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

ಸ್ವಾತಂತ್ರ್ಯದ ಅಮೃತ ಮಹೋತ್ಸವ

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)/SSL-394A/2022-23/1056 Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022–23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ 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. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022–23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, **ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ** ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ (NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಕುಲಸಚಿವರು.

ಅಡಕ: ಮೇಲಿನಂತೆ

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

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.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

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 TO IV,

OPEN ELECTIVE COURSE (OEC) FOR SEM I TO IV and

SKILL ENHANCEMENT COURSE (SEC) FOR SEM I & III

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. Pulp and Paper (Hons.)Program

SYLLABUS FOR SEM I, II, III & IV

Course: Pulp and Paper

DISCIPLINE SPECIFIC CORE COURSE (DSCC)

SEMESTER-I

DSCC-1	*Physics Theory*	*081BSP011*
DSCC-2	*Physics Practical*	*081BSP012*
DSCC-3	*Chemistry Theory*	*081BSP013*
DSCC-4	*Chemistry Practical*	*081BSP014*
OEC -1	*Chemical plant Utilities Theory*	*001BSP051*

SEMESTER-II

DSCC-5	*Wood Chemistry Theory*	*082BSP011*
DSCC-6	*Wood Chemistry Practical*	*082BSP012*
DSCC-7	*Mechanical Operation and Process Calculations*	*082BSP013*
DSCC-8	*Mathematics*	*082BSP014*
OEC- 2	*Electrical Engineering Basics*	*002BSP051*

SEMESTER-III

DSCC-9	*Pulp Manufacture Theory*	*083BSP011*
DSCC-10	*Pulp Manufacture Practical*	*083BSP012*
DSCC-11	*Chemistry Theory*	*083BSP013*
DSCC-12	*Chemistry Practical*	*083BSP014*
OEC -3	*Thermodynamics and Heat transfer*	*003BSP051*

SEMESTER-III

DSCC-13	*Stock Preparation and Papermaking Theory*	*084BSP011*
DSCC-14	*Stock Preparation Practical*	*084BSP012*
DSCC-15	*Computer Concepts and Fundamentals of Programming Theory*	*084BSP013*
DSCC-16	*Python programming Practical*	*084BSP014*
OEC- 4	*Mass Transfer and Fluid Mechanics*	*004BSP051*

[With effect from 2021-22]

AS PER NEP – 2020

Karnatak University, Dharwad

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

Sem	Type of Course	Course Title Theory/ Practical	Course / Paper Code	Instruction hour / week	Total hours of syllabus/ Sem	Duration of Exam	Formative Assessment marks	Summative Assessment marks	Total marks	CREDITS
I	*AEC*	*Kannada - 1*	*031KAN041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	AEC	*English- 1*	*031ENG041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	AEC	*Hindi - 1*	*031HIN041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	DSCC-1	*Physics Theory*	*081BSP011*	*04 hrs*	*56 hrs*	*02 hrs*	*40*	*60*	*100*	*4*
	DSCC-2	*Physics Practical*	*081BSP012*	*04 hrs*	*52 hrs*	*03 hrs*	*25*	*25*	*50*	*2*
	DSCC-3	*Chemistry - I Theory*	*081BSP013*	*04 hrs*	*56 hrs*	*02 hrs*	*40*	*60*	*100*	*4*
	DSCC-4	*Chemistry - I Practical*	*081BSP014*	*04 hrs*	*52 hrs*	*03 hrs*	*25*	*25*	*50*	*2*
	OEC -1	*Chemical plant Utilities Theory*	*001BSP051*	*03 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	SEC- 1	*Water treatment and Analysis Practical*		*03 hrs*	*30 hrs*	*02 hrs*	*25*	*25*	*50*	*2*
	Value Based	*Health and WellnessPractical*		*02 hrs*						*1*
		Yoga/Sports		*02 hrs*						*1*
									TOTAL	***25***
II	*AEC*	*Kannada - 2*	*032KAN041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	AEC	*English- 2*	*032ENG041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	AEC	*Hindi - 2*	*032HIN041*	*04 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	AEC	*Environmental Science*	*002EVS041*	*02 hrs*	*30 hrs*	*01 hr*	*25*	*25*	*50*	*2*
	DSCC-5	*Wood Chemistry Theory*	*082BSP011*	*04 hrs*	*56 hrs*	*02 hrs*	*40*	*60*	*100*	*4*
	DSCC-6	*Wood Chemistry Practical*	*082BSP012*	*04 hrs*	*52 hrs*	*03 hrs*	*25*	*25*	*50*	*2*
	DSCC-7	*Mechanical Operation and Process Calculations*	*082BSP013*	*03 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	DSCC-8	*Mathematics*	*082BSP014*	*03 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	OEC- 2	*Electrical Engineering Basics*	*002BSP051*	*03 hrs*	*42 hrs*	*02 hrs*	*40*	*60*	*100*	*3*
	Value Based	*NCC/NSS/R&R(S&G) / Cultural*		*02 hrs*						*1*
		Yoga/Sports		*02 hrs*						*1*
									TOTAL	***25***

Sem	Type of Course	Course Title Theory/ Practical	Course / Paper Code	Instruction hour/ week	Total hours of syllabus/ Sem	Duration of Exam	Formative Assessment marks	Summative Assessment marks	Total marks	CREDITS
III	AEC	Kannada – 3	033KAN041	04 hrs	42 hrs	02 hrs	40	60	100	3
	AEC	English- 3	033ENG041	04 hrs	42 hrs	02 hrs	40	60	100	3
	AEC	Hindi - 3	033HIN041	04 hrs	42 hrs	02 hrs	40	60	100	3
	DSCC-9	Pulp Manufacture Theory	083BSP011	04 hrs	56 hrs	02 hrs	40	60	100	4
	DSCC-10	Pulp Manufacture Practical	083BSP012	04 hrs	52 hrs	03 hrs	25	25	50	2
	DSCC-11	Chemistry- II Theory	083BSP013	04 hrs	56 hrs	02 hrs	40	60	100	4
	DSCC-12	Chemistry - II Practical	083BSP014	04 hrs	52 hrs	03 hrs	25	25	50	2
	OEC -3	Thermodynamics and Heat transfer	003BSP051	03 hrs	42 hrs	02 hrs	40	60	100	3
	SEC- 2	Deinking and Waste Paper Recycling		03 hrs	30 hrs	02 hrs	25	25	50	2
	Value Based	Health and Wellness Practical		02 hrs						1
		Yoga/Sports		02 hrs						1
IV	AEC	Kannada - 4	034KAN041	04 hrs	42 hrs	02 hrs	40	60	100	3
	AEC	English- 4	034ENG041	04 hrs	42 hrs	02 hrs	40	60	100	3
	AEC	Hindi - 4	034HIN041	04 hrs	42 hrs	02 hrs	40	60	100	3
	AEC	Constitution of India	004EVS041	02 hrs	30 hrs	01 hr	25	25	50	2
	DSCC-13	Stock Preparation and Papermaking Theory	084BSP011	04 hrs	56 hrs	02 hrs	40	60	100	4
	DSCC-14	Stock Preparation Practical	084BSP012	04 hrs	52 hrs	03 hrs	25	25	50	2
	DSCC-15	Computer Concepts and Fundamentals of Programming Theory	084BSP013	03 hrs	56 hrs	02 hrs	40	60	100	4
	DSCC-16	Python programming Practical	084BSP014	04 hrs	52 hrs	03 hrs	25	25	50	2
	OEC- 4	Mass Transfer and Fluid Mechanics	004BSP051	03 hrs	42 hrs	02 hrs	40	60	100	3
	Value Based	NCC/NSS/R&R(S&G) /Cultural		02 hrs						1
		Yoga/Sports		02 hrs						1
									TOTAL	***25***

Name of Course (Subject):Pulp and Paper

Programme Specific Outcome (PSO):

Name of Course: B Sc Pulp andPaper (Apprenticeship/internship embedded)

Programme Specific Outcome (PSO):

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

PSO 1: Instill an enthusiasm for Pulp and Paper technology, an appreciation of its application in allied fields and to getstrong foundation in chemical engineering and the basic sciences related to papermaking.

PSO 2: Develop broad and balanced knowledge and understanding of key chemical, mechanical, electrical and operational concepts of paper technology.

PSO 3: Understand

- 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: Develop ability to apply standard methodology to solve problems in pulp and paper manufacture

PSO 5: Get knowledge and skill towards employment or higher education in Pulp and Paper technology or multi-disciplinary areas involving pulp and paper technology.

PSO 6: 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: Develop ability to adapt and apply methodology to the solution of unfamiliar types of problems.

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

PSO 9: Get professional employment or research degrees in Pulp and Paper technology.

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

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

PSO 12: 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

Course: Physics
Discipline Specific Course (DSCC)

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 Code	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
081BSP011	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: Moment of Inertia	**14 hrs**
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: Acceleration due to Gravity andElasticity	**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, bendingof beams, cantilever, 'Y' by bending, Rigidity modulus by dynamical method. Related problems are to be solved	
Unit-III: Simple Harmonic Motion	**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 :Interference	**14 hrs**
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	

Books 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. Murugeshan - S. Chand and Co. New Delhi (1994)
6. Elements of Properties of Matter, D. S. Mathur

B.Sc. Pulp and Paper Semester –I

Course: Physics
Discipline Specific Course (DSCC)

Course No.-1 (Practical)

Course Code	Type of Course	Theory / Practical	Credits	Instructionhour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
081BSP012	DSCC - 2	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 / Semester

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 EndExamination

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 Marks
	Total	**-**	**25 marks**

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

Books recommended:

1. Practical Physics, C. L. AroraS,Chand and Co. New Delhi (2004)
2. Practical Physics, Warsnop 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.Flint 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

Course: Chemistry
Discipline Specific Course (DSCC)

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 Code	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
081BSP013	DSCC - 3	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: Analytical Chemistry and Titrimetric analysis	**14 hrs**
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. **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 from source materials (salts). **Acid-base titrimetry**: Theory, titration curves for all types of acids – base titrations. **Redox titrimetry**: Theory, balancing redox equations, titration curves, theory of redox indicators and applications. **Precipitation titrimetry:** Theory, titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. **Complexometrictitrimetry:** 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. Numerical problems are to be solved wherever applicable.	
Unit-II: Pulping chemicals and Colloidal state	**14 hrs**
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. **Colloidal state:** Electrical Properties, charge, stability, Electrophoresis, Electrocoagulation, Peptization, Hardy-Schulze Rule protective colloids, Gold Number, Emulsions, micro emulsions and gels.	
Unit-III: Alcohols and Carbohydrates	**14 hrs**
Alcohols: Definition and classification. Reaction of alcoholic –OH groups with oxidizing agents such as HNO_3, $KMnO_4$, Cr_2O_3, $K_2Cr_2O_7$, Reducing agents such as $NaBH_4$ and Lithium aluminium hydride. OH group transformation by acylation, alkylation, xanthation, regenerated cellulose as viscose rayon, properties and applications. **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.	
Unit-IV Solutions and distribution law	**14 hrs**
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, Measurement of osmatic 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 recommended:

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. FinarVol 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 Murron, 4th edition, Oxford & IBH Publication New Delhi-1980

8. Physical chemistry by Deniels and Alberty, 1st Edition, John Weley& Co ltd., Newyork1995
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

Course : Chemistry
Discipline Specific Course (DSCC)

Course No.-1 (Practical)

Course Code	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
081BSP014	DSCC - 4	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.1 (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(Na_2CO_3 + $NaHCO_3$) using HCl

CO 4: Understand effluent using standard $AgNO_3$ solution

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

List of the Experiments for 52 hrs / Semester

INORGANIC VOLUMETRIC ANALYSIS:

1. Standardization of HCl using standardized NaOH Solution.
2. Titration of mixture of (NaOH + Na_2CO_3) using HCl
3. Titration of mixture of (NaOH + $NaHCO_3$) using HCl
4. Titration of mixture of (Na_2CO_3 + $NaHCO_3$) 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 $K_2Cr_2O_7$ solution.
9. Iodimetric titration: Volumetric determination of Iodine using Standard $Na_2S_2O_3.5H_2O$ Solution.
10. Iodometric titration: Estimation of Cu^{+2} in $CuSO_4.5H_2O$ solution using standard $Na_2S_2O_3.5H_2O$ 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 practical. The same shall be recorded in the Journal.

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 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

Course: Chemical plant utilities
Open Elective Course (OEC-1)
Course No.-1 (Theory)

Course Code	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
001BSP051	OEC - 1	Theory	03	03	42 hrs	2 hrs	40	60	100

Course No.-1 (Theory) 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: Know the process of generation of power to run plant
CO 3: Learn about compressors and use of compressed air for the process and instruments
CO 4: Understand basics of lubrication and its use in running of equipment.
CO 5: Know **i**mportance of insulation in plants
CO 6: Learn measures to minimize energy losses

Syllabus- OEC: Title - Chemical plant utilities	**Total Hrs: 42**
Unit-I: Utilities for process plant operation	**14 hrs**
Introduction: Different utilities. Role of utilities in process plant operation and criteria for selection and estimation of suitable utilities. **Compressed air:** Compressors and fans performance characteristics and selection Boosters and air receivers quality of compressed air for instrument and process compressed air distribution system-piping and accessories. **Lubrication:** Types of lubricants - properties purpose and method of lubrication	
Unit-II: Steam generation	**14 hrs**
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. **Steam boilers:** Fire tube and water tube boilers, high-pressure boilers, boiler mountings and boiler accessories -waste heat boilers.	
Unit-III: Steam Turbines and Insulation	**14 hrs**
Steam Turbines and Condensers: Introduction, classification types and details of turbines and condensers compounding for pressure and velocity efficiency calculations and numerical problems. cooling devices spray ponds and cooling towers **Insulation:** Insulation Materials & Selection – Economics of insulation. Insulating factors. Properties and classification. Cold insulation and cryogenic insulation.	

Books 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

Course: Water treatment and Analysis
SKILL ENHANCEMENT COURSE (SEC)-I
Course No.-1 (Practical)

Type of Course	Theory / Practical	Credits	Instruction hour perweek	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	2hr	25	25	50

Course No.-1 (Practical) Title of Paper: Water treatment and Analysis

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.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 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% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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:2022-23

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 weightage 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

Course: Wood Chemistry
Discipline Specific Course (DSCC)

The course Wood Chemistryin 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 Code	Type of Course	Theory / Practical	Credits	Instructionhour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
082BSP011	DSCC - 5	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: LearnStructural differences between hard wood, soft wood and grasses and agricultural residues

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

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

CO 5: Learn 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: Raw materials for paper	**14 hrs**
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 **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.	
Unit-II: Structure of wood and proximate analysis	**14 hrs**
Structure of wood: Microscopic and submicroscopic structure of cell wall structural elements and organisation. Arrangement of micro fibril, structures of micro fibrils. **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.	
Unit-III: Chemical components of wood	**14 hrs**
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: S**tructure of xylans, galactomannasglucomannas and arabinogalactans. Reactions of hemicellulose with cooking liquor. **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. **Wood extractives:** Types of wood extractives. Effect of wood extractives on pulp quality.	
Unit-IV: Storage and handling of fibrous raw materials	**14 hrs**
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. **Preparation of fibrous raw material for cooking:** Debarking, depithing, chipping, chopping, chip analysis washing, screening, types of storage - chip conveying to digesters.	

Books 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

Course: Wood Chemistry
Discipline Specific Course (DSCC)

Course No.-2 (Practical)

Course Code	Type of Course	Theory / Practical	Credits	Instructionhour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	SummativeAssessment Marks	Total Marks
082BSP012	DSCC - 6	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: Understandimportance of moisture content in raw material and pulp paper production.

CO 2: Learn significance of determination of ash.

CO 3: Knowsolubility tests and their significance in proximate analysis of raw material used for papermaking.

CO 4: Knowchemical components of wood like cellulose, lignin, pentosans and extractives.

CO 5: Learn method oftesting silica and pith for non woody fibers

CO 6: Learn microscopic study of fibers and identification of fibers.

List of the Experiments for 52 hrs / Semester

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) □, □ and □ 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

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 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 (DSCC)

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

Course No.-2 (Theory)

Course Code	Type of Course	Theory / Practical	Credits	Instructionhour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	SummativeAssessment Marks	Total Marks
082BSP013	DSCC - 7	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 Calculationcourse (Theory), students will be able to:

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

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

CO 3: Understand basics of 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 Processcalculation	**Total Hrs: 56**
Unit-I : Mechanical operation	**14 hrs**
Particle Technology: Particle diameter different ways of expressions shape factor **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. **Filtration:** Theory of filtration-batch and continuous filters, types of filters, industrial filters, filters aids washing filter cakes **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) **Dust and Mist collection** – Definition and working of ESP	
Unit-II: Basic chemical engineering and gas law	**14 hrs**
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	
Unit-III: Material and Energy balance	**14 hrs**
Material balance involving unit operations: Evaporation, drying, absorption and mixing of steams. Material balance involving recycle and bypass streams. Material balance of successive operations. **Energy balance:** Energy balance for systems without chemical reaction Application of material and energy balance with reference to pulp and paper industry. **Thermochemistry:** Heats of formation, Heat of combustion and heat of reaction- Heat of mixing - Heat capacity	

Books recommended:

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

B.Sc. Pulp and Paper Semester –II

Course: Mathematics
Discipline Specific Course (DSCC)

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 Code	Type of Course	Theory / Practical	Credits	Instructionhour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
082BSP014	DSCC - 8	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: Successive differentiation	**14 hrs**
nth derivative of some standard functions e^{ax+b}, $(ax+b)^n$, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}\sin(ax+b)$, $e^{ax}cos(ax+b)$.Leibritz'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: Differential Equations	**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 : Integral calculus	**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 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

Course: Electrical Engineering Basics
Open Elective Course (OEC-2)
Course No.-2 (Theory)

Course Code	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
002BSP051	OEC - 2	Theory	03	03	42 hrs	2hrs	40	60	100

Course No.-2 (Theory)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: Learn functions and importance of electrical equipment like Motor Generator transformer etc.

CO 3: Understand methods of generation and flow of electricity from generating station to consumer premises.

CO 4: Know the difference between single and three-phase power.

CO 5: Learn importance of electricity and its efficient use in day today life**.**

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

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

Syllabus- OEC: Title - Electrical Engineering Basics	Total Hrs: 42
Unit-I: D.C Circutes and Machines	**14 hrs**
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 **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.	
Unit-II : Transformers and Induction motors	**14 hrs**
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. **The single-phase transformer:** Principles constructional features, E. M. F. equation, relation between primary and secondary turns, voltages and current.**The three phase Induction Motor:** Construction, working principle production of Torque slip, industrial applications	
Unit-III: Electromagnetism and measuring instruments	**14 hrs**
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. **Measuring Instruments:** Basic principles of moving iron, moving coil and induction, type meters formeasuring current, voltage, power and energy.	

Books recommended:

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

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

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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 weightage shall be given to each unit based on number of hours prescribed.

B.Sc. Pulp and Paper Semester –III

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 –III

Course:Pulp Manufacture

Discipline Specific Course (DSCC)

The course Pulp Manufacture in III 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.-3 (Theory)

Course code	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
083BSP011	DSCC - 9	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.3 (Theory): Title of the course (Theory): Pulp Manufacture

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

CO1: Understand different pulping methods used for lingo cellulosic materials, bleaching and properties and uses of these pulps.

CO2: Know high yield pulping methods and difference between high yield and low yield pulping methodsand properties and uses of these pulps.

CO3:Understand chemistryof alkaline pulping, terms used in Kraft process, equipment and accessories for cooking, variables associated with raw material and process and properties and uses of these pulps.

CO4: Know different types of digesters used in pulping, their construction and operation, batch digestersand continuous digestersand their merits and demerits.

CO5: Learn theextended delignification processes to understand various modified cooking methods, their advantages and disadvantages.

Syllabus- Course 3 (Theory): Title- Pulp Manufacture	Total Hrs: 56
Unit-I : Pulping and methods of pulping	**14 hrs**
Introduction to Pulping: General principles of pulping-classification of pulping, technical andcommercial aspects of pulping. **Mechanical Pulping:**Introduction History and description of the process-equipment and accessories - mechanical pulp from chips modifications like RMP,CSRMP,TMP process details. Bleaching-characteristics and applications. **Non wood fiber pulping and bleaching:** Pulping and bleaching of bagasse, bamboo, kenaf, jute, straw, hemp and cotton linters (cooking methods and equipment used)	
Unit-II : High yield pulping methods	**14 hrs**
High Yield Pulps: Definition and scope- NSSC, cold soda, hot soda, acid sulphite, bisulfite, raw materials, cooking chemicals, digesters-fiberizing-process control and operation, newsprint manufacture, characteristics and process technology, bleaching of these pulps. Characteristics and applications of high yield pulps.	
Unit-III : Chemistry of Alkaline Pulping and Nano Cellulose	**14 hrs**
Alkaline Pulping: Introduction, history of alkaline pulping-description of the Kraft process-standard Kraft pulping terms, composition of Kraft liquors. **Process Variables:** General considerations, analysis of experimental results, the ross diagram variables associated with the wood, with the processand pulping operation. H factor. **Nano Cellulose:**Manufacture, properties and application, advantages and disadvantages.	
Unit-IV: Types of digesters and extended delignification processes	**14 hrs**
Alkaline digester systems: Batch digester and their operation-continuous digester and their operations, batch Vs continuous digesters, digester scale and corrosion. Kraft batch digesting continuous digester control. Properties and uses of Kraft pulps. **Extended delignification processes:** Vapour phase pulping, modified continuous cooking (MCC), rapid displacement heating (RDH), super batch cooking oxygen delignification catalysts used in pulping with respect to carbohydrate conservation soda-AQ, sulfate-AQ-etc.	

Books recommended:

1. Alkaline Pulping, Vol. V - Published by Technical Section Canadian Pulp & Paper Association (1996)
2. Secondary fibers and non wood pulping published by Joint Text Book Committee, Vol. III - TAPPI Press (1993)
3. Secondary fiber - recycling - Edited Richard J. Spangenberg, TAPPI – Press.
4. Micro and Nanotechnology in Paper Manufacturing - Industry Paper, Patel Avenue, Sambalpur, Orrisa, 2009

B.Sc. Pulp and Paper Semester –III

Course: Pulp Manufacture
Discipline Specific Course (DSCC)

Course No.-3 (Practical)

Course code	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
083BSP012	DSCC - 10	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.3 (Practical): Title of the Course (Practical): Pulp Manufacture

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

CO1: Understand method of preparation of Kraft cooking liquor and methods of testing it.

CO2: Know the importance of caustic soda and sodium sulfite purity.

CO3: Learn different methods of preparation of pulp, handling of bomb digester, rotary digester and controlling cooking parameters.

CO4: Know the importance of testing pulp for rejects, yield, viscosity and residual alkali in black liquor.

CO5: Understand importance of causticity and sulfidity of mill white liquor.

CO6: Know to optimize cooking parameters.

CO7: Use the pulping aids and know their advantages.

CO8: Analyse CED solution and calculate the value of R.

List of the experiments for 52 hrs / semester

1. Preparation of Kraft cooking liquor

2. Analysis of Kraft cooking liquor
3. Analysis of caustic soda
4. Determination of Kappa number of pulp
5. Preparation of soda pulp using woody and non woody fiber (study of H factor, residual alkali, consumption, rejects and yield)
6. Analysis of white liquor - sulphite, sulphate and chloride in white liquor
7. Analysis of CED solution
8. Determination of viscosity of pulp
9. Analysis of sodium sulfite
10. Preparation of Kraft pulp using wood and non wood fiber (study of H factor, residual alkali, consumption, rejects and yield)
11. Optimization studies of cooking (chemical charge to get desired yield & Kappa Number)
12. AQ reinforced cooking and study of H factor, residual alkali, consumption, rejects and yield
13. Preparation of high yield pulp

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 Marks
	Total	**-**	**25 marks**

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

Reference Books:

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 –III

Course: Chemistry -II
Discipline Specific Course (DSCC)

The course Chemistryin III 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 thecourses are as under.

Course No.-3 (Theory)

Course code	Type of Course	Theory / Practical	Credits	Instruction hour/ week	Total No. of Lectures/ Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
083BSP013	DSCC - 11	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.3 (Theory): Title of the Course (Theory): Chemistry - I

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

CO 1: Understand chromatography principles, ion exchange resins, applications

CO 2: Learn preparationof oxy-acids of chlorine, manufacture of bleaching chemicals

CO3: Know cellulose esters, starch derivatives and their application in paper industry

CO 4: Understand propertiesof liquids, surface tension, viscosity, dipole moment

Syllabus- Course 3 (Theory): Title- Chemistry	Total Hrs : 56
Unit-I : Chromatographic techniques	**14 hrs**
Chromatography: Introduction, history, classification, principle & basic theory of chromatography **Column chromatography:** Principle, types, theory and application **Thin layer chromatography:** Principle, types, theory and application **Paper chromatography:** Principle, types, theory, applications and significance of R_f value **Ion-exchange chromatography**: Types of ion exchange resins, basic requirements of useful resin, principle and applications **Liquid chromatography and high performance liquid chromatography :** Principle, instrumentation and applications **Gas chromatography:**Advantages, principle, instrumentation and applications	
Unit-II : Oxy acids of chlorine and bleaching agents	**14 hrs**

Oxy acids of chlorine and their salts: Introduction**, g**eneral methods of preparation, properties, structures and their applications in pulp and paper Industry **Bleaching Chemicals:** Manufacturing processes of bleaching chemicals needed in pulp and paper industry and their applications in bleaching of pulp a)Borohydrides b)Dithionites c)Oxygen and ozone d)Chlorine e) Chlorine dioxide f)Sodium hypochlorite g)Calcium hypochlorite and h)Bleaching powder	
Unit-III : Polymers and chemical kinetics	**14 hrs**
Addition and Condensation Polymers: Definition with examples, methods of addition and condensation polymerization, cationic, anionic and free radical polymerisation. Celluloseesters and ethers- cellulose acetate, nitrate and starch derivatives. Cationic, anionic, oxidized and enzyme starches, their applications in paper industry **Chemical kinetics:** Rate of a reaction**,** order of a reaction, expression for second order reaction and their experimental determination. Study of kinetics of reaction between KI and $K_2S_2O_8$ and lignin oxidation. Arrhenius theory, energy of activation and interpretation on the rate of delignification. Half-life period, method of determination of order of a reaction by hit and trial (integration) method, half-life period method, differential equation method, Ostwald's isolation method.	
Unit-IV: Physical properties and chemical constitution of liquids	**14 hrs**
Properties of liquids (a) Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise. Determination of surface tension by using stalagmometer, parachor and its applications. (b) Viscosity, fluidity, molar and intrinsic viscosity (definitions, determination of relative viscosity by using Ostwald's viscometer. Viscosity as a major factor in black liquor evaporation, cellulose viscosity and its importance in pulp and paper making. (c) Application of molar refractivity. i) Structural determination. ii) Percentage composition. iii) Dipole moment and its determination by temperature variation method. Applications of dipole moment.	

Reference Books:

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. Inorganic Quantitative analysis by A.I. Vogel, E L B S &Londman, London, 1979
4. Pulp and paper chemistry and chemical technology by James P. Casey- Volume I, Pulp and Paper Industry Canada, 1985
5. Organic chemistry by Morrison and Boyd – 5th edition, Pearson Education, Delhi, 2012.
6. Organic chemistry by I.L. FinarVol I & II – 6th edition., Pearson Education, Delhi, 2001
7. Organic Quantitative analysis by Vogel, 4th edition, E L B S & V Londman, London, 1979
8. Principles of physical chemistry by Prutton and Murron, 4th edition, Oxford & IBH Publication New Delhi-1980
9. Physical chemistry by Deniels and Alberty, 1st Edition, John Weley& Co ltd., Newyork 1995
10. Text book of physical chemistry by B.D. Khosla, 3rdEdition, R Chand & Co. Delhi-1982

B.Sc. Pulp and Paper Semester –III

Course: Chemistry-II
Discipline Specific Course (DSCC)

Course No.-3 (Practical)

Course code	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
083BSP014	DSCC - 12	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.3 (Practical): Title of the Course (Practical): Chemistry - I

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

CO 1: Understand techniques of chromatography and separation of sugars

CO 2: Determine Phenol, Amide, Ester, Aniline and Methoxygroup

CO 3: Prepare and estimate CED

CO 4: Learn iindustrial applications of CED

List of the experiments for 52 hrs / semester

I. Experiments on chromatography:

1. Separation of sugars from a given mixture of D-Glucose, D-Xylanose and Lactose by paper chromatography.
2. Separation of indicators in a given mixture containing 0.05% Ethanol, Alizarin- Red, Methyl red and Methyl orange.
3. Separation of components present in different inks by column chromatography.
4. Separation of phenol on activated silica gel using TLC preparing a solution in 3% ethanol,(Resorcinol +m-nitrophenol+ o-nitrophenol)

II. Determination of the following in organic compounds:

5. Phenol
6. Amide
7. Ester
8. Aniline
9. Acetyl content
10. Methoxy group

III. 11. Preparation of CED

12. Estimation of CED
13. Determination of viscosity of pulp.

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

1. Test - 15 Marks
2. Viva - 5 Marks
3. Journal - 5 Marks

Total - 25 Marks

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

Reference Books:

1. Instrumental methods of analysis by Willard, merit and Dean. CBS P & D Delhi 1986
2. Introduction to chromatography theory and practice by V.K. Srivastava K.K. Srivastava, S Chand and company Ltd 1991

B.Sc. Pulp and Paper Semester – III

Course: Thermodynamics and Heat Transfer

Open Elective Course (OEC-3)

Course No.-3 (Theory)

Coursecode	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	SummativeAssessment Marks	Total Marks
003BSP051	OEC - 3	Theory	03	03	42 hrs	2hrs	40	60	100

Course No.-3 (Theory) OEC-3: Title of the Course: Thermodynamics and Heat Transfer

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

CO1: Understand the role of different thermodynamic properties. And will be able to solve problems using the properties and relationship of thermodynamics.

CO2: Derive and discuss first and second law of thermodynamics.

CO3: Understand basic concept of heat transfer and Fourier's law and its applications

CO4: Differentiate between a *pure substance*, homogeneous mixture and aheterogeneous mixture.

CO5: Develop knowledge related to heat exchangers,andsolve numerical problems.

Syllabus- OEC 3: Title - Thermodynamics and Heat Transfer	Total Hrs: 42
Unit-I: Thermodynamics -I	**14 hrs**
Introduction to thermodynamics: Basic concept and terminologies used, first law of thermodynamics, applications to steady and non-steady flow processes and simple problems. **Second law of thermodynamics:** Concept of entropy, concept of carnot cycle. Application to engineering relating to equilibrium, maximum and minimum work conditions, concept of Gibbs and Helmboltzfreeenergy and numerical problems.	
Unit-II : Thermodynamics -II	**14 hrs**
Properties of Pure substances: Changes in thermodynamics, properties and their inter relationships, concept of sagality and fugacity coefficient for real gases. **Heat transfer equipment:** Elementary treatment of process design of double pipe heat exchangers, shell and tube type heat exchangers Extended surface heat exchangers, fins. Numerical problems.	
Unit-III : Conduction and Convection	**14 hrs**
Conduction: Fouriers law, steady state un directional heat flow through single- and multiplayer slabs cylinders and spheres for constant and variable thermal conductivity Insulation, properties of insulation materials, types of insulation, critical and optimum thickness of insulation. Numerical problems. **Convection:** Individual and over all heat transfer coefficients LMTD Dimensionless numbers dimensional analysis, Empirical correlations forced and natural convection. Numerical problems.	

Reference Books:

1. Engineering Thermodynamics, Dodge &McGraw Hill Publication.
2. Thermodynamics, P.C. RakshitThe New booksheel, Calcutta
3. Postulate and statistical Thermodynamics, YVC Rao Allied publishers ltd.
4. Thermodynamics kinetics Theory and statistical thermodynamics, Sears and SelimgerNoraso Publishing House, Chennai, 1996.
5. Chemical Engineering Vol. I 3rdEdn., Pergamon& ELBS 1977
6. Unit Operations in chemical Engineering 7th Edition 2008, McCabe and Smith McGraw Hill Co., New York
7. Process Heat transfer, by Kern Tata, McGraw Hill Co., New York
8. Process Heat transfer by Kerm D.O., McGraw Hill Co., New York

B.Sc. Pulp and Paper Semester - III

Course:Deinking and Waste Paper Recycling

SKILL ENHANCEMENT COURSE (SEC)-II

Course No.-3 (Practical)

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	SummativeAssessment Marks	Total Marks
SEC-II	Theory + Practical	02	03hrs	30	Practical	2 hr	25	25	50

Course No.-3 SEC(Practical) : Title of course: Deinking and Waste Paper Recycling

Course Outcome (CO): After completion of Skill Enhancement course, students will be able to:

CO1: Understand different sources of waste papers available for recycling and importance of recycling.

CO 2: Comparesecondary fiber with virgin fiber and know their impact on paper making process and equipment.

CO 3: Know different deinking methods and other pulp treatment methods

CO 4: Learn enzyme deinking and its merits and demerits

CO 5: Additives used in deinking, their principle and mechanisms

Secondary fiber pulping: Sources, and grading contaminants consumption and use ofsecondary fiber-economics comparison with virgin fiber and their impact on paper making process and equipment. Pulping systems-washing ink from the pulp slurry, flotation deinking, cleaning and screening, reject handling bleaching, process and quality control. Enzyme deinking, additives used in deinking principles, mechanism.

10 Hours

List of the Experiments for 20 hrs / Semester

1. Deinking of waste Paper
2. Deinking newsprint
3. Measurement of shives and viscosity
4. Screening of deinked pulp
5. Hand sheet making using deinked pulp

6. Measurement of brightness
7. Testing of hand sheets
8. Blending of deinked pulp for strength improvement
9. Bleaching of deinked pulp
10. Optimization of additives used in deinking

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 Marks
	Total	**-**	**25 marks**

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

Reference Books:

1. TAPPI Test methods 1996-97, TAPPI Press, Atlanta Georgia.
2. 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	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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: 2022-23

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

Part-A

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

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 weightage shall be given to each unit based on number of hours prescribed.

B.Sc. Pulp and Paper Semester –IV

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 –IV

Course: Stock Preparation & Paper making
Discipline Specific Course (DSCC)

Course No.-4 (Theory)

Course code	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
084BSP011	DSCC - 13	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.4 (Theory): Title of the Course (Theory): Stock Preparation & Paper making

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

CO 1: Understand basics and effects of refining of pulp.

CO 2: Learn applications of enzymes in refining

CO 3: Know methods of reuse and recycle of process water.

CO 4: Learn sources of fiber lossand its control methods.

CO 5: Know types of non fibers additives and their effect on paper making.

CO 6: Learn basic paper making process and modified paper making machinaries.

CO 7: Learn concept of multi layer board's manufacture.

Syllabus- Course 4 (Theory): **Title- Stock Preparation & Paper making**	**Total Hrs: 56**
Unit-I : Refining and Stock Proportioning	**14 hrs**

Refining of Pulp: Introduction,history,effect of refining on fiber structure, theory of refining, refiner,refiner types, construction, operation and control, specific edge load, metallurgy of plates, product properties calculation, application of enzymes in refining. **Stock Proportioning and blending:** White water and its reclamation, debris removal, types of screens, cleaners, principle, types, design and operation, deaerators, types of save-alls,broke system, design and control	
Unit-II : Non fibrous additives and deposit control	**14 hrs**
Fillers for Paper: Introduction characteristics of fillers, types of fillers, filler selection, retention and wet end chemistry, retention aids, drainage aids and formation aids and their effect on paper properties, colloidal mechanisms, retention measurement. **Internal sizing:** Introduction, types of sizing like acidic, neutral and alkaline sizing, mechanisms, cellulose reactive sizing agents, other agents. **Wet and Dry Strength resins:** Introduction, types and mechanism of wet and dry strength resin. **Paper Dyes: D**ye stuffs classification storage and handling, shade matching, common problems, automated dyeing. **Deposit control agents:** Introduction, classification, causes and problems slime, pitch and foam problems.	
Unit-III : Paper Machine and its accessories	**14 hrs**
Fourdrinierpaper machine: History and development, modern fourdrinier, sheet forming process,fourdrinier stock and white water system. Approach flow systems, drainage and sheet formation, suction boxes and couch roll. **Head boxes:T**ypes of head boxes, flow eveners, perforated rolls, baffles, slices, operation and controls of head box, calculations. **Paper machine wires:** Types, weave patterns, running and life of wires, wire cleaning devices, changing of wires, patching and repair of wires. **Dandy rolls:** Construction, function and method of operations, problems faced with dandy rolls, watermarking dandies, dandy drive. **Paper machine showers and doctors:** Introduction, shower application, doctor application and installation, maintenance calculation.	
Unit-IV : Board machineand multiple wire formers	**14 hrs**
Cylinder paper machine: History and development cylinder machine products single cylinder, wet board machine, multi cylinder paper board machine stock entries, factors affecting web formation, cylinder mould, couch rolls, felt whippers, functions of felt, felt conditioning and cleaning rubber and other rolls coverings-broke handling, pressure formers. **Twin wire and multiple wire formers:**Introduction, definitions, principles of twin and multiple wire formation and drainage and principles and operation tissue mechanisms.	

Books recommended:

1. Pulp and Paper Manufacture Volume 6 Stock preparation Edited by R.W Hagemeyer and D.W Manson. Published by Joint textbook committee of the Paper Industry
2. Pulp and Paper Manufacture Volume 7 Paper machine operations Edited by B. A. Thorp. Published by the Technical Section Canadian Pulp and paper Association
3. Pulp and Paper chemistry and chemical Technology - volume I to III James P. Casey
4. Hand book for Pulp and Paper Technologists - G. A. Smook, Angus Wilde Publications, Vancouver Bellingham -1964
5. Hand Book of Pulp Volume I – Edited by Herbert Sixta Published by Wiley-VCH VerlagGemb H and Company KGaA, Weinheim
6. Pulp and Paper Chemistry and Chemical Technology by James P. Casey

B.Sc. Pulp and Paper Semester –IV

Course: Stock Preparation
Discipline Specific Course (DSCC)

Course No- 4 (Practical)

Course code	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
084BSP012	DSCC - 14	Practical	02	04	52 hrs	3 hrs	25	25	50

Course No.4 (Practical) : Title of the Course (Practical): Stock Preparation

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

CO 1: Understand properties of fillers

CO 2: Understand internal sizing and sizing chemicals

CO 3: Analyse white water

CO 4: Understand fiber and filler retention

CO 5: Laboratory beating of pulp and concept of measurement of ^{0}SR

CO 6: Sheet making and pressing in laboratory

CO 7: Shade matching and optimization

List of the Experiments for 52 hrs / Semester

1. Analysis of talc
2. Analysis of clay

3. Analysis of rosin emulsion
4. Analysis of calcium carbonate
5. Analysis of alum/ poly aluminium chloride
6. Analysis of sodium silicate
7. Analysis of cationic starch
8. Analysis of white water and head box stock and fiber and filler retention
9. Testing of white water for pH, conductivity, cationic demand and anionic demand.
10. Laboratory beating of mill pulp to required ^{0}SR
11. Sheet making and pressing
12. Acid sizing in laboratory and testing
13. Shade matching and optimization

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 Marks
	Total	**-**	**25 marks**

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

Reference Books:

1. TAPPI Test methods 1996-97, TAPPI Press, Atlanta Georgia
2. Laboratory manual of testing procedures published by Director, CPPRI, Saharanpur, UP, 2000

B.Sc. Pulp and Paper Semester –IV

Course: Computer concepts and fundamentals of programming

Discipline Specific Course (DSCC)

The course Computer concepts and fundamentals of programmingin IV 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.-4 (Theory)

Course code	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours/ Semester	Duration of Exam	Formative Assessment Marks	SummativeAssessment Marks	Total Marks
084BSP013	DSCC - 15	Theory	04	04	56 hrs	2 hrs	40	60	100

Course No.4 (Theory):Title of the Course (Theory):Computer concepts and fundamentals of programming

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

CO 1: Learn fundamental concepts and computer programming

CO 2: Know concept of programming by developing and executing in c and python

CO 3: Learn structured and web developing projects

CO 4: Develop numerical abilities

CO 5: Acquire practical skills related to ESS, presentation and mini web-based projects

Syllabus- Course 4 (Theory) : Title- Computer concepts and fundamentals of programming	**Total Hrs: 56**
Unit-I : Computer and office management	**14 hrs**
Introduction of computer: Computer architecture and functions, types of computers. I/O and storage devices, introduction of operating system, types of operating system, DOS, WINDOWS, introduction to internet, services, networking, world wide web (www), using E-mail, use of cloud drive, social media services. **Introduction of office management:** Word processing, uses of spreadsheets, power point presentation and uses of google applications.	
Unit-II : Computer programming and C' programming	**14 hrs**
Introduction of computer programming: Introduction of programming. Types of programming, compiler, translator. Problem solving through algorithm and flowcharting. **Introduction of C programming:** Structure of a C program. Tokens, data types, constants and variables, managing I/O functions. Creating and executing a C program. Sample basics of C programs.	
Unit-III : Fundamentals of python programming	**14 hrs**
Introduction, understanding programming, conversing with python, writing a program. The building blocks of programs, operators and expressions, conditional execution, functions, control structures: if-else family, for loop, for loop with if break, while loop, sample python programs.	
Unit-IV : Basics of python spyder	**14 hrs**
Introduction, working with directory, creating and saving script file, executing file, operators, data types and associated operations, sequence data types and associated operations, strings, lists, arrays, tuples, dictionary, sets, range, NumPy-ndArray, Pandas data frame related operations and data visualation-case study.	

References:

1. The C Programming Language ,Second Edition, By Pearson Paperback – 1 January 2015by Brian W. Kernighan / Dennis Ritchie (Author)
2. Programming In C & Data Structure, by P B Kotur (Author), Publisher:Sapna Book House (1 January 2017)
3. Python for Everybody: Exploring Data Using Python 3by (2016-Jul-05 First Complete Python 3.0 version) by Dr. Charles R. Severance.
4. Mastering Python for Data Science by Sameer Madhavan published by Packt Publishing Ltd. (First Edition – August 2015)

B.Sc. Pulp and Paper Semester –IV

Course: Python programming
Discipline Specific Course (DSCC)

Course No.-4 (Practical)

Course code	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
084BSP014	DSCC - 16	Practical	02	04	52 hrs	3 hrs	25	25	50

Course No.4 (Practical):Title of the Course (Practical): Python programming

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

CO 1: Understand basics of programming by executing the simple programming

CO 2: Learn design and execution of code

CO 3: Know methods of presentation, arrays and functions

CO 4: Learn designing and implementing basic operations by applying python coding

CO 5: Know design and implementation of mini web-based projects

List of the Experiments for 52 hrs / Semester

Sample Programs using: C and Python programming:
Activity:

- Programming environment and tools
- Compiler and run time errors
- Program simulations offline/online/virtual lab programs
- Internet applications/google applications
- Sample web pages and blogs

Lab Programming:

1. Write program to check for factorial of n
2. Write Program to generate n primes
3. Write program to check a number for palindrome
4. Write program to generate n fibonacci numbers
5. Write program to read string, reverse it and check it for palindrome
6. Write a program to read, display and add two m x n matrices using functions
7. Write a program to find factorial of a number using both iterative & recursive function
8. Preparing word documents: formatting, designing templates and mail merging -case studies
9. Preparing worksheets, working on formulae and charts, data validation – case studies
10. Preparing offline and online interactive presentation and simulations, templates, quiz and add–on interactive-case studies
11. Use of e-mail and social media, working with google applications – case studies
12. Preparing sample website and blogs
13. Mini case studies/assignments/live web-based projects, case study

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

1.	Test	-	15 Marks
2.	Viva	-	5 Marks
3.	Journal	-	5 Marks
	Total	**-**	**25 marks**

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

B.Sc. Pulp and Paper Semester –IV

Course:Mass Transfer and Fluid Mechanics

Open Elective Course (OEC-4)

Course No.-4 (Theory)

Course code	Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	SummativeAssessment Marks	Total Marks
004BSP051	OEC - 4	Theory	03	03	42 hrs	2 hrs	40	60	100

Course No.-4 (Theory) OEC-4: Title of the Course: Mass Transfer and Fluid Mechanics

Course Outcome (CO): After completion of course, students will be able to:

CO 1: Understand diffusion, due to concentration difference, which is the basic driving force for all the mass transfer processes.

CO 2: Understand application of mass transfer processes for industrial applications.

CO 3: To select the proper type of equipment for the processes like evaporation, drying, cooling towers, absorption etc.

CO 4: To understand the basic factors which affect the above processes.

CO 5: To understand basics of fluid statics and dynamics, type of energy involved with fluids like static head (potential energy), velocity head (kinetic energy), and pressure and friction loss

CO 6: To calculate power requirement for pumping the liquids.

Syllabus- OEC 4 : Title - Mass Transfer and Fluid Mechanics	Total Hrs: 42
Unit-I : Mass transfer	**14 hrs**
Molecular and eddy diffusion in fluids: Mass transfer by diffusion measurement and calculation of diffusivities mass transfer coefficients and their correlations, analogies in transfer processes - Theories of mass transfer. **Evaporation:** Single and multiple effect evaporators - different methods of feeding in multiple effect evaporators. **Humidification:** General theory, psychrometric chart, fundamental concepts in humidification anddehumidification cooling towers. **Drying:** Drying rate curves, batch and continuous drying mechanism of drying calculation of batch and continuous drying. **Absorption:** Principles of gas absorption, types of absorption towers, design of absorption towers.	
Unit-II : Fluid statics and Dynamics	**14 hrs**
Fluid Statics: Static fluid pressure-hydrostatic equilibrium measurement of fluid pressure, manometry,hydrostatic forces on plane and curve surfaces-buoyancy. **Fluid Dynamics:** Types of flow-wheel stress and sheer rate fields, viscosity, classification of fluids. Basic equations of incompressible fluid, flow conservation of mass, momentum and energy, uni-dimensional flow, derivation of uni-dimensional flow. Eular's and bernoulli's equations. Applications of basic equation of flow.	
Unit-III : Fluid flow, transportation and metering of fluids	**14 hrs**
Flow of incompressible fluid: Flow of incompressible fluid through circular conduits, laminar and turbulent flow equations - Derivation of Hagen Poiseuille equation. **Transportations and metering of fluids:** Pipes fittings and valves, liquid and gas, pumps and compressors for chemical plants-reciprocating, rotary centrifugal, air lift pumps.	

Reference Books:

1. Mass transfer Operations, McGraw Hill - Robert Treybal
2. Unit Operations of chemical Engineering, McCabe and Smith McGraw Hill
3. Chemical Engineering Volume I and II: Coulson and Richardson. Pergamon Press Publication.
4. Principles of Unit Operations - Foust etial, John Wiley.

Details of Formative Assessment (IA) for DSCC theory/OEC: 40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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: 2022-23

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 : 10 marks

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 weightage shall be given to each unit based on number of hours prescribed.