ST. FRANCIS DE SALES COLLEGE
A FRANSALIAN INSTITUTE OF HIGHER EDUCATION AUTONOMOUS
NAAC A GRADE • AFFILIATED TO BANGALORE UNIVERSITY • AICTE APPROVED • 2(F) & 12 (B) RECOGNITION OF UGC • ISO 9001:2015 CERTIFIED
Electronics City P.O., Bengaluru - 560 100, Karnataka, INDIA (+91) 8088140679 pro@sfscollege.in www.sfscollege.in

B.Sc.

[Mathematics, Physics, Chemistry]

PHYSICS [3 YEARS]
Syllabus and Scheme
2024-2025(Onwards)

BOARD OF STUDIES
[PHYSICAL SCIENCES]

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

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Members of Board of Studies

Sl. No	Name	Designation
1	Ms Maya Mathew, Asst. Professor of Electronics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Chairperson
2	Dr. B. Chaluvaraju, Associate Professor , Department of Mathematics, Bangalore University, Bengaluru	University Nominee
3	Dr. Manoj B, Professor& Head, Department of Physics and Electronics, Chirst(Deemed to be University),Bengaluru	External Subject Expert- Physics
4	Dr. B Gunapriya , Associate Professor of Electrical and Electronics Engineering ,New Horizon College of Engineering(VTU), Bengaluru	External Subject Expert-Electronics
5	Dr. Athimoolam Arunachalampillai, Associate Director, Amgen Inc.Bengaluru	Subject Expert in Chemistry& Industry Expert
6	Mr. Chella Pandian Pitchai, Global Head, DEI, Biocon Biologics, Bengaluru	Industry Expert
7	Mr. Sanju Joseph, Project Manager, WIPRO Technologies, UK	Alumni Representative
8	Ms.Sonima Mohan, Asst. Professor of Physics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
9	Ms Umamaheswari U, Asst. Professor of Physics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
10	Dr. GisaGrace Ninan, Asst. Professor of Physics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
11	Dr.Savithri H. Ezhikode, Asst. Professor of Physics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
12	Ms. Jenifer Sujitha, Asst. Professor of Electronics, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
13	Dr. Regimol George,Asst.Professor of Chemistry, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
14	Dr. Julia Sebastian, Asst.Professor of Chemistry, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member
15	Dr. S H Yasmin, Asst.Professor of Chemistry, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member

16	Sr.Rofin Mangali, Asst.Professor of Chemistry, Department of Physical Sciences &Mathematics St. Francis de Sales College (Autonomous), Bengaluru	Member

PREFACE TO THE BSc 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.

ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 166 ಯುಎನ್‌ಇ 2023, ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 08.05.2024.

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,

(ಕೆ. ಪರಮೇಶ್ 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, ಸಿಸುಆಇ (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 (Physical Sciences) of St. Francis de Sales College (Autonomous),has decided to adopt the grading scheme of the parent university for its BSc(Physics) 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 PHYSICS

The course deals with the fundamentals of physics and its different properties like energy or force. This course aims to provide the aspirants with the foundation knowledge possible for a science-based career. The main goal while studying physics is to devise how the universe acts and behaves. The program is split into six semesters. The classroom lectures are accompanied by assessments, assignments, internships, seminars, and practical sessions

VISSION

Create, Nurture Scientific Knowledge& Research Aptitude

MISSION

Science in Service to Humanity

ELIGIBILITY CRITERIA

Students who have passed PUC/ 10+2 or equivalent in Science stream with Physics and Mathematics subjects are eligible for opting Physics in UG program.

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 Bachelor's Degree in Science with Physics as one of the major subject by Bangalore University.

PROMOTION

A candidate who has obtained a minimum of 40% 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.

PROGRAME OUTCOME (PO)

PO1	**Disciplinary Knowledge:** Acquire and apply the subject knowledge of physics in solving day to day and their complexed real world problems.
PO2	**Communication Skills:** Communicates effectively on physical activities with scientific community and with the society at large scale, and write effective reports on science events and design documentation, makes effective communication skills.
PO3	Critical thinking, Reflective thinking, Analytical reasoning, Scientific reasoning**:** Ability to think in unique manner unlike in conventional methods, giving scientific reasoning for all daily actions and generate solutions using critical thinking.
PO4	**Problem Solving:** Acquire knowledge to solve any complex problems using simply methods
PO5	**Research Related Skills :** Rendering co-operation and willing to work in team, leading the team with high expectations
PO6	**Co-operation/Team work/Leadership qualities:** Be prepared for higher studies or research roles in advanced fields with an understanding to integrate the interdisciplinary application of Physics
PO7	**Information/Digital Literacy/Modern tool usage :** Utilize the techniques and modern tools for solving complex problems with an understanding of limitations
PO8	**Environment and Sustainability** : Understand the impact of environmental conditions on the development of subject and demonstrate the Rendering co-operation and willing to work in team, leading the team with high expectations knowledge and need of the sustainable development
PO9	**Multicultural competence** : Applying the basics of physics in multicultural fields with excellent competence.
PO10	**Multi-disciplinary Field**: Function effectively, as an individual, as a member or leader in divorce teams in Multi-disciplinary fields.
PO11	**Moral and ethical Awareness/Reasoning:** Apply ethical principles and commit to professional ethics and responsibilities and norms of scientific practices
PO12	**Lifelong Learning/Self-directed learning** Recognize the need for and have the preparations and ability to engage in independent and lifelong learning of physical studies

COURSE MATRIX

Sl. No.	Semester	Title of the Paper	Teaching Hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (Hours)		Total Marks / paper	Credits	
						Theory			**Practical**							
				Theory	Practical	Max.	Min.	IA	Max.	Min.	IA	Theory	Practical		Theory	Practical
1	**I**	24BSC14B: Mechanics and Properties of Matter 24BSC17B: Mechanics and Properties of Matter (Practical)	**60**	**4**	**4**	**80**	**32**	**20**	**40**	**16**	**10**	**3**	**3**	**150**	**4**	**2**
2	**II**	24BSC24B: Kinetic Theory of Gases, Heat and Thermodynamics 24BSC27B: Kinetic Theory of Gases, Heat and Thermodynamics (Practical)	**60**	**4**	**4**	**80**	**32**	**20**	**40**	**16**	**10**	**3**	**3**	**150**	**4**	**2**

CONTINUOUS INTERNAL ASSESSMENT

THEORY

S.No	ASSESSMENT	MARKS
1	Continuous Internal Assessment (C1 & C2)	20 marks
2	End semester Examination	80 marks

PRACTICAL

S.No	ASSESSMENT	MARKS
1	Continuous Internal Assessment (C1 & C2)	10 marks
2	End Semester Examination	40 marks

THEORY

S.NO	ASSESSMENTS	COMPONENTS	MARKS & ATTENDANCE	IA MARKS
1	Unit Test 1(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 2(25% of Syllabus covered after MSE)	C1	25	2.5
5	Attendance 75.00-% - 79.99% -1 Mark 80.00-% - 84.99% -2 Mark 85.00-% - 89.99% -3 Mark 90.00-% - 94.99% -4 Mark 95.00-% - 100.99% -5 Mark	C1	Minimum of 75%	5
			Total	20

PRACTICAL

S.NO	ASSESSMENTS	COMPONENTS	MARKS & ATTENDANCE	IA MARKS
1	Model Practical Examination	C1	10	5
2	Attendance 75.00-% - 79.99% -1 Mark 80.00-% - 84.99% -2 Mark 85.00-% - 89.99% -3 Mark 90.00-% - 94.99% -4 Mark 95.00-% - 100.99% -5 Mark	C2	Minimum of 75%	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
80.1-90.1	8.01-9.01	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

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. The question paper pattern is as follows.

PART	TYPE OF QUESTIONS	MARKS	NUMBER OF QUESTIONS TO BE ANSWERED
A	Conceptual Question	2	10 OUT OF 12
B	Problem Analysis	5	4 OUT OF 6
C	Descriptive Question	10	4 OUT OF 6
TOTAL 80 MARKS			

PRACTICAL

There shall be a written semester examination at the end of each semester for all Practical courses of duration of 3 hours with maximum 40 marks. The question paper pattern is as follows.

SL No	Particulars	Marks
1	Writing Principle/Statement/Formulae with symbols.	5
2	Drawing illustrative diagrams and expected graphs	3
3	Setting up the experiment & taking readings	12
4	Calculations and graphs drawn based on experimental data.	05
5	Accuracy of results with units.	05
6	Valuation of Practical Record	05
7	Viva	05
TOTAL 40 MARKS		

SEMESTER I

Course Code	24BSC14B	**Course Title**	Mechanics and Properties of Matter
Course Type	DSC	**Contact Hours**	4 Hours per Week
Credit	4	**Total Hrs**	60hrs

COURSE OBJECTIVE:

1. Understand the concepts of vector calculus, mechanics and planetary motion.
2. Analyse the work done by various forces and work-energy theorem.
3. Application of rigid body dynamics and oscillations and its analysis.
4. Explore the applications of surface tension and viscosity.
5. To study the elastic properties of matter in detail.

COURSE OUTCOME:

COs	**COURSE OUTCOME**
CO1	Enrich the knowledge of vector algebra, mechanics and planetary motion.
CO2	Facilitate the students to learn the importance of force, work and energy
CO3	Evaluate the concepts of rigid bodies and oscillations in daily life
CO4	Analyse the behaviour of fluids and their viscous properties in different fields
CO5	Equip the students to analyse the different elastic materials, their material constants and design the structure accordingly.

Syllabus

UNIT I	**Mechanics, Properties of matter and Gravitation** **15 HOURS** **Vector algebra:** Scalars and Vectors, vector algebra and operations, graphical and analytical methods, components of vectors, scalars and vector products. **2 HOURS** **Newton's Laws of Motion** (Statement and illustration), Motion in a resistive medium; concept of terminal velocity, Drag force and Drag Coefficient, Drag force with velocity [v] dependence (only (vertical) and v^2 dependence (only vertical) – derivation for velocity and position- graphs with and without resistance. **6 HOURS** **Gravitation and Planetary motion:** Law of Gravitation, Gravitational Field and Potential – relation between them, Field and Potential due to a solid sphere (derivation), Kepler's law(statements), Satellite motion, Orbital velocity and Escape Velocity (derivation). **7 HOURS**
UNIT II	**Work, Energy and Friction** **15 HOURS** **Work and Energy:** Work done by a constant and variable force; Work energy theorem; Work and potential energy; examples of potential energy; Work done by gravitational force; Work done by a spring force. Conservative and non – conservative forces, elastic and inelastic collisions. Concept of a system of particles, general expression for Centre of mass, Newton's law for a system of particles. Motion of rockets (qualitative). **8 HOURS** **Friction** – Friction as a self-adjusting force, Coefficient of Static and dynamic friction; Expression for acceleration of a body moving along an inclined plane with and without friction, Free Body Diagrams for the following cases (i) Two masses connected by a string hanging over a frictionless pulley (ii) Two masses in contact and connected by string on a smooth horizontal surface (iii) Two masses connected by a string passing over a frictionless pulley fixed at the edge on a horizontal plane. **7 HOURS**

UNIT III	**Rigid body dynamics and Oscillations** **15 HOURS** **Dynamics of Rigid bodies:** Rotational motion about an axis, Relation between torque and angular momentum (derivation), Conservation of angular momentum with illustrations, Rotational energy (derivation).. **5 HOURS** **Moment of inertia (MI):** Definition of MI and Radius of gyration, Laws of Moment of inertia, MI of a circular disc, sphere, rectangular lamina and Flywheel. **5HOURS** **Simple harmonic motion (SHM)**: Definition of simple harmonic motion, Differential equation of SHM and its solutions, different forms of the wave equation, expressions for amplitude, period, frequency of oscillations, Simple pendulum and compound pendulum; damped oscillations; forced oscillations, concept of resonance, coupled oscillations in phase and out of phase, energy transfer. . **6 HOURS**
UNIT IV	**Surface Tension, Viscosity and Elasticity** **15 HOURS** **Surface tension of fluids**: Molecular interpretation of surface tension; Surface energy (derivation); Angle of contact, Pressure difference across a curved surface - derivation in case of (a) spherical and (b) cylindrical surfaces. Interfacial tension (qualitative), factors affecting surface tension. **5 HOURS** **Viscosity of fluids**: Laminar flow, coefficient of viscosity, Poiseiulle's method of measuring viscosity, factors affecting viscosity, Stokes' law (derivation). **5 HOURS** **Elasticity:** Hooke's law, Stress – Strain diagram, definitions of three elastic moduli; Relationship between three elastic constants (derivation); Poisson's ratio; Bending of beams, Bending moment, Theory of single cantilever, Torsional oscillations, Couple per unit twist (derivation). **5 HOURS**

TEACHING PEDOGOGY

Pedagogy: Interactive lectures, inquiry-based learning,
Blended learning, Learning based on Experiments

SEMESTER I

Course Code	24BSC17B	**Course Title**	**Mechanics and Properties of Matter** (Practical)
Course Type	DSC	**Contact Hours**	4 Hours per Week
Credit	2	**Total Hrs**	60hrs

Syllabus	**56hrs**
Content	1. Determination of coefficients of static, kinetic and rolling frictions. 2. Determination of **"g"** using bar pendulum. 3. Determination of **"g"** using simple pendulum and show that time period is independent of mass. 4. Study of motion of a spiral spring and to calculate spring constant and unknown mass. 5. Work done by a variable force using a spiral spring. 6. Verification of principle of conservation of energy. 7. Verification of parallel axis theorem using a bar-pendulum. 8. Verification of perpendicular axis theorem using torsional oscillations. 9. Determination of moment of inertia and mass of a Fly Wheel. 10. Determination of frequency of Coupled oscillator. 11. Verification of Hooke's law. 12. Determination of the Young's Modulus of the material of a bar by uniform bending method. 13. Determination of elastic constants of the material of a wire by Searle's double bar method. 14. Determination of rigidity modulus of the material of a wire - dynamic method. 15. Determination of rigidity modulus of the material of a rod – static torsion method. 16. Determination of the Young's Modulus of the material of a bar by single cantilever method. 17. Determination of surface tension of water and the interfacial tension between two immiscible liquids using drop weight method. Determination of coefficient of viscosity of a liquid by Stoke's method (A minimum of eight experiments to be performed) **A Minimum of two Virtual Lab Experiments**
	References 1. B.Sc Practical Physics by C.L Arora 2. B.Sc Practical Physics by Harnam Singh and P.S. Hemne

SEMESTER II

Kinetic Theory of Gases, Heat and Thermodynamics

Course Code	24BSC24B	**Course Title**	**Kinetic Theory of Gases, Heat and Thermodynamics**
Course Type	DSC	**Contact Hours**	4 Hours per Week
Credit	4	**Total Hrs**	60hrs
Syllabus			
UNIT I	**Kinetic Theory of Gases:** **15 HOURS** **Kinetic theory of gases:** Assumptions of Kinetic Theory of Gases, derivation of the pressure of a perfect gas, $PV = 1/3\ nmc^2$, Maxwell's law of distribution of velocities (qualitative), and deduction of most probable velocity, mean velocity and rms velocity. Expression for mean free path, degrees of freedom and principle of equipartition of energy. Specific heats of an ideal gas and atomicity of gases with derivation. **7HOURS** **Transport Phenomena**: Viscosity and thermal conduction in gases (derivation). Relation between coefficient of viscosity and thermal conductivity of a gas. . **3HOURS** **Real Gases**: Derivation of Van der Waal's equation of state, Derivation of critical constants, Andrew's experiment on carbon dioxide, comparison of Van der Waal's isotherms with Andrew's isotherms. . **5HOURS** .		
UNIT II	**Thermodynamics** **15HOURS** **Introduction to Thermodynamics:** Basic Concepts of Thermodynamics, Concept of system and Surroundings, Intensive and Extensive Properties, Microscopic and Macroscopic description of a system, Concept of mechanical, chemical and Thermal Equilibrium, Zeroth law of Thermodynamics and its significance, Concept of Heat and Temperature. **5HOURS** **First law of Thermodynamics:** Sign Convention of Heat and Work, The first law of Thermodynamics, equation form of first law, and significance of first law. PV diagram, Equation of state PV^{γ} = Constant. Work done in an isothermal and adiabatic process for a perfect gas. Internal energy as a state function, Application of first law for cyclic, isothermal, adiabatic, isochoric, isobaric process**.** **4HOURS** **Second law of Thermodynamics:** Reversible and Irreversible Process, Carnot engine, Carnot cycle and its efficiency (Derivation), Second law of Thermodynamics, (Kelvin's & Clausius Statements and their equivalence), Carnot Theorem (Proof), Practical Internal Combustion engines, OTTO and Diesel cycle, Refrigerator- Coefficient of Performance , Basic concept of Entropy, Change in entropy in Reversible and Irreversible Process - Entropy and disorder, Relation between Entropy and second law, Clausius inequality, T-S diagram of a Carnot cycle. **6HOURS**		
UNIT III	**Thermodynamic potentials and Low Temperature Physics** **15 HOURS** **Thermodynamic potentials:** Basic concepts of internal Energy, Enthalpy, Helmholtz Free Energy, Gibbs free Energy and their importance, Derivation of Maxwell's Thermodynamic		

	relations using Thermodynamic potentials, TdS Equations, Energy Equations and Heat Capacity equations **6HOURS** **Low Temperature Physics:** Joule Thomson experiment: Derivation of Joule Thomson Coefficient, Inversion Temperature. Adiabatic demagnetisation (Working and Theory) **5HOURS** **Phase Transitions of First Order:** Melting, Freezing, Condensing, Vaporising, Deposition, Sublimation. Conditions of equilibrium of phases in terms of Gibbs potential, Clausius-Clapeyron equation, Elevation of boiling point and depression of freezing point, triple point **4HOURS**

UNIT IV	**Heat and Radiation** **15 hours** **Black Body Radiation:** Black body radiation and its Spectral energy distribution; Emissive power, Absorptive power, Emissivity, Kirchhoff's law, Stefan's law, Stefan-Boltzmann's law, Wien's displacement law, Wien's distributive law, Rayleigh- Jeans law (Statements), Derivation of Planck's law, Deduction of Wien's law and Rayleigh- Jeans law from Planck's Radiation law, Solar Constant, Estimation of Surface temperature of Sun**.** **8HOURS** **Transmission of heat in matter** Conduction-Coefficient of Thermal Conductivity, Thermal conductivity of a good Conductor by Forbe's method, Thermal Conductivity of a poor conductor by Lee's disc method. Conduction along a bar, Conductivity of liquids and gases, Natural and forced Convection, Reynolds's number**.** **6HOURS**

REFERENCE BOOKS:

. Fundamental of Physics- R. Resnick & D. Halliday, Wiley 6th Edition 2001.

2. Heat and Thermodynamics- MM Zemansky, McGraw-Hill Education (India), 8th Edition 2011.

3. Heat and Thermodynamics- Brijlal and Subramanyam S Chand & Co, New Delhi 1985.

4. Heat and Thermodynamics- DS Mathur, S Chand & Co, New Delhi, 5th Edition 2004.

5. Thermal Physics- SC Garg, RM Bansal, CK Ghosh, McGraw-Hill education, 2nd Edition 2013.

6. Thermodynamics, Kinetic Theory of gases & Statistical Thermodynamics – F W Sears, G L Salinger, Narosa Publishing House, 3rd Edition, 1998.

7. Thermodynamics & Statistical Physics- Sharma & Sarkar, Himalaya Publishing House, 3rd edition, 1991.

COURSE OBJECTIVE: Facilitate the students to learn the importance of basic concepts of Thermodynamics, Kinetic Theory of Gases, Heat and Thermodynamics laws of Thermodynamics and entropy as measure of dis-orderness.	
CO CODE	**COURSE DESCRIPTION**
	COURSE OUTCOME
CO1	Enrich the knowledge of Kinetic Theory of Gases, Transport phenomena in fluids and behaviour of real gases.
CO2	Facilitate the students to learn the importance of basic concepts of Thermodynamics, Kinetic Theory of Gases, Heat and Thermodynamics laws of Thermodynamics and entropy as measure of dis-orderness.
CO3	Evaluate the concepts of Thermodynamic Potentials, phase transitions of first order and applications of low temperature physics
CO4	Understand the concepts of black body radiation, the various laws to explain the complete blackbody spectrum
CO5	Explore the transmission of heat mechanism in solids and liquids..

TEACHING PEDOGOGY

Pedagogy: Interactive lectures, inquiry-based learning,
Blended learning, Learning based on Experiments

Course Code	24BSC27B	**Course Title**	Kinetic Theory of Gases, Heat and Thermodynamics (Practical)
Course Type	DSC	**Contact Hours**	4 Hours per Week
Credit	2	**Total Hrs**	60hrs

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Syllabus	**60hrs**
Content	1. Determination of Specific heat capacity of liquid by Newton's law of cooling. 2. Verification of Newton's law of Cooling by the method of cooling. 3. Determination of Thermal Conductivity of Rubber by heating method. 4. Determination of Thermal Conductivity of bad conductor- Lee's &Charlton's method. 5. Determination of Thermal Conductivity of Copper- Searle's Method. 6. Verification of Stefan's law by electrical method. 7. Determination of Stefan's Constant by electrical method. 8. Verification of Clausius-Clapeyron Equation using Pressure Cooker. 9. Study of Gaussian distribution using Monte Carlo method. 10. Determination of Planck's constant using LED. 11. Thermal behaviour of a torch Filament-Determination of temperature of the filament of the bulb. 12. Calibration of Thermistor for temperature measurement. (A minimum of eight experiments to be performed) **References** 1. B.Sc Practical Physics by C.L Arora 2. B.Sc Practical Physics by Harnam Singh and P.S. Hemne **SUGGESTED ADDITION: A Minimum of two Virtual Lab Experiments**

COURSE OBJECTIVES:
COURSE OBJECTIVE: Facilitate the students to learn the importance of basic concepts of Thermodynamics, Kinetic Theory of Gases, Heat and Thermodynamics laws of Thermodynamics and entropy as measure of dis-orderness.

COURSE OUTCOME	
CO CODE	**COURSE DESCRIPTION**
CO1	Enrich the knowledge of Kinetic Theory of Gases, Transport phenomena in fluids and behaviour of real gases.
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