



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



Tele: 0836-2215224
e-mail: academic.st@kud.ac.in
Pavate Nagar, Dharwad-580003
ಪಾವಟೆ ನಗರ, ಧಾರವಾಡ - 580003

NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No.KU/Aca(S&T)/RPH-394A/2021-22/1155

Date: 29 OCT 2021

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2021-22ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ
ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 19.08.2021
3. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/18 ದಿ:21.08.2021.
4. ಸರ್ಕಾರಿ ಆದೇಶ ಸಂ ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1),ಬೆಂಗಳೂರು ದಿ. 15.9.2021.
5. ಎಲ್ಲ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಸಭೆಗಳ ನಡವಳಿಗಳು
6. ಎಲ್ಲ ನಿಖಾಯಗಳ ಸಭೆಗಳು ಜರುಗಿದ ದಿನಾಂಕ: 24,25-09-2021.
7. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 28.9.2021.
8. ಈ ಕಚೇರಿ ಸುತ್ತೋಲೆ ಸಂ.No. KU/Aca(S&T)/RPH-394A/2021-22/954 ದಿ:30.09.2021.
9. ಎಲ್ಲ ನಿಖಾಯದ ಡೀನರು / ಸಂಪನ್ಮೂಲ ತಜ್ಞರ ಸಭೆ ದಿನಾಂಕ 21.10.2021.
10. ಎಲ್ಲ ಸ್ನಾತಕ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರುಗಳ ಸಭೆ ದಿನಾಂಕ 22.10.2021.
11. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 01 ದಿನಾಂಕ: 27.10.2021.
12. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 29-10-2021

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2021-22ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music)/BVA/ BTM/ BSW/ B.Sc./B.Sc. Pulp & Paper
Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS)/ & BBA ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ 1 ಮತ್ತು 2ನೇ
ಸೆಮಿಸ್ಟರ್ಗಳಿಗೆ NEP-2020 ರಂತೆ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಈಗಾಗಲೇ
ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಮುಂದೆ ದಿನಾಂಕ 04.10.2021 ವರೆಗೆ ಸರಕಾರವು ಕಾಲಕಾಲಕ್ಕೆ ನೀಡಿದ ನಿರ್ದೇಶನಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು
ದಿನಾಂಕ 27.10.2021 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯಲ್ಲಿ ಅನುಮೋದನೆ ಪಡೆದು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ
www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು
ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ
ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಆಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಭಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

Handwritten signature
ಕುಲಸಚಿವರು.



KARNATAK UNIVERSITY, DHARWAD

04 - Year

B.Sc. Pulp and Paper (Hons.) Program

SYLLABUS

Subject: Pulp and Paper

[Effective from 2021-22]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM I & II,

OPEN ELECTIVE COURSE (OEC) FOR SEM I & II and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM I

Karnatak University, Dharwad

Four Years Under Graduate Program in Pulp and Paper for B.Sc.Pulp and Paper (Hons.) Effective from 2021-22

Sem	Type of Course	COURSE TITLE Theory/ Practical	Instruction hour per week	Total hours of syllabus/ Sem	Duration of Exam	Formative Assessment marks	Summative Assessment marks	Total marks	CREDITS
I	AEC	Kannada - 1	04 hrs	42 hrs	02 hrs	40	60	100	03
	AEC	English- 1 / Hindi - 1	04 hrs	42 hrs	02 hrs	40	60	100	03
	DSCC-1	Physics Theory	04 hrs	56 hrs	02 hrs	40	60	100	04
		Physics Practical	04 hrs	52 hrs	03 hrs	25	25	50	02
	DSCC-2	Chemistry Theory	04 hrs	56 hrs	02 hrs	40	60	100	04
		Chemistry Practical	04 hrs	52 hrs	03 hrs	25	25	50	02
	OEC -1	Chemical plant Utilities Theory	03 hrs	42 hrs	02 hrs	40	60	100	03
	SEC- 1	Water treatment and Analysis Practical	03 hrs	30 hrs	02 hrs	25	25	50	02
	Value Based	Health and Wellness Practical	02 hrs						01
Yoga		02 hrs						01	
							TOTAL	25	
II	AEC	Kannada - 2	04 hrs	42 hrs	02 hrs	40	60	100	03
	AEC	English- 2 / Hindi - 2	04 hrs	42 hrs	02 hrs	40	60	100	03
	AEC	Environmental Science	02 hrs	30 hrs	01 hr	25	25	50	02
	DSCC-3	Wood Chemistry Theory	04 hrs	56 hrs	02 hrs	40	60	100	04
		Wood Chemistry Practical	04 hrs	52 hrs	03 hrs	25	25	50	02
	DSCC-4	Mechanical Operation and Process Calculations	03 hrs	42 hrs	02 hrs	40	60	100	03
	DSCC-5	Mathematics	03 hrs	42 hrs	02 hrs	40	60	100	03
	OEC- 2	Electrical Engineering Basics	03 hrs	42 hrs	02 hrs	40	60	100	03
	Value Based	NCC/NSS/R&R(S&G) / Cultural	02 hrs						01
		Sports	02 hrs						01
							TOTAL	25	

Details of the other Semesters will be given later

Name of Course (Subject):Pulp and Paper

Programme Specific Outcome (PSO):

On completion of the 03/ 04 years Degree in **Pulp and Paper** students will be able to:

PSO 1: To instill in students an enthusiasm for Pulp and Paper technology, an appreciation of its application in allied fields and to provide strong foundation in chemical engineering and the basic sciences

PSO 2: To provide students with broad and balanced knowledge and understanding of key chemical, mechanical, electrical and operational concepts of paper technology.

PSO 3: To develop in students to learn

- Different raw materials,
- Basic papermaking terms and major differences between fibers, pulp types, additives, grades of paper and board; and important product properties
- Different chemical plant utilities
- Internal and external sizing, dyeing and study of additives and retention aids
- Identify and label major processes and equipment involved in making pulp and paper; i.e., label a flow chart; list major operating variables
- Importance of instrumentation, maintenance and online control of variable

PSO 4: To develop ability in students to apply standard methodology to solve problems in pulp and paper manufacture

PSO 5: To provide students with knowledge and skill towards employment or higher education in Pulp and Paper technology or multi-disciplinary areas involving Pulp and Paper technology.

PSO 6: To provide students with the ability to plan and carry out experiments independently such as

- To make pulp from different raw materials and testing them.
- Hand sheet making and testing different properties
- Major converting, coating and printing operations
- Current environmental concerns relating to pulp and paper production (i.e. air and water, effluent issues in the pulp mill)

PSO 7: To develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.

PSO 8: To instill critical awareness of advances at the forefront of Pulp and Paper technology (chemical sciences).

PSO 9: To prepare students effectively for professional employment or research degrees in Pulp and Paper technology.

PSO 10: To cater to the demands of Pulp and Paper Industries of well-trained graduates.

PSO 11: To build confidence in the candidate to be able to work on his own in Industry and Institution of higher education.

PSO 12: To develop an independent and responsible work ethics.

B.Sc. Pulp and Paper Semester –I

Syllabus of B.Sc. Programme AEC is adopted for B.Sc. Pulp and Paper Programme

AEC language question paper pattern will be same as B.Sc. programme.

B.Sc. Pulp and Paper Semester –I

Subject: Physics
Discipline Specific Course (DSC)

The course Physics in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC - 1	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.1 (Theory): Title of the Course (Theory): Physics

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1: Demonstrate conceptual understanding of fundamental physics principles.

CO 2: Understand the dynamics of rotating objects i.e. rigid bodies, angular velocity, the moment of inertia, parallel axis theorem, the inertia tensor, the motion of rigid bodies. non-inertial frames: pseudo forces, examples involving the centrifugal force and coriolis force.

CO 3: Understand the basics of material properties like, elasticity, elastic constants and their relation, torsion of a cylinder, bending of a beam, cantilever, beam supported at its ends and loaded in the middle.

CO 4: The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization. The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering and Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies.

CO 5: Recognize how and when physics methods and principles can help address problems in their major and then apply those methods and principles to solve problems in the majors.

Syllabus- Course 1(Theory): Title- Physics	Total Hrs: 56
---	----------------------

Unit-I	14 hrs
Moment of Inertia: Kinetic energy of rotating body (derivation), laws of rotational motion, general theorem of parallel and perpendicular axis. Derivation of expressions of MI of Laminar, Cylindrical rods, Solid and Hollow cylinders about standard axis, Sphere and Disc, MI of a fly wheel experiment and theory. Related problems are to be solved.	
Unit-II	14 hrs
Acceleration due to Gravity: Theory of compound pendulum, Interchangeability of centres of suspension and oscillation, Four points collinear with the C.G. about which the time period is same conditions for maximum and minimum time periods, Bar pendulum, Experimental determination of "g" using Bar pendulum, Bifilar suspension with parallel threads. Related problems are to be solved Elasticity: Stress, Strain, Hooke's law, Elastic limit, Elastic constants and relation between them. 'Y' by Searle's method, torsion of a cylinder, Maxwells needle, bending of beams, cantilever, 'Y' by bending, Rigidity modulus by dynamical method. Related problems are to be solved	
Unit-III	14 hrs
Simple Harmonic Motion (SHM): Definition of SHM, Expressions for displacement, velocity and acceleration of a particle executing SHM, Differential Equation of linear SHM, Total energy of a particle executing SHM (Derivation), Expressions for the period of oscillation of flat spiral spring (Derivation) composition of two linear SHM's of equal periods acting at right angles to each other, Lissajous figures. Related problems are to be solved.	

Unit-IV	14 hrs
<p>Interference: Division of wavelength, fresnelbiprism method of determining wavelength with theory. Division of amplitude method, Stoke's treatment of reflection and refraction at an interface. Thin films condition for maximum and minimum (both reflected and transmitted), colour of thin films, expression for path difference, Newton's rings - theory and experiment to determine wavelength of light. Lip Mann process of colour photography. Related problems are to be solved</p>	

Books/References recommended:

1. General Properties of matter, D. S. Mathur - S. Chand and Co. New Delhi (2010)
2. General Properties of matter, Khanna and Gulati - R. Chand and Co. New Delhi (1978)
3. Text Book of Light, D.N. VasudevAtmaram and Sons, Delhi (1987)
4. Optics, Khanna and Gulati - R. Chand and Co. New Delhi (1989)
5. Modern Physics ,R. Murugesan - S. Chand and Co. New Delhi (1994)
6. [Elements of Properties of Matter](#), D. S. Mathur

B.Sc. Pulp and Paper Semester –I

Subject: Physics
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC - 1	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (Practical): Title of the Course (Practical): Physics

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1: Study the basic ideas of the experiment

CO 2: Study the behaviour of rigid body dynamics.

CO 3: Understand the nature of calorimetry by specific heat of solids and law of thermodynamics and entropy.

CO 4: Study the elastic behaviour of materials and understand the acceleration due to gravity by determination of its value.

CO 5: Perform the procedure as per standard values and Understand the application.

List of the Experiments for 52 hrs / Semesters

1. Bar Pendulum (L-V)
2. Bar Pendulum (L^2 - Lt^2)
3. Fly Wheel
4. Maxwell's Needle
5. Volume Resonator
6. Moment Of Inertia By Disc
7. Parallel Axes Theorem
8. Perpendicular Axes Theorem

9. Torsion Pendulum
10. Viscosity By Stokes Method
11. Y-Bending Of Beam
12. Y-By Searle's Method
13. Frequency of AC Sonometer

General instructions:

- Before coming to the laboratory, student must be aware of the experiment allotted to them and they should be well-prepared to perform the experiment in one turn. A booklet /laboratory manual provides write-up for each experiment. The write-up gives a brief description of the experiment including theory, apparatus, procedure, observation and tables etc. For more details, they can use other reference books.
- When you come to laboratory class, your laboratory note book should contain the object, apparatus, formula used, out line of the procedure (in brief steps), relevant diagrams and observation tables. The laboratory note book will be checked by the teaching assistants. If your note book is found incomplete, you may not be allowed to perform the experiment.
- You should note down all observations directly in the tables drawn in your note book, and nowhere else. For each set of measurements, you must get at least one reading checked by one of the teaching assistants present in the class.
- Once the experiment is over, if time permits, you must try to complete all the calculations in the laboratory itself. Your calculations will be checked by the teacher, and you will be assessed on the understanding of the experiment performed by you in following turn. Therefore, your lab reports must be complete in all respects on the next turn; they must include all calculations, graphs, possible sources of errors, precautions and log error calculations

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Accuracy 12 Marks

2. Technique 3 Marks
3. Calculation 3 Marks
4. Viva 4 Marks
5. Journal 3 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended:

1. Practical Physics, C. L. Arora, Chand and Co. New Delhi (2004)
2. Practical Physics, Worsnop and Flint — Asia Publishing House, New Delhi (1971)
3. Practical Physics, M.A. Hipparagi — Uday Publication, Belgaum (1989)
4. Advanced Practical Physics for students, B.L.Flnt and H.T.Worsnop, 1971, Asia Publishing House.
5. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
6. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
7. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.

B.Sc. Pulp and Paper Semester –I

Subject: Chemistry
Discipline Specific Course (DSC)

The course Chemistry in I semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-1 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC - 2	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): Chemistry

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1: Understand Analytical Chemistry aspects, concept of $N_1V_1=N_2V_2$, Titration curves types of indicators.

CO 2: All the process of bleaching chemicals used in Pulp & Paper Industry. Study of colloids using hardy scuzle rule.

CO 3: Study of oxidizing agents. Applications of cellulose viscose rayon

CO 4: Solutions types henrys law and raoults law.

Syllabus- Course 1(Theory): Title- Chemistry	Total Hrs: 56
Unit-I	14 hrs
<p>Analytical Chemistry: Introduction to Analytical Chemistry and its interdisciplinary nature. Significant figures. Concept of sampling. Accuracy, precision, selectivity and sensitivity. Method validation. Types and sources of errors in analytical measurements. Presentation of experimental data and results from the point of view of significant figures.</p> <p>Titrimetric analysis: Principle, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparation and dilution of reagents/solutions using $N_1V_1= N_2V_2$, preparation of ppm level solutions</p>	

<p>from source materials (salts).</p> <p>Acid-base titrimetry: Theory, titration curves for all types of acids – base titrations.</p> <p>Redox titrimetry: Theory, balancing redox equations, titration curves, theory of redox indicators and applications.</p> <p>Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.</p> <p>Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water.</p> <p>Numerical problems are to be solved wherever applicable.</p>	
Unit-II	14 hrs
<p>Pulping chemicals: Introduction to pulping chemicals, their significance and reactions involved in different types of pulping processes. Manufacturing processes of pulping chemicals – sodium hydroxide, sodium sulphide, sodium sulphate, sodium sulphite, sodium peroxide and sodium carbonate. Oxygen delignification process.</p> <p>Colloidal state: Electrical Properties, charge, stability, Electrophoresis, Electrocoagulation, Peptization, Hardy-Schulze Rule protective colloids, Gold Number, Emulsions, micro emulsions and gels.</p>	
Unit-III	14 hrs
<p>Alcohols: Definition and classification. Reaction of alcoholic –OH groups with oxidizing agents such as HNO₃, KMnO₄, Cr₂O₃, K₂Cr₂O₇, Reducing agents such as NaBH₄ and Lithium aluminium hydride. OH group transformation by acylation, alkylation, xanthation, regenerated cellulose as viscose rayon, properties and applications.</p> <p>Carbohydrates: Introduction, classification, ascending and descending of sugar series, Carbohydrates as a source for ethanol by fermentation, basics of fermentation, conversion of sugar to alcohol, Study of Molasses and Bagasse as fibrous materials and their applications.</p>	
Unit-IV	14 hrs
<p>Solutions: Solutions of gas in liquids -Henry's law and its limitations. Solutions of solid in liquids-Rauolt's Law, Ideal and Non-ideal solutions. Osmosis and Osmotic pressure. Preparation of cupric ferrocyanide membrane,</p>	

Measurement of osmotic pressure by Barkeley and Hartly method. Theories of semi permeability. Applications, reverse osmosis and desalination of sea water, Laws of Osmotic pressure.

Nernst distribution law: Distribution law, Thermodynamic derivation of distribution law, calculation of partition coefficient, deviation from distribution law due to molecular complexity (association and dissociation), application of distribution law- solvent extraction, use of various solvents in extraction of wood, bark taking example of one polar solvent and a non-polar solvent, extraction of substance from a solution with derivation.

Note - Numerical problems may be taught wherever applicable.

Books/referencesrecommended :

1. Advanced Inorganic chemistry by R.D. Madan, S Chand & Co Ltd., New Delhi, 1987
2. Inorganic chemistry by J.D. Lee, Blackwell Science Ltd., 5th Edition 2014
3. Pulp and paper chemistry and chemical technology by James P. Casey- Volume I, Pulp and Paper Industry Canada, 1985
4. Organic chemistry by Morrison and Boyd - 5th edition, Pearson Education, Delhi, 2012.
5. Organic chemistry by I.L. Finar Vol I & II - 6th edition., Pearson Education, Delhi, 2001
6. Basic principles of organic chemistry by Roberts and Caserio, Wabenzaman, London, 1976
7. Principles of physical chemistry by Prutton and Murrion, 4th edition, Oxford & IBH Publication New Delhi-1980
8. Physical chemistry by Deniels and Alberty, 1st Edition, John Weley& Co Ltd., Newyork 1995
9. Physical chemistry by Barrow, 5th edition, M C Graw hill book, Singapore -1988
10. Text book of physical chemistry by Glasstone. 2nd edition, M.C. Millan, India Ltd., Delhi.- 1989
11. Text book of physical chemistry by B.D. Khosla, 3rd Edition, R Chand & Co. Delhi-1982
12. A text Book of Organic Chemistry, ArunBahl and Bahl B,S, 15th Edition S. Chand and Company, New Delhi, 1998.

B.Sc. Pulp and Paper Semester –I

Subject: Chemistry
Discipline Specific Course (DSC)

Course No.-1 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-01	DSCC - 2	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical) : Chemistry

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1: Titration of acids and base

CO 2: Understand iodometric and iodimetric titrations

CO 3: Understand ($\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$) using HCl

CO 4: Understand effluent using standard AgNO_3 solution

CO 5: Understand Complexometric titration of Zn^{+2} using EDTA

List of the Experiments for 52 hrs / Semesters

INORGANIC VOLUMETRIC ANALYSIS:

1. Standardization of HCl using standardized NaOH Solution.
2. Titration of mixture of ($\text{NaOH} + \text{Na}_2\text{CO}_3$) using HCl
3. Titration of mixture of ($\text{NaOH} + \text{NaHCO}_3$) using HCl
4. Titration of mixture of ($\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$) using HCl
5. Standardization of KMnO_4 using oxalic acid
6. Titration of mixture of oxalic acid + sodium oxalate with KMnO_4
7. Determination of Chloride in water / effluent using standard AgNO_3 solution.
8. Determination of Iron (II) using $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
9. Iodimetric titration: Volumetric determination of Iodine using Standard $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ Solution.
10. Iodometric titration: Estimation of Cu^{+2} in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ solution using standard $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ solution.
11. Complexometric titration of Zn^{+2} using EDTA

General instructions: There shall be instructions/training for the students about laboratory etiquettes, handling of reagents, laboratory safety measures, use of apparatus / instruments pertaining to the semester before commencement of the regular practicals. The same shall be recorded in the Journal.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Accuracy 12 Marks
 2. Technique 3 Marks
 3. Calculation 3 Marks
 4. Viva 4 Marks
 5. Journal 3 Marks
- Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Inorganic Quantitative analysis by A.I. Vogel, E L B S & Londman, London, 1979
2. Instrumental methods of analysis by Willard, merit and Dean., CBS P & D Delhi 1986
3. Text book of practical in physical chemistry by B.D.Khosla, R, Chand & Co. Delhi -1980
4. Organic Quantitative analysis by Vogel, 4th edition, E L B S & Londman, London, 1979

B.Sc. Pulp and Paper Semester –I

Subject: Chemical plant utilities Open Elective Course (OEC-1)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-1	OEC - 1	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-1: Title of the Course :Chemical plant utilities

Course Outcome (CO):

After completion of course, students will be able to:

- CO 1:** Understand uses of steam process heating
- CO 2:** To know the process of generation of power to run plant
- CO 3:** To know about compressors and use of compressed air for the process and instruments
- CO 4:** To understand basics of lubrication and its use in running of equipment.
- CO 5:** Importance of insulation in plants
- CO 6:** Measures to minimize energy losses

Syllabus- OEC: Title - Chemical plant utilities	Total Hrs: 42
Unit-I	14 hrs
<p>Introduction: Different utilities. Role of utilities in process plant operation and criteria for selection and estimation of suitable utilities.</p> <p>Compressed air: Compressors and fans performance characteristics and selection</p> <p>Boosters and air receivers quality of compressed air for instrument and process compressed air distribution system-piping and accessories.</p> <p>Lubrication: Types of lubricants - properties purpose and method of lubrication</p>	

Unit-II	14 hrs
<p>Steam and Power: Formation and use of wet dry and superheated steam Dryness fraction and its determination Enthalpy, specific volume External work Internal Energy- use of steam tables and charts Steam Handling and distribution calculation and estimation of steam piping and accessories.</p> <p>Steam boilers: Fire tube and water tube boilers, high-pressure boilers, boiler mountings and boiler accessories -waste heat boilers.</p>	
Unit-III	14 hrs
<p>Steam Turbines and Condensers: Introduction, classification types and details of turbines and condensers compounding for pressure and velocity efficiency calculations and simple problems. cooling devices spray ponds and cooling towers</p> <p>Insulation: Insulation Materials & Selection – Economics of insulation. Insulating factors. Properties and classification. Cold insulation and cryogenic insulation.</p>	

Books/References recommended.

1. Project Engineering of process plants - (Chem Engineering Edu Div. Centre IIT Madras, Bhasin SD-
2. Project Engineering of process plants - Rose HF and Barrow M. H Publisher-John Willey and sons, New York, 1964
3. Materials Science and Engineering - V. Raghavan, PHI Private Ltd, New Delhi, 1997.
4. Corrosion Engineering - Fontana and 'Greene.-Mcgraw Hill, EDCH, New Delhi -2013
5. Elements of Mechanicals Engineering - K. R. Gopalkrishna published by Subhash Stores

B.Sc. Pulp and Paper Semester - I

Subject: Water treatment and Analysis
SKILL ENHANCEMENT COURSE (SEC)-I

Title of Paper: Water treatment and Analysis

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Mode of Examination	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
SEC-I	Theory + Practical	02	03hrs	30	Practical	2hrs	25	25	50

Course Out come (CO):

After completion of Skill Enhancement course, students will be able to:

- CO 1:** Understand different sources of water
- CO 2:** Differentiate between process water, drinking water and boiler feed water requirements
- CO 3:** Different water treatment methods and necessity of treatment
- CO 4:** Methods of storage and handling of drinking and industrial water.
- CO 5:** Analysis of water according to requirements and uses and standards of fresh water and process water

Water Treatment: Water resources, Process Water, Cooling Water, drinking water and boiler feed water Quality Standards. Water treatment processes for drinking process and boiler feed. Storage and handling of water. Types and selection of pumps, piping and accessories. Water pretreatment, reuse and recycling.

10 Hours

List of the Experiments for 20 hrs / Semester

Determination of the following in water and boiler water samples :

- i. Hardness
- ii. Residual Chlorine
- iii. Sulphate
- iv. Sulphite
- v. Alkalinity
- vi. Acidity
- vii. Calcium

- viii. Phosphate
- ix. Silica
- x. Dissolved Oxygen

General instructions:

There shall be instructions/training for the students about laboratory etiquettes, handling of reagents, laboratory safety measures, use of apparatus / instruments pertaining to the semester before commencement of the regular practical. The same shall be recorded in the Journal.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

- 1. Accuracy 12 Marks
- 2. Technique 3 Marks
- 3. Calculation 3 Marks
- 4. Viva 4 Marks
- 5. Journal 3 Marks
- Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended:

- 1. Standard methods for the examination of water and waste water (1980) – American Public Health Association, Washington DC
- 2. TAPPI Test methods 1996-97, TAPPI Press, Atlanta Georgia.
- 3. Laboratory manual of testing procedures published by Director, CPPRI, Saharanpur, UP, 2001

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions: 20 marks

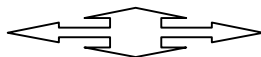
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have subquestions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Pulp and Paper Semester –II

Syllabus of B.Sc. Programme AEC is adopted for B.Sc. Pulp and Paper Programme

AEC language question paper pattern will be same as B.Sc. programme

B.Sc. Pulp and Paper Semester –II

Subject: Wood Chemistry
Discipline Specific Course (DSC)

The course Wood Chemistry in II semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC - 3	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory) :Wood Chemistry

Course Outcome (CO):

After completion of course (Theory), students will be able to:

CO 1: Identify different woody and non woody raw materials used in paper industry and their sources and collection

CO 2: Structural differences between hard wood, soft wood and grasses and agricultural residues

CO 3: Important properties of fiber required for papermaking fibers and their effect on papermaking

CO 4: Chemical components of wood and testing these physical and chemical properties and importance of proximate analysis

CO 5: Methods of preparing raw materials for cooking and storage and handling of these raw materials

Syllabus- Course 2(Theory): Title - Wood Chemistry	Total Hrs: 56
Unit-I	14 hrs
<p>Introduction: Raw materials required for Paper Industry and their requirements and procurement. General structure of coniferous and broad leaf wood, structural elements of wood and bark, anatomical and chemical differences of softwood, hardwood and grasses</p> <p>Non-woody fibers: Scope and utilization of non-wood fibers in paper making, Physical and chemical characteristics of baggase, bamboo, straw, kenaf, jute, hemp, cotton linters and agave. Their distribution, occurrence and availability.</p>	
Unit-II	14 hrs
<p>Structure of wood: Microscopic and submicroscopic structure of cell wall structural elements and organisation. Arrangement of micro fibril, structures of micro fibrils.</p> <p>Fiber morphology and proximate analysis: Fiber morphology, fiber length, diameter, lumen width, cell wall, thickness, slenderness ratio, flexibility coefficient and their significance from papermaking point of view., principle involved in the proximate analysis of fibrous raw materials with respect to paper industry.</p>	
Unit-III	14 hrs
<p>Cellulose : Chemical components of wood occurrence, distribution, isolation and chemical structure of cellulose, cellulose reactions with cooking liquor - cellulose derivatives used in paper industry- solutions of cellulose and their applications. Hemicellulose: Structure of xylans, galactomannasglucomannas and arabinogalactans. Reactions of hemicellulose with cooking liquor.</p> <p>Lignin: Introduction, structure of lignin, physical properties, reactions of lignin with sulfite and sulphate pulping liquor, laboratory and commercial separations of lignin, biosynthesis of lignin.</p>	
Unit-IV	14 hrs
<p>Wood extractives: Types of wood extractives. Effect of wood extractives on pulp quality.</p> <p>Storage and handling of fibrous raw materials at mill sites: Measurement of wood, storage of raw materials and stacking, protection against fire and decay handling and conveying of raw material.</p> <p>Preparation of fibrous raw material for cooking: Debarking, depithing, chipping, chopping, chip analysis washing, screening, types of storage - chip conveying to digesters.</p>	

Books/References recommended:

1. Text book of wood technology Volume I – AJ Oanshin and CdeZeeuw, McGraw Hill Book Company
2. The Chemical Technology of Wood - H. F. B. Wenzl Academic Press, New York
3. Pulp and Paper Manufacture Volume III, Secondary Fibers and Non – Wood Pulping -Edited by F Hamilton and B. Leopold Published by the Technical Section Canadian Pulp and paper Association
4. Hand Book of Pulp Volume I – Edited by Herbert Sixta Published by Wiley-VCH VerlagGembH and Company KGaA, Weinheim
5. Wood and Cellulose Chemistry Edited by David N.S. Hon Nobuo Shiraishi – 1998, Library of Congress, New York.

B.Sc. Pulp and Paper Semester –II

Subject: Wood Chemistry
Discipline Specific Course (DSC)

Course No.-2 (Practical)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC - 3	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.2 (Practical): Title of the Course (Practical) : **Wood Chemistry**

Course Outcome (CO):

After completion of course (Practical), students will be able to:

CO 1:By determiningmoisture oven dry and air dry concepts are taught to students. Moisture is one of the important property tested for raw material and pulp as all the additions are done on moisture free basis and in calculation of yield and shrinkage.

CO 2:Ash test is significant to know residual inorganic components left after combustion.

CO 3:Different solubility tests are significant in proximate analysis of any raw material used for papermaking.

CO 4:Chemical components of wood are tested by holocellulose, lignin, pentosans and extractives.

CO 5: Silica and pith are tested for non woody fibers

CO 6: Microscopic study of fibers is important in identification of fibers.

List of the Experiments for 52 hrs / Semesters

- 1.Determination of following properties in different wood and non wood samples
 - a) Moisture
 - b) Ash
 - c) Cold water solubility
 - d) Hot water solubility.

- e) NaOH solubility.
 - f) Alcohol benzene solubility.
 - g) Holo cellulose
 - h) α , β and γ cellulose.
 - i) Lignin.
 - j) Pentosans.
 - k) Silica
2. Fiber separation and microscopic study of fibers of softwood, hardwoods, non woods.
 3. Determination of Pith content in bagasse.

General instructions:

There shall be instructions/training for the students about laboratory etiquettes, handling of reagents, laboratory safety measures, use of apparatus / instruments pertaining to the semester before commencement of the regular practical. The same shall be recorded in the Journal.

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

1. Accuracy 12 Marks
2. Technique 3 Marks
3. Calculation 3 Marks
4. Viva 4 Marks
5. Journal 3 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended:

1. TAPPI Test methods 1996-97, TAPPI Press, Atlanta Georgia.
2. Laboratory manual of testing procedures published by Director, CPPRI, Saharanpur,UP, 2001

B.Sc. Pulp and Paper Semester –II

Subject: Mechanical operation and process Calculation
Discipline Specific Course (DSC)

The course Mechanical operation and process Calculation in II semester has one Theory Paper for 03 credits. Details of the courses are as under.

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC - 4	Theory	03	03	42 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): Mechanical operation and process Calculation

Course Outcome (CO):

After completion of Process Calculation course (Theory), students will be able to:

CO 1: Designing of any process system, to achieve a desired production capacity by selecting proper sizes of the equipments.

CO 2: For calculating the required flow rates of various input and output streams and thereby decide the piping sizes.

CO 3: Based on mass flow rates, energy balance and specific utilities consumption per tonne of product (water, steam, power, compressed air) is decided, which ultimately decides economics of any process.

CO 4: Different kinds of products, when processed in same batch equipment, require different process flow and parameters. This influence can be studied by process calculations.

CO 5: A plant can be operated simply by knowing "know how". But knowledge of this subject help us in understanding the "know why" for any process and optimize the process.

CO 6: Study of **Mechanical Operations** include study of physical changes of material like size reduction, study of particle size analysis, filtration, sedimentation, dust collection methods, mineral beneficiation, froth flotation, storage and conveying etc

Particle technology: Understanding of particle size and shape is important e.g. 1 kg of filler of a given size will be able to cover how much area by a paint/dye, which size of filler will be retained to what extent by fibres in paper etc.

CO 7: Size reduction: In nature particles are available in different sizes, but same cannot be utilized as such and needs to be converted to a given size as in case of burning of coal in boiler, addition of fillers, wood chip sizes for digester. Different equipments are available for primary and secondary size reduction. This subject helps in proper selection of equipment.

CO 8: Filtration: This helps in effectively removing the solids from a liquid, in energy efficient manner.

CO 9: Movement of solids in a stagnant fluids: Clarifiers are useful in removing turbidity from river water. Similarly thickeners are useful in separating clear effluent from sewage stream in ETP.

CO 10: By Electrostatic Precipitator, the dust from chimney of boilers, Rotary lime kiln etc. is collected for controlling air pollution as well as in collecting the particles, which can be effectively utilized. Other methods of dust collection include venturi scrubbers, bag filters, cyclone separators etc.

Syllabus - Course 2(Theory): Title - Mechanical operation and Process calculation	Total Hrs: 56
Unit-I	14 hrs
<p>Particle Technology: Particle diameter different ways of expressions shape factor</p> <p>Movement of solids in a stagnant fluids: Terminal setting velocity, stokes law, Newton's law region, free and hindered setting, thickener design - cyclones, simple problems on stoke's law.</p> <p>Filtration: Theory of filtration-batch and continuous filters, types of filters, industrial filters, filters aids washing filter cakes</p> <p>Size reduction: Size reduction laws governing size reduction, simple problems equipment for crushing and grinding –jaw crusher ball mill, open and closed circuit grinding (only mode of operation to be taught)</p>	

Unit-II	14 hrs
<p>Introduction to Chemical Engineering: Elementary description of major unit operation and related equipments. Units and dimensions, Conversion of units, Methods of expressing compositions of matter and their mixtures, Ideal and real gas equations of state, Vapour pressure, Raoult's law, Henry's law</p> <p>Dust and Mist collection – Definition and working of ESP</p>	
Unit-III	14 hrs
<p>Material balance involving unit operations: Evaporation, drying, absorption and mixing of steams. Material balance involving recycle and bypass streams. Material balance of successive operations.</p> <p>Energy balance: Energy balance for systems without chemical reaction Application of material and energy balance with reference to pulp and paper industry.</p> <p>Thermochemistry: Heats of formation, Heat of combustion and heat of reaction- Heat of mixing - Heat capacity</p>	

Books/References recommended:

1. Foust-et-al – Principles of unit operations
2. Budger & Benchers – Introduction to chemical Engg, McGraw Hill, Koga Kusha Ltd., Tokyo, 1978.
3. Unit Operations in chemical Engineering 7th Edition, 2008, McCabe and Smith McGraw Hill Co., New York
4. Coulson and Richardson- Chemical Engg. Vol. 2, Butter Worth Heinemann, 2006
5. Basic principles and calculation in chemical engineering David M. Himmelblau 6th edition Prentice Hall of India 1997.
6. Elementary principles of chemical processes 2nd edition Richard M. Felder Ronald W. Rousseau 1986.
7. Process calculation for chemical Engineer chemical Engineering education Development Centre (1973) IIT Madras.
8. Stoichiometry Bhatt B.I and Vora SM Tata McGraw Hill, New Delhi, 1989.

B.Sc. Pulp and Paper Semester –II

Subject: Mathematics
Discipline Specific Course (DSC)

**The course Mathematics in I semester has one theory paper for 03 credits:
Details of the courses are as under**

Course No.-2 (Theory)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-02	DSCC - 5	Theory	03	03	42 hrs	2hrs	40	60	100

Course No.2 (Theory): Title of the Course (Theory): Mathematics

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1:** Learn the techniques of differentiation of functions of real variables
- CO 2:** Solving the differential equations of different orders
- CO 3:** To know the formation of PDE by different methods
- CO 4:** Evaluate multiple integrals
- CO 5:** Evaluate the integrals with the help of Beta and Gamma functions

Syllabus- Course 2(Theory): Title- Mathematics	Total Hrs: 56
Unit-I	14 hrs
nth derivative of some standard functions e^{ax+b} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax}\sin(ax + b)$, $e^{ax}\cos(ax + b)$. Leibnitz's rule for n th derivative of the product of two functions and related problems. Taylor's and Maclaurin's Theorem (statement only) and problems.	
Unit-II	14 hrs
Differential Equations. Formation of differential Equations. Equations of the first order and first degree. Variable separable form and Homogeneous equations. Functions of two or more variables. Partial Differentiation. Formation of PDEs by elimination of arbitrary constants / functions. Jacobians.	

Unit-III	14 hrs
Reduction formulae. Evaluation double and triple of integrals. Beta and Gamma functions. Relation between Beta and Gamma functions. Simple examples and problems to be solved.	

Books/References recommended:

1. Engineering Mathematics, H.K. Dass - S. Chand and Co. New Delhi (1995)
2. Statistical Methods, S.P. Gupta - S. Chand and Co. New Delhi (1987)
3. Business Statistics, R. Dhareshwar - S. Chand and Co. New Delhi (1987)
4. Practical Statistics, S.P. Gupta - S. Chand and Co. New Delhi (1990)
5. Differential Calculus, Shanti Narayan - S. Chand and Co. New Delhi (2009)

B.Sc. Pulp and Paper Semester – II

Subject: Electrical Engineering Basics Open Elective Course (OEC-2)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC	OEC - 2	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-2: Title of the Course: Electrical Engineering Basics

Course Outcome (CO):

After completion of course, students will be able to:

CO 1: Understand the basics of electricity.

CO 2: Functions and importance of electrical equipment like Motor Generator transformer etc.

CO 3: Generation and flow of electricity from generating station to consumer premises.

CO 4: Difference between single and three-phase power.

CO 5: Importance of electricity and its efficient use in day today life.

CO 6: Safety in the use of electricity to man and machine.

CO 7: Measurement of power and its integration at mill site and domestic sites.

Syllabus- OEC: Title - Electrical Engineering Basics	Total Hrs: 42
Unit-I	14 hrs
<p>D.C Circutes: Ohm's Law and Kirchhoff's current Law Kirchhoff's voltage Law-applications for the analysis of only series and parallel resistive circuits exited by independent voltage sources: Power and Energy in such circuits. Illustrative examples</p> <p>D. C. Machines: Principle of D. C. Generator and motor constructional features, classification, simple, lap and wave windings. The e.m.f. equation, production of torque in a D. C. motor. The torque equation necessity of a starter. The three-point starter, Industrial applications of D. C. motors.</p>	
Unit-II	14 hrs
<p>Three-Phase A. C. Circuits: Generation of 3 phase voltages, advantages of 3-phase systems star andDelta connections current and voltage relations, 3-phase power and its measurement by 2-water meter method. Earthing of electrical appliances and systems .safety in the use of electric power.</p> <p>The single-phase transformer: Principles constructional features, E. M. F. Equation, Relation between primary and secondary turns, voltages and currents</p> <p>The three phase Induction Motor: Construction, working principle production of Torque slipIndustrial applications</p>	
Unit-III	14 hrs
<p>Electromagnetism: Faradays Laws, Lenz's Law Fleming's rules, Statically and dynamically induced E.M.F.'s Concept of self and mutual inductance. Concept of coefficient of coupling. Energy stored inmagnetic field, Illustrative examples.</p> <p>Measuring Instruments: Basic principles of moving iron, moving coil and induction, type meters formeasuring current, voltage, power and energy.</p>	

Books/References recommended:

1. Electrical Technology, Hugar - CBSP & D, New Delhi, 1988
2. Applied Electricity - H. Cotton
3. Electrical Technology, H. Cotton
4. Electrical Engineering - Doves Vol. I & II
5. Introduction to Electrical Engineering - M. H. Ward
6. Basic Electrical Engineering (4th Edition), Fitzgerald, MCGraw Hill International Book Co., New York, 1989
7. Electrical Technology by B.L TherejaVol I& II Basic Electrical By P.M Chandrashekarayya

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

**Faculty of Science
04 - Year UG Honors programme:2021-22**

**GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.

