B.Sc. (Computer Science)

[3 YEARS]

Syllabus and Scheme From 2024-2025

BOARD OF STUDIES
[COMPUTER SCIENCE AND APPLICATIONS]

St. Francis de Sales College
[Autonomous]
Electronics City P.O. Bengaluru 560100
Karnataka, INDIA

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6.	Mr. Phani Pramod, Senior Development Manager, Essbase and Database tools, Oracle	Industry Expert
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11.	Ms. Thejaswi Nandyala Assistant Professor, St. Francis de Sales College (Autonomous), Electronic City, Bengaluru.	Member
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15.	Ms. Arundhati Ghosh, Assistant Professor, St. Francis de Sales College (Autonomous), Electronic City, Bengaluru.	Member
16.	Mr. Joseph Rajakumar, Assistant Professor, St. Francis de Sales College (Autonomous), Electronic City, Bengaluru.	Member
17.	Mr. Kirubakaran, Assistant Professor, St. Francis de Sales College (Autonomous), Electronic City, Bengaluru.	Member
18.	Ms. Samadrita Chakraborty, Assistant Professor, St. Francis de Sales College (Autonomous), Electronic City, Bengaluru.	Member

PREFACE TO THE B.Sc., 2024-2025 SYLLABUS

ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ನಡಾವಳಿಗಳು

ವಿಷಯ: ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯ ವ್ಯಾಪ್ತಿಯಲ್ಲಿನ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು ಮತ್ತು ಕಾಲೇಜುಗಳಲ್ಲಿ 2024-25ನೇ ಸಾಲಿನಿಂದ ಪದವಿ ಕಾರ್ಯಕ್ರಮಗಳ ಅವಧಿ ಮತ್ತು ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸುವ ಬಗ್ಗೆ.

ಓದಲಾಗಿದೆ:
1. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್‌ಇ 2019 (ಭಾಗ-1) ಬೆಂಗಳೂರು, ದಿನಾಂಕ:07.08.2021.
2. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂಖ್ಯೆ:ಇಡಿ 166 ಯುಎನ್‌ಇ 2023, ಬೆಂಗಳೂರು ದಿನಾಂಕ:11.10.2023
3. ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗದ ಮಧ್ಯಂತರ ವರದಿ ದಿನಾಂಕ:18.01.2024.
4. ಕರ್ನಾಟಕ ರಾಜ್ಯ ಉನ್ನತ ಶಿಕ್ಷಣ ಪರಿಷತ್ತಿನ ಟಿಪ್ಪಣಿ ದಿನಾಂಕ: 14.02.2024.
5. ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗದ ವರದಿಗಳ ದಿನಾಂಕ: 19.01.2024 ಮತ್ತು 10.03.2024.
6. ಸರ್ಕಾರದ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಯವರ ಕಛೇರಿಯ ಅನಧಿಕೃತ ಟಿಪ್ಪಣಿ ಸಂಖ್ಯೆ: CS/05/SCM/2024, dated: 02.04.2024.

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ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (1) ರ ದಿನಾಂಕ: 07.08.2021ರ ಆದೇಶದಲ್ಲಿ ಭಾರತ ಸರ್ಕಾರವು ಪ್ರಕಟಿಸಿರುವ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿಯನ್ನು ರಾಜ್ಯದ ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯಡಿ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು ಮತ್ತು ಸಂಯೋಜಿತ ಕಾಲೇಜುಗಳಲ್ಲಿ 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ವರ್ಷದಿಂದ ಅಗತ್ಯ ಮಾರ್ಗಸೂಚಿಗಳನುಸಾರ ಅನುಷ್ಠಾನಗೊಳಿಸಲಾಗಿರುತ್ತದೆ.

ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (2) ರ ದಿನಾಂಕ: 11.10.2023ರ ಆದೇಶದಲ್ಲಿ ಹೊಸ ಶಿಕ್ಷಣ ನೀತಿಯನ್ನು ರೂಪಿಸುವ ಉದ್ದೇಶದಿಂದ ಕರ್ನಾಟಕ ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿಯ ಕರಡನ್ನು ಸಿದ್ಧಪಡಿಸಲು ಶ್ರೇಷ್ಠ ಶಿಕ್ಷಣ ತಜ್ಞರಾದ Prof. Sukhdev Torat, ಇವರ ಅಧ್ಯಕ್ಷತೆಯಲ್ಲಿ ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವನ್ನು ರಚಿಸಲಾಗಿರುತ್ತದೆ.

ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (3) ರಲ್ಲಿ ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವು ದಿನಾಂಕ: 18.01.2024ರಂದು ಸರ್ಕಾರಕ್ಕೆ ಮಧ್ಯಂತರ ವರದಿಯನ್ನು ಸಲ್ಲಿಸಿರುತ್ತದೆ.

ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (4) ರಲ್ಲಿ ಕರ್ನಾಟಕ ರಾಜ್ಯ ಉನ್ನತ ಶಿಕ್ಷಣ ಪರಿಷತ್ತು ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವು ಸರ್ಕಾರಕ್ಕೆ ಸಲ್ಲಿಸಿರುವ ಮಧ್ಯಂತರ ವರದಿಯನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ಒಪ್ಪಲು ಶಿಫಾರಸ್ಸು ಮಾಡಿರುತ್ತದೆ.

ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (5) ರಲ್ಲಿ ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವು ದಿನಾಂಕ: 19.01.2024ರಂದು REPORT PART-1 ಮತ್ತು ದಿನಾಂಕ: 10.03.2024ರಂದು ನ್ನು REPORT PART-1(a) ಮಧ್ಯಂತರ ವರದಿಗಳನ್ನು ಸರ್ಕಾರಕ್ಕೆ ಸಲ್ಲಿಸಿರುತ್ತದೆ.

ಮೇಲೆ ಓದಲಾದ ಕ್ರಮ ಸಂಖ್ಯೆ (6) ರಲ್ಲಿ ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವು ಸರ್ಕಾರಕ್ಕೆ ಸಲ್ಲಿಸಿರುವ ಮಧ್ಯಂತರ ವರದಿಯಲ್ಲಿನ ಶಿಫಾರಸ್ಸುಗಳನ್ನು 2024-25 ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪದವಿ ಕಾರ್ಯಕ್ರಮಗಳಿಗೆ ಅನುಷ್ಠಾನಗೊಳಿಸಲು ದಿನಾಂಕ: 02.04.2024ರಂದು ಚುನಾವಣಾ ಆಯೋಗದ ಅನುಮತಿಯನ್ನು ಪಡೆಯಲಾಗಿರುತ್ತದೆ.

ಮೇಲ್ಕಂಡ ಅಂಶಗಳ ಹಿನ್ನೆಲೆಯಲ್ಲಿ, ರಾಜ್ಯ ಶಿಕ್ಷಣ ನೀತಿ ಆಯೋಗವು ಸರ್ಕಾರಕ್ಕೆ ಸಲ್ಲಿಸಿರುವ ಮಧ್ಯಂತರ ವರದಿಗಳಲ್ಲಿನ ಶಿಫಾರಸ್ಸುಗಳನ್ನು 2024 25 ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪದವಿ ಕಾರ್ಯಕ್ರಮಗಳಿಗೆ ಅನುಷ್ಠಾನಗೊಳಿಸಲು ಉದ್ದೇಶಿಸಿ, ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್‌ಇ 2019 (ಭಾಗ-1)

ಬೆಂಗಳೂರು, ದಿನಾಂಕ:07.08.2021ರ ಆದೇಶವನ್ನು ಪರಿಷ್ಕರಿಸಲು ಸರ್ಕಾರವು ನಿರ್ಧರಿಸಿ, ಅದರಂತೆ, ಈ ಕೆಳಕಂಡ ಆದೇಶ.

<u>ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 166 ಯುಎನ್'ಇ 2023, ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 08.05.2024.</u>

ಪ್ರಸ್ತಾವನೆಯಲ್ಲಿ ವಿವರಿಸಿರುವ ಅಂಶಗಳನ್ವಯ ರಾಜ್ಯದಲ್ಲಿ ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯಡಿಯ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು ಮತ್ತು ಸಂಯೋಜಿತ ಕಾಲೇಜುಗಳಲ್ಲಿ, ಪದವಿ ಕಾರ್ಯಕ್ರಮಗಳಿಗೆ 2024-25ನೇ ಶೈಕ್ಷಣಿಕ ವರ್ಷದಿಂದ ಅನುಬಂಧ-1 ಮತ್ತು ಅನುಬಂಧ-2 ರ ಮಾರ್ಗಸೂಚಿಗಳಿಗನುಸಾರವಾಗಿ ಪದವಿ ಕಾರ್ಯಕ್ರಮಗಳ ಅವಧಿ ಮತ್ತು ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಅನುಷ್ಠಾನಗೊಳಿಸಿ ಆದೇಶಿಸಲಾಗಿದೆ.

1. ಅನುಷ್ಠಾನದ ಮಾರ್ಗಸೂಚಿಗಳು - ಅನುಬಂಧ-1
2. ಪ್ರೋಗ್ರಾಮ್ ವಿನ್ಯಾಸ (Curriculum Structure) - ಅನುಬಂಧ-2

ಕರ್ನಾಟಕ ರಾಜ್ಯಪಾಲರ ಆಜ್ಞಾನುಸಾರ
ಮತ್ತು ಅವರ ಹೆಸರಿನಲ್ಲಿ

(ಸ. ಪಿಕೇಶ್ ಬಾಬು)
ಸರ್ಕಾರದ ಉಪ ಕಾರ್ಯದರ್ಶಿ
ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ (ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು)

ಇವರಿಗೆ,
1. ಸರ್ಕಾರದ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿರವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ಕರ್ನಾಟಕ ಸರ್ಕಾರ.
2. ಕುಲಪತಿಗಳು, ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯಡಿಯ ಸಾರ್ವಜನಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು, ಕರ್ನಾಟಕ.
3. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಮಾನ್ಯ ಮುಖ್ಯ ಮಂತ್ರಿಗಳ ಕಛೇರಿ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
4. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು ಮತ್ತು ಅಭಿವೃದ್ಧಿ ಆಯುಕ್ತರು, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
5. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಆರ್ಥಿಕ ಇಲಾಖೆ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
6. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಸಿಬ್ಬಂದಿ (ಇ-ಆಡಳಿತ ಇಲಾಖೆ), ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
7. ಸರ್ಕಾರದ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿ, ಶಾಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ಸಾಕ್ಷರತಾ ಇಲಾಖೆ, ಬಹುಮಹಡಿ ಕಟ್ಟಡ, ಬೆಂಗಳೂರು.
8. ಆಯುಕ್ತರು, ಕಾಲೇಜು ಮತ್ತು ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಶೇಷಾದ್ರಿ ರಸ್ತೆ, ಬೆಂಗಳೂರು-1.
9. ಉಪಾಧ್ಯಕ್ಷರು, ಕರ್ನಾಟಕ ರಾಜ್ಯ ಉನ್ನತ ಶಿಕ್ಷಣ ಪರಿಷತ್, ಬೆಂಗಳೂರು
10. ಕಾರ್ಯ ನಿರ್ವಾಹಕ ನಿರ್ದೇಶಕರು, ಕರ್ನಾಟಕ ರಾಜ್ಯ ಉನ್ನತ ಶಿಕ್ಷಣ ಪರಿಷತ್, ಬೆಂಗಳೂರು.
11. ಕುಲಸಚಿವರು (ಆಡಳಿತ) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯಡಿಯಲ್ಲಿನ ಸಾರ್ವಜನಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು, ಕರ್ನಾಟಕ
12. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ), ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆಯಡಿಯಲ್ಲಿನ ಸಾರ್ವಜನಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು, ಕರ್ನಾಟಕ
13. ಮಾನ್ಯ ಉನ್ನತ ಶಿಕ್ಷಣ ಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
14. ಮಾನ್ಯ ಶಾಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ಸಾಕ್ಷರತಾ ಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
15. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿರವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ, ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ವಿಧಾನಸೌಧ, ಬೆಂಗಳೂರು.
16. ಸರ್ಕಾರದ ಉಪ ಕಾರ್ಯದರ್ಶಿ (ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು), ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಬೆಂಗಳೂರು.
17. ಸರ್ಕಾರದ ಉಪ ಕಾರ್ಯದರ್ಶಿ (ಕಾಲೇಜು ಮತ್ತು ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ), ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಬೆಂಗಳೂರು.

Based on the order received from the parent university (Bangalore University - given above), the Board of Studies (Computer Applications) of St. Francis de Sales College (Autonomous), has decided to adopt the grading scheme of the parent university for its BCA Syllabus from 2024-2025 onwards.

ST. FRANCIS DE SALES COLLEGE (AUTONOMOUS)

ABOUT THE COLLEGE

St. Francis de Sales College (Autonomous), popularly known as SFS College, is one of the leading Institutions of Higher Education in Bengaluru, Karnataka. Founded in 2004 with the vision of Excellence, Efficiency, and Transformation, and the Mission of Love of God and Service to Humanity, the College is run by the Missionaries of St. Francis de Sales (MSFS) of the South West India Province, also known as Fransalians. The College is accredited with "A" grade by NAAC, approved by AICTE, recognized under 2(f) & 12(b) by UGC, and certified under ISO 9001:2015. Permanently affiliated to Bangalore University, the College offers several degree programs at the Bachelors, Masters, and Doctoral levels under various disciplines. In 2024, St. Francis de Sales College received the Autonomous status, and it remains as a center for quality education, equipping the students with the skills, knowledge, and values needed to excel and make a meaningful impact in the world.

VISION AND MISSION

VISION
Excellence, Efficiency and Transformation.

MISSION
Love of God and Service to Humanity.

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

The Computer Science and Applications Department is dedicated to advancing the understanding of computational systems and technologies through rigorous education, innovative research, and community engagement. The department offers a comprehensive curriculum that blends theoretical foundations with practical skills to prepare students for the rapidly evolving technology landscape. With a focus on problem-solving, software development, and cutting-edge research, the department strives to equip students with the tools and knowledge required to excel in a variety of computing fields.

Vision

Empowering through technology, innovation and expertise

Mission

Leveraging computation knowledge to drive societal progress and student success.

ELIGIBILITY CRITERIA

Candidates who have completed two years Pre University course of Karnataka State or its equivalent as notified by the Government from time to time are eligible to seek admission for this programme. The students of other states and foreign countries are eligible in accordance with state and central government guidelines from time to time.

PROGRAMME STRUCTURE AND DURATION

The programme is for Three (03) years consisting of Six Semesters altogether. A candidate shall complete his/her degree within six (06) academic years from the date of his/her admission to the first semester. A Student who successfully completes Three (03) years of the programme will be awarded Bachelors Degree in Science (B. Sc) by Bangalore University.

PROMOTION

A candidate who has obtained a minimum of 35% marks in End Semester examination and an aggregate of 40% marks in each subject shall be eligible for a pass or exemption in that subject.

3 majors with a general degree – number of course and credit course wise in all the semesters

Sem	Major 1-Mathematics/ Computer Science	Major 2-Computer Science/ Physics/ Psychology	Major 3-Electronics/ Chemistry/ Journalism	Elective/opti onal	Language	Compulsory
1	6	6	6		Language 1 3 credits Language 2 3 credits	Compulsory 1 Constitutional Values 2 credits
2	6	6	6		Language 1 3 credits Language 2 3 credits	Compulsory 2 Constitutional Values 2 credits
3	6	6	6	Elective-1 2 credits	Language 1 3 credits Language 2 3 credits	
4	6	6	6	Elective-2 2 credits	Language 1 3 credits Language 2 3 credits	
5	6	6	6			Compulsory 2 Practical Knowledge or skill -2 2 credits
6	6	6	6			Compulsory 2 Practical Knowledge or skill -3 2 credits
Total	36	36	36	04	24	08
Total 144 credits						

PROGRAME OUTCOME (PO)

PO1	Computational Knowledge: Acquire in-depth computational and mathematical knowledge with an ability to abstract and conceptualize from defined problems and requirements.
PO2	Dynamic Problem- Solving Skill: Identify, formulate, and exhibit strong analytical and dynamic problem-solving skills to address evolving computational challenges.
PO3	Innovative System Analysis and Design/ Development: Design and evaluate solutions for complex problems in Data Science, AI & ML, and Full Stack Development, considering societal, cultural, and environmental factors.
PO4	Investigate complex computing problem: Conduct literature surveys, analyze information, and design experiments using appropriate research methods to derive valid conclusions in relevant domains.
PO5	Use of modern tools/ Adaptive proficiency: Select, adapt, and apply modern IT tools and programming languages effectively in Data Science, AI & ML, and Full Stack Development to solve diverse computing challenges.
PO6	Knowledge Optimization: Modify algorithms or software systems to improve efficiency or resource utilization.
PO7	Life Long Continuous learning and Technology Adaptability: Pursue lifelong learning to stay updated with emerging technologies in Data Science, AI & ML, and Full Stack Development for sustained employability.
PO8	Soft skills and Collaborative Teamwork: Communicate effectively, enhance interpersonal skills, and collaborate in multidisciplinary teams essential for success in professional environments.
PO9	Cyber Security Proficiency: Understand cyber threats, develop secure software, and protect sensitive data in Data Science, AI & ML, and Full Stack Development applications.
PO10	Ethical and Professional Conduct: Adhere to ethical standards and professional practices in Data Science, AI & ML, and Full Stack Development roles and responsibilities.
PO11	Employability: Identify market trends, upgrade skills accordingly, and enhance employability in Data Science, AI & ML, and Full Stack Development careers.
PO12	Innovation and Entrepreneurship: Identify opportunities, innovate, and create value through Data Science, AI & ML, and Full Stack Development projects for personal growth and societal impact.

Continuous Internal Assessment

Undergraduate Programs:
 Theory:
1. Continuous Internal Assessment (C1 & C2) – 20 marks
2. End Semester Examination – 80 marks

 Practical
1. Continuous Internal Assessment (C1 & C2) – 10 marks
2. End Semester Practical Examination – 40 marks

S.NO	ASSESSMENTS	COMPONENTS	MARKS & ATTENDANCE	IA MARKS
1	Unit Test I (25% of Syllabus)	C1	25	2.5
2	**Skill-Based Activities:** Case Study / Seminar / Assignment / Quiz	C2	10	5
3	Mid Semester Examination (50% of Syllabus)	C2	80	5
4	Unit Test II (25% of Syllabus covered after the MSE)	C1	25	2.5
5	**Attendance** 75.00%-79.99% - 1 Mark 80.00%-84.99% - 2 Marks 85.00%-89.99% - 3 Marks 90.00%-94.99% - 4 Marks 95.00%-100.00% - 5 Marks	C1	Minimum of 75%	5
	Total			**20 marks**
SEC & PRACTICAL SUBJECTS				
1	**Attendance** 75.00%-79.99% - 1 Mark 80.00%-84.99% - 2 Marks 85.00%-89.99% - 3 Marks 90.00%-94.99% - 4 Marks 95.00%-100.00% - 5 Marks	C1	Minimum of 75%	5
2	Mid Semester Examination / Model Practical Examination	C2	40	5
	Total			**10 marks**

GRADING SYSTEM

Table of Conversion of % Marks to grade point:

% Marks	Grade Point
96-100	10
91-95	9.5
86-90	9.0
81-85	8.5
76-80	8.0
71-75	7.5
66-70	7.0
61-65	6.5
56-60	6.0
51-55	5.5
46-50	5.0
41-45	4.5
40	4

Final Result/Grade Description:

Semester/ Programme % of Marks	Semester GPA/ Programme/ CGPA	Grade Alpha Sign	Result/Class Description
90.1-100	9.01-10.00	O	Outstanding
80.1-90.0	8.01-9.00	A+	First Class Exemplary
70.1-80.0	7.01-8.00	A	First Class Distinction
60.1-70.0	6.01-7.00	B+	First Class
55.1-60.0	5.51-6.00	B	High Second Class
50.1-55.0	5.01-5.50	C	Second Class
40.0-50.0	4.00-5.00	P	Pass Class
Below 40	Below 4.0	F	Re-Appear

EXTERNAL EVALUATION

THEORY COURSE

There shall be a written semester examination at the end of each semester for all theory courses of duration of 3 hours with maximum 80 marks. A question paper may contain short answer type and long essay type questions. The question paper pattern is as follows.

SECTIONS	TYPE OF QUESTIONS	MARKS	NUMBER OF QUESTIONS TO BE ANSWERED
A	CONCEPTUAL	2	5 OUT OF 8
B	ANALYTICAL	5	6 OUT OF 8
C	PROBLEM SOLVING	8	5 OUT OF 6
TOTAL 80 MARKS			

SEMESTER I

	Subjects	Paper/Subject Code	Total Teaching hrs (L+T+P)	Duration of Exam (hrs.)	Marks			Credits
					IA	Uni. Exam	Total	
Part 3 Core Papers	Problem Solving Technique	24BSC14A/C	60	3	20	80	100	4
	Problem Solving Technique Lab	24BSC17A/C	60	3	10	40	50	2

SEMESTER II

	Subjects	Paper/Subject Code	Working hrs (L+T+P)	Duration of Exam (hrs.)	Marks			Credits
					IA	Uni. Exam	Total	
Part 3 Core Papers	Data Structure	24BSC24A/C	60	3	20	80	100	4
	Data Structure Lab	24BSC27A/C	60	3	10	40	50	2

24BSC14 A/C: PROBLEM SOLVING TECHNIQUE

Course Code	24BSC14A/C	Course Title	Problem Solving Technique
Course Type	DSC	Contact Hours	4 Hours per Week Total Hours: 60
Credit	3	Domain	Computer Science

SYLLABUS			

I	**Introduction** **15 Hours** The Role of Algorithms in Computing, Algorithms as a technology, Analyzing algorithms, Designing algorithms. Fundamental Algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial Computation, Generating of the Fibonacci sequence, Reversing the digits of an integer. Overview of C: History and importance of C, Basic structure of C program, executing a C program. Constants, Variable and Data Types: Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants
II	**C Programming** **14 Hours** Getting Started, Arithmetic expressions. Input and Output: Standard input and output, formatted output- printf, variable length argument list, formatted input-scanf. Control Flow: Statements and Blocks, If-else, else-if, switch, loops: while loop, for loop, do while, break and continue, goto and labels. Pointers and Arrays: pointers and address, pointers and function arguments, multidimensional array, initialization of pointer arrays, command line arguments.
III	**Factoring Methods** **16 Hours** Finding the square root of a number, the smallest Divisor of an integer, the greatest common divisor of two integers, computing the prime factor of an integer, raising a number to a large power. Array Techniques: Array order reversal, Array counting, Finding the maximum number in a set, removal of duplicates from an ordered array, partitioning an array, finding the kth smallest element, and multiplication of two matrices.
IV	**Sorting** **15 Hours** Sorting by selection, sorting by exchange, sorting by insertion, sorting by diminishing increment, sorting by partitioning. Searching: Linear Search, Binary search. File Management in C: Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files.

Reference Books:

1. **"Introduction to Algorithms"** by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein,4th Edition (2022)
2. **"Programming in ANSI C"** by E. Balagurusamy,8th Edition (2021), McGraw Hill
3. **"Let Us C"** by Yashavant Kanetkar,17th Edition (2020),BPB Publications
4. Greg Perry and Dean Miller, "C programming Absolute Beginner's Guide", 3rd edition, Pearson Education, Inc, 2014.
5. **"Data Structures and Algorithms Made Easy in C"** by Narasimha Karumanchi 2nd Edition (2011),CareerMonk Publications.

COURSE OUTCOME	
CO CODE	**COURSE DESCRIPTION**
CO1	To understand algorithmic strategies for enhancing problem solving proficiency
CO2	Demonstrate problem solving tools and techniques using C.
CO3	To analyze the given problems and use appropriate algorithms.
CO4	To implement sorting and searching techniques to develop programs.
CO5	Implement file handling operations in C, including opening, closing, reading, writing, and handling errors in file input/output to manage and process data efficiently.

TEACHING PEDOGOGY

Active Learning through Practical Application, Conceptual Understanding, Problem-Based Learning, Collaborative Learning, Divide-and-Conquer Approach, Think-Pair-Share, Hands-on Labs, Use of Technology, Scaffolding and Differentiation, Assessment for Learning. Formative Assessment: Regular quizzes, problem-solving sessions, and practical tasks on key concepts such as Matrices. This helps in tracking student progress and understanding.

SKILL DEVELOPMENT

Code Implementation Practice
Algorithm Complexity Analysis
Debugging Exercises
Algorithm Optimization

24BSC17 A/C: PROBLEM SOLVING TECHNIQUE LAB

Course Code	24BSC17A/C	Course Title	Problem Solving Technique Lab
Course Type	DSC	Contact Hours	4 Hours per Week
Credit	2	Domain	Computer Science

SYLLABUS

Write, and execute C Program for the following:

1. To read the radius of the circle and to find area and circumference.
2. To read the numbers and find the biggest of three.
3. To check whether the number is prime or not.
4. To find the root of quadratic equation.
5. To read a number, find the sum of the digits, reverse the number and check it for palindrome.
6. To read the numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers.
7. To read percentage of marks and to display appropriate message. If a percentage is 70 and above- Distinction, 60-69 – First Class, 50-59 – Second Class, 40-49 Pass, below 40 – Fail.(Demonstrate of if-else ladder)
8. To simulate a simple calculator with addition, subtraction, multiplication, division and it should display the error message for division of zero using switch case.
9. To read marks scored by n students and find the average of mark (Demonstration of single dimensional array)
10. To remove duplicate elements in a single dimensional array.
11. To find the factorial of a number.
12. To generate Fibonacci series.
13. To demonstrate string functions. (String Length, String Copy, String Concatenate, String Comparison)
14. To find the length of the string without using built-in function.
15. To read, display and add two n x m matrices using function.
16. To read a string and to find the number of alphabets, digits, vowels, consonants, space and special characters.
17. To swap two numbers using pointers.
18. To demonstrate student structure to read & display records of n students.
19. To demonstrate the difference between structure and union for the following Student name (String), Student roll no(integer), Student mark(float)
20. To design the following pattern using nested for loop:
```
        *
      *   *
    *   *   *
  *   *   *   *
```

COURSE OUTCOME	
CO CODE	**COURSE DESCRIPTION**
CO1	Demonstrate proficiency in fundamental C programming concepts for mathematical calculations and logical comparisons.
CO2	Apply array and string manipulation techniques to perform operations like searching, sorting, and modifying data structures efficiently.
CO3	Utilize advanced programming concepts such as pointers, structures, and unions to manage complex data types and memory manipulation.
CO4	Implement problem-solving strategies using loops and decision-making constructs in C to design patterns, process student data, and
CO5	Simulate real-life scenarios like calculators or grade evaluation.

TEACHING PEDOGOGY

Active Learning through Practical Application, Conceptual Understanding, Problem-Based Learning, Collaborative Learning, Use of Technology, Scaffolding and Differentiation, Assessment for Learning

SEMESTER II

24BSC24 A/C: DATA STRUCTURES

Course Code	24BSC24A/C	Course Title	Data Structures	
Course Type	DSC	Contact Hours	4 Hours per Week	Total Hours: 60
Credit	3	Domain	Computer Science	

SYLLABUS	
I	**Introduction and Overview:** **14 Hours** Definition, Elementary data organization, Data Structures, data Structures operations, Abstract data types, algorithms complexity, time-space trade-off. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. Introduction to Strings, Storing String, Character Data Types, String Operations, word processing, Introduction to pattern matching algorithms.
II	**Arrays and Linked List** **15 Hours** Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, multi-dimensional arrays, Matrices and Sparse matrices, searching and sorting techniques using array. Linked list: Definition, Representation of Singly Linked List in memory, Traversing a Singly linked list, Searching in a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly linked list; Doubly linked list, Header linked list, Circular linked list.
III	**Stacks and Queues:** **16 Hours** Definition, Array representation of stacks, Linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Conversion of infix expression to postfix expression, Evaluation of Postfix expression, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack. Queues: Definition, Array representation of queue, Linked list representation of queues. Types of queue: Simple queue, Circular queue, Double-ended queue, Priority queue, Operations on Queues, Applications of queues. **SUGGESTED ADDITIONS:** **Searching and Sorting: Linear and Binary search, bubble sort, selection sort, insertion sort and heap sort.**
IV	**Binary Trees:** **15 Hours** Definitions, Tree Search, Traversal of Binary Tree, Tree Sort, Building a Binary Search Tree, Height Balance: AVL Trees, Contiguous Representation of Binary Trees: Heaps, Red Black Tree: Insertion and Deletion, External Searching: B-Trees, Applications of Trees. Graphs: Mathematical Background, Computer Representation, Graph Traversal. Hashing: Hash Table ADT, understanding Hashing, Components of Hashing, Hash Table, Hash Function, Hashing Techniques, collisions, collision resolution techniques.

Reference Books:

1. "Digital Logic and Computer Design" by M. Morris Mano (5th Edition, 2021)
2. "Fundamentals of Digital Logic with VHDL Design" by Stephen Brown and Zvonko Vranesic (4th Edition, 2019)
3. Ramesh Gaonkar – "Microprocessor Architecture, Programming, and Applications with the 8085", 6th Edition, Penram International Publishing (India) Private Limited, 2013.
4. David A. Patterson, John L. Hennessy – "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann, 2014.
5. A. Anand Kumar – "Fundamentals of Digital Circuits", 4th Edition, PHI Learning, 2016. Soumitra Kumar Mandal – "Microprocessors and Microcontrollers: 8085, 8086, and 8051", 2nd Edition, Tata McGraw Hill, 2013.

COURSE OUTCOME	
CO CODE	**COURSE DESCRIPTION**
CO1	Understand basic concepts of data structures.
CO2	Analyzing and exploring various ways of storing data using Array and Linked list.
CO3	Demonstrate stack and queue data structures and their applications
CO4	Analyze and implement various nonlinear data structures.
CO5	Design and analyze searching (linear and binary) and sorting techniques

TEACHING PEDOGOGY

Active Learning through Game-Based Learning, Practical Application, Simulations, Conceptual Understanding, Problem-Based Learning, Collaborative Learning, Use of Technology, Scaffolding and Differentiation, Assessment for Learning.

Formative Assessment: Regular quizzes, problem-solving sessions, and practical tasks on key concepts such as Matrices. This helps in tracking student progress and understanding.

SKILL DEVELOPMENT

Hands-On Analysis

Group Activities

Pattern Matching Practice

Error Handling

Recursive Solutions

24BSC27 A/C: DATA STRUCTURES LAB

Course Code	24BSC27A/C	Course Title	Data Structures Lab
Course Type	DSC	Contact Hours	4 Hours per Week
Credit	2	Domain	Computer Science
SYLLABUS			

NOTE: For all the programs write the output, flowchart and number of basic operations performed.
1. Write a program to search for an element in an array using binary and linear search.
2. Write a program to sort list of n numbers using Bubble Sort algorithms.
3. Perform the Insertion and Selection Sort on the input {75,8,1,16,48,3,7,0} and display the output in descending order.
4. Write a program to insert the elements {61,16,8,27} into singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
5. Write a program to insert the elements {45, 34, 10, 63,3} into linear queue and delete three elements from the list. Display your list after each insertion and deletion.
6. Write a program to simulate the working of Circular queue using an array.
7. Write a program to insert the elements {61,16,8,27} into ordered singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
8. Write a program for Tower of Honoi problem using recursion.
9. Write recursive program to find GCD of 3 numbers.
10. Write a program to demonstrate working of stack using linked list.
11. Write a program to convert an infix expression x^y/(5*z)+2 to its postfix expression
12. Write a program to evaluate a postfix expression 5 3+8 2 - *.
13. Write a program to create a binary tree with the elements {18,15,40,50,30,17,41} after creation insert 45 and 19 into tree and delete 15,17 and 41 from tree. Display the tree on each insertion and deletion operation.
14. Write a program to create binary search tree with the elements {2,5,1,3,9,0,6} and perform inorder, preorder and post order traversal.
15. Write a program to Sort the following elements using heap sort {9.16,32,8,4,1,5,8,0}.
16. Given S1={"Flowers"} ; S2={"are beautiful"} I. Find the length of S1 II. Concatenate S1 and S2 III. Extract the substring "low" from S1 IV. Find "are" in S2 and replace it with "is.
17. Write a program to implement adjacency matrix of a graph.
18. Write a program to insert/retrieve an entry into hash/ from a hash table with open addressing using linear probing.

COURSE OUTCOME	
CO CODE	**COURSE DESCRIPTION**
CO1	Analyze and implement basic searching and sorting algorithms using arrays.
CO2	Develop and manipulate linear and non-linear data structures like linked lists, stacks, queues, and trees.
CO3	Solve problems using recursion and understand its application in algorithmic solutions.
CO4	Apply stack and queue operations in real-world applications like expression conversion and evaluation.
CO5	Implement and analyze advanced data structures such as heaps, hash tables, and graphs.

TEACHING PEDOGOGY

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