ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.

ಜ್ಞಾನ ಗಂಗಾ, ಕಲಬುರಗಿ–585 106, ಕರ್ನಾಟಕ, ಭಾರತ

(ಕರ್ನಾಟಕ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳ ಅಧಿನಿಯಮ 1976ರಡಿಯಲ್ಲಿ 10-09-1980 ರಂದು ಸ್ಥಾಪಿಸಲಾದ ವಿಶ್ವವಿದ್ಯಾಲಯ ಮತ್ತು 2000ರ ಅಧಿನಿಯಮದ ಅಡಿಯಲ್ಲಿ ಬದಲಾಯಿಸಿದಂತೆ)

ದೂರವಾಣಿ ಸಂ. 08472-263202 ಫ್ಯಾಕ್ಸ್: 08472-263206, ಇ-ಮೇಲ್: registrargug@rediffmail.com

ವಿದ್ಯಾಮಂಡಲ

ಕ್ರ.ಸಂ.ಗುವಿಕ/ವಿಮವಿ/ಬಿ.ಎಸ್/2024-25/ 177 ದಿನಾಂಕ: 23/07/24

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಸ್ನಾತಕ ಪದವಿ ಕೋರ್ಸಿನ **ಗಣಕವಿಜ್ಞಾನ (ಬಿ.ಸಿ.ಎ) ವಿಷಯದ** ಪಠ್ಯಕ್ರಮ ಅನುಮೋದಿಸಿ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ:1. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ. ಇಡಿ 166 ಯುಎನ್ಇ 2023 ಬೆಂಗಳೂರು, ದಿನಾಂಕ:08.05.2024
2. ಗಣಕವಿಜ್ಞಾನ ವಿಷಯದ ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 10.07.2024
3. ವಿಜ್ಞಾನ ನಿಕಾಯಗಳ ಸಮಿತಿ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 11.07.2024
4. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆ ದಿನಾಂಕ: 15.07.2024
5. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ:19.07.2024

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ಸರ್ಕಾರದ ನಿರ್ದೇಶನದಂತೆ, 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿರುವ ಸ್ನಾತಕ ಪದವಿ ಪಠ್ಯಕ್ರಮವನ್ನು ಜಾರಿಗೊಳಿಸಬೇಕಾಗಿರುವ ಪ್ರಯುಕ್ತ **ಗಣಕವಿಜ್ಞಾನ (ಬಿ.ಸಿ.ಎ)** ಅಧ್ಯಯನ ಮಂಡಳಿಯು ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಶಿಫಾರಸ್ಸು ಮಾಡಿರುವುದರಿಂದ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿಜ್ಞಾನ ನಿಕಾಯದ ಸಭೆಯಲ್ಲಿ ಒಪ್ಪಗೆ ಪಡೆದಿರುವಂತೆ, ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆಯಂತೆ ಪದವಿ ಕೋರ್ಸಿನ **ಗಣಕವಿಜ್ಞಾನ (ಬಿ.ಸಿ.ಎ)** ಸ್ನಾತಕ ಪಠ್ಯಕ್ರಮವನ್ನು 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಲಾಗಿದೆ.

ಈ ಮಾಹಿತಿಯನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರಗಳನ್ನು ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gug.ac.in ದಿಂದ ಪಡೆಯಬಹುದಾಗಿದೆ.

ಕುಲಸಚಿವರು
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

ಗೆ,

1. ಮುಖ್ಯಸ್ಥರು, **ಗಣಕವಿಜ್ಞಾನ ವಿಷಯದ** ವಿಭಾಗ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.
2. ಎಲ್ಲಾ ಪದವಿ ಕಾಲೇಜುಗಳ ಪ್ರಾಂಶುಪಾಲರುಗಳಿಗೆ.

ಪ್ರತಿಗಳು:

1. ಡೀನ್‌ರು, ಕಲಾ ನಿಕಾಯ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
2. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ
3. ನಿರ್ದೇಶಕರು, ಪಿಎಂಇಬಿ ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
4. ಗ್ರಂಥಪಾಲಕರು, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
5. ವಿಜ್ಞಾನ ನಿಕಾಯದ ಎಲ್ಲಾ ಅಧ್ಯಯನ ವಿಭಾಗಗಳ ಮುಖ್ಯಸ್ಥರಿಗೆ ಗು.ವಿ. ಕಲಬುರಗಿ
6. ಸಂಯೋಜಕರು, ಟಾಸ್ಕ್‌ಫೋರ್ಸ್ ಸಮಿತಿ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
7. ವಿಶೇಷಾಧಿಕಾರಿಗಳು, ಆಡಳಿತ, ವಿದ್ಯಾಮಂಡಲ, ಪರೀಕ್ಷಾ, ಅಭಿವೃದ್ಧಿ ಗು.ವಿ. ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
8. ಮುಖ್ಯಸ್ಥರು, ಗಣಕ ಕೇಂದ್ರ, ಗು.ವಿ. ಕಲಬುರಗಿ ರವರಿಗೆ ವೆಬ್‌ಸೈಟ್‌ನಲ್ಲಿ ಪ್ರತ್ಯೇಕ ಪೋರ್ಟಲ್‌ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ಸೂಚಿಸಲಾಗಿದೆ.
9. ನೋಡಲ್ ಅಧಿಕಾರಿಗಳು, UUCMS, ಗು.ವಿ.ಕಲಬುರಗಿ ಇವರ ಮಾಹಿತಿಗಾಗಿ
10. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ/ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರ ಗು.ವಿ. ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.

GULBARGA UNIVERSITY, KALABURAGI

DEPARTMENT OF COMPUTER SCIENCE

STATE EDUCATION POLICY (SEP)

SYLLABUS FOR BACHELOR OF COMPUTER APPLICATIONS

(B.C.A.)

(CBCS SCHEME)

(SYLLABUS WITH EFFECT FROM ACADEMIC YEAR 2024-25 &ONWARDS)

Approved the Syllabus by BOS(UG) on dated 10-07-2024 and Faculty on dated 11-07-2024.

BACHELOROF COMPUTER APPLICATIONS (B.C.A.) SEP CBCS SYLLABUS

(SEP CBCS Scheme)

(With effect from the academic year 2024-25 and onwards)

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 (Post Graduate) 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, B.Sc. and M.Sc. programmes with specialization in Computer Science were introduced to train manpower in this highly demanding area.

BCA 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 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.

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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 analyze 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

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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

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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.

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Additional Program Outcomes: **BCA Degree**

The Bachelor of Computer Application (BCA) 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.

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Gulbarga University, Kalaburagi
Department of Computer Science

Proceedings of the meeting of Board of Studies (U.G.) in Computer Science held on 10/07/2024 at 11:00 AM in the Department of Computer Science, Gulbarga University, Kalaburagi.

The following Members were present off-line :

1. Dr. Shivanand S.Rumma — Chairman
2. Dr. Veershetty — Member
3. Dr. Surender Singh — Member

The following Members were present on-line:

4. Dr. Mallamma Reddy — Member
5. Dr. Sridevi — Member

1. The Board prepared the SEP structure & CBCS syllabi for B.Sc. with Computer Science & B.C.A. courses according to the circular issued by the Registrar, Gulbarga University, Kalaburagi vide Ref.No. GU/K/AC.A.BOS/2024-25 Too dated : 07.06.2024. Further, it resolved to accept and approve the syllabi of B.Sc. & B.C.A. courses to be introduced from the academic year 2024-25 onwards. (The said syllabi of B.Sc. & B.C.A.I and II Semester are enclosed).

2. The board resolved to accept and approved the following

   i. The titles of B.Sc. with Computer Science & B.C.A. from I Semester to VI semesters of 3 years U.G programme.
   ii. Detailed curriculum contents of B.Sc. with Computer Science & B.C.A. of I and II Semesters only.

3. The Papers "Discrete Mathematical Structures in B.C.A. Course" are taught by the Computer Science faculty only. Hence board resolved to accept and approve the same.

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GULBARGA UNIVERSITY KALABURAGI
SCHEME OF STUDY AND EXAMINATION FOR B.C.A. IN COMPUTER SCIENCE UNDER CBCS SCHEME
W.E.F. ACADEMIC YEAR 2024-25 AND ONWARDS
SEP-2024-2025

Paper Code	Title of the Course	Marks			Duration of Theory / Practical Exam. Hrs.	Teaching Hours/Week			Credits
		Semester	IA	Total		L	T	P	
FIRST SEMESTER 2024-25 & ONWARDS									
Language-1T	Kannada/MIL-1	80	20	100	03	4	-	-	4
Language-2T	English-1	80	20	100	03	4	-	-	4
Comp-1T	Environmental Studies	80	20	100	03	4	-	-	3
DSC-1AT	Fundamentals of Computers	80	20	100	03	4	-	-	4
DSC-2AT	Discrete Mathematical Structures	80	20	100	03	4	-	-	4
DSC-3AT	Problem Solving Using C	80	20	100	03	4	-	-	4
PRACTICALS									
DSC-1AP	Practical-I: Fundamentals of Computers Lab	40	10	50	02	-	-	4	2
DSC-2AP	Practical-II: Discrete Mathematical Structures Lab	40	10	50	02	-	-	4	2
DSC-3AP	Practical-III: Problem Solving Using C Lab	40	10	50	02	-	-	4	2
TOTAL MARKS FOR FIRST SEMESTER				**750**					**29**
SECOND SEMESTER 2024-25 & ONWARDS									
Language-1T	Kannada/MIL-1	80	20	100	03	4	-	-	4
Language-2T	English-1	80	20	100	03	4	-	-	4
Comp-2T	Indian Constitution	80	20	100	03	4	-	-	3
DSC-1BT	Operating System	80	20	100	03	4	-	-	4
DSC-2BT	Data Structures Using C	80	20	100	03	4	-	-	4
DSC-3BT	Object Oriented Programming with C++	80	20	100	03	4	-	-	4
PRACTICALS									
DSC-1BP	Practical-IV: Operating System Lab	40	10	50	02	-	-	4	2
DSC-2BP	Practical-V: Data Structures Using C Lab	40	10	50	02	-	-	4	2
DSC-3BP	Practical-VI: Object Oriented Programming with C++ Lab	40	10	50	02	-	-	4	2
TOTAL MARKS FOR SECOND SEMESTER				**750**					**29**
THIRD SEMESTER 2025-26 & ONWARDS									
Language-1T	Kannada/MIL-1	80	20	100	03	4	-	-	4
Language-2T	English-1	80	20	100	03	4	-	-	4
DSC-1CT	Java Programming	80	20	100	03	4	-	-	4
DSC-2CT	Computer Networks	80	20	100	03	4	-	-	4
DSC-3CT	Database Management System	80	20	100	03	4	-	-	4
Elective-1 DSE-1T	a) Internet of Things b) Cyber Security	40	10	50	02	2	-	-	2
PRACTICALS									
DSC-1CP	Practical-VII: Java Programming Lab	40	10	50	02	-	-	4	2
DSC-2CP	Practical-VIII: Computer Networks Lab	40	10	50	02	-	-	4	2
DSC-3CP	Practical-IX: Database Management System Lab	40	10	50	02	-	-	4	2
TOTAL MARKS FOR THIRD SEMESTER				**700**					**28**
FOURTH SEMESTER 2025-26 & ONWARDS									
Language-1T	Kannada/MIL-1	80	20	100	03	4	-	-	4
Language-2T	English-1	80	20	100	03	4	-	-	4

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Skill-1P	R Programming	40	10	50	02	-	-	4	2
DSC-1DT	VB.NET	80	20	100	03	4	-	-	4
DSC-2DT	Python Programming	80	20	100	03	4	-	-	4
DSC-3DT	Software Engineering	80	20	100	03	4	-	-	4
Elective-2 DSE-2T	a) Big Data Analytics b) Cloud Computing	40	10	50	02	2	-	-	2
PRACTICALS									
DSC-1DP	Practical-X: VB.NET Lab	40	10	50	02	-	-	4	2
DSC-2DP	Practical-XI : Python Programming Lab	40	10	50	02	-	-	4	2
TOTAL MARKS FOR FOURTH SEMESTER				**700**					**28**
FIFTH SEMESTER 2026-27 & ONWARDS									
Skill-2T	Research Methodology	40	10	50	02	2	-	-	2
DSC-1ET	Design and Analysis of Algorithms	80	20	100	03	4	-	-	4
DSC-2ET	Computer Graphics	80	20	100	03	4	-	-	4
DSC-3ET	Web Technologies	80	20	100	03	4	-	-	4
PRACTICALS									
DSC-1EP	Practical-XII: Design and Analysis of Algorithms Lab	40	10	50	02	-	-	4	2
DSC-2EP	Practical-XIII: Computer Graphics Lab	40	10	50	02	-	-	4	2
DSC-3EP	Practical-XIV: Web Technologies Lab	40	10	50	02	-	-	4	2
TOTAL MARKS FOR FIFTH SEMESTER				**500**					**20**
SIXTH SEMESTER 2026-27 & ONWARDS									
DSC-1FT	Digital Image Processing	80	20	100	03	4	-	-	4
DSC-2FT	Data Science	80	20	100	03	4	-	-	4
DSC-3FT	Artificial Intelligence	80	20	100	03	4	-	-	4
PRACTICALS									
DSC-1FP	Practical-XV: Digital Image Processing Lab	40	10	50	02	-	-	4	2
DSC-2FP	Practical-XVI: Data Science Lab	40	10	50	02	-	-	4	2
Skill-3 MP	Major Project Report (MPR) (90 for Project evaluation, 30 for viva-voce=120,30 for IA , Total=150 marks)	120	30	150	03	-	-	12	6
TOTAL MARKS FOR SIXTH SEMESTER				**550**					**22**
TOTAL MARKS & CREDITS FOR THE COURSE				**3950**					**156**

Note: Course = Paper, DSC: Discipline Specific Core Course, DSE= Discipline Specific Elective, L=Lecture, T=Tutorial, P=Practical.

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Theory Examination Question Paper Pattern for Major Subjects of B.Sc. /BCA

Time:03 Hours **Max. Marks:80**

Instructions to Candidates:

1. **All Sections are Compulsory.**
2. **Draw neat and labelled diagrams wherever necessary.**

Section-A			
Answer ALL the following Questions			**10x2=20**
Q1	a	Question to be asked from Unit-I	
	b	Question to be asked from Unit-I	
	c	Question to be asked from Unit-I	
	d	Question to be asked from Unit-II	
	e	Question to be asked from Unit-II	
	f	Question to be asked from Unit-II	
	g	Question to be asked from Unit-III	
	h	Question to be asked from Unit-III	
	i	Question to be asked from Unit-IV	
	j	Question to be asked from Unit-IV	

Section-B		
Answer any SIX of the following Questions		**6x5=30**
2	Question to be asked from Unit-I	
3	Question to be asked from Unit-I	
4	Question to be asked from Unit-II	
5	Question to be asked from Unit-II	
6	Question to be asked from Unit-III	
7	Question to be asked from Unit-III	
8	Question to be asked from Unit-IV	
9	Question to be asked from Unit-IV	

Section-C		
Answer any Three of the following Questions		**3x10=30**
10	Question to be asked from Unit-I	
11	Question to be asked from Unit-II	
12	Question to be asked from Unit-III	
13	Question to be asked from Unit-IV	

Note : While drawing the Questions, all the units in the syllabus must be given equal weightage.

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Theory Examination Question Paper Pattern for Elective/Skill Papers of B.Sc. /BCA

Time:02 Hours **Max. Marks:40**

Instructions to Candidates:

1. **All Sections are Compulsory.**
2. **Draw neat and labelled diagrams wherever necessary.**

Section-A			
Answer ALL the following Questions			**5x2=10**
Q1	a	Question to be asked from Unit-I	
	b	Question to be asked from Unit-I	
	c	Question to be asked from Unit-I	
	d	Question to be asked from Unit-II	
	e	Question to be asked from Unit-II	
Section-B			
Answer any SIX of the following Questions			**6x5=30**
2		Question to be asked from Unit-I	
3		Question to be asked from Unit-I	
4		Question to be asked from Unit-I	
5		Question to be asked from Unit-I	
6		Question to be asked from Unit-II	
7		Question to be asked from Unit-II	
8		Question to be asked from Unit-II	
9		Question to be asked from Unit-II	

Note : While drawing the Questions, all the units in the syllabus must be given equal weightag

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Course Content for BCA
Semester-I

Course Code: DSC-1AT	**Course Title:** Fundamentals of Computers
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03

Course Learning Objectives:

- To introduce the fundamentals of computing devices with respect to personal use of computer hardware and software, the Internet, and networking.
- To provide knowledge of computer course, types of computer languages, translators and flowchart.
- Explore the knowledge of types of memory, processors, slots, drives and chipset.
- Understand Network terminologies, configuration, modem, network hardware and connecting the network using various topologies.
- Knowledge of connecting computer or a device to the Internet, various Internet protocols and handling of e-mail.

Course Outcomes

- Learn the functional units of Computer,Evolution,computer course , Boolean algebra and types of softwares.
- To connect hardware components to the computer systems and practice connecting ports, cables, connectors and interfaces.
- Ability to understand network basics, network hardware and construct various network topologies.
- To perform various procedures to connect Internet to the System, study Internet Protocols and learn proficiency in writing e-mails.

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Contents	Hours
Unit – 1	
Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer. **Number Systems** – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables,Logic gates. **Types of Software**–System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program-Algorithm, Flowchart and Pseudo code with Examples.	12
Unit – 2	
Components of a Computer System Central Processing Unit, Bus-Address bus, Data Bus, Control Bus, Registers-Types of Register, Cache Memory, Memory-ROM-.PERMANENT ROM, SEMI PERMANENT ROM, RAM, Motherboard, Form Factors, Memory Slots, Processor Slots, Clock Chip & CMOS battery, Drives, HDD,CD/DVD, Tape Drive, Chip Set. **Ports, Cables and Connectors** Ports-USB, PS/2, Serial Port, Parallel Port, Audio Port, VGA Port. Cables-Parallel Advanced Technology Attachment (PATA) cables, Serial Advanced Technology Attachment (SATA) cables, SMPS, CPU Fan, and Heat Sink. Connectors-Motherboard Power Connectors, SATA Power Connector, Molex Power Connectors, Berg Power Connector. **Cards and Interfaces** Cards- Display Adaptor Card-EGA, VGA,SVGA, Video Card/Graphics Card, Network Interface Card(NIC),Flash Memory-NOR and NAND Flash Memory.	12
Unit – 3	
Network Hardware Network hardware -Modem, RJ-45 Connector, NIC, Hub-Active & Passive, Switch, Repeaters, Bridge, Router, Gateway. **Network Basics** Introduction to networking, network terminologies, classification of networks, benefits, Transmission media, Switching techniques, Network configuration. **Network topology:** Point to point, bus, ring, star, tree, mesh, and hybrid topology networks.	12

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Unit – 4	
INTERNET Introduction, Uses of Internet, Internet Protocol (IP) Address, Domain Names, Electronic Mail Address, Transmission Control Protocol (TCP), Uniform Resource Locator (URL), Access to Internet- Dial-up – Connection, Digital Subscriber Line (DSL),Cable Modems, Direct Connection, Integrated Service Digital Network (ISDN), T1 (Tee-one) and T3 (Tee-Three) Dedicated Line, Prerequisites For Internet. **Internet Protocols** Introduction, Transmission Control Protocol/Internet Protocol [TCP/IP|, File Transfer Protocol (FTP), Hyper Text Transfer Protocol (HTTP), Telnet, Gopher, Wide Area Information Service (WAIS). **E-Mail** Introduction: Email, Creating An E-mail Account, E-mail Sending and Receiving, E-mail Names and Programs- Address Book, Signature Features, Attachment Facility, Setting Priority, Advantages and Disadvantages of E-mail, World Wide Web (WWW), Website, Webpage, Web Browsers.	12

Text 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,

References:

1. J. Glenn Brook shear," Computer Science: An Overview", Addision-Wesley, TwelfthEdition,
2. R.G. Dromey, "How to solve it by Computer",PHI,
3. Goel, Computer Fundamentals, Pearson Education, 2010.
4. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
5. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

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Course Code: DSC-1AP	**Course Title: Fundamentals of Computers Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02

Part A:

1. Installation and partitioning of Windows and Ubuntu Operating system.
2. System Configuration – BIOS Settings, Registry Editor, MS Config, Task Manager, System Maintenance, Third-party System Maintenance Tools (Similar to CCleaner and Jv16 PowerTools ...)
3. Flow charts: Installation and using of flowgarithms software for different arithmetic tasks like sum, average, product, difference, quotient and remainder of given numbers, calculate area of Shapes (Square, Rectangle, Circle and Triangle), arrays and recursion.
4. Identify types of computer ,components, various ports on the CPU and its usage
5. Identify types of computer and find its usage in agricultural, education and weather forecasting areas
6. Connect the computers using network topologies and then configuring the network.
7. Installation and Uninstallation of Software – Office Tools, Utility Software (like Anti-Virus, System Maintenance tools); Application Software - Like Photo/Image Editors, Audio Recorders/Editors, Video Editors ...); Freeware, Shareware, Payware and Trialware; Internet Browsers, Programming IDEs,
8. Identify network devices and transmission media.
9. Assembling and Dismantle a Desktop computer

Part B:

1. Connecting your Wi-Fi TV to a Wi-Fi PC. And Configure the browser (Internet Explorer) on your computer
2. Enable sharing of file on a network.
3. Tasks involving Internet Browsing
4. Use the Help Index to find Help on the topic personal distribution lists and display it. Follow the instructions to create and add a name to a personal distribution list.
   i. Open any of the e-mail messages in your Inbox.
   ii. Send a reply to the e-mail message adding any suitable reply above the original message.

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iii. Create a new e-mail message.
iv. Add a class address, e.g., Student 2, student 6 as the mail to address in the new mail message.
v. Add another class address, e.g., Student5, student7 as the copy address in the new mail
vi. message. Add Blessings as the subject line, and add the following text in the body of the e-mail message: 'Hi, I found this to be very inspiring. Hope you enjoy it as much as I did.'
vii. Attach the image file Blessings.pps from the directory path C:\My Documents to the e-mail message.
viii. Send the e-mail message with the setting for High Priority enabled.
ix. Open the Address Book from the Tools menu and create a contact for one of the other people on the course.
x. Send a high priority message to the person using the Address Book.
xi. When you receive the message, create a subfolder in the Inbox called Internet Training and move the new message into it.
xii. Delete one of the e-mail messages in your Inbox.
xiii. Retrieve an e-mail message from the Deleted items mail bin and place in the Inbox
xiv. Open the e-mail application, i.e., Microsoft Outlook. Verify your username and type in the password "Password".

5. Configure outlook express for e-mail account.
6. Modify the toolbar display in Microsoft Outlook so that the Status Bar is visible.
7. Write a steps to Creating an e-Mail Account and perform the following

i. Sending and receiving emails.
ii. Chatting, Video Conferencing
iii. Accessing Educational Websites.
iv. Google meets.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Activity – 1 from Part A	Write up on the activity/ task	05
	Demonstration of the activity/ task	10
Activity-2 from Part B	Write up on the activity/ task	05
	Demonstration of the activity/ task	10
	Viva Voce	10
	Total	**40**

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Course Code: DSC-2AT	**Course Title: Discrete Mathematical Structures**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03 Hours

Course Learning Objectives:

- To introduce the concepts of Discrete Mathematical Structures.
- To learn correctness of argument using propositional logic, predicate logic and truth tables.
- Ability to understand the concepts of counting, permutations, combinations, recurrence relations and generating functions.
- Construct mathematical proofs using mathematical induction, recursion and relations.
- Bring the awareness of basic concepts of graphs,its applications and shortest path algorithms.

Course Outcomes

On successful completion of course, the student will able to:

- Ability to apply mathematical logic to solve problems.
- Apply Counting and advanced counting techniques.
- Able to model and solve real-world problems using mathematical induction, recursion and relations.
- Able to model and solve real-world problems using graphs and shortest path algorithms.

Contents	Hours
Unit – 1	
The Foundation: Logic and Proofs: Propositional logic, Applications of propositional logic, propositional equivalence, predicates and quantifiers, nested quantifiers, rules of inference. Introduction to proofs, proof methods and strategy. **Sets and Functions:** Fundamentals of set theory, types of sets, operations on sets, laws of set theory, counting principles, Venn diagrams, principles of duality, Cartesian product. Functions: Representation of a function, domain, Co-domain and range of a function, types of functions, Sequences and Summations. **Matrices:** Matrix, Dimension of Matrix, types of Matrices, Determinants, Minor, Cofactors and adjoint of a Matrix, inverse of a matrix, Rank of a matrix, system of linear equations, Applications of matrices to solve system of linear equations-Cramer's rule and Matrix method.	12

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Unit – 2	
Counting: Basics of counting-sum rule principle, product rule principle. Pigeonhole principle. Permutations: Permutations, permutations on 'n' different things taken 'r' at a time, theorems on permutations, permutations of objects not all different. Combinations: Difference between permutation and combinations, combination of 'n; different things taken 'r' at a time. Properties of combinations. Binomial coefficients-binomial theorems for any positive integer n, general and middle terms. **Recurrence Relation:** Recurrence relations, Applications of recurrence relations-modeling with recurrence relation with Fibonacci numbers and Tower of Hanoi problems, Classification of recurrence relations, Types of recurrence relations. Divide and Conquer problems and recurrence relations. **Generating Functions and Inclusion-Exclusion** : Extended binomial coefficient, counting problems and generating functions, using generating functions to solve recurrence relations. Inclusion –Exclusion: Principle of Inclusion –Exclusion for two and three sets. Applications of Principle of Inclusion-Exclusion-the sieve Eratosthenes, the number of onto functions, derangements.	12
Unit – 3	
Mathematical Induction: Introduction: Definition, principles of mathematical and strong mathematical induction with examples. Well-ordering principle, working procedure, examples. **Recursion:** Recursive definition, recursively defined sets and structures. Structural induction, steps involved in structural induction. Recursive algorithm, program correctness. **Relations:** Domain and range of relations, Complement of relation, Representation of a relation, Kinds of relation, and properties of relations, Representing relations using matrices and digraphs. Composition of relations, closure operations on relations and equivalence relations- Warshall algorithms. Equivalence relations and partitions-equivalence classes, partitions, Operations on relations.	12
Unit – 4	
Introduction to Graphs : Introduction, Definition of graph, undirected and directed graph, basic terminologies of a graph, different form or types of graphs. Representation of Graphs: Important ways to represent graphs-Adjacency matrix, incidence matrix, adjacency list, advantages and disadvantages of adjacency matrix and adjacency list representation of a graph. Isomorphism: Definition of graph isomorphism, graph isomorphism conditions. **Graphs Connectivity:** Meaning of connected and disconnected, Connectivity-cut vertex, cut edge, cut-set of a graph. Vertex connectivity, edge connectivity. Euler and Hamilton paths: Konigsberg bridge problem, applications of Euler paths and circuits, conditions for the existence of Hamilton circuits, Euler's and Hamilton digraphs, applications of Hamilton circuits. Planar Graphs: Definition, important	12

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properties of planar graphs, examples. **Shortest Path Problems and Graph Coloring :** Introduction, single source shortest path Dijkstra's algorithms, solution for single source shortest path by Greedy approach, travelling sales Man-Problem. Graph Coloring: Introduction, Graph coloring, vertex coloring, chromatic number, examples on graph coloring.	

Text Book:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen: Seventh Edition, 2012.

References:

1. Richard Johnsonburg, "Discrete mathematics", 7th edition, Pearson Education, 2008.
2. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall of India, 2006.
3. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 1997.
4. Joe L. Mott, Abraham Kandel and T. P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians" , 2nd edition, Prentice Hall of India Ltd, 2012.
5. D.S. Malik & M.K. Sen, "Discrete Mathematics" , Revised edition Cengage Learning.
6. C. L. Liu and D. P. Mohapatra "Elements of Discrete Mathematics, "4th edition, McGraw Hill education (India) Private Limited.
7. Dr.D.S.Chandrasekaharraiah "Discreate Mathematical Structures" PRISM book Pvt.Ltd
8. Seymour Lipschutz "Discreate Mathematics" Schaum's series McGraw

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Course Code: DSC-2AP	**Course Title: Discrete Mathematical Structures Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02 Hours

Part A:

1. Write a C Program to demonstrate conjunction.
2. Write a C Program to demonstrate disjunction
3. Write a C Program to demonstrate negation.
4. Write a C Program to demonstrate Implication.
5. Write a C Program to demonstrate Bi-conditional Implication.
6. Write a C program for creating a new set with initial members of the set & displays all members of the set.
7. Write a C program for finds union of two sets, set1[] and set2[] and stores the result in set3[].
8. Write a C program for finds Intersection of two sets, set1[] and set2[] and stores the result in set3[].
9. Write a C program for to finds difference of two sets, set1[] and set2[] and stores the result in set3[]
10. Write a C program for finds Cartesian product of two sets.
11. Write a C program to print Identity Matrix
12. Write a C program C Program to demonstrate the Sum of Diagonals of a Matrix.
13. Implementation of C Program to find Diagonal Upper and Lower Triangle of Matrix

Part B:

1. Write C program to calculate determinant of a matrix.
2. Write a C program to find inverse of a 3*3 matrix.
3. Write a C program to find the rank of a matrix (order 2).
4. Write a C Program to Represent Linear Equations in Matrix Form.
5. Write a C program to find nPr
6. Write a C program to find nCr

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7. Write a C Program to find Binomial Co-Efficient using recursion.
8. Write a C program to print Fibonacci series using recursion
9. Write a C program to solve C Program for Tower of Hanoi problem.
10. Write a C Program for cube sum of first n natural numbers using Mathematical Formula: (n (n + 1) / 2) ^ 2.
11. Write C program to implement Adjacency Matrix of a given Graph
12. Write a C Program for Travelling Salesman Problem.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	05
	Writing the Program	05
Program -2 from Part B	Flowchart/Algorithm	05
	Writing the Program	05
Execute any one program of Examiner choice		10
	Viva Voce	10
Total		**40**

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Course Code: DSC-3AT	**Course Title: Problem Solving Using C**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03

Course Learning Objectives:

- To provide complete knowledge of C language.
- To familiarize with the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.
- To use arrays, pointers, strings and structures in solving problems.
- To understand user defined functions, user defined data types and files.

Course Outcomes:

- Apply algorithmic thinking to understand, define and solve problems
- Develop computer programs using programming constructs and control structures.
- Demonstrate the ability to write C programs using Arrays, Strings and pointers.
- Implement user defined functions,user defined data types and files.

Contents	Hours
Unit – 1	
Introduction to Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration and initialization of variables; Symbolic constants. **Input and output** : 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

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Unit – 2	
Operators and 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. **Decision making and Branching**: The Simple-If Statement, the If-Else Statement, the Nested-If-Else Statement, the Else-If ladder, The Switch Statement **Decision making and Looping:** The while loop, The For loop, Variations of for loop, The Do-While loop, Jumps in loops, The break statement, The Continue statement, Nesting of loops, Jumps in Nested loops, The break statement in nested loops, The continue statement in nested loops	12
Unit – 3	
Derived data types: Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. **Strings:** Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc. **Pointers:** Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers.	12
Unit-4	
User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types:** Structures - Structure Definition, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures, Advantages of Structure. Unions - Union definition; difference between Structures and Unions. **Files:** Opening and Closing of Files, File I/O Functions - Character Oriented Functions -fputc(), fgetc(), String Oriented Functions - fputs(), fgets(), Mixed-data Oriented Functions – fprintf(), fscanf(), Unformatted Record I/O Functions – fwrite(), fread(), Random Accessing of Files – fseek(), ftell(), rewind().	12

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Text Books:

1. M.T.Somashekara ,Problem Solving with C, 2E, PHI Learning.

Reference Books:

1. C: The Complete Reference, By HerbertSchildt.
2. C Programming Language, By Brain W.Kernighan
3. Kernighan & Ritchie: The C Programming Language(PHI)
4. P. K. Sinha & Priti Sinha: Computer Fundamentals(BPB)
5. E. Balaguruswamy: Programming in ANSI C(TMH)
6. Kamthane: Programming with ANSI and TURBO C (PearsonEducation)
7. V. Rajaraman: Programming in C (PHI –EEE)
8. S. Byron Gottfried: Programming with C(TMH)
9. Yashwant Kanitkar: Let usC
10. P.B. Kottur: Programming in C (Sapna BookHouse)

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Course Code: DSC-3AP	**Course Title: Problem Solving using C Lab**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02 Hours

PART A

1. Write a Program to read radius of a circle and to find area and circumference
2. Write a Program to read three numbers and find the biggest of three
3. Write a Program to demonstrate library functions in math.h
4. Write a Program to check for prime and generate prime number.
5. Write a Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
6. Write a Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
7. Write a Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
8. Write a Program to find the roots of quadratic equation (demonstration of switch Case statement)
9. Write a Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
10. Write a Program to remove Duplicate Element in a single dimensional Array
11. Write a Program to perform addition, subtraction and multiplication using arrays.
13. Write a Program to find the length of a string without using built in function.
14. Write a Program to find the length of string and to perform string copy without Using string handling functions.
15. Write a Program to append a string without using string handling functions.

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PART B

1. Write a Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters
2. Write a Program to check a number for prime by defining is prime( )function
3. Write a Program to demonstrate pointers in C
4. Write a Program to Reverse a String using Pointer
5. Write a Program to Swap Two Numbers using Pointers.
6. Write a Program to read, display and add two m x n matrices using functions
8. Write a Program to read, display and multiply two m x n matrices using functions
9. Write a Program to demonstrate student structure to read & display records of n students.
10. Write a Program to demonstrate the difference between structure &union.
11. Write a program to illustrate how a file stored on the disk is read.
12. Write a Program to read name and marks of n number of students and store them in a file.
13. Write a program to create a file called emp.rec and store information about a person, in terms of name, age and salary.
14. Write a Program to write all the members of an array of structures to a file using fwrite( ).

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	05
	Writing the Program	05
Program -2 from Part B	Flowchart/Algorithm	05
	Writing the Program	05
Execute any one program of Examiner choice		10
	Viva Voce	10
Total		**40**

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Semester-II

Course Code: DSC-1BT	**Course Title:** Operating System
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03 Hours

Course Learning Objectives:

- To understand the structure and implementation of modern operating systems.
- Provide basic knowledge of computer operating system structures, process management, and operation on processes.
- To understand the goal of multithreading,CPU Scheduling criteria and how to prevent data inconsistency among processes.
- Ability to understand deadlock and memory management.
- Ability to understand to solve problem of limited memory space using virtual memory.

Course Outcomes

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

- Outline the basic concept of operating systems
- Analyze various Scheduling algorityhms, multithreading and process synchronization.
- To understand the deadlock to prevent set of concurrent process for completing their task.
- Implement Paging algorithm, analyze them,storage management and files system.

Contents	Hours
Unit-1	
Introduction to Operating System: Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure. **Process Management:** Process Concept- Process Definition, Process State, Process Control Block, Process scheduling-Multiprogramming, Scheduling Queues, Context Switch. **Operations on Processes**- Creation and Termination of Processes; Inter process	12

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communication (IPC)- Definition and Need for Inter process Communication; IPC Implementation Methods- Shared Memory and Message Passing.	
Unit-2	
Multithreaded Programming: Introduction to Threads; Types of Threads; Multithreading- Definition, Multithreading Models; Thread Libraries; Threading Issues,Advantages of Multithreading. **CPU Scheduling**: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling. **Process Synchronization:** Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores.	12
Unit-3	
Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem; Monitors. **Deadlocks:** System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock. **Memory Management:** Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging and Segmentation.	12
Unit-4	
Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing. **Storage management:** Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, RAID Structure. **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.	12

Text Book:

1. Operating System Concepts, Silberschatz' et al.,10th Edition, Wiley, 2018.

References:

1. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
2. Understanding Operating Systems, McHoes A et al.,7th Edition, Cengage Learning, 2014.
3. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.

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4. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
5. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

Course Code:DSC-1BP	**Course Title:** Operating System Lab
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02 Hours

PART A

1. Installation of Operating system : Windows/ Linux
2. Write a C Program to implement Process Management using System Calls : Fork, Exec, Getpid, Exit, Wait, Close
3. Write C programs to implement the FCFS -CPU Scheduling Algorithm.
4. Write C programs to implement the SJF -CPU Scheduling Algorithm.
5. Write C programs to implement the Round Robin -CPU Scheduling Algorithm.
6. Write C programs to implement the Priority -CPU Scheduling Algorithm.
7. Write a C Program to implement inter process communication strategy.
8. Write a C Program to implement mutual exclusion by Semaphores
9. Write a C program to avoid Deadlock using Banker's Algorithm
10. Write a C program to Implement Deadlock Detection Algorithm
11. Write C program to implement Threading
12. Write a C Program to implement Paging Technique.

PART B

1. Write C programs to implement the First Fit MemoryAllocation Methods.
2. Write C programs to implement the Worst Fit MemoryAllocation Methods.
3. Write C programs to implement the Best Fit MemoryAllocation Methods.
4. Write C programs to implement the FIFO Page Replacement Algorithms.
5. Write C programs to implement the LRU Page Replacement Algorithms
6. Write C programs to Implement the various File Organization Techniques
7. Write C programs to Implement Sequential File Allocation Strategy.
8. Write C programs to Implement Indexed File Allocation Strategy.
9. Write C programs to Implement Linked File Allocation Strategy.

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10. Write C programs for the implementation of FCFS disk scheduling algorithms
11. Write C programs for the implementation of SCAN disk scheduling algorithms
12. Write C programs for the implementation of C-SCAN disk scheduling algorithm

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	05
	Writing the Program	05
Program -2 from Part B	Flowchart/Algorithm	05
	Writing the Program	05
Execute any one program of Examiner choice		10
	Viva Voce	10
Total		**40**

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Course Code: DSC-2BT	**Course Title: Data Structures using C**
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03 Hours

Course Learning Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To learn basic concepts of data structures, memory allocation and arrays.
- Ability to understand various searching, sorting methods and linked lists.
- To understand linear data structures and their applications.
- Explore the knowledge of non-linear data structures.

Course Outcomes (COs):

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

- To understand data structures, memory allocation and various operations on arrays.
- Implement searching, sorting and various types of linked lists.
- Implement stacks, its applications and queues.
- To study the characteristics, properties and their implication of non-linear data structures.

Contents	Hours
Unit – 1	
Introduction to data structures: Definition, classification of data structures, operations on data structures; abstract data types. **Memory allocation:** Static and Dynamic memory allocation; dynamic memory allocations function- *malloc*, *calloc*, *realloc* and *free*. **Arrays:** Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Traversing linear arrays; Inserting and deleting elements; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Multidimensional arrays; Representation of multidimensional arrays.	12
Unit – 2	
Searching and Sorting – Searching-linear and binary search methods. Sorting-selection sort, bubble sort, insertion sort, quick sort, merge sort. **Linked list** – Basic Concepts – Definition and Representation of linked list ,Singly	12

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linked list implementation, insertion, deletion and searching operations on linear list. **Types of linked lists:** Circularly linked lists- Operations for Circularly linked lists, doubly linked list implementation, insertion, deletion and searching operations, applications of linked lists.	
Unit – 3	
Stacks: Basic Concepts, Definition and Representation of stacks; Operations on stacks; array and linked Implementations. Expression:Infix, postfix and prefix notations; Conversion of Expressions; Evaluation of Expression using stack; Applications of stack. **Recursion:** Definition; Types of recursions; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient ^{n}Cr, Towers of Hanoi; Comparison between iterative and recursive functions. **Queues:** Basic Concepts – Definition and Representation of queues, Operations on Queues; array and linked Implementations, Types of queues – Simple queues, Circular queues, Double ended queues, Priority queues; Applications of queue.	12
Unit - 4	
Trees : Definitions, Tree terminologies, tree representation, types, properties of trees. **Binary tree**: Binary tree properties, Binary tree representation, ,types, binary tree traversals, binary tree implementation, binary search tree; traversal of binary search tree (BST); *preorder, inorder* and *postorder* traversal; applications of trees. **Graphs:** Basic concept, graph terminology, graph implementation, types, graph traversals, Application of graphs.	12

Text Books

1. Data Structures Using C , Balaguruswamy:, McGraw Hill Education
2. Data Structures Using C, Reema Thareja,Oxford University Press
3. Padma Reddy: Data Structure UsingC

References

1. Satraj Sahani: Fundamentals of Data Structures
2. Tanenbaum: Data structures using C (PearsonEducation)
3. Kamathane: Introduction to Data structures (PearsonEducation)
4. Y. Kanitkar: Data Structures Using C(BPB)
5. Kottur: Data Structure UsingC
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education,2007)

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Course Code: DSC-2BP	**Course Title: Data Structures Using C Lab**
Course Credits: 02	Hour of Practical/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02

Part A:

1. Write a C program Implement Dynamic memory allocation function (malloc(), calloc(), free() and realloc()) in C using switch case.
2. Write a C program to search an element using linear search in 1-d array.
3. Write a C program to search an element using linear search in 2-d array.
4. Write a C program to search an element using binary search in 1-d array.
5. Write a C program to search an element using binary search in 2-d array.
6. Write a C program to sort the elements using bubble sort.
7. Write a C program to sort the elements using selection sort.
8. Write a C program to sort the elements using insertion sort.
10. Write a C program to search the elements using switch case.
    i). linear search.
    ii).binary search.
11. Write a C program to implement stack operation using array.
12. Write a C program to implement stack operation using linked list.
13. Write a C program to Convert Infix to Postfix.
14. Write a C program to Convert Infix to Prefix.
15. Write a C program to Convert Postfix to Infix.

Part B:

1. Write a C program to Convert Postfix to Prefix.
2. Write a C program to Convert Prefix to Infix.
3. Write a C program to Convert Prefix to Postfix.
4. Write a C program to evaluate prefix and postfix expression
5. Write a C Program to implement Towers of Hanoi.
6. Write a C Program to generate n Fibonacci numbers using recursive function.

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7. Write a C program to implement Linear Queue using an Array.

8. Write a C program to implement circular Queue.

9. Write a C program to implement Double Ended Queue/Dqueue.

10. Write a C program to implement Single linked list.

11. Write a C program to implement circular linked list.

12. Write a C program to implement Doubly linked list.

13. Write a C program to implement Binary tree using sequential representation.

14. Write a C program to implement Binary tree traversal (inorder,preorder,postorder).

15. Write a C program to implement DFS and BFS

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	05
	Writing the Program	05
Program -2 from Part B	Flowchart/Algorithm	05
	Writing the Program	05
Execute any one program of Examiner choice		10
	Viva Voce	10
Total		**40**

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Course Code: DSC-3T	**Course Title: Object Oriented programming with C++**
Course Credits: 04	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 20
Exam Marks: 80	Exam Duration: 03 Hours

Course Learning Objectives:

- To understand how C++ improves C with object-oriented features.
- To learn the syntax and semantics, operators,control structures of the C++ programming language.
- To learn to design C++ Classes, Constructors,destructors and operator overloading.
- Ability to learn various types of Inheritance, I/O streams and file handling.
- Ability to understand string handling,exception handling and templates.

Course Outcomes

- To study the basic concepts of OOPS and learn and implemnt operators and contol structures.
- Implement Classes, Objects and study constructor,destructors and operator overloading.
- Implement Various Inheritence,I/O streams and file handling.
- Implement String handling,exception handling and templates.

Contents	Hours
Unit – 1	
Introduction to Object Oriented Programming Paradigm: Object Orientated Programming Paradigm, Principles of OOP, Objects, Classes, Encapsulation, Abstraction, Polymorphism, Inheritance, Message Passing, Dynamic Binding, Advantages of Object Oriented Programming, Application areas of Object Oriented Programming, Object Oriented Programming Languages, Limitations of OOP **Introduction to the C++ language:** Evolution of C++, The Salient Features of the C++ Language, Tokens, Keywords and Identifiers, Constants, Integer constants, Real constants, Character constants, Variables, Data types, Console I/O, Structure of a C++ Program, Executing a C++ program, Errors. **Operators and Control Structures**: Assignment Operator, Arithmetic operators,	12

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Relational operators, Logical operators , Shorthand arithmetic assignment operators , Increment/decrement operators, Conditional operator, The InstanceOf() Operator, the Dot Operator, Bit-wise Operators, Type Conversion, Precedence and associativity summary of all the operators, Simple-If statement, If-Else statement, Nested If-Else statement, Else-if ladder, The Switch Statement, The while loop, The For loop, The Do-While loop, Jumps in loops, The break statement, The Continue statement.	
Unit – 2	
Classes and Objects: Class Definition and Access Specifiers Private. Public, Passing Objects as Arguments, Returning Objects from Functions, Arrays of Objects , Arrays as Member Data, Static Member Data, Static Member Functions, Friend Functions, Friend Class, Const Member Functions, Const Objects, this pointer, Nesting of Member Functions **Constructors and Destructors:** Constructors and their Characteristics, Types of Constructors, Default Constructor, Parameterized Constructors, Copy Constructor, Dynamic Constructor, Multiple Constructors in a Class, Using a Constructor to Return an Object, Destructor and its Characteristics **Operator Overloading:** Syntax of Operator Overloading Function, Overloading Unary operators, Overloading Binary operators, Overloading Array subscript operator [], Overloading Function call Operator () , Overloading new and delete Operators, Overloading operators using Friend Functions, Overloading >> and << operators, Type Casting, Conversion from Basic type to Derived type and Vice-versa, Conversion from one Derived type to another Derived type and Vice-versa, Operators which cannot be overloaded.	12
Unit – 3	
Inheritance: Single Level Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Pointer to Objects, Pointers to Derived Classes and Virtual Functions, Pure Virtual Functions and Abstract Class, Constructors and Destructors in Derived Classes, Constructors and Destructors in Multiple Inheritance, Virtual Destructor, Private Inheritance, Protected Inheritance, Containership **I/O Streams:** Built-in Classes Supporting I/O, Unformatted I/O Operations, Formatting of Outputs, IOS Class Functions and Flags, Manipulators, Built-in Manipulators, User-Defined Manipulators **File Handling:** Built-in Classes for File I/O Operations , Types of Data Files (Text Files and Binary Files), Opening and Closing a File, Detecting End of File , Text Files, Character I/O - put( ), get( ) Member Functions, String I/O – The << operator and the getline() Member Function, Mixed Data I/O – The << and >> Operators, Binary Files, Objects I/O – write() and read( ) Member Functions, Searching for required data in a Binary File, Random accessing of a Binary File (seekg( ), seekp( ), tellg( ),	12

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tellp( ), Member Functions), Error Handling During File I/O Operations- fail(), bad(), good(), rdsate(), Command Line Arguments	
Unit-4	
String Handling: String class and its Constructors, The Assignment Operator (=), The Extraction Operator >> and the Insertion Operator << , The Relational Operators (<, <=, >, >=, ==, ! =), Concatenation (+, +=), Member Functions of String Class. **Exception Handling:** Exception Handling Mechanism, Throwing in one function and catching in the other, Single Try Block -Multiple Catch Blocks, Catching all exceptions in a single catch block, Rethrowing an Exception, Specification of Exceptions. **Templates:** Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Member Function Templates, Overloading Template functions, Non-type Template Arguments.	12

Textbooks:

1. M.T. Somashekara et.al, Object Oriented Programming with C++, PHI Learning Private Limited, New Delhi, 2012

Reference Books:

1. E. Balaguruswamy, Object Oriented Programming with C++,7 th edition, McGraw-Hill Education, 2017.
2. Robert Lafore, Object Oriented Programming in C++, 4th edition, SAMS Publishing, 2008.
3. D.S. Malik, C++ Programming: From Problem Analysis to Program Design, 6th edition, Cengage Learning, 2013.
4. Herbert Schildt, C++: The Complete Reference, 4th Edition, McGraw Hill, 2003

Course Code:DSC-3BP	**Course Title: Object Oriented programming with C++ Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 48	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 02 Hours

PART A

1. Write a in C++ program to find the size of fundamental data types
2. Write a in C++ program to check the upper and lower limits of integers.
3. Write a C++ program to display the operation of pre and post increment and

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decrement.

4. Write a program in C++ to test Type Casting.
5. Write a program in C++ to find the first 10 natural numbers.
6. Write a C++ program to create class to get and print details of a student.
7. Write a C++ program to create student class, read and print N student's details (Example of array of objects).
8. Write a C++ program to demonstrate example of friend function with class.
9. Write a C++ program to count the created objects using static member function.
10. Write a C++ program to create an object of a class inside another class declaration.
11. Write a C++ program to demonstrate example of default constructor or no argument constructor.
12. Write a C++ program to demonstrate example of parameterized constructor.
13. Write a C++ program to demonstrate example of copy constructor.
14. Write a C++ program to demonstrate example of constructor overloading.
15. Write a C++ program to demonstrate example of destructors.
16. Write a C++ program to read and print student's information using single inheritance.

PART B

1. Write a C++ program to demonstrate example of multilevel inheritance
2. Write a C++ program to read and print employee information using multiple inheritance.
3. Write a C++ program to demonstrate example of hierarchical inheritance to get square and cube of a number.
4. Write a C++ program for unary minus (-) operator overloading.
5. Write a C++ program for unary increment (++) and decrement (--) operator overloading.
6. Write a C++ program to add two objects using binary plus (+) operator overloading.
7. Write a C++ program to write and read text in/from file.
8. Write a C++ program to write and read values using variables in/from file.
9. Write a C++ program to write and read object using read and write function.

10. Write a C++ program to write and read time in/from binary file using fstream.
11. Write a C++ program to append text to a text file in C++.
12. Write a C++ program to demonstrate the use of try, catch and throw.
13. Write a C++ program to define function that generates exception.
14. Write a C++ program to throw multiple exceptions and define multiple catch statement.
15. Write a C++ program to implement class template with multiple parameters.
16. Write a C++ program to overload template functions.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	05
	Writing the Program	05
Program -2 from Part B	Flowchart/Algorithm	05
	Writing the Program	05
Execute any one program of Examiner choice		10
	Viva Voce	10
Total		**40**

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