CAC06, CAC07, CAC08, CAC09, CAC10, CAC11, CAC12, CAC13, CAC14, CAC15, CAC16, CAC17, CAC18, CAC19, CAC20, CAC21	Compulsory	As Mentioned in Table I
CA E	CAE-1A	Elective	Cyber Law and Cyber Security OR Business Intelligence OR Fundamentals of Data Science
	CAE-2A	Elective	Fundamentals of Data Science OR Mobile Application Development OR Embedded Systems
	CAE-3A	Elective	Data Compression OR Internet of Things (IoT) OR Data Analytics
	CAE-4A	Elective	Open-source Programming OR Storage Area Networks OR Pattern Recognition OR Machine Learning
Vocational	Vocational -1	Elective	DTP, CAD and Multimedia OR Hardware and Server Maintenance OR Web Content Management Systems OR Computer Networking OR Health Care Technologies OR Digital Marketing OR Office Automation
	Vocational -2	Elective	
	Vocational -3	Elective	
	Vocational -4	Elective	
SEC	SEC 1	Compulsory	Health & Wellness/ Social & Emotional Learning
	SEC 2	Compulsory	Sports/NCC/NSS etc
	SEC 3	Compulsory	Ethics & Self Awareness
	SEC 4	Compulsory	Professional Communication
AECC	AECC1	Compulsory	Environmental Studies
	AECC2	Compulsory	Constitution of India
Language 1	L1-1, L1-2, L1-3, L1-4	Compulsory	Kannada/Functional Kannada
Language 2	L2-1, L2-2, L2-3, L4-4	Elective	English/Hindi/French/ Additional English/ etc.

Proposed Scheme of Teaching & Evaluation for B.C.A (Basic/Hons) having practical core courses

Semester I									
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)		SEE	CIE	Total Marks	Credits
				Theory	Lab				
1	G 735 LA1.1	Language–I	AECC	4	-	60	40	100	3
2	G 736 LA2.1	Language-II	AECC	4	-	60	40	100	3
3	**G 601 DC 1.1**	**Fundamentals of Computers**	**DSC-1**	**3**	**-**	**60**	**40**	**100**	**3**
4	**G 601 DC 2.1**	**Programming in C**	**DSC -2**	**3**	**-**	**60**	**40**	**100**	**3**
5	**G 601 DC 3.1**	**Mathematical Foundation**	**DSC -3**	**3**	**-**	**60**	**40**	**100**	**3**
6	**G 601 DC 1.1P**	**LAB1: Information Technology**	**DSC-1P**	**-**	**4**	**25**	**25**	**50**	**2**
7	**G 601 DC 2.1P**	**LAB2: C Programming**	**DSC -2P**	**-**	**4**	**25**	**25**	**50**	**2**
8	**G 601 OE 1.1**	**Business Statistics**	**OEC**	**3**	**-**	**60**	**40**	**100**	**3**
9	**G 650 SB 1.1**	**Digital Fluency**	**SEC SB**	**1**	**2**	**30**	**20**	**50**	**2**
10	**G 702 AE 1.1**	Environmental Studies & VE	**AECC**	**3**		**30**	**20**	**50**	**2**
11	G 705 VB 1.1	Physical Education-Yoga	SEC VB		2	15	10	25	1
12	G 706 VB 2.1	Health & Wellness/ Social & Emotional Learning	SEC VB		2	15	10	25	1
Sub–Total(A)				**35**		**500**	**350**	**850**	**28**

Semester II									
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)		SEE	CIE	Total Marks	Credits
				Theory	Lab				
1	G 735 LA1.2	Language-I	AECC	4	-	60	40	100	3
2	G 736 LA2.2	Language–II	AECC	4	-	60	40	100	3
3	**G 601 DC 1.2**	**Data Structures using C**	**DSC-4**	**3**	**-**	**60**	**40**	**100**	**3**
4	**G 601 DC 2.2**	**Object Oriented Concepts using JAVA**	**DSC -5**	**3**	**-**	**60**	**40**	**100**	**3**
5	**G 601 DC 3.2**	**Discrete Mathematical Structures**	**DSC -6**	**3**	**-**	**60**	**40**	**100**	**3**
6	**G 601 DC1.2P**	**LAB3: Data Structure lab**	**DSC-4P**	**-**	**4**	**25**	**25**	**50**	**2**
7	**G 601 DC 2.2P**	**LAB4: JAVA lab**	**DSC -5P**	**-**	**4**	**25**	**25**	**50**	**2**
8	**G 601 OE 1.2**	**Applied Statistics**	**OEC**	**3**	**-**	**60**	**40**	**100**	**3**
9	G 702 AE 1.2	Human Rights & VE	AECC	2		30	20	50	2
10	G 705 VB1.2	Physical Education-	SEC VB		2	15	10	25	1

		Sports							
11	G 706 VB2.2	NCC/NSS/R&R(S&G) /Cultural	SEC VB		2	15	10	25	1
Sub–Total(B)				**34**		**470**	**330**	**800**	**26**

Semester III

Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)		SEE	CIE	Total Marks	Credits
				Theory	Lab				
1	G 735 LA1.3	Language-I	AECC	4	-	60	40	100	3
2	G 736 LA2.3	Language–II	AECC	4	-	60	40	100	3
3	**G 601 DC 1.3**	**Data Base Management Systems**	**DSC-7**	**3**	**-**	**60**	**40**	**100**	**3**
4	**G 601 DC 2.3**	**C# and DOT NET Framework**	**DSC -8**	**3**	**-**	**60**	**40**	**100**	**3**
5	**G 601 DC 3.3**	**Operating System Concepts**	**DSC -9**	**3**	**-**	**60**	**40**	**100**	**3**
6	**G 601 DC 1.3P**	**LAB: DBMS**	**DSC-7P**	**-**	**4**	**25**	**25**	**50**	**2**
7	**G 601 DC 2.3P**	**LAB: C# and DOT NET Framework**	**DSC -8P**	**-**	**4**	**25**	**25**	**50**	**2**
8	**G 601 OE 1.3**	**Computer Oriented Numeric Analysis**	**OEC**	**3**	**-**	**60**	**40**	**100**	**3**
9	G 650 SB 1.3	Artificial Intelligence/ Alternative paper	SEC SB	**1**	**2**	**30**	**20**	**50**	**2**
10	G 702 AE 1.3	**Gender Equity and Value Education**	AECC	3		30	20	50	2
11	G 705 VB 1.3	Physical Education-Sports	SEC VB		2	15	10	25	1
12	G 706 VB 2.3	Health & Wellness/ Social & Emotional Learning	SEC VB		2	15	10	25	1
Sub–Total(C)				**35**		**530**	**370**	**900**	**28**

Semester IV									
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week (L + T + P)**		**SEE**	**CIE**	**Total Marks**	**Credits**
				Theory	**Lab**				
1	G 735 LA1.4	Language-I	AECC	4	-	60	40	100	3
2	G 736 LA2.4	Language–II	AECC	4	-	60	40	100	3
3	**G 601 DC 1.4**	**Python Programming**	**DSC-10**	**3**	**-**	**60**	**40**	**100**	**3**
4	**G 601 DC 2.4**	**Computer Multimedia and Animation**	**DSC -11**	**3**	**-**	**60**	**40**	**100**	**3**
5	**G 601 DC 3.4**	**Computer Communication and Networks**	**DSC -12**	**3**	**-**	**60**	**40**	**100**	**3**
6	**G 601 DC1.4P**	**LAB: Python programming**	**DSC-10P**	**-**	**4**	**25**	**25**	**50**	**2**
7	**G 601 DC 2.4P**	**LAB: Multimedia and Animation**	**DSC -11P**	**-**	**4**	**25**	**25**	**50**	**2**
8	**G 601 OE 1.4**	**Open Elective**	**OEC**	**3**	**-**	**60**	**40**	**100**	**3**
9	G 702 AE1.4	Constitution of India & VE	AECC	2		30	20	50	2
10	G 705 VB1.4	Physical Education-Sports	SEC VB		2	15	10	25	1
11	G 706 VB2.4	NCC/NSS/R&R(S&G)/Cultural	SEC VB		2	15	10	25	1
Sub–Total(D)				**34**		**470**	**330**	**800**	**26**

Semester V									
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week (L + T + P)**		**SEE**	**CIE**	**Total Marks**	**Credits**
				Theory	**Lab**				
1	**G 601 DC 1.5**	**Internet Technologies**	**DSC-13**	**3**	**-**	**60**	**40**	**100**	**3**
2	**G 601 DC 2.5**	**Statistical Computing and R Programming**	**DSC -14**	**3**	**-**	**60**	**40**	**100**	**3**
3	**G 601 DC 3.5**	**Software Engineering**	**DSC -15**	**3**	**-**	**60**	**40**	**100**	**3**
4	**G 601 DC1.5P**	**LAB: JAVA Script, HTML and CSS**	**DSC-13P**	**-**	**4**	**25**	**25**	**50**	**2**
5	**G 601 DC 2.5P**	**LAB: R Programming**	**DSC -14P**	**-**	**4**	**25**	**25**	**50**	**2**
6	**G 601 DE 1.5**	**(a) Cyber Law and Cyber Security (b) Cloud Computing (c) Business Intelligence**	**DSE-1**	**3**	**-**	**60**	**40**	**100**	**3**
7	**G 601 VO 1.5**	**DTP, CAD and Multimedia / Hardware and Server Maintenance / Web Content**	**Vocational**	**3**	**-**	**60**	**40**	**100**	**3**

		Management Systems							
8	**G 650 SB 1.5**	**Cyber Security**	**SEC SB**	**1**	**2**	**60**	**40**	**100**	**2**
9	G 705 VB 1.5	Physical Education-Sports	SEC VB		2	15	10	25	1
10	G 706 VB 1.5	Health & Wellness/ Social & Emotional Learning	SEC VB		2	15	10	25	1
Sub–Total(E)				**30**		**440**	**310**	**750**	**23**

Semester VI									
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week (L + T + P)**		**SEE**	**CIE**	**Total Marks**	**Credits**
				Theory	**Lab**				
1	**G 601 DC 1.6**	**PHP and MySQL**	**DSC-16**	**3**	**-**	**60**	**40**	**100**	**3**
2	**G 601 DC 2.6**	**Artificial Intelligence and Applications**	**DSC -17**	**3**	**-**	**60**	**40**	**100**	**3**
3	**G 601 DC 1.6P**	**LAB: PHP and MySQL**	**DSC-16P**	**-**	**4**	**25**	**25**	**50**	**2**
4	**G 601 PR 1.6P**	**Project Work**	**DSC -18**	**-**	**12**	**120**	**80**	**200**	**5**
5	**G 601 DE 1.6**	**(a) Fundamentals of Data Science (b) Mobile Application Development (c) Embedded Systems**	**DSE-2**	**3**	**-**	**60**	**40**	**100**	**3**
6	**G 601 VO 1.6**	**DTP, CAD and Multimedia / Hardware and Server Maintenance / Web Content Management Systems**	**Vocational**	**3**	**-**	**60**	**40**	**100**	**3**
7	G 650 SB1.5	**Professional Communication**	SEC SB	2		60	40	100	2
8	G 705 VB 1.5	Physical Education-Sports	SEC VB		2	15	10	25	1
9	G 706 VB 1.5	NCC/NSS/R&R(S&G)/Cultural	SEC VB		2	15	10	25	1
Sub–Total(F)				**34**		**675**	**325**	**800**	**23**

Semester VII									
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week (L + T + P)**		**SEE**	**CIE**	**Total Marks**	**Credits**
				Theory	**Lab**				
1	**G 601 DC 1.7**	**Analysis and Design of Algorithms**	**DSC-18**	**3**	**-**	**60**	**40**	**100**	**3**
2	**G 601 DC 2.7**	**Data Mining and Knowledge Management**	**DSC -19**	**3**	**-**	**60**	**40**	**100**	**3**
3	**G 601 DC 1.7P**	**LAB: Algorithms**	**DSC - 18P**	**-**	**4**	**25**	**25**	**50**	**2**
4	**G 601 DC 2.7P**	**LAB: Data Mining**	**DSC-19P**	**-**	**4**	**25**	**25**	**50**	**2**
5	**G 601 IN 1.7P**	**Internship**	**DSC**	**2**		**25**	**25**	**50**	**2**
6	**G 601 DE 1.7**	((a) Data Compression (b) IoT (c) Data Analytics	DSE-3	3	-	60	40	100	3
7	**G 601 VO 1.7**	Computer Networking / Health Care Technologies / Digital Marketing / Office Automation	Vocational	3	-	60	40	100	3
8	**G 601 DE 2.7**	Research Methodology:	DSE	3		60	40	100	3
Sub–Total(E)				**25**		**375**	**275**	**650**	**21**

Semester VIII									
Sl. No	**Course Code**	**Title of the Course**	**Category of Courses**	**Teaching Hours per Week (L + T + P)**		**SEE**	**CIE**	**Total Marks**	**Credits**
				Theory	**Lab**				
1	**G 601 DC 1.8**	**Automata Theory and Compiler Design**	**DSC-20**	**3**	**-**	**60**	**40**	**100**	3
2	**G 601 DC 2.8**	**Cryptography and Network Security**	**DSC -21**	**3**	**-**	**60**	**40**	**100**	3
3	**G 601 DC 1.8P**	**LAB: Compiler Lab**	**DSC-20P**	**-**	**4**	**25**	**25**	**50**	2
4	**G 601 PR 1.8P**	**Project Work**	**DSE**	**-**	**12**	**120**	**80**	**200**	6
5	**G 601 DE 1.8**	**(a) Open-Source Programming (b) Storage Area Networks (c) Pattern Recognition (a) Machine Learning**	**DSE-4**	**3**	**-**	**60**	**40**	**100**	3
6	**G 601 VO 1.8**	**Computer Networking / Health Care Technologies / Digital Marketing / Office Automation**	**Vocational**	**3**	**-**	**60**	**40**	**100**	3
Sub–Total(F)				**28**		**385**	**265**	**650**	**20**

Semester: I

Course Code: **G 601 DC 1.1**	**Course Title: Fundamentals of Computers**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Course Outcomes (COs):
After completing this course satisfactorily, a student will be able to:

- Understand the fundamentals of computer system
- Identify different components within the computer system
- Understand different types of input and output devices
- Demonstrate the working concepts of different devices connected to computer
- Explain different generations of programming languages and their significance
- Understand the use of Word processing, Spreadsheet, Presentation and DBMS applications
- Understand Digital computer and digital systems functioning

Course Contents

Contents	Hours
Unit - 1	
Computer Basics: Introduction, Characteristics computers, Evolution computers, Generations of computers, Classification of computers, the computer system, Application of computers. **Computer Architecture:** Introduction, Central processing unit- ALU, Registers, Control unit, system bus, main memory unit, cache memory **Input devices**: Introduction, Types of input devices, Keyboard, Mouse, Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, webcam, flatbed scanner **Output devices**: Types of output, Classification of output devices, Printers – Dot matrix, Ink-jet, Laser, Hydra, Plotter, Monitor – CRT, LCD, Differences between LCD and CRT	10
Unit - 2	

Computer software: Introduction, software definition, relationship between software and hardware, software categories **Computer programming languages**: Introduction, Developing a program, Program development cycle, Types of programming languages, generation of programming languages, Features of a good programming language. **Problem Solving techniques:** Introduction, Problem solving procedure. **Algorithm:** Steps involved in algorithm development, Algorithms for simple problems (To find largest of three numbers, factorial of a number, check for prime number, check for palindrome, Count number of odd, even and zeros in a list of integers) **Flowcharts:** Definition, advantages, Symbols used in flow charts. Flowcharts for simple problems mentioned in algorithms. Psuedocode.	10

Unit-3	
Digital Computers and Digital System: Introduction to Number System, Decimal number, Binary number, Octal and Hexadecimal numbers, Number base conversion, Complements, Binary codes, Binary arithmetic, Addition, Subtraction in the 1's and 2's complements system, Subtraction in the 9's and 10's complement system. **Boolean Algebra:** Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra.	10
Unit-4	
Digital logical gate: Boolean functions, Canonical and Standard forms, Minterms, Maxterms, other logic operations, Digital logic gates, Universal gates. **Simplification of Boolean function:** The map method, Two and three variable maps, Four- variable maps, Don't care conditions, Sum of Product simplification. **Combinational Circuits:** Introduction, Binary Half Adder, Full Adder **Sequential Circuits:** Introduction, Flip-Flops, RS, D,JK,T Flip Flops(JK and T block diagrams only), Introduction to Registers.	12

Text Books:

1. ITL Education Solution Limited, Introduction to Information Technology, Second Edition, Pearson
2. M. Morris Mano, Digital Logic and Computer design, PHI, 2015

Reference Books:

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, Sixth Edition, BPB Publication.
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC.
3. J. Glenn Brookshear, Computer Science: An Overview, Twelfth Edition, Addison-Wesley
4. R.G. Dromey, How to solve it by Computer, PHI.

Course Code: **G 601 DC 2.1**	**Course Title: Programming in C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Confidently operate Desktop Computers to carry out computational tasks
- Understand working of Hardware and Software and the importance of operating systems
- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays

Course Contents

Contents	Hours
Unit - 1	
Overview of C : History of C , Importance of C Program, Basic structure of a C-program, Execution of C Program. **C Programming Basic Concepts:** Character set, C token, Keywords and identifiers, Constants, Variables, data types, Declaration of variables, assigning values to variables, defining symbolic constants. **Input and output with C:** Formatted I/O functions - *printf* and *scanf*, control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar*, *putchar*, *gets* and *puts* functions.	12
Unit - 2	
Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion. **Control Structures:** Decision Making and Branching -Decision making with if statement, simple if statement, the if else statement, nesting of if … else statements, the else if ladder, the switch statement, the ?: operator, the go to statement. Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, jumps in loops.	10
Unit - 3	
Derived data types in C: Arrays - declaration, initialization and access of one-dimensional and two-dimensional arrays. programs using one- and two-dimensional arrays, sorting and searching arrays. **Handling of Strings:** Declaring and initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, String handling functions - *strlen, strcmp, strcpy, strstr and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc. **Pointers:** Understanding pointers, accessing the address of a variable, declaring and initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments and scale factor, pointers and arrays, pointer and strings.	10

Unit - 4	
User-defined functions: Need for user-defined functions, Declaring, defining and calling C functions, return values and their types, Categories of functions: With/without arguments, with/without return values. Nesting of functions. **Recursion:** Definition, example programs. **Structures and unions:** Structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, Structure and functions, structures within structures. Unions	10

Text Book:

1. E. Balagurusamy, Programming in ANSI C, 7th Edition, Tata McGraw Hill

Reference Books:

1. Herbert Schildt, C: The Complete Reference, 4th Edition
2. Brain W. Kernighan, C Programming Language, 2nd Edition, Prentice Hall Software
3. Kernighan & Ritchie: The C Programming Language, 2nd Edition, PHI
4. Kamthane, Programming with ANSI and TURBO C, Pearson Education
5. V. Rajaraman, Computer Programming in C, 2nd Edition, PHI
6. S. Byron Gottfried, Programming with C, 2nd Edition, TMH
7. Yashwant Kanitkar, Let us C, 15th Edition, BPB
8. P.B. Kottur, Computer Concepts and Programming in C, 23rd Edition, Sapna Book House

Course Code: **G 601 DC 3.1**	**Course Title: Mathematical Foundation**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Course Outcomes (COs):

- Study and solve problems related to connectives, predicates and quantifiers under different situations.
- Develop basic knowledge of matrices and to solve equations using Cramer's rule.
- Know the concept of Eigen values.
- To develop the knowledge about derivatives and know various applications of differentiation.
- Understand the basic concepts of Mathematical reasoning, set and functions

Course Contents:

Contents	Hours
Unit - 1	
Algebra: Logarithms- Introduction, Definition, Laws of operations, change of base **Binomial theorems**- Introduction, Binomial theorem, Position of terms. **Analytical geometry:** Introduction, directed line, midpoint, distance between two points, Section formula, external division, coordinates of a centroid, Area of a triangle. **The straight line** – slope of a straight line, different forms of equations of the straight line. **Circle** -The equation of a circle, different forms of circles, General equation of the circle, equation of tangent and normal to the circle.	12
Unit - 2	
Trigonometry: Introduction, Measurement of angles, trigonometric functions, relation between trigonometric functions, signs of trigonometric functions, trigonometric functions of standard angles. **Mathematical logic**: Introduction, statements, Connectives, negation, conjunction, disjunction, statement formulas and truth tables, conditional and bi Conditional statements, tautology, contradiction, equivalence of formulas, duality law, Predicates and Quantifiers, arguments, joint Daniel	10
Unit - 3	
Sets: Definition, notation, inclusion and equality of sets, the power set, Operations on sets,Venn diagram, ordered pairs, and n-tuples, Cartesian product, **Relations**: Introduction, properties of a binary relation in a set, Relation matrix and graph of a relation, equivalence relations, compatibility relations, composition of Binary relation	**10**
Unit - 4	
Calculus: Limit of function, continuity of a function. **Differentiation**: Derivative of a function of one variable, Power function, constant with a function, sum of functions, product of two functions, quotient of two functions. **Integration-** Indefinite integral, rules of integration, some standard results and examples, definite integral.	10

Text Books:

1. C Sanchethi and V K Kapoor,Business Mathematics, Sulthan Chand &Sons Educational publishers, New Delhi, Eleventh Revised Edition
2. P. R. Vittal-Business Mathematics and Statistics, Margham Publications, Chennai
3. Pundir &S.K. Pundir, A Text Book of BCA Mathematcis - I, Rimple A, Pragatis Edition (IV)
4. B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, New Delhi

Course Code: **G 601 DC 1.1P**	**Course Title: Information Technology Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Practice Lab

1. Identification of the peripherals of a computer, components in a CPU and their functions.
2. Assembling and disassembling the system hardware components of personal computer.
3. Basic Computer Hardware Trouble shooting.
4. LAN and WiFi Basics.
5. Operating System Installation – Windows OS, UNIX/LINUX, Dual Booting.
6. Activities using word processing, presentation and spreadsheet software
7. Tasks involving Internet Browsing

Information Technology Lab

Part A: Word Processing & Presentation

I. Word Processing

1. Prepare a document using different formatting tools

Highlights of the National Education Policy (NEP) 2020

Note4Students

From UPSC perspective, the following things are important :

Prelims level : National Education Policy

Mains level : Need for imbibing competitiveness in Indian education system

New Policy aims for **universalization of education** from pre-school to secondary level with 100 % Gross Enrolment Ratio (GER) in school education by 2030. NEP 2020 will bring 2 crores out of school children back into the mainstream through the open schooling system.

- *The current 10+2 system to be replaced by a **new 5+3+3+4 curricular structure** corresponding to ages 3-8, 8-11, 11-14, and 14-18 years respectively.* **This will bring the hitherto uncovered age group of 3-6 years under the school curriculum, which has been recognized globally as the crucial stage for the development of mental faculties of a child.**
- The new system will have 12 years of schooling with three years of Anganwadi/ pre-schooling.
  - Emphasis on Foundational Literacy and Numeracy, no rigid separation between academic streams, extracurricular, vocational streams in schools; Vocational Education to start from Class 6 with Internships
  - Teaching up to at least Grade 5 to be in mother tongue/ regional language. No language will be imposed on any student.
- Assessment reforms with **360° Holistic Progress Card**, tracking Student Progress for achieving Learning Outcomes
- A new and comprehensive National Curriculum Framework for Teacher Education, NCFTE 2021, will be formulated by the NCTE in consultation with NCERT.
- By 2030, the minimum degree qualification for teaching will be a 4-year integrated B.Ed. degree.
- Gross Enrolment Ratio in higher education to be raised to **50% by 2035; 3.5 crore seats to be added in higher education.**
- The policy envisages broad-based, multi-disciplinary, holistic Under Graduate Program with flexible curricula, creative combinations of subjects, integration of vocational education and multiple entries and exit points with appropriate certification.
- Academic Bank of Credits to be established to facilitate Transfer of Credits

Multidisciplinary Education and Research Universities (MERUs), at par with IITs, IIMs, to be set up as models of best multidisciplinary education of global standards in the country.

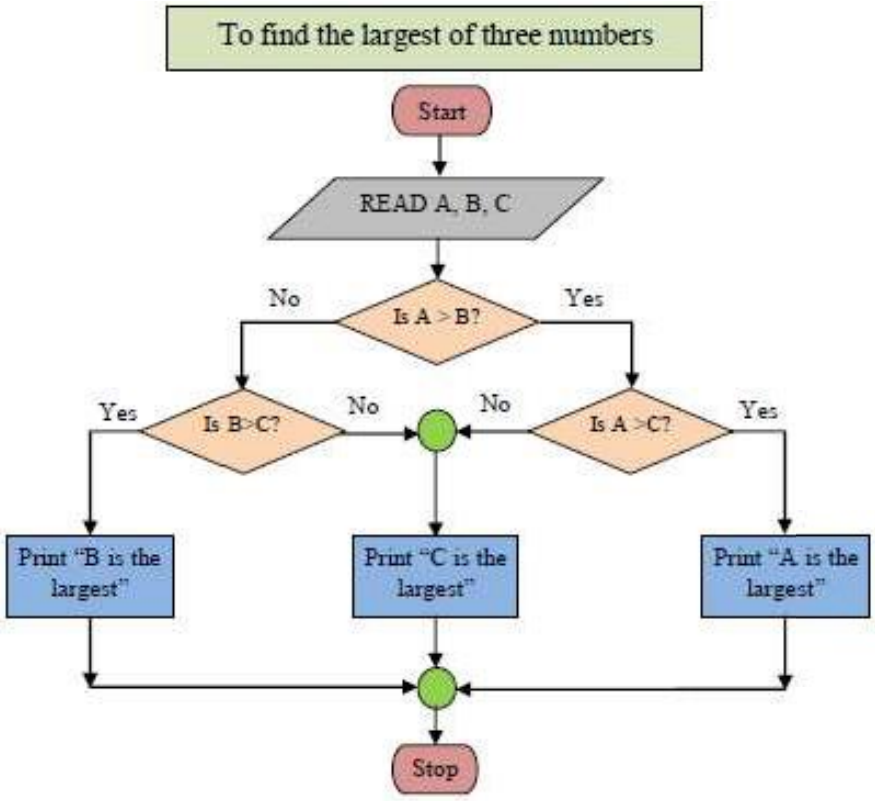
Affiliation of colleges is to be **phased out in 15 years** and a stage-wise mechanism is to be established for granting graded autonomy to colleges.

Over a period of time, it is envisaged that every college would develop into either an Autonomous degree-granting College or a constituent college of a university.

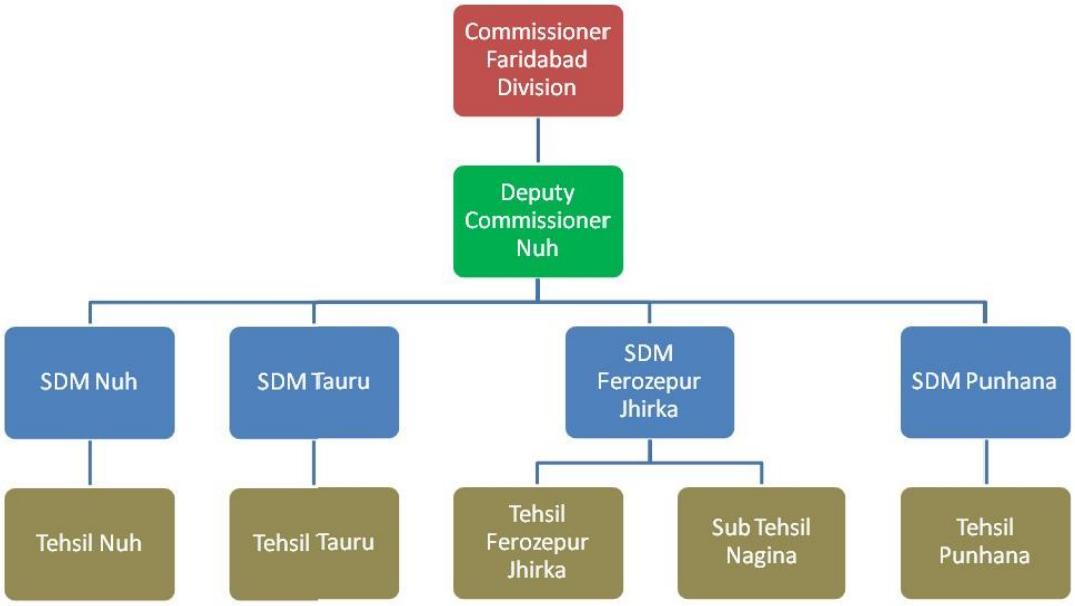
$$\frac{df}{dt} = \lim_{h \to 0} \frac{f(t+h) - f(t)}{h}$$

$$(a+b)^2 = a^2 + 2ab + b^2$$
$$(a-b)^2 = (a+b)^2 - 4ab$$
$$a^2 + b^2 = (a-b)^2 + 2ab$$

2. Prepare a document using SmartArt and Shapes tools



Organization Chart – Administration Faridabad Division



3. Prepare a document with table to store sales details of a company for different quarters and calculate total, average and find maximum, minimum sales value.

Branch Code	Branch	Sales in Quarters				Total	Avg
		1	2	3	4		
A101	Mangalore	354690	244610	383290	413670		
A102	Udupi						
Total (Across Branches)							
Average (Across Branches)							
Highest Sales (Across Branches)							
Lowest Sales (Across Branches)							

TIME TABLE

Class : I BCA						Room No. 206	
Day	**I**	**II**	**III**	**IV**		**V**	**VI**
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday						***	

4. Prepare interview call letters for five candidates describing about the company and instructions about the interview. Use Mail merge feature

Interview call Letter Format

Date:
[Name of the candidate]
[Address]

Dear [name of the candidate]

This is to the reference of your application for the job [name of the job] indicating interest in seeking employment in our organisation. We thank you for the same.

We would like to inform you that your profile is being shortlisted for the job role and is best suited for it. Therefore, we would like to take a face to face interview with you on [date of interview] at [venue details].

We hope that the venue is suitable for you. If not please get in touch with us, so that we can arrange the date and venue according to your availability.

The company will reimburse you all the expenses incurred by you for this interview. This letter has an attachment in which you need to fill the details and carry it along on the date of interview. Please carry your CV also along with you.

Kindly confirm your availability for the date and venue. If there are any changes to be done, please contact us at phone number: [999xxxx999] and email id: abcnd@mail.com.

We look forward to seeing you.

Regards,
Name of the Manager
Designation Name
Company name

II. Presentation

1. Create a presentation (minimum 5 slides) about your college. It should contain images, chart, Bulletted text, …..
2. Create a presentation (minimum 5 slides) to advertise a product. The slides should be displayed automatically in a loop. Make use of Transition and Animations.
3. A simple quiz program. Use hyperlinks to move to another slide in the presentation to display the result and correct answer/wrong answer status. Use at least four questions.

Part B: Spreadsheet

(Note: Give proper titles, column headings for the worksheet. Insert 10 records for each exercise in such a way to get the result for all the conditions. Format the numbers appropriately wherever needed).

1. Create a worksheet to maintain student information such *as RollNo, Name, Class, Marks in three subjects* of 10 students. Calculate total marks, average and grade. Find grade for Distinction, First class, Second class, Pass and Fail using normally used conditions.

    - Using custom sort, sort the data according to class: - Distinction first, FirstcClass next, and so on. Within each class, average marks should be in descending order.
    - Also draw the Column Chart showing the RollNo versus Average scored.

(Note: Worksheet creation and for marks) **atting 4 marks, calculations: 5 marks, sorting: 3 marks, chart: 3**

2. Prepare a worksheet to store details of Electricity consumed by customers. Details are Customer No, Customer Name, Meter No, Previous meter reading, Current meter reading of 10 customers. Calculate total number of units consumed and total amount to be paid by each consumer using following conditions:
    - If unit consumed is up to 30, charge is 100.
    - 31 to 100 units, 4.70 per unit
    - 101 to 200 units, 6.25 per unit
    - Above 200 units, 7.30 per unit.
    - Use Data validation to see that current reading is more than previous reading.
    - Arrange the records in the alphabetic order of names.
    - Filter the records whose bill amount is more than Rs.1500.

(Note: Worksheet creation and formatting 4 marks, Data validation: 2 marks, calculations: 5 marks, sorting: 2 marks, filtering: 2 marks)

3. Create Employee worksheet having EmpNo, EmpName, DOJ, Department, Designation and Basic Pay of 8 employees. Calculate DA, HRA, Gross Pay, Profession Tax, Net Pay, Provident Fund as per the rule :
    - DA = 30% of basic pay
    - HRA = 10% of basic pay if basic pay is less than 25000, 15% of basic pay otherwise.
    - Gross =DA +HRA+ Basic pay
    - Provident fund =12% of Basic pay or Rs.2000, whichever is less.
    - Profession Tax= Rs.100 if Gross pay is less than 10000, Rs.200 otherwise.
    - NetPay = Gross - (Professional tax + Provident Fund)
- Using Pivot table, display the number of employees in each department and represent it using Pie chart.

(Note: Worksheet creation and formatting 4 marks, calculations: 5 marks, Pivot table: 3 marks, Chart: 3 marks)

4. Create a table COMMISSION containing the percentage of commission to be given to salesmen in different zones as follows:

Zone	Percentage
South	10
North	12.5
East	14
West	13

Create another table SALES in the same worksheet to store salesman name, zone name, place, name of the item sold, rate per unit, quantity sold. Calculate total sales amount of each salesman. Referring the COMMISSION table, write the formula to compute the commission to be given.(Hint: Use if function and absolute cell addresses)
Using advanced filtering show the result in other parts of the worksheet.

- Show the records of various zones separately.
- Show the records of only East and West zones.
- Display the details of the items sold more than 50, in South or North zones.

(Note: Worksheet creation and formatting: 4 marks, calculations: 5 marks, filtering: 6 marks)

Evaluation Scheme for Lab Examination :

Assessment Criteria	Marks

Activity – 1 from Part A	Word Processing / Presentation	15
Activity - 2 from Part B	Spreadsheet	20
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Course Code: **G 601 DC 2.1P**	**Course Title: C Programming Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Programming Lab

Part A:

1. Program to read marks of five subjects, calculate percentage of marks and to display appropriate grade declaration message (using else-if ladder)
2. Program to find the greatest of three numbers (using nested if statement)
3. Program to read two integer values & a operator as character and perform basic arithmetic operations on them using switch case (+, -, *, / operations)
4. Program to reverse a number and find the sum of individual digits. Also check for palindrome.
5. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
6. Program to count occurrences of a character in a string.
7. Program to calculate and display the first 'n' Fibonacci numbers
8. Program to find given number is a prime or not.
9. Program to read a string and find a) length b) reverse of it c) check palindrome string d) merge original & reversed string (using built in string library functions)
10. Program to search for a number in a list of numbers using one-dimensional array.

Part B:

1. Program to find the largest and smallest elements with their position in a one-dimensional array
2. Program to read 'n' integer values into a single dimension array and arrange them in ascending order using bubble sort method.
3. Program to perform addition and subtraction of two Matrices
4. Program to display factorial of first 'n' integers using recursive function.
5. Program to check a number is a Armstrong by defining isArm( ) function
6. Program to read a string and count number of letters, digits, vowels, consonants, spaces and special characters present in it.
7. Program sort a list of strings in ascending order using Pointers
8. Program to add two distances in the inch-feet format using structures (convert inches to feet if greater than 12)
9. Program to enter the information of a student like name, register number, marks in three subjects into a structure and display total, average and grade Display details in a neat form.
10. Program to input Name of the branches, Total sales of company into an array of structures. Display branch details in a tabular format. Also display the branch name that recorded the highest sales.

Evaluation Scheme for Lab Examination :

Assessment Criteria		**Marks**
Program – 1 from Part A	7	7
	8	8
Program -2 from Part B	8	8
	12	12
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Course Code: **G601 OE 2.1**	**Course Title: Office Automation**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Compare and contrast various types of operating systems
- Explain the purpose of office automation
- Describe how information is stored and retried in/from computer memory
- Know about various types of office automation software and their applications
- Create document using word processing software
- Design presentation using presentation software
- Create worksheets using spreadsheet software
- Store and retrieve data in/from database management application

Course Contents

Contents	Hours
Unit – 1	
Computer software : Introduction, Software definition, Software categories, Installing and uninstalling software, Software piracy, Software terminologies, Computer Memory **Introduction to windows Operating System**, Functions of operating System, operating with windows, starting an application, essential accessories, creating shortcuts, windows explorer, control panel, finding folders and files, System utilities. **MS-Office** : Introduction, Office user interface, Microsoft office Components **MS-Word:** Introduction, Starting MS-Word, Microsoft word Environment working with word documents, working with text, working with tables checking spelling and grammar, adding graphs to the document, mail merge, header and footers, page numbers, protect the document, working with formatting tools. **Basic of Computer networks:** LAN, MAN,WAN.	12
Unit – 2	
MS-Excel: Introduction, starting MS Excel, Microsoft Excel environment, working with Excel workbook, working with worksheet – Entering data, Excel formatting tips and Techniques, generating graphs, Formulas and Functions, Inserting charts, Sorting, Pivot Tables, data extraction, adding clip art, add an image from a file, Printing in Excel.	10
Unit - 3	

MS-Power point- Starting MS–Power Point , Working with power point -, Creating, Saving and Printing a presentation, Working with Animation, Adding a slide to presentation, Navigating through a presentation, Slide-sorter, Slide-show, Editing slides, Working with Graphics and Multimedia in PowerPoint (Inserting Photo, Video & Sound). **The Internet :** Basic internet terms, Internet applications, Internet tools, Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, Advantages and disadvantages of email.	10

Unit - 4	
Database fundamentals- Basic database terms, Database Management System **MS-Access:** Introduction to Access, Creating Tables and Database, Data Type and Properties, Adding & Deleting Field in Table, Primary Key Fields, Queries, Forms: The Forms wizard saving forms, Modifying forms, Pages, Macro, Module, Reports, Printing Report, Forms	10

Text Book:

1. ITL Education Solution Limited, Introduction to Information Technology, Second Edition., Pearson

Reference Books:

1. Peter Norton, Introduction to Computers, 7th edition, Tata McGraw Hill Publication, 2011 2)
2. Anita Goel, Computer Fundamentals, Pearson Education, 2011.
3. Linda Foulkes, Learn Microsoft Office 2019: A comprehensive guide to getting started with Word, PowerPoint, Excel, Access, and Outlook, Packt Publishing Limited, 2020
4. Bittu Kumar, Mastering MS Office: Concise Handbook With Screenshots, V&S Publishers, 2017

Course Code: **G601 OE 1.1**	**Course Title: Business Statistics**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

Upon the completion of this course students should be able to:

- Frame and formulate management decision problems.
- Understand the basic concepts underlying quantitative analysis.
- Use sound judgment in the applications of quantitative methods to management decisions.

Course Contents

Contents	Hours
Unit – 1	
Statistical Data and Descriptive Statistics : Nature and Classification of data: univariate, bivariate and multivariate data; time-series and cross-sectional data. Measures of Central Tendency: mathematical averages including arithmetic mean geometric mean and harmonic mean, properties and applications. Positional Averages Mode and Median (and other partition values including quartiles, deciles, and percentiles). Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/variance Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures; Concept of Kurtosis.	12
Unit – 2	
Ratios and Proportions, Percentages, Interests and Discounts: Ratios & Proportions - Direct proportion, Inverse proportion, Compound proportions & problems. Percentages. Trade discount & cash discount - Problems. Concept of Simple interest & compound interest- nominal & effective rate of interest- Problems on all the se. Compound interest for fraction of year, Compound interest when rate changes year by year - Problems and Problems on Depreciation.	10
Unit - 3	
Index Numbers : Definition, Problems involved in the construction of index numbers, methods of constructing index numbers of prices and quantities, simple aggregate and price relatives method, weighted aggregate and weighted average of relatives method, important types of weighted index numbers: Laspeyre's, Paasche's, Bowley's, Marshall- Edgeworth, Fisher's, method of obtaining price and quantity index numbers, tests consistency of index numbers, time reversal test and factor reversal test for index numbers, Uses and limitations of index numbers. Consumer price index number: involved in the construction of cost of living index number, advantages and disadvantages, Aggregative expenditure method and Family budget method for the construction of consumer price index numbers. Applications of Cost of Living Index numbers. Definition and measurement of Inflation rate – CPI and GNP Deflator.	10

Unit - 4	
Time Series Analysis: Introduction, definition and components of Time series, illustrations, Additive, Multiplicative and mixed models, analysis of time series, methods of studying time series: Secular trend, method of moving averages, least squares method – linear, quadratic, exponential trend fittings to the data. Seasonal variation - definition, illustrations, measurements, simple average method, ratio to moving average method, ratio of trend method, link relatives method, Cyclical variation- definition, distinction from seasonal variation, Irregular variation- definition, illustrations.	10

Reference Books:

1. Levin, Richard, David S. Rubin, Sanjay Rastogi, and H M Siddiqui. Statistics for Management. 7th ed., Pearson Education.

2. David M. Levine, Mark L. Berenson, Timothy C. Krehbiel, P. K.Viswanathan, Business Statistics: A First Course, Pearson Education.

3. Siegel Andrew F. Practical Business Statistics. McGraw Hill Education.

4. Gupta, S.P., and Archana Agarwal. Business Statistics, Sultan Chand and Sons, New Delhi.

5. Vohra N. D., Business Statistics, McGraw Hill Education.

6. Murray R Spiegel, Larry J. Stephens, Narinder Kumar. Statistics (Schaum's Outline Series), Mc-Graw Hill Education.

7. Gupta, S.C. Fundamentals of Statistics. Himalaya Publishing House.

8. Anderson, Sweeney, and Williams, Statistics for Students of Economics and Business, Cengage Learning.

Semester: II

Course Code: **G 601 DC 1.2**	**Course Title: Data Structures using C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
- Write programs that use arrays, linked structures, stacks, queues, trees, and graphs
- Demonstrate different methods for traversing trees
- Compare alternative implementations of data structures with respect to performance
- Describe the concept of recursion, give examples of its use
- Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

Course Contents

Contents	Hours
Unit - 1	
Introduction to data structures: Introduction, Basic terminology; Elementary Data Organization, Data Structures, Data Structure Operations **Introduction to Algorithms, Preliminaries**: Introduction, Algorithmic notations, Control structure. **Recursion:** Definition; Recursion Technique Examples –Factorial, Fibonacci sequence, Towers of Hanoi. **Arrays:** Basic Concepts – Definition, Declaration, Initialization, Operations on arrays, Types of arrays, Representation of Linear Arrays in memory, Traversing linear arrays, Inserting and deleting elements, Multidimensional arrays- Two Dimensional Arrays Representation of two- dimensional arrays, Sparse matrices. **Sorting**: Selection sort, Bubble sort, Quick sort, Insertion sort, Merge sort	12
Unit - 2	
Searching : Definition, Sequential Search, Binary search **Linked list**: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header linked list, Circular linked list, Representation of Linked list in Memory; Operations on Singly linked lists– Traversing, Searching, Insertion, Deletion, Memory allocation.	10
Unit - 3	
Stacks: Basic Concepts –Definition and Representation of stacks- Array representation of stacks, Linked representation of stacks, Operations on stacks, Applications of stacks, Infix, postfix and prefix notations, Conversion from infix to postfix using stack, Evaluation of postfix expression using stack, Application of stack in function calls. **Queues**: Basic Concepts – Definition and Representation of queues- Array representation of Queues, Linked representation of Queues, Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues, Operations on queues	10

Unit - 4	
Trees: Definition, Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth **Binary tree:** Type of binary trees - strict binary tree, complete binary tree, binary search tree,; Array representation of binary tree, Traversal of binary tree- preorder, inorder and postorder traversal	10

Text Books :

1. Seymour Lipschutz, Data Structures with C, Schaum's Outlines Series, Tata McGraw Hill, 2011
2. R. Venkatesan and S. Lovelyn Rose, Data Structures, First Edition: 2015, Wiley India Pvt. Ltd. Publications

Reference Books:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Computer Science Press, 1982.
2. Aaron M. Tenenbaum , Data structures using C, First Edition, Pearson Education
3. Kamathane, Introduction to Data structures, Pearson Education , 2004
4. Y. Kanitkar, Data Structures Using C, Third Edition, BPB
5. Padma Reddy: Data Structure Using C, Revised Edition 2003, Sai Ram Publications.
6. Sudipa Mukherjee, Data Structures using C – 1000 Problems and Solutions, McGraw Hill Education, 2007

Course Code: **G 601 DC 2.2**	**Course Title: Object Oriented Programming with JAVA**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the features of Java and the architecture of JVM
- Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
- Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance
- The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language
- Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

Course Contents

Contents	Hours
Unit – 1	
Fundamentals of Object Oriented Programming: Introduction, Object Oriented Paradigm, Basic Concepts of OOP, Benefits and Applications of OOP. **Introduction to Java:** Java Features, Java Environment, Simple Java Program, Java Program Structure, Java Tokens, Java Statements, Java Virtual Machine. **Java Programming Basics:** Constants, Variables, Data Types, Declaration of variables, Giving values to the variable, Scope of variables, Symbolic constants, Type casting. **Operators and Expressions**: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operators, Conditional Operator, Special Operators, Mathematical functions. **Using I/O:** Byte streams and character streams, predefined streams, reading console input, reading characters, strings, writing console output.	12
Unit – 2	
Class & Objects - Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The 'this' keyword, Overloading Methods, Using Objects as Parameters, Returning Objects, Recursion, Understanding 'static', Introducing 'final ', Using Command-Line Arguments, Varargs : Variable-Length Arguments **Arrays and Strings:** One dimensional arrays, Creating an arrays, Two dimensional arrays , Strings, Vectors, Wrapper classes.	10

Unit - 3	
Inheritance - Inheritance Basics, using 'super', Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using final with Inheritance. **Packages & Interfaces** - Packages, Access protection in packages, Importing Packages, Interfaces. **Exception Handling** - Exception Handling Fundamentals – Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's built-in Exceptions	10
Unit - 4	
Multithreaded Programming- Introduction, Creating threads, Extending the thread class, stopping & blocking thread, Life cycle of a thread, Using thread methods, Implementing the runnable interface. **Event and GUI programming:** The Applet Class, Types of Applets, Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repaint, The HTML APPLET tag. Event Handling - The delegation event model, Event Classes –ActionEvent, KeyEvent & MouseEvent Classes, Event Listener Interfaces –ActionListener, KeyListener & MouseListener interfaces. Using the Delegation Event Model. Window Fundamentals, Working with Frame Windows, Creating a Frame Window in an Applet. Creating a Windowed Program, Displaying information within a window. **Introducing swing** – two key swing features, components and containers, the swing packages, a simple swing application, event handling. Exploring Swing- Jlabel, JTextField, JButton, Checkboxes , Radio buttons , Jlist , JComboBox.	10

Text Books :

1. E Balagurusamy, Programming with Java – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Herbert Schildt, Java : The Complete Reference, Seventh Edition, McGraw Hill Publication.

Reference Books:

1. Herbert Schildt, Java 2 - The Complete Reference, Fifth Edition, McGraw Hill publication.
2. Cay S. Horstmann, Core Java Volume I –Fundamentals, Prentice Hall.
3. Somashekara, M.T., Guru, D.S., Manjunatha, K.S, Object Oriented Programming with Java, EEE Edition, PHI.

Course Code: **G 601 DC 3.2**	**Course Title: Discrete Mathematical Structures**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- To understand the basic concepts of Mathematical reasoning, set and functions.
- To understand various counting techniques.
- Understand the concepts of various types of relations, partial ordering and equivalence relations.
- To understand the concept of probability and mathematical induction.
- Familiarize the fundamental concepts of graph theory and shortest path algorithm.
- To understand the concept of binary tree representation.

Course Contents

Contents	Hours
Unit - 1	
Matrix Algebra: Definition, types of matrices, algebra of matrices – addition of matrices, subtraction of matrices, multiplication of matrices, determinant of a matrix, Adjoint of a matrix, orthogonal and unitary matrix, rank of a matrix, echelon form of a matrix, normal form of a matrix, equivalence of Matrices **Inverse of a matrix, Characteristic equation of a matrix,** Cayley Hamilton theorem, Eigen values. **System of Linear equations:** solution of Linear homogeneous and non-homogeneous equations (matrix method), Cramer's rule **Arithmetic progression:** Definition, formula for nth term, sum to n terms, Arithmetic mean, problems **Geometric progression:** Definition, formula for nth term, sum to n terms, geometric mean, problems	12
Unit - 2	
Partial Ordering: Definition, lexicographic ordering, Partially ordered set, Hasse diagram, well-ordered set **Functions**: Definition and introduction, types of functions, composition of functions, inverse functions **Counting**: Basics of counting, Pigeonhole principle, Permutation and combination, Generalized Permutations and Combinations, generating permutation and combination, inclusion and exclusion	10
Unit - 3	
Discrete Probability: Introduction, finite probability, probabilities of complements and unions of events, probability theory, conditional probability, independence, random variables, Bayes' theorem, expected value and variance, independent random variable. **Mathematical Induction**: Mathematical Induction, principle of mathematical induction, proving inequalities, strong induction and well ordering **Number Theory**: Division algorithm, Modular arithmetic, primes and greatest common divisors, least common multiple, the Euclidean algorithm	10
Unit - 4	
Graphs: Graphs and Graph models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. **Trees**: Directed tree, leaf node, branch node, ordered tree, degree of a node, forest, descendent, m-ary tree, conversion of directed tree into a binary tree.	10

Text Books:

1. J.P. Trembley and R. Manobar, Discrete Mathematical Structures, McGraw Hill Education Private Limited, New Delhi,
2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Seventh Edition, 2012.
3. Bernard Kolman, Robert C, Busby, Sharon Ross, Discrete Mathematical Structure, 2003.

Reference Books:

1. D C Sanchethi and V K Kapoor, Business Mathematics, Eleventh Revised Edition, Sulthan Chand & Sons Educational publishers, New Delhi,
2. Narsingh Deo, Graph Theory with Applications to Engg and Comp. Sci, PHI, 1986.
3. Ralph P. Grimaldi, B. V. Ramatta, Discrete and Combinatorial Mathematics, 5th Edition, Pearson, Education
4. K Chandrashekhara Rao, Discrete Mathematics, Narosa Publishing House, New Delhi

Course Code: **G 601 DC 1.2P**	**Course Title: Data Structures Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03 Hours

Programming Lab

Part A:

1. Program to sort the given list using selection sort technique.
2. Program to sort the given list using insertion sort technique.
3. Program to sort the given list using bubble sort technique.
4. Program to search an element using linear search technique.
5. Program to search an element using binary search technique.
6. Program to implement Stack operations using arrays.
7. Program to implement Queue operations using arrays
8. Program to implement dynamic array. Find smallest and largest element.

Part B:

1. Program to sort the given list using merge sort technique.
2. Program to implement circular queue using array
3. Program to search an element using recursive binary search technique
4. Program to implement Stack operations using linked list.
5. Program to implement Queue operations using linked list.
6. Program to evaluate postfix expression.
7. Program to perform insert node at the end, delete a given node and display contents of singly linked list.
8. Menu driven program for the following operations on Binary Search Tree (BST) of Integers
   (a) Create a BST of N Integers
   (b) Traverse the BST in Inorder, Preorder and Post Order

Evaluation Scheme for Lab Examination

Assessment Criteria		**Marks**
Program – 1 from Part A	Writing the Program	7
	Execution and Formatting	8
Program -2 from Part B	Writing the Program	8
	Execution and Formatting	12
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Course Code: **G 601 DC 2.2P**	**Course Title:** JAVA Lab
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 04 Hours

Programming Lab

PART A

1. Program to accept student name and marks in three subjects. Find the total marks, average and grade (depending on the average marks).
2. A menu driven program to input two integers & an operator to perform basic arithmetic operations (+ ,-,* and /) using switch case structure.
3. Program, which reads two numbers having same number of digits. The program outputs the sum of product of corresponding digits.(Hint Input 327 and 539 output 3x5+2x3+7x9=84)
4. Program to input Start and End limits and print all Fibonacci numbers between the ranges.(Use for loop) 5.Define a class named Pay with data members String name, double salary, double da, double hra, double pf, double grossSal, double netSal and methods: Pay(String n, double s) - Parameterized constructor to initialize the data members, void calculate() - to calculate the following salary components, and void display() - to display the employee name, salary and all salary components.

   Dearness Allowance = 15% of salary
   House Rent Allowance = 10% of salary
   Provident Fund = 12% of salary
   Gross Salary = Salary + Dearness Allowance + House Rent Allowance
   Net Salary = Gross Salary - Provident Fund

   Write a main method to create object of the class and call the methods to compute and display the salary details.
6. Program to create a class DISTANCE with the data members feet and inches. Use a constructor to read the data and a member function Sum ( ) to add two distances by using objects as method arguments and show the result. (Input and output of inches should be less than 12.)
7. Program to check whether the given array is Mirror Inverse or not.
8. Program to create a class “Matrix” that would contain integer values having varied numbers of columns for each row. Print row-wise sum.
9. Program to extract portion of character string and print extracted string. Assume that ‘n’ characters extracted starting from mth character position.
10. Program to add, remove and display elements of a Vector

PART-B

1. Create a class named 'Member' having data members: *Name, Age, PhoneNumber, Place and Salary.* It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherit the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.
2. Program to implement the following class hierarchy:

   Student: id, name
   StudentExam (derived from Student): Marks of 3subjects, total marks
   StudentResult (derived from StudentExam) : percentage, grade

   Define appropriate methods to accept and calculate grade based on existing criteria and display details of N students
3. Program to calculate marks of a student using multiple inheritance implemented through interface. Class **Student** with data members rollNo, name, String **cls** and methods to set and put data. Create another class **test** extended by class Student with data members mark1, mark2, mark3 and methods to set and put data. Create interface sports

with members sportsWt = 5 and putWt(). Now let the class results extends class test and implements interface sports. Write a Java program to read required data and display details in a neat format.

4. Program to create an abstract class named shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Ellipse such that each one of the classes extends the class shape. Each one of the class contains only the method print Area() that print the area of the given shape.
5. Create a package to convert temperature in centigrade into Fahrenheit, and one more package to calculate the simple Interest. Implement both package in the Main () by accepting the required inputs for each application.
6. Program that implements a multi-threaded program has three threads. First thread generates a random integer every second, and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.
7. Program to create a window when we press M or m the window displays Good Morning, A or a the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night.
8. Program that creates a user interface to perform basic integer operations. The user enters two numbers in the TextFields - Num1 and Num2. The result of operations must be displayed in the Result TextField when the "=" button is clicked. Appropriate Exception handling message to be displayed in the Result TextFieldwhen Num1 or Num2 is not an integer or Num2 is Zero when division operation is applied.
9. Program to accept the employee name, employee number and basic salary as inputs and find the gross and net salaries on the following conditions.
   if Salary <= 20000 D.A is 40% Salary; H.R.A is 10% Salary.
   P.F 12% of Gross; PT is Rs .100
   if Salary > 20000 D.A is 50% of salary ; H.R.A 15% of salary
   P.F 12% of Gross ; PT is Rs.150
   Gross = basic salary +D.A +HRA and Net = Gross -PT –PF
10. Using the swing components, design the frame for shopping a book that accepts book code, book name, and Price. Calculate the discount on code as follows.

Code	Discount rate
101	15%
102	20%
103	25%
Any other	5%

Find the discount amount and Net bill amount. Display the bill.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Writing the Program	7
	Execution and Formatting	8
Program -2 from Part B	Writing the Program	08
	Execution and Formatting	12
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Course Code: **G601 OE 2.2**	**Course Title: Web Designing**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand various Internet related terminologies
- Explain features and evolution of Internet
- Explain the use of search engines
- Know the use of different tags available in HTML
- Design web pages using HTML5, CSS3, XML and XHTML
- Implement websites using linked web pages.

Course Contents

Contents	Hours
Unit – 1	
The Internet: Introduction, Evolution, basic internet terms, Getting connect to internet, Internet applications, Data over the internet. **Internet tools:** Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, checking email, sending email, email attachment, How email works, advantages and disadvantages of email. **Search Engines:** Searching an internet, refining the search, Instant messaging, Features of messengers.	12
Unit -2	
Overview of HTML5 -Exploring new features of HTML5, Structuring an HTML Document, Creating an saving HTML document, Viewing an HTML document. **Fundamentals of HTML-**Understanding Elements, Root elements, Metadata elements, Style element, Section element, Header and Footer element, Address element, Basic HTML data types, Data types defined by RFC and IANA Documentation. **Working with Text:** Formatting Text with HTML Elements, Defining MARK element, Defining STRONG element, Defining CODE element, Defining SMALL element. **Organizing Text in HTML:** Arranging text, Displaying Lists.	10
Unit - 3	
Working with Links and URLs- Exploring the Hyperlinks, Exploring the URL, Exploring Link Relations. **Creating Tables-**Understanding Tables, Describing the table element. **Working with Images, Colors and Canvas -** Inserting images in a web page, Exploring Colors, Introducing Canvas **Working with Forms:** Exploring Form element, Exploring types of the INPUT element, Exploring the BUTTON element, Exploring the Multiple-Choice elements, Exploring TEXTAREA and LABEL elements. **Working with Frames:** <FRAMESET>, <FRAME> tag with attributes.	10
Unit - 4	

Overview of CSS3- Understanding the syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML document. **Background and Color Gradients in CSS:** Exploring Background of a Web Page, Exploring Color Properties, Exploring Gradient Properties, Exploring Font properties. **Working with Basics of XML**-Exploring XML, Comparing XML with HTML, Describing the Structure of an XML document.	10

Text Books

1. ITL Education Solution Limited, Introduction to Information Technology, Pearson Education, 2012
2. DT Editorial Services, HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Second Edition, Dreamtech Publisher, 2016

Reference Books

1. Laura Lemay & Rafe Colburn, Mastering Html, CSS & Javascript, Web Publishing, 2016
2. Firuza Aibara, HTML 5 for Beginners, 2012
3. Glenn Johnson, Training Guide – Programming in HTML5 with JavaScript and CSS3 (Microsoft Press Training Guide), 2013

Course Code: **G601 OE 1.2**	**Course Title: Applied Statistics**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

- Understand the Price and Quantity Index numbers and their different measures, understand the applicability of cost-of-living Index number.
- Know the components and Need for Time series, understand the different methods of studying trend and Seasonal Index.
- Study the concept of vital statistics, sources of data, different measures of Fertility and Mortality, Understand the Growth rates- GRR and NRR and their interpretations.
- Know the concept of Population, Sample, Sampling unit, sampling design, sampling frame, sampling scheme, need for sampling, apply the different sampling methods for designing and selecting a sample from a population, explain sampling and non-sampling errors.
- Describe the philosophy of statistical quality control tools as well as their usefulness in industry and hence develop quality control tools in a given situation.

Course Contents

Contents	Hours
Unit – 1	
Vital Statistics **10 Hours** Sources of demographic data, errors in data. Measurement of mortality: crude death rate, specific death rates, and standardized death rates, infant mortality rate, maternal mortality rate, neo natal mortality rates, merits and demerits and comparisons of various mortality rates. Measurement of Fertility and Reproduction: Fecundity, fertility, measurement of fertility, crude birth rate, general fertility rate, age specific fertility rate and total fertility rates, merits and demerits of each measure of fertility, comparative study of these measures of fertility, Growth rates: Gross reproduction rate and Net reproduction rates.	10
Unit – 2	
Sampling Methods **10 Hours** Population and Sample. Need for sampling, Complete Enumeration versus Sample Surveys, Merits and Demerits, Non-Probability and Probability Sampling, Need and illustrations. Use of random numbers, principal steps in sample survey. Requisites of a good questionnaire. Pilot surveys, Sampling and non – sampling errors, Simple random sampling, Stratified random sampling, Systematic random sampling procedure of obtaining sample. Merits and demerits of these sampling methods.	10
Unit - 3	
Correlation and Regression Analysis **Correlation Analysis**: Concept of correlation, Scatter diagram, Karl Pearson's coefficient and its properties (Statement only). Rank correlation coefficient, Applications of correlation. **Regression Analysis**: Meaning of regression, regression lines, and properties of regression coefficients and applications of regression equation.	12
Unit - 4	

Statistical Quality Control	**10 Hours**	
Concept of quality and its management, meaning of SQC, Causes of variations in quality: chance and assignable. General theory of control charts, Control charts for variables: X- bar and R-charts. Control charts for attributes: p and c-charts. Applications of these charts. Acceptance Sampling Plans (Product control): Basic terminologies: AQL, LTPD, AOQ, AOQL, ASN, OC curve, producer's risk, and consumer's risk. Single sampling plan, double sampling plan.		10

Reference Books

4. Laura Lemay & Rafe Colburn, Mastering Html, CSS & Javascript, Web Publishing, 2016
5. Firuza Aibara, HTML 5 for Beginners, 2012
6. Glenn Johnson, Training Guide – Programming in HTML5 with JavaScript and CSS3 (Microsoft Press Training Guide), 2013

Semester: III

Course Code: **G 601 DC 1.3**	**Course Title: Data Base Management Systems**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objective:

- To facilitate the creation of data structures which can store thousands of records in it also removes duplicity in data and allows access to multiple users.
- Course emphasizes on how to organize, maintain and retrieve efficiently, and effectively information from a DBMS.

Learning Outcome:

The student will be able:

- To describe data models and schemas in DBMS
- To understand the features of database management systems and Relational database.

- To Demonstrate an understanding of the relational data model and use SQL.
- To understand the functional dependencies and use SQL solutions to a broad range of query and data update problems.

Contents	Hours
Unit - 1	
Database System Concepts and Architecture: History of Database Systems, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, Database Systems versus File Systems. Data Abstraction, Three-Schema Architecture, Data independence, Schemas and Instances, Data models, Database Languages, Interfaces, Database Users, DBA. Structure of Database Systems. Centralized and Client/Server Architecture for DBMSs, Classification of DBMSs. **E-R Model:** Entity-Relationship modelling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	12
Unit - 2	
Relational model: Basic Concepts of relational data model, Relational model constraints and relational database schemas-Domain Constraints, Key Constraints, Relational Database Schema. **Relational Algebra**: Basic Relational algebra operations-SELECT, PROJECT, Set Operations, Cartesian Product, Renaming. JOIN operations. Nested Sub Queries-Views. **Design theory of Relational Database:** Introduction to Relational database design, Semantics of Attributes, Problems caused by Redundancy-Anomalies, Functional Dependency-Uses of Functional Dependency, Diagrammatic way of showing FDs, Closure Set Properties. Normalization (First normal form, Second normal form, Third normal form. Boyce-Codd normal form).	10
Unit - 3	

Creation of Database: Creating, changing and dropping the tables, Integrity Constraints specification, maintaining reference integrity constraints, Data insertion, deletion and modification. MySQL Datatypes, The ENUM type, MySQL Operators – Arithmetic, Comparison, Logical operators, Aggregate functions, String manipulation, Date and time manipulation functions. LIKE clause, The NULL and NOT NULL Modifiers, The DEFAULT Modifiers, The AUTO_INCRMENT Modifier. **Querying the database:** Information retrieval using SELECT statement, various features of SELECT statement, ORDER BY clause, GROUP BY Clause, HAVING Clause, Working with expressions and sub queries Handling of multiple tables. DCL commands-Grant and revoke. TCL commands-commit, rollback, save point.	10
Unit - 4	
Transaction Processing: Database transaction – concept, Transaction- Definition, Read and write actions of a Transaction, inconsistency in Database. **Views in MySQL:** What are Views in MySQL? Advantages of Views, Disadvantages of VIEWS, Creating Views, MYSQL Updatable Views, MySQL Views with CHECK OPTION. **MySQL Stored Procedures:** What Is a Stored Program? three major types of MySQL stored programs, Drawbacks of using stored procedures. Language Fundamentals- Variables, Assigning Values to Variables, Parameters, Conditional Statements, And Looping statements (Iterative Programming), Using SELECT Statements with an INTO Clause, Creating and Using Cursors, fetching a Single Row from a Cursor, Fetching an Entire Result Set, Creating Stored Functions, MySQL Error handling in stored procedure.	10

Text Books :

1. Ramez Elamassri, Shankant B. Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2015 (Unit I)
2. Ivan Bayross, SQL, PL/SQL The programming Language – Oracle, BPB Publications(Unit III)
3. S. Nanda Gopalan, Data base Management Systems with oracle 9i and VB 6.0, 4th Edition, Sapna Book House Bangalore.(unit II).
4. Vikram Vaswani "The complete Reference MySQL "Tata McGraw-Hill Edition 2004, Eleventh reprint 2009. (Unit III)

5. Guy Harrison with Steven Feuerstein “MySQL Stored Procedure Programming”. O’REILLY (Unit IV)

Reference Books:

1. Silberschatz and Korth , Database System Concepts, McGrawHill Publication
2. Ivan Bayross, Commercial Application Development using Oracle D2k, BPB Publications.
3. CJ Date, Introduction to Database Systems, Published by Addison Wesley.
4. Bipin C. Desai, Introduction to Database Systems, Galgotia.

Semester: III

Course Code: **G 601 DC 2.3**	**Course Title: C# and DOT NET Framework**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Contents	Hours
Unit - 1	
Introduction to C# language, The .Net Architecture and .Net Framework, The Common Language Runtime (CLR), Microsoft Intermediate Language (MSIL) Code, Just In Time Compilers (JITers), The Framework Class Library (FCL), The Common Languages Specification (CLS), The Common Type System (CTS), Garbage Collection (GC), The .Net Framework. **C# Console programming:** Structure of C# program: name space, types, value type, simple type, reference type, boxing and unboxing, and their conversions.	12

C# operators: arithmetic operators, shift operators, logical operators, conditional operators, conversion operators, checked& unchecked operators.	
Unit - 2	
Decision Making and Branching: if-else, switch, For Loop, While Loop, Do-While Loop, Break, Continue, Goto. **Arrays & Collections:** Introduction to arrays, Declarations and its types. Introduction to collection, Array list, jagged array, stack implementation. **Object oriented programming**: Object and Classes: Concept of a class, Objects, Fields, Methods, Access modifiers, Properties, Static members of the class, Constructors, Destructors, Method overloading, events and delegates, operator overloading.	10
Unit - 3	
Inheritance: introduction, types, base class inheritance, derived class inheritance. method overriding. Interface: Interface, declaration modifiers, methods, properties, events. **Windows Applications** Windows Forms-Common Controls, Control Properties and Layout, Labels, Textboxes and Buttons, Group Boxes and Panels, Checkboxes and Radio Buttons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling.Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI).	10
Unit - 4	
Exception Handling: Definition, Exception handling techniques (statements), types, creating our own exception class. **ADO.net:** Components of ADO.net, Understanding ADO.NET: Describing the Architecture of ADO.NET, Connection Strings: Syntax for Connection Strings. Working with Connection Object: Creating a Connection to a Database: SQL Server Database, OLEDB Database, Creating a Command Object. Inserting, Updating and Deleting Records.	10

Text Book

1. Black Book, ASP.NET 4.0
2. E.Balaguruswamy: Programming in C#, 2nd Edition, Tata McGraw Hill, 2008.

Reference Books:

1. Andrew Troelsen: Pro C# with .Net 3.0, 4th Edition, Wiley India, 2009.
2. Tom Archer: Inside C#, WP Publishers, 2001.
3. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.
4. ShibiPanikkar and Kumar Sanjeev, C# with .NET Frame Work, Firewall Media

Semester: III

Course Code: **G 601 DC 3.3**	**Course Title: Operating System Concepts**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objectives:

- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.
- Subject Demonstrates a knowledge of process control, threads, concurrency.

Learning Outcome:

- At the end of the course students will able to Analyze the structure of OS and basic architectural components involved in design Analyze the various resource management techniques conceptualize the components involved in designing a contemporary OS.
- Learn Windows Operating system basics

Contents	Hours
Unit - 1	

Introduction Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems, Functions of Operating Systems, computer system architecture, operating system structure, special purpose systems, computing environment **System structures** Operating System Services, user operating system interface, Systems Calls. **Process concept** Process, process state, process control block, Process Scheduling-Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; operations on process Multithreaded Programming, Overview, Multithreading Models,	12
Unit - 2	
Process Scheduling Basic Concepts, Scheduling Criteria, CPU Scheduling algorithms **Synchronization** Introduction, Race Condition, Critical section problem, Peterson solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.	10
Unit - 3	
Deadlocks System model, deadlocks characterization, methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlocks detection, recovery from Deadlock. **Memory Management** logical versus physical address space, swapping, contiguous memory Allocation, Paging, Segmentation with Paging.	10
Unit - 4	
Virtual Memory Management : Basic concepts of Demand Paging, Page Replacement - basic page replacement, FIFO page replacement, optimal page replacement, LRU page replacement, Allocation of Frames,Thrashing. **File System:** File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management	10

Text Book

1. Abraham Silberschartz and Peter Galvin, andgreggagne, Operating System principles, 7th edition, McGraw Hill 2000.
2. Andrew S Tanenbaum, Modern Operating System 2nd edition , (Case Studies)

Reference Books

1. D.M Dhamdhare , operating system
2. Brinch Hansen .p., Operating System principles, PHI.
3. Milan Milenkovic., Operating System, McGraw Hill.
4. Logical design of operating systems by Show. A., PHI..

Text Books

1. Kamalesh Bajaj and Debjani, **E-commerce The Cutting Edge of Business**
2. C. S. V. Murthy, **E-commerce: Concepts, Models, Strategies**, Himalaya Publishing House, 2011

Reference Books:

1. David Whiteley, **E-Commerce: Strategy, Technologies and Applications**, Tata McGraw Hill EducationPrivate limited, 2004
2. Ravi Kalakota, Andrew B. Whinston, **Frontiers of Electronic Commerce**, Addison-Wesley Publications,2000

Course Code: **G 601 OE 1.3**	**Course Title: COMPUTER ORIENTED NUMERICAL ANALYSIS**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Contents	Hours
Unit - 1	
System of Linear Algebraic Equation - Definitions, Direct method of solving System of equation, Crammer rule, Gauss Elimination method, Gauss-Jordan Elimination method, LU Decomposition method, Matrix Norm.	12
Unit - 2	
Iteration Methods - Jacobi method, Gauss seidel method **Interpolation & Approximation -** Finite difference operators, Lagrange's interpolation, Lagrange's inverse interpolation, Newton interpolation – Forward Differences & Backward differences – Derivations and problems	10
Unit - 3	
Newton's divided differences: Newton's divided differences, interpolating polynomials using finite difference operators. **Numerical Differentiation –** Derivation of Numerical differentiation formula using Newton's forward and backward difference interpolation formula and problems.	10
Unit - 4	

Numerical Integration - Numerical Integration - Newton's Generalized Integration formula, Derivation of Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8 rule formulas and problems.	10

Semester: IV

Course Code: **G 601 DC 1.4**	**Course Title: Python Programming**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objectives:

To Study Python Fundamentals to advanced concepts like OOPS, Exception handling, multi-threading, Networking, Database Connectivity and Graphical User Interface

Learning outcomes:

Be skilled at creating, debugging and testing a software application using the Python programming language.

Contents	Hours
Unit - 1	
Introduction to Python: Features of Python, Flavors of python, Python Versions, Python Virtual machine, Memory management, Garbage Collection, Comparison between Python and C, Java and Python. Installing Python for windows, Writing and executing Python program, Writing comments. **Python Basics:** Identifiers; Keywords; Statements and Expressions; Variables, Datatypes, Indentation, Comments, Operators, Precedence and Association. Determining data types of variables. Input & Output: Input/output Statements, Command line arguments. **Control Statements** – if, if..else, if..elif, while loop , for loop , else suite, break , continue ,assert , return Statements. **Arrays in Python**- Creating arrays, importing array module, Indexing and slicing on arrays, Processing the arrays, types of arrays, NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays. Creating array using linspace() , logspace() , arrange() , zeros() and ones() functions.	12

Unit - 2	
Strings and characters- Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences. **Lists**: Creating , updating ,concatenating lists ,Repetition of list ,Aliasing and cloning lists, Sorting lists , Nested lists, **Tuples and sets:** Creating and accessing tuple elements, Basic operations on tuples ,Functions to process tuples , Nesting ,inserting ,modifying and deleting tuple elements. Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods. **Dictionaries:** Operations on Dictionaries, Dictionary methods, Sorting elements of dictionary, Converting list and strings into Dictionary.	10
Unit - 3	
Functions – Functions and methods, Defining, calling functions, returning multiple values, formal and actual parameters, Keyword argument Default arguments and variable argument. Local and Global variables , Anonymous functions and Lambdas. **Classes and Objects**- Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values. **Inheritance and Polymorphism**: Type of Inheritance, super () method, method overloading & Overriding, Abstract classes and interfaces.	10
Unit - 4	
Exception Handling –Type of exceptions, assert Statement, Except Block, User defined exceptions, logging the exceptions. **Database Connectivity:** Types of databases used with Python, Using MySQL from Python, Retrieving and Inserting , updating and deleting data in a table, Creating Database tables through Python. **Pandas:** Pandas- Introduction to Pandas, Time Series and DataFrames, Creating DataFrames, Operations on DataFrames.	10

Text Book:

1. Dr.Pooja Sharma, Programming in Python, BPB publications, First Edition 2017

Reference Books:

1. . Ch Satynarayana, M Radhika Mani, ands B N Jagadeesh, Python Programming, Universities Press,2018.
2. Python The Complete Reference by Martin C. Brown ,McGraw Hill Education
3. Complete Introduction to Python Language By Mark Summerfield , Second Edition.
4. Dr. R. Nageshwara Rao , Core Python Programming , Dreamtech Press , Second Addition

Semester: IV

Course Code: **G 601 DC 2.4**	**Course Title: Computer Multimedia and Animation**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objective: To learn about various technologies in animation and virtual reality system.

Learning Outcome: Students are able to draw primitive graphical shapes and perform transformation techniques programmatically. They are also learning about various new technologies developed and their applications.

Contents	Hours
Unit - 1	
Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and tags; Overview and features of CSS3. **JavaScript:** Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input.	12
Unit - 2	
Introduction, Media and Data Streams, Audio Technology Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases. Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces &Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission. **Animation:** What is an Animation? The Start and End States, Interpolation, Animations in HTML. All About CSS Animations, Creating a Simple Animation, Detailed Look at the CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. All About CSS Transitions, Adding a Transition, Looking at Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions.	10
Unit - 3	

HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5 – SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star.	10
Unit - 4	
HTML5 – CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients, **HTML5** - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas – Animations.	10

Text Book:

1. Rajesh K. Maurya, Computer Graphics with Virtual Reality Systems., 2nd Edition, Wiley publication, 2014.
2. Donald Hearn, M. Pauline Baker**, Computer Graphics - C version**, 2nd Edition, LPE Pearson, 1996.

Reference Books:

1. Tay Vaughan, Multimedia: Making It Work, 8th Edition, Tata McGraw Hill, 2011.
2. Steven Harrington, Computer Graphics: A Programming Approach, McGraw Hill Education, 1987.
3. James D. Foley, Fundamentals of interactive computer graphics, Addison Wesley Longman Publishing Co, 1982.

Semester: IV

Course Code: **G 601 DC 3.4**	**Course Title: Computer Communication and Networks**

Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objective:

- Provides the theoretical knowledge of data communication and computer networks.
- Helps in understanding the concepts of resource sharing.

Learning Outcome:

- At the end of the course the students will be able to understand the architectural principles of computer networking and compare different approaches to organizing networks.

Contents	Hours
Unit - 1	
Uses of Computer Networks Business Applications, Home Applications, Mobile Users; **Network hardware** LAN, MAN, WAN, wireless networks, Home Networks, Internet works, introduction to Ad-hoc networks. **Network Software** protocol hierarchies, design issues for the layers, connection oriented and connectionless services, service primitives, the relationship of services to protocols. **Transmission Media** magnetic media, twisted pair, coaxial cable, fiber optics. **Transmission Modes** Parallel Transmission, Serial Transmission- asynchronous and synchronous transmission.	12
Unit - 2	
Communication network: Line Configuration - Point- to- point, Multipoint, Topology - Mesh, Star, Tree, Bus, Ring, Hybrid Topology, Transmission Mode - Simplex, Half- duplex, Full- Duplex. **Elements of data communication**: Data and Signals - analog and digital signal. Periodic and A Periodic signals, composite signals. **Transmission Impairment** attenuation, delay distortion, noise, **Encoding and Modulating** Digital to digital conversion, data encoding, unipolar, Polar-NRZ, NRZ-L, NRZ-I, RZ, Biphase, Manchester codes signals, bipolar- AMI, B8ZS, HDB3,	10
Unit - 3	
Network Architecture and Distributed Processing The OSI Reference Model, the TCP/IP Reference Model, comparison between OSI and TCP/IP reference Model Network standardization. network interface, principles of inter-networking, internet protocols- TCP/IP, IP address class, network services, electronic mail, Digital Signature and Firewalls.	10
Unit - 4	

Switching Circuit Switching, Packet Switching, Message Switching. **Multiplexing** Many to one/one to many, Frequency division multiplexing (FDM). **Data security:** Error detection and correction - Types of errors, detection, Checksum, single bit error correction, Hamming Distance , Hamming code, Burst error correction. **Design and Setting a** practical **Network** Repeaters, Hubs, Bridges, Switches and Routers, Cables, IEEE 802.1, 802.6, token bus, token ring, FDDI	10

Text Books:

1. Computer Networks – fourth edition - Andrew s. Tanenbaum, E E Edition. (Unit I, IV)
2. Data Communications and Networking- Behrouz A. Forouzan, 4th Edition, TATA McGraw Hill (Unit II, III)

Reference Books

1. Internetworking with TCP/IP, Vol 1, 2, 3 by Douglas E Comer
2. J.Martin, "Computer Network and Distributed Data Processing", Prentice Hall.
3. Fred Halsall, L.G. Kulkarni, "Computer Networking and the Internet", Pearson

Course Code: **G 601 OE 1.4**	**Course Title: E-COMMERCE**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objective:

- This course provides an introduction to information systems for business and management.

- It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems

Learning Outcome:

- Upon completion of the course students should be able to: Analyze the impact of E-commerce on business models and strategy.

Contents	Hours
Unit - 1	
Introduction to Electronic Commerce: The meaning, benefits, impact, Classification, application of Electronic Commerce technologies. **Electronic Commerce Business models:** B2B, B2C.	12
Unit - 2	
Electronic Payment System: Introduction to payment system, Online payment system, prepaid electronic payment systems. **EC Security** Security of transactions, Firewalls, SET, SSL, cryptography-symmetric and asymmetric, RSA algorithm. Digital Signatures, PKIS, protocols for secure messaging, Key management, Virtual Private Network	10
Unit - 3	
Electronic Data Interchange: conventional trading process, meaning of EDI, building blocks of EDI system, layered architecture, value added networks, benefits and application of EDI **Electronic Commerce: Architectural framework:** **Electronic Commerce: Information distribution and messaging:** FTP application, Email, WWW server, HTTP, Web Servers implementation	10
Unit - 4	
Internet Marketing The PROS and CONS of online shopping, the cons of online shopping, Justify an Internet business Internet marketing techniques: The E-cycle of Internet marketing, Personalization e-commerce **Mobile Commerce: Introduction, Framework and models:** meaning, benefits, impediments, framework	10

Course Code: **G 601 OE 1.4**	**Course Title: Accounting Package with Tally**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Learning Objective:

The objective of the subject is to familiarize the students with E- Commerce models and Tally

Contents	Hours
Unit - 1	

MS-EXCEL: Spread Sheet-working with MS EXCEL: Features of MS Excel - worksheet, workbook, cell, cellpointer, cell address etc., Parts of Ms Excel window -Saving, opening and Closing workbook - Insertion and deletion of worksheet – Entering and Editing data in worksheet - cell range - Formatting - Auto Fill -Formulas and its advantages - References: Relative, absolute and mixed; Functions: Meaning and Advantages of functions, different types of functions available in Excel; Templates - Charts – Graphs; Macros: Meaning and Advantages of macros creation, editing and deletion of macros; Data Sorting, Filtering, validation, Consolidation, Grouping, Pivot Table and Pivot Chart Reports.	12
Unit - 2	
GETTING STARTED WITH TALLY: Meaning of Tally software – Features – Advantages - Preparation for installation of tally software - installation. Items on Tally screen: Menu options, creating a New Company, Basic Currency information, other information, Company features and Inventory features	10
Unit - 3	
CONFIGURING TALLY ERP 9: GST on Tally ERP 9, Introduction to GST – GSTN, GST computation – composition Levy, Regular Levy – Input Tax Credit – CGST, SGST / UTGST, IGST, Generate GSTR-1 Returns, GSTR-2 Returns, GSTR-3B Returns, Challan Reconciliation Report for GST Payments, Creating Income and expenses ledger in GST and reverse charge on purchase from unregistered dealer. Working with Tally ERP 9: Groups, Ledgers, writing voucher, different types of voucher, voucher entry Problem on Voucher entry -Trail Balance, Accounts books, Cash Book, Bank Books, Ledger Accounts, Group Summary, Sales Register and Purchase Register, Journal Register, Statement of Accounts, & Balance Sheet.	10
Unit - 4	
REPORTS IN TALLY: Generating Basic Reports in Tally – Financial Statements – Accounting Books and Registers – Inventory Books and Registers – Exception reports – printing reports – Types of Printing Configuration of Options – Printing Format	10

1. Agarwala K. N. and Deeksha Ararwala : Business on the Net – Bridge to the online store front, Macmillan, New Delhi.
2. Diwan, Prag and Sunil Sharma, Electronic Commerce – A manager guide to Ebusiness, Vanity Books International, Delhi
3. Tally for Enterprise Solutions

Semester: V

Course Code: **G 601 DC 1.5**	**Course Title: Design And Analysis of Algorithms(Theory)**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

· CO1. Understand the fundamental concepts of algorithms and their complexity, including time and space complexity, worst-case and average-case analysis, and Big-O notation.

· CO2. Design algorithms for solving various types of problems, such as Sorting, Searching, and Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques.

· CO3. Analyze and compare the time and space complexity of algorithms with other algorithmic techniques.

· CO4. Evaluate the performance of Sorting, Searching, Graph traversal, Decrease-and-Conquer, Divide-and-Conquer and Greedy Techniques using empirical testing and benchmarking, and identify their limitations and potential improvements.

· CO5. Apply various algorithm designs to real-world problems and evaluate their effectiveness and efficiency in solving them.

Contents	Hours
Unit - 1	
Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. **Introduction**: Introduction to Algorithm. Fundamentals of Algorithmic problem solving, Important Problem Type Fundamentals of Data Structures, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies. **Asymptotic Notations and Basic:** Efficiency classes, Informal Introduction, O-notation, Ω-notation, θ-notation, mathematical analysis of non-recursive algorithms, and mathematical	13

analysis of recursive algorithms.	
Unit - 2	
Brute Force & Exhaustive Search: Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search- -Closest-Pair and Convex-Hull Problems by Brute Force, Exhaustive Search -Travelling Salesman Problem and Knapsack Problem.	13
Unit - 3	
Decrease-and-Conquer: Introduction, Insertion Sort, Depth First Search, Breadth First Search Topological Sorting. **Divide-and-Conquer:** Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties, Multiplication of large Integers and Strassen's Matrix Multiplication.	13
Unit - 4	
Greedy Technique: Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees, Lower-Bound Arguments, Decision Trees, P Problems, Challenges of Numerical Algorithms.	13

Text Books:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms,: 2nd Edition, 2009, Pearson.

References:

1. Ellis Horowitz, SatrajSahni and Rajasekaran Computer Algorithms/C++, , 2nd Edition, 2014, Universities Press.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford (Higher Education)
4. Weblinks and Video Lectures (e-Resources):

http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html
https://nptel.ac.in/courses/106/101/106101060/ http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html
http://cse01- iiith.vlabs.ac.in/
http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Course Code: **G 601 DC 1.5P**	**Course Title: Design And Analysis of Algorithms Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03 Hours

Evaluation Scheme for Lab Examination :

Assessment Criteria		**Marks**
Activity – 1 from Part A	Writing:8Marks Execution:7Marks	15
Activity - 2 from Part B	Writing:12 Marks Execution:8Marks	20
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Semester: V

Course Code: **G 601 DC 2.5**	**Course Title: Statistical Computing and R Programming**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

 CO1. Explore fundamentals of statistical analysis in R environment.

 CO2. Describe key terminologies, concepts and techniques employed in Statistical Analysis.

 CO3. Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.

 CO4. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.

 CO5. Understand, Analyze, and Interpret Correlation Probability and Regression to analyze the underlying relationships between different variables.

Contents	**Hours**
Unit - 1	
Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid	13

System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting	
Unit - 2	
Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand-alone statement with illustrations in exercise, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility. Basic Data Visualization.	13
Unit - 3	
Descriptive Statistics: Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Percentailes, Quartiles, Measures of Variability, Mean Absolute Deviation Range, Inter-Quartile-Range, Standard Deviation, Z-Scores. Coefficient of Variation, Measure of shaper-Skewness and Kurtosis, Bar Chart, Pie Chart and Box Plot, Histogram, Frequency Polygon, Stem and Leaf Diagram. **Probability, Probability and Sampling Distribution**: Methods of assigning probability, Structure of probability, Marginal, union, joint and conditional probabilities. Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution, Uniform Distribution.	13
Unit - 4	
Statistical Inference and Hypothesis Testing: Types of Hypotheses, and Sample, Null and Alternate Hypothesis, Level of Significance, Type I and Type II Errors, One Sample t-Test, One Sample Proportion Test, Paired Sample t-Test, One Way Analysis of Variance and Chi Square Test. **Correlation and Regression**: Analysis of Relationship, Positive and Negative Correlation, Perfect Correlation, Karl Pearson Coefficient of Correlation, Correlation Matrix, Scatter Plots, Simple Regression Analysis.	13

Text Books:

1. Tilman M. Davies, “The book of R: A first course in programming and statistics”, San Francisco, 2016. 2. Ken Black, Business Statistics, New Delhi, Wiley, 2013.

References:

1. Vishwas R. Pawgi, “Statistical computing using R software”, Nirali prakashan publisher, e1 edition, 2022.
2. https://www.youtube.com/watch?v=KlsYCECWEWE
3. https://www.geeksforgeeks.org/r-tutorial/
4. https://www.tutorialspoint.com/r/index.html

Course Code: **G 601 DC 2.5P**	**Course Title: R Programming Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03 Hours

Evaluation Scheme for Lab Examination :

Assessment Criteria		**Marks**
Activity – 1 from Part A	Writing:8Marks Execution:7Marks	15
Activity - 2 from Part B	Writing:12 Marks Execution:8Marks	20
Practical Record		10
Viva		**5**
Total (Converted to 25)		**50**

Course Code: **G 601 DC 3.5**	**Course Title: Software Engineering**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

 CO1 How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
 CO2 An ability to work in one or more significant application domains.
 CO3 Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
 CO4 Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
 CO5 Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Contents	Hours
Unit - 1	

Introduction: Introduction to software, Types of software, classes of software, introduction to software engineering, software components, characteristics, software engineering processes, some terminologies. **Software Development Life Cycle Models:** Software development life cycle, waterfall model, prototyping model, spiral model, evolutionary development model, Iterative enhancement model. Agile Software Development: Agile methods; Plan- driven and agile development. **Introduction to software requirement specification:** Types of Requirements: Requirement engineering task, process of requirement engineering. SRS document, SRS validation, components of SRS, characteristics of SRS.	13
Unit - 2	
System models: Context Models; Behavioral models Data Flow Models, State Machine Models; Data Models; Object Models: Inheritance models, object aggregation, object behavior modeling, Structured methods. **Software reliability and quality Assurance** Verification and validation, Software Quality assurance, capability maturity model, Reliability Issues, Metrics. .	13
Unit - 3	
System Design System/Software Design, Architectural Design, Low level design, coupling and cohesion, functional versus Object- Oriented Approach, Design Specification, Verification for design, monitoring and control for design. **Software Testing:** Introduction, Testing principles, Testing objectives, Test oracles, Levels of testing, Verification and Validation, white Box Testing/ Structural Testing, Functional/ Black Box Testing, Test Plan, Test case design, Test characteristics.	13
Unit - 4	
Software Testing Strategies: Static testing Strategy, Debugging, Error, Fault and failure. **Software Maintenance and Project Management:** Software configuration Management activities, Change control Process, Software version control, Software configuration management, Need for maintenance, Categories of maintenance. **Software Maintenance: introduction & case study on maintenance**	13

Text Book:

1. B B Aggarwal - Software Engineering by New Age International
2. Ian Somerville-Software Engineering 8th Edition, Pearson Education,2009 (UNIT II & UNIT III)

Reference Books

1. Pankaj Jalote, Integrated Approach to Software Engineering.
2. Pressmann, An Integrated Approach to Software Engineering, McGraw Hill.

Semester: V

Course Code: **G 601 DE 1.5**	**Course Title: Cloud Computing**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- CO1 Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- CO2 Apply the fundamental concepts in data centers to understand the trade-offs in power, efficiency and cost.
- CO3 Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
- CO4 Analyze various cloud programming models and apply them to solve problems on the cloud.

Contents	Hours
Unit - 1	

Defining Cloud Computing - Defining Cloud Computing**,** Cloud types: The NIST model, The cloud Cube Model, Deployment Models, Service Models, Examining the Characteristics of Cloud Computing: Paradigm shift, Benefits of cloud computing; Assessing the Role of Open standards. **Understanding Cloud Architecture** – Exploring the cloud computing stack: composability, infrastructure, platforms, virtual appliances, communication protocols, applications, connecting to the cloud.	12
Unit - 2	
Managing the Cloud – Administrating the clouds: Management responsibilities, Lifecycle management, Cloud management Products, Emerging Cloud Management Standards: DMTF cloud management standards, Cloud Commons and SMI, **Understanding Cloud Security** - Securing the cloud: The security boundary, Security service boundary, Security mapping, Security Data: Brokered cloud storage access, Storage location and tenancy, Encryption, Adding and compliance, Establishing Identity and Presence: Identity Protocol standards, Windows Azure identity standards, presence.	10
Unit - 3	
Understanding Abstraction and Virtualization: Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology. **Working with Cloud-based Storage –** Measuring the digital universe, cloud storage definition, provisioning cloud storage, managed and unmanaged cloud storage, creating cloud storage systems, virtual storage containers, exploring cloud backup solutions: types, cloud backup features, cloud attached backup; cloud storage interoperability, CDMI, OCCI.	10
Unit - 4	
Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services; Google AppEngine- Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations; Microsoft Azure- Azure Core Concepts (Compute, Storage, Core Infrastructure and Other Services), SQL Azure, Windows Azure Platform Appliance. **Cloud Applications:** Scientific Applications- Healthcare (ECG Analysis in the Cloud) Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing);	10

Text Books:

1. A T. Velte, Toby J Velte, " Cloud Computing A Practical Approach", Tata McGrawHill
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering CloudComputing- Foundations and Applications Programming", Elsevier, 2013
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley India

Reference Books

1. Michael Miller, "Cloud Computing : Web based Applications", Pearson Education Asia
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering CloudComputing- Foundations and Applications Programming", Elsevier, 2013
3. 2 Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
4. Roger Jennings, "Cloud Computing with the Windows Azure Platform", Wiley India
5. David S Linthicum, "Cloud Computing and SOA Convergence in Enterprise", Pearson
6. Henry Li, "Introducing Windows Azure", Wiley Express
7. Eric A Marks, Bob Lozano, "Executive's Guide to Cloud Computing", Wiley
8. Krishna Shanker, Susan A, "Enterprise Web 2.0 Fundamentals", Pearson India

Semester: V

Course Code: **G 601 VO 1.5**	**Course Title: Digital Marketing**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

CO1. Understand the fundamental concepts and principles of digital marketing.
CO2. Develop practical skills to implement various digital marketing strategies and techniques
Co3. Analyze and evaluate the effectiveness of digital marketing campaigns.
CO4. Apply critical thinking and problem-solving skills to real-world digital marketing scenarios.
CO5. Create comprehensive digital marketing plans and strategies.

Contents	**Hours**
Unit - 1	
Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown.	12

Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. **Introduction & origin of Digital Marketing**: Traditional v/s Digital Marketing. Digital Marketing Strategy, The P-O-E-M Framework, Segmenting & Customizing Messages, The Digital landscape, Digital Advertising Market in India. Skills required in Digital Marketing. Digital Marketing Plan. **Case Study on share market** **Overview of Electronic Payment systems:** Types of Electronic payment schemes (Credit cards, Debit cards, Smartcards, UPI, Internet banking), E- checks, E-Cash Concepts and applications of EDI and Limitation	
Unit - 2	
Social Media Marketing: Overview of social media marketing, social media platforms and their features, Creating and optimizing social media profiles, social media content strategy, social media advertising and analytics. Case study	10
Unit - 3	
Email Marketing: Introduction to email marketing, building an email list, creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics. **Mobile Marketing:** Mobile marketing overview, Mobile advertising strategies, Mobile app marketing, Location-based marketing, Mobile marketing analytics. **Content Marketing**: Introduction, Content marketing statistics, Types of Content, Types of Blog posts, Content Creation, Content optimization, Content Management & Distribution, Content Marketing Strategy, Content creation tools and apps, Challenges of Content Marketing, Content promotion and amplification, Content marketing metrics and analytics.	10
Unit - 4	
Search Engine Optimization: Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimize website, On-page and off-page optimization. **Search Engine Marketing**: Introduction to SEM, Introduction to Ad Words - Google Ad Words, Ad Words fundamentals, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation, Display marketing, Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA). **Analytics and Reporting:** Importance of analytics in digital marketing, Setting up web	10

analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators (KPIs), Conversion tracking and optimization, Reporting and data visualization	

Text Books:

1. Simon Kingsnorth- "Digital Marketing Strategy: An Integrated Approach to Online Marketing"
2. Whitley, David, “E-Commerce Strategy, Technologies and Applications”, Tata McGrawHill, 2017
3. Seema Gupta, Digital Marketing, McGraw Hill Education, 2nd Edition

Reference Books

1. S. Pankaj, E-Commerce, A.P.H. Publication, New Delhi
2. Punit Singh Bhatia, Fundamentals of Digital Marketing, Pearson, 2nd Edition
3. Damian Ryan, Calvin Jone , “Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation”,. Kogan Page, 4thEdition.
4. "Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications and Advertising" by Daniel Rowles.
5. "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik.

Semester: V

Course Code: **G 601 SB 1.5**	**Course Title:** Cyber Security
Course Credits: 02	Hours/Week: 03
Total Contact Hours: 30	Formative Assessment Marks: 20
Exam Marks: 30	Exam Duration: 02 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

CO1: Understand the concept of Cyber security and issues and challenges associated with it.
CO2: Understand the cybercrimes, their nature, legal remedies and as to how report the crimes through available

platforms and procedures.
CO3: Appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.
CO4: On completion of this course, students should be able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.

Contents	Hours
Unit - 1	
Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown. **Information System** Introduction to Information Security – Need for Information Security, Information Security Management, Threats to Information system, Information System Attacks Information Assurance – Information assurance Process, Scope of Information Assurance, Information Assurance Model, Security Counter Measures, Time Cyber Security – Need of Cyber Security, Cyber Security Model, Security Risk Analysis. **Security Threats** Introduction, Virus Attacks, Email Viruses, WORMS, Trojan, Logic Bombs, Phishing and Spoofing Attacks, Malware, Denial of Service.	10
Unit - 2	
Cybercrime and Cyber law: Classification of cybercrimes, Common cyber-crimes-cyber-crime targeting computers and mobiles, cyber-crime against women and children, financial frauds, social engineering attacks, malware and ransom ware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime, IT Act 2000 and its amendments, Cyber-crime and offences, Organizations dealing with Cybercrime and Cyber security in India, Case studies.	10
Unit – 3	
Social Media Overview and Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral	10

content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	
Practical (assignment or case study) 1. Checklist for reporting cyber-crime at Cyber-crime Police Station. 2. Checklist for reporting cyber-crime online. 3. Reporting phishing emails. 4. Demonstration of email phishing attack and preventive measures. 5. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User). 6. Setting and configuring two factor authentication in the Mobile phone. 7. Security patches management and updates in Computer and Mobiles.	

Text Book

1. Avantika Yadav, Cyber Security, Narosa Publishing House(UNIT I)
2. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010(UNIT II &III)

Reference Books

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
7. Fundamentals of Network Security by E. Maiwald, McGraw Hill

Semester: V

Course Code: **G 601 SB 1.5**	**Course Title:** Employability Skills
Course Credits: 02	Hours/Week: 03
Total Contact Hours: 30	Formative Assessment Marks: 20
Exam Marks: 30	Exam Duration: 02 Hours

Course Outcomes: On successful completion of the course, the students will be able to

a) Develop systematic problem-solving abilities.
b) Enhance verbal and non-verbal reasoning skills.
c) Improve numerical and analytical abilities.
d) Enhance English language and communication skills.

Contents	Hours
Unit – 1	
Quantitative Aptitude – 1 Overview of Competitive exams in India, Series, Number System, LCM and HCF, Squares and Square roots, Cube and Cube Roots, Surds and Indices, Clocks and Calendar, Algebra, Percentage, Profit and Loss, Interest: simple and Compound interest	12
Unit – 2	
Quantitative Aptitude – 2 Ratio and Proportion and Partnership, Time and Work, Pipes and Cisterns, Speed, Time, and Distance, Trains, Boats and Streams, Permutation and Combination, Probability.	10
Unit – 3	
Logic Reasoning: Verbal Reasoning: Data analysis, Data sufficiency, Decision making, coding & decoding, Blood relations, Puzzle tests, Direction sense test, Problems based on Venn Diagram/Syllogisms, Alphabet test, Arithmetical reasoning, Input/Output, Series and Seating arrangements. Non-Verbal Reasoning: Analogy, Water images, mirror images, embedded figures, Completion of Pattern, Paper folding, Cubes & dice, Figure Formation & Analysis.	10
Unit – 4	
Analytical Ability English Grammar, Verbal ability, Sentence, Spot the error, fill in the blanks, Passages, Statement and Assumptions, Critical Reasoning, Comprehension, Data Interpretation	10
Skill Development Activities: Various activity-based learning methods such as problem-solving exercises, case studies, role-playing, debates, group discussions, mock tests, and assessments can be conducted, in addition to any other relevant activities for the course to ensure effective learning.	

Formative Assessment for Theory	
Assessment Occasion / type	**Marks**

Internal Test (2 Tests)	20
Assignment/Case Study	10
Other activities: Mock test/ Surprise Test/Reports Writing/ Seminars/ Group Discussion Choose any 02 of the activities.	10
Total	**40 Marks**
Summative Assessment for Theory	
There shall be 60 multiple choice questions. Each unit shall have 15 questions. Each questions shall carries 01 marks	60 Marks
Calculators are **not** allowed for the examination	
Question papers shall be set in English and Kannada language	
Total	**60 Marks**

Semester: VI

Course Code: **G 601 DC 1.6**	**Course Title: PHP and MySQL**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes:

After the successful completion of the course, the student will be able to:

CO1. Design dynamic and interactive web pages and websites.

CO2. Run PHP scripts on the server and retrieve results.
CO3. Handle databases like MySQL using PHP in websites

Contents	Hours
Unit – 1	
Introduction to PHP: Introduction to PHP, History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML and White Space, Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.	13
Unit – 2	
Programming with PHP: Conditional statements: if, if-else, switch, The ? Operator, Looping statements: while Loop, dowhile Loop, for Loop Arrays in PHP: Introduction- What is Array?, Creating Arrays, Accessing Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.	13
Unit – 3	
Using Functions, Class- Objects, Forms in PHP: Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus actual parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions Strings in PHP: What is String? Creating and Declaring String, String Functions. **Class &Objects in PHP:** What is Class & Object, Creating and accessing a Class &Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor Form Handling:	13
Unit – 4	
Creating HTML Form, Handling HTML Form data in PHP Database Handling Using PHP with MySQL **Introduction to MySQL**: Database terms, Data Types.Accessing MySQL – Using MySQL Client and Using php MyAdmin, MySQL Commands, Using PHP with MySQL: PHP MySQL Functions, Connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results, Counting Returned Records, Updating Records with PHP. **Working with cookies, Sessions and Headers** Working with cookies – Cookie Basics, Cookie attributes, Cookie Headers, Setting Cookies, Reading Cookies, removing Cookies.	13

Working with sessions – Session Basics, Creating Sessions and Session Variables, Removing and Session Variables	

Text Books:

PHP & MySQL for Dynamic Web Sites- Fourth Edition By Larry Ullman.

References:

1.. Learning PHP, MySQL and JavaScript By Robin Nixon –O"REILLY Publications
2. Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre
3. SAMS Teach Yourself PHP in 24 hours, Author: Matt Zandstra, Sams Publishing

Course Code: G 601 DC 2.6	**Course Title: Advanced JAVA and J2EE**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to

- At the end of the course students will be able to Design/Develop Program
- Develop appropriate data model and database scheme
- Create and test prototypes

Contents	Hours

Unit – 1	
Introducing J2EE Need for Enterprise Computing, The J2EE Advantage: Platform Independence, Managed Objects, Reusability, Modularity. Enterprise Architecture Types: Single – Tier Systems, 2- tier Architecture, 3- Tier Architecture, n-Tier Architecture, Architecture of J2EE. Introducing J2EE Runtime and J2EE APIs. Types of J2EE Technologies: Introducing J2EE Components, Containers and Connectors. Introducing J2EE Service Technologies, Introducing J2EE Communication Technologies.	13
Unit – 2	
Java DataBase Connectivity **Getting Started with JDBC** - Introducing JDBC, JDBC Components, JDBC Features, JDBC Architecture, Types of JDBC Drivers, **Working with JDBC API** – Major Classes and Interfaces, Communication with Databases by using JDBC APIs. **Implementing JDBC Statements and ResultSets,** JDBC Statements, working with Statement, Methods of Statement Class, Working with PreparedStatement interface, Comparing Statement and PreparedStatement Objects, Describing setters of PreparedStatement, Advantages and disadvantages of PreparedStatement, Using PreparedStatement, working with ResultSet Interface, Using Result Set.	13
Unit – 3	
Java Servlets: Introduction to Java Servlets, Benefits of Using a Java Servlet, A Simple Java Servlet, Anatomy of a Java Servlet, Deployment Descriptor, Reading Data from a Client, Reading HTTP Request Headers, Sending Data to a client and Writing the HTTP Response Header, Working with cookies, Tracking Sessions.	13
Unit – 4	
Java Server Pages: **Introduction to JSP –** Understanding JSP, Advantages of JSP over Servlets, the JSP architecture, JSP Life Cycle, Creating Simple JSP Page, **Working with JSP Basic Tags and Implicit objects-** Scripting Tags, Implicit Objects, Directive Tags **Working with JavaBeans and Action Tags –** JavaBean, Advantages of Using Beans, Action Tags	13

Text Books

1. Java Server Programming, J2EE 1.4 Edition, Black Book, Dreamtech Software Team (Unit I)
2. Santhosh Kumar K, JDBC Servlet, and JSP, Black Book, Dreamtech Press (Unit II & Unit IV)
3. Jim Keogh ,The Complete Reference J2EE, TATA McGraw-Hill Edition (Unit III)

Reference Books

1. Mukhar Kevin and Weaver L James, Beginning J2EE 1.4, Wrox Press Ltd.
2. Core Servlets and JavaServer Pages Volume 1: Core Technologies second Edition
3. Bergster Hans, Java Server Pages, O'Reilly and Associates Inc
4. Valesky Tom, Enterprise JavaBeans, Pearson Education Asia
5. Hunter Jason, Crawford William, Java Servlet Programming, O'Reilly and Associates Inc

Semester: VI

Course Code: **G 601 DC 3.6**	**Course Title: Artificial Intelligence and Applications**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to

 Gain a historical perspective of AI and its foundations.

 Become familiar with basic principles and strategies of AI towards problem solving
 Understand and apply approaches of inference, perception, knowledge representation, and learning.
 Understand the various applications of AI

Contents	Hours
Unit – 1	
Introduction- What is Artificial Intelligence, Foundations of AI, History, AI - Past, Present and Future. Intelligent Agents-Environments- Specifying the task environment, Properties of task environments, Agent based programs-Structure of Agents , Types of agents- Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.	13
Unit – 2	
Problem Solving by Searching-Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies-Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Greedy best-first search, A* Search, AO* search Informed (Heuristic) Search Strategies, Heuristic Functions.	13
Unit – 3	
Knowledge Representation - Knowledge-Based Agents, The Wumpus World , Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining.	13
Unit – 4	
Learning– Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines. **Applications of AI** - Natural Language Processing, Text Classification and Information Retrieval, Speech Recognition , Image processing and computer vision, Robotics.	13

Text Books:

1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003

References:

1. Tom Mitchell, “Machine Learning”, 1st Edition, McGraw-Hill,2017 Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition

Semester: VI

Course Code: **G 601 DE 1.6**	**Course Title: Fundamentals of Data Science**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand the concepts of data and pre-processing of data.
- Know simple pattern recognition methods
- Understand the basic concepts of Clustering and Classification
- Know the recent trends in Data Science

Contents	Hours
Unit - 1	
Data Mining: Introduction to data – small data, Big data, Types of digital data , Data Mining Definitions, Knowledge Discovery in Databases (KDD) Vs Data Mining, DBMS Vs Data Mining, DM techniques, Problems, Issues and Challenges in DM, DM applications.	13
Unit – 2	
Data Warehouse: Introduction, Definition, Data Warehousing: A Multitier Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse Extraction, Transformation, and Loading Metadata Repository. Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Data Cleaning, Data Integration and transformation, Data reduction, Discretization.	13
Unit – 3	
Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods -Apriori and Frequent Pattern Growth (FPGrowth) algorithms -Mining Association Rules	13
Unit – 4	
Classification: Basic Concepts, Issues in Classification, And Algorithms: Decision Tree Induction. Bayes Classification Methods, Rule-Based Classification, Lazy Learners (or Learning from your Neighbours), k Nearest Neighbour. Prediction – Accuracy-Precision and Recall **Clustering:** Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.	13

Text Books:

1. Jiawei Han and Micheline Kambar – “Data Mining Concepts and Techniques” Second Edition
2. Arun K Pujari – “Data Mining Techniques” 4th Edition, Universities Press
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012.
4. K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI
5. Pang-Ning Tan, Michael Steinbach, Vipin Kumar - “Introduction to Data Mining”, Pearson Education

Semester: VI

Course Code: **G 601 VO 1.6**	**Course Title: Web Content Management System**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:
CO1 Understand content development basics;
CO2 Gain Knowledge of tools for multimedia content development for audio/ video, graphics, animations, presentations, screen casting
CO3 Host websites and develop content for social media platforms such as wiki and blog
CO4 Understand e-publications and virtual reality
CO5 Use of e-learning platform Moodle and CMS applications Drupal and Joomla

Contents	Hours
Unit - 1	
Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing,	13
Unit – 2	
Web Hosting and Managing Multimedia Content. Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques, Multilingual Content Development.	13
Unit – 3	
Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WIKI Site, Creating and Managing a Blog Site,	13
Unit – 4	
E- Publication Concept, E- Pub Tools, Simulation and Virtual Reality Applications, Creating 2D and 3 D Animations. Introduction to Moodle, Creating a New Course and Uploading, Create and Add Assessment, Add and Enroll User and Discussion Forum, Content Management System: Joomla, Content Management System: Drupal.	13

Text Books:

1. Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker.
2. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
3. Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
4. Using Joomla!: Efficiently Build and Manage Custom Websites 2nd Edition by Ron Severdia

Additional Reading: https://onlinecourses.swayam2.ac.in/cec20_lb09/preview

Semester: VI

Course Code: **G 601 SB 1.6**	**Course Title: Internship/Mini Project**
Course Credits: 02	Hours/Week: 02
Total Contact Hours: 30	Formative Assessment Marks: 20
Exam Marks: 30	Exam Duration: 02 Hours

GUIDELINES FOR CONDUCTING INTERNSHIP:

Internships can cover a wide range of concepts and topics and some common concepts that can be covered under various types of internships:

- **Technical Skills**
  - Depending on the field, interns can develop technical skills such as programming languages, software tools, data analysis, design software, and more.
- **Soft Skills:**
  - Communication: Written and verbal communication skills, including effective email communication, presentations, and client interactions.
  - Teamwork: Collaborating with colleagues, working in cross-functional teams, and building effective

relationships.

- Time Management: Prioritizing tasks, managing deadlines, and staying organized.
- Problem Solving: Analysing challenges, identifying solutions, and making informed decisions.
- Adaptability: Handling changes, learning new processes, and adjusting to evolving situations.

Innovation and Entrepreneurship:

- Exploring innovative business ideas, product development, market research, and business model creation.

Data Analytics and Interpretation:

- Learning how to work with data, perform analysis, and derive insights to inform decision-making.

Leadership and Management:

- Developing leadership skills, understanding different management styles, and learning how to motivate teams.

These are just a few examples of the many concepts that can be covered in internship programs. The specific concepts/coverage of the above will vary based on college infrastructure and faculty competence. It is important to tailor the internship experience to align with the interns' career goals and the industry needs. Evaluation: The report shall be prepared by the student under the guidance of the identified mentor in the college and submitted to the Head of the Department for evaluation. The report shall be evaluated by the two internal faculty members and submit the final sessional and summative marks.

Semester: VI

Course Code: **G 601 SB 1.6**	**Course Title: Mini Project**
Course Credits: 02	Hours/Week: 02
Total Contact Hours: 30	Formative Assessment Marks: 20
Exam Marks: 30	Exam Duration: 02 Hours

PROJECT GUIDELINES

Preamble:

Project work has been made a part of BCA course to give students exposure to Software development exercises. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices. As such, during the development of the project students shall involve themselves in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation, with an overall emphasis on the development of reliable software systems. Since, the project work spans over the entire final semester, the students shall be advised to take up projects for solving problems

of software industry or any research organization or the real-life problems suggested by the faculty in- charge of BCA project work in the Institutions. Topic chosen of work must be nontrivial, analytical and application–oriented. It must involve substantial original work and/or development effort based on the theme. Solved, off-the-shelf and pirated work is not entertained. Any attempt of plagiarism or use of unfair means will result in rejection of the work. All activities of the Project Development must be time-bound and the equal participation of the team members expected throughout the Development process.

GENERAL GUIDELINES TO THE INSTITUTIONS

- Calendar of Project Work shall be announced before the commencement of the Sixth semester. Calendar should contain tentative schedules for the submission of Project Proposal, Project Acceptance, Project Synopsis, Problem Analysis Document, System Design Document, Database Design , Detailed Design , Coding and Testing , Final Report, Internal Assessment exams (at least two), Viva/Voce etc.

- Students shall undertake projects with real life problems (that has direct relevance in day-to-day activities or to knowledge extension) either in their Colleges or in industry/research and development laboratories/software companies as recommended by the faculty in-charge of BCA project work in the Institutions. If a student intends to do industry project, the faculty incharge shall ensure that the projects are genuine and original in nature.

- There shall be not more than three members in a Project team.

- At least two internal assessment exams shall be conducted to evaluate the progress made by the students at different stages of project work. Such exams may include written tests, document verification and presentations, work demonstration, group discussion, viva-voce etc. so as to objectively assess the understanding gained by the students in course of their project work.

PROJECT VALUATION

- External and Internal Examiners together conduct project valuation objectively.
- To begin with, the finer details about various points contained in the scheme of valuation may be conclusively agreed upon through mutual consultation. During project evaluation, a student shall present his/her work through live demonstration of the software application developed as a part of project.
- However, if live demonstration is not possible due to the reason that some companies do not divulge source code on account of owner
- ship rights or copyrights, students may be allowed to make PPT presentation of their authentic works.
- In such cases, candidates shall produce necessary declarations issued by the companies to this effect. However, students shall be enabled to present their work in entirety.
- The primary objective of project evaluation shall be to assess the extent of effort that was put in to meet the objectives of the project and also to gauge the understanding gained by the students in course of their project works.
- While evaluating Project Reports, examiners shall scrutinize whether Software Development Life Cycle (SDLC) principles have been consistently followed in the project work and the same are documented well in the

Reports.

- However, the relative and overall emphasis of these principles to a particular problem domain chosen may be taken into account so that project evaluations remain fair and objective.

SCHEME OF VALUATION and Marks Distribution

Program Name	**B.C.A**	Semester	**VI**
Course Title	Mini Project***		
Course Code:	**G 601 SB 1.6**	No.of Credits	**02**
Contact hours	**30 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**30**

FORMAT OF PROJECT SYNOPSIS

Synopsis is a brief outline or general view, as of a subject or written work; an abstract or a summary of the Project Work. It must be as brief (NOT MORE THAN 20 A4 sized paper pages) as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up.

The write up must adhere to the guidelines and should include the following;

Title of the Project.
2. Introduction, objectives and scope of the Project.
3. Project category (Database/WebApplication/Client-server/Networking/ Multimedia/gaming/Simulation etc).
4. Tools / Platform, Hardware and Software Requirement specifications.
5. Analysis (DFDs at least up to second level, ER Diagrams/ Class Diagrams, Database Design etc, as per the project requirements).
6. A complete structure which includes: Number of modules and their description to provide an estimation of the students effort on the project, Data Structures as per the project requirements for all the modules, Process logic of each module, testing process to be used, reports generation (Mention tentative content of report).
7. Whether Industry Defined/Client Defined/User Defined Project? Mention the type.Mention the name and Address of the Industry/Client.
8. Limitation of the project. 9. Future scope and further enhancement of the project.

GUIDELINES FOR PREPARATION OF DISSERTATION

The dissertation shall be presented in a number of chapters; starting with Introduction and ending with Conclusion. Each of the chapters will have precise title reflecting the contents of the chapter. A chapter can be subdivided intosections, sub-sections and subsub-sectionso as to present the content discretely and with due emphasis.

Sequence of items in Dissertation Report

The following sequence may be followed in the preparation of the final dissertation report:

●Cover Page (On the hardbound cover)
 Title Page (Inner Cover Page)
 Certificate from the Institute
 Certificate from the Company
 Declaration
 Acknowledgement
 (Detailed) Table of Contents (with page numbers).
 List of Figures (with figure number, figure titles and page numbers)
 List of Tables with table number, table title and page number.
 Chapters

1. Introduction

1. Introduction

a. Introduction of the System

i. Project Title
ii. Category
iii. Overview

b. Background
    i. Introduction of the Company
    ii. Brief note onn Existing System
c. Objectives of the System
d. Scope of the System
e. Structure of the System
f. System Architecture
g. End Users
h. Software/Hardware used for the development
i. Software/Hardware required for the implementation

2. SRS

a. Introduction (Brief write-up about SRS)
b. Overall Description
    i. Product perspective
    ii. Product Functions
    iii. User characteristics.
    iv. General constraints
    v. Assumptions
c. Special Requirements (Software / Hardware-if any)
d. Functional requirement.
    i. Module 1
    ii. Module 2
e. Design Constraints
f. System Attributes
g. Other Requirements (if any)

3. System Design (Functional Design)

a. Introduction (brief write-up about System Design)
b. Assumptions and Constraints
c. Functional decomposition
d. Description of Programs
    i. Context Flow Diagram (CFD)
    ii. Data Flow Diagrams (DFDs–Level 0, Level 1, Level 2)

e. Description of components
    i. Functional component 1
    ii. Functional component 2

4. Database Design (or Data structure)

a. Introduction (brief write-up about Database design)
b. Purpose and scope
c. Table Definition
d. ER diagram

5. Detailed Design (Logic design of modules)

a. Introduction (brief write-up about Database design)
b. Structure of the software package (structure chart)
c. Modular decomposition of the System
    i. Module1
        1. Inputs
        2. Procedural details
        3. File I/O interfaces
        4. Outputs
        5. Implementation aspects (if any)
    ii. Module 2 …..

6. Program code listing

a. Database connection
b. Authorization / Authentication
c. Data store / retrieval /update
d. Data validation
e. Search
f. Named procedures / functions
g. Interfacing with external devices (if any)
h. Passing of parameters
i. Backup/recovery
j. Internal documentation

7. User Interface (Screens and Reports)

a. Login
b. Main Screen / Home page
c. Menu
d. Data store / retrieval / update
e. Validation

f. View
g. On screen reports
h. Data Reports
i. Alerts
j. Error messages

8. Testing

a. Introduction (brief write-up about Software Testing)
   i. Unit Testing
   ii. Integrate Testing
   iii. System Testing
b. Test Reports

- Conclusion
- Limitations
- Scope for enhancement (future scope)
- Abbreviations and Acronyms (list)
- Bibliography / References (list in specified format)

Do not include any header or footer in any page of the report. Only page numbers should be mentioned at the bottom center of each page. 'n'copies of dissertation along with soft copy in CD should be prepared by the candidate.

2. DISSERTATION FORMAT

2.1 Paper

2.1.1 Quality

The dissertation shall be printed on white bond paper, whiteness 95% or above, weight 70 gram or more per square meter.

2.1.2 Size

The size of the paper shall be standard A4; height 297 mm, width 210 mm.

2.1.3 Type-Setting, Text Processing and Printing

The text shall be printed employing Laserjet or Inkjet printer, the text having been processed using a standard text processor. The standard font shall be Times New Roman of 12 pts with 1.5 line spacing.

2.1.4 Page Format

The printed sheets shall have the following writing area and margins: Top margin .5"

Bottom margin .5”
Left margin 1”
Right margin .75”

2.1.5 Pagination

Page numbering in the text of the dissertation shall be numerals starting from **‘1’ at the center of the footer**. The text of the written dissertation shall not beless than 60 pages excluding references, tables, questionnaires and other annexure.

Pagination for pages before the Introduction chapter shall be in lower case Roman numerals, e.g., ‘iv’.

2.1.6 Paragraph format

Vertical space between paragraphs shall be about 2.5 line spacing.

The first line of each paragraph should normally be indented by five characters or 12 mm. A candidate may, however, choose not to indent if (s) he has provided sufficient paragraph separation.

A paragraph should normally comprise more than one line. A single line of a paragraph shall not be left at the top or bottom of a page (that is, no windows or orphans should be left). The word at the right end of the first line of a page or paragraph should, as far as possible, not be hyphenated.

2.2 Chapter and Section format

2.2.1 Chapter

Each chapter shall begin number (in Hindu on a fresh page with an additional top margin of about 75 mm. Chapter Arabic) and title shall be printed at the center of the line in 6 mm font size (18 pt) in bold face using both upper and lower case (all capitals or small capitals sha ll not be used). A vertical gap of about 25 mm shall be left between the chapter number and chapter title lines and between chapter title line and the first paragraph.

2.2.2 Sections and Sub sections

A chapter can be divided into Sections, Sub sections and Sub different concepts separately. Sections and sub-- sub sections so as to present sections can be numbered using decimal points, e.g., 2.2 for the second Section in Chapter 2 and 2.3.4 for the fourth Sub Sections and Sub-- section in third Section of Chapter 2. Chapters, Sections shall be included in the Contents with page numbers flushed to the right. Further subsections need not be numbered or included in the contents. The Sections and Sub sections titles along with their numbers in 5 and 4mm (16 and 14 pt) fonts, respectively, in bold face shall be flushed to the left (not centered) with 15 mm space above and below these lines. In further subdivisions character size of 3 and 3.5 with bold face, small caps, all caps and italics may be sued for the titles flushed left or centered. These shall not feature in the contents.

2.2.3 Table / Figure Format

As far as possible tables and figures should be presented in portrait style. Small size table and figures (less than half of writing area of a page) should be incorporated within the text, while larger ones may be presented in separate pages. Table and figures shall be numbered chapter wise. For example, the fourth figure in Chapter 5 will bear the number Table Figure 5.4 or Fig.5.4

Table number and title will be placed above the table while the figure number and caption will be located below the figure. Reference for Table and Figures reproduced from elsewhere shall be cited in the last and separate line in the table and figure caption,
e. g. (after McGregor [12]).

3 AUXILIARY FORMATS

1.1 Binding

The dissertation shall be hard cover bound in leather or rexin.

1.2 Front Covers

The front cover shall contain the following details:

- Full title of dissertation in 6 mm 22 point size font properly centered and positioned at the top.
- Full name of the candidate in 4.5 mm 15 point size font properly centered at the middle of the page.
- A 40 mm dia replica of the college emblem followed by the name of the Department and the year of submission, each in a separate line and properly centered and located at the bottom of the page.

1.2.1 Lettering

All lettering shall be embossed in gold.

1.2.2 Bound back

The degree, the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.

1.3 Blank sheets

In addition to the white sheets (binding requirement) two white shall be put at the beginning and end of the dissertation.

1.4 Title sheet

This shall be the first printed page of the dissertation and shall contain the submission statement: the Dissertation submitted in partial fulfillment of the requirements of the BCA, the name and Roll No. Of the candidate, name (s) of the supervisor and co- supervisor (s) (if any), Department and year of submission.

Scheme of Assessment for Theory Examination

Duration: 3 Hrs

Max Marks: 60

<table>
<tr><th colspan="2">Question Pattern</th><th>Marks</th></tr>
<tr><td colspan="3">Part – A</td></tr>
<tr><td colspan="2">1. Answer any SIX sub-questions (6×2=12)</td><td rowspan="5">12</td></tr>
<tr><td>Sub-question</td><td>Unit</td></tr>
<tr><td>a, b</td><td>1</td></tr>
<tr><td>c, d</td><td>2</td></tr>
<tr><td>e, f</td><td>3</td></tr>
<tr><td>g, h</td><td>4</td></tr>
<tr><td colspan="3">Part – B
(Answer any ONE full question from each unit – 12 marks each)
(Combinations of sub-questions of 3 to 6 marks)</td></tr>
<tr><td colspan="2">Unit-1</td><td rowspan="3">12</td></tr>
<tr><td colspan="2">2.</td></tr>
<tr><td colspan="2">3.</td></tr>
<tr><td colspan="2">Unit-2</td><td rowspan="3">12</td></tr>
<tr><td colspan="2">4.</td></tr>
<tr><td colspan="2">5.</td></tr>
<tr><td colspan="2">Unit-3</td><td rowspan="3">12</td></tr>
<tr><td colspan="2">6.</td></tr>
<tr><td colspan="2">7.</td></tr>
<tr><td colspan="2">Unit-4</td><td rowspan="3">12</td></tr>
<tr><td colspan="2">8.</td></tr>
<tr><td colspan="2">9.</td></tr>
<tr><td colspan="2">Total</td><td>60</td></tr>
</table>

Computer Application Core Courses (CAC) for BCA (Hons)

Sl. No	Course Code	Title of the Paper
1	CAC01	Fundamentals of Computers
2	CAC02	Programming in C
3	CAC03	Mathematical Foundation
4	CAC04	Discrete Mathematical Structures
5	CAC05	Object Oriented Concepts using JAVA
6	CAC06	Data Structures using C
7	CAC07	Data Base Management Systems
8	CAC08	C# and DOT NET Framework
9	CAC09	Operating System Concepts
10	CAC10	Python Programming
11	CAC11	Computer Multimedia and Animation
12	CAC12	Computer Communication and Networks
13	CAC13	Internet Technologies
14	CAC14	Statistical Computing and R Programming
15	CAC15	Software Engineering
16	CAC16	PHP and MySQL
17	CAC17	Artificial Intelligence and Applications
18	CAC18	Analysis and Design of Algorithms
19	CAC19	Data Mining and Knowledge Management
20	CAC20	Automata Theory and Compiler Design
21	CAC21	Cryptography and Network Security

Computer Application Electives (CAE) for BCA (Hons)

Sl. No	Computer Application Electives (CAE)
1	Business Intelligence
2	Cyber Law and Cyber Security
3	Data Analytics
4	Data Compression
5	Embedded Systems
6	Fundamentals of Data Science
7	Internet of Things (IoT)
8	Machine Learning
9	Mobile Application Development
10	Open-source Programming
11	Pattern Recognition
12	Storage Area Networks

Vocational Electives

Sl. No	Vocational Electives
1	DTP, CAD and Multimedia
2	Hardware and Server Maintenance
3	Web Content Management Systems
4	Computer Networking
5	Health Care Technologies
6	Digital Marketing
7	Office Automation

Open Electives in Computer Science

(For Students studying Core Courses other than Computer Science/ Computer Applications)

Sl. No	Open Electives in Computer Science
1	C Programming Concepts
2	Office Automation
3	Multimedia Processing
4	Python Programming Concepts
5	R Programming
6	E-Content Development
7	E-Commerce
8	Web Designing
9	Computer Animation
10	Accounting Package