FACULTY OF SCIENCES

SYLLABUS

For

Bachelor of Science (Honours)

(Non-Medical & Computer Science)

(Semester IV)

(Offered under 4 Year U.G. Degree Programme)

(Credit Based Continuous Evaluation Grading System)

Under NEP-2020

Session: 2026-27

The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(AUTONOMOUS)

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME
Bachelor of Science (Honours)
(Non-Medical & Computer Science)
Session-2026-27

Semester-IV								
Course Code	Course Name	Course Type	Credits	Total Marks	ESE		CA	Examination time (in Hours)
					L	P		
BSNL/BCSL-4421 BSNL/BCSL-4031 BSNL/BCSL-4431	Punjabi (Compulsory) [1]Basic Punjabi [2]Punjab History and Culture	C	4-0-0	100	70	-	30	3
BSNL/BCSL-4212	Appreciating English Literature -II	AEC	4-0-0	100	70	-	30	3
BSNL/BCSL-4333	Mathematics (Analysis)	DSC	4-0-0	100	70	-	30	3
BSNP/BCSP-4333	Analysis Laboratory		0-0-1	50	-	35	15	3
BSNL-4084	Inorganic Chemistry-II (Periodic Table and Coordination Chemistry)	DSC	4-0-0	100	70	-	30	3
BSNP-4084	Inorganic Chemistry-II Lab (Volumetric/Gravimetric Analysis and Preparation)		0-0-2	50	-	35	15	3
BCSM-4134	Computer Science (Data Structures)	DSC	3-0-1	100	40	30	30	3+3
BSNL/BCSL-4395	Physics (Quantum Physics)	DSC	4-0-0	100	70	-	30	3
BSNP/BCSP-4395	Thermal and Modern Physics Lab		0-0-2	50		35	15	3
**BSNM/BCSM-4390	Applied Optics	SEC	3-0-0	100	70	-	30	3
VACP-4511	Personality Development and Gender Sensitization	VAAC	2-0-0	50	35	-	15	3
	Total credits		26/24					

[1] Special paper in lieu of Punjabi (Compulsory) for those who have not studied Punjabi .

[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.

*credits/ grade points of these courses will not be added in SGPA/ CGPA of the semester/ Programme and only grades will be provided.

** Student Can opt any one of the given course

C- Compulsory

MDC- Multi Disciplinary Course

DSC-Discipline Specific Course

SEC- Skill Enhancement Course

VAAC-Value Added Audit Course, AEC- Ability Enhancement Course

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Semester IV

Punjabi (Compulsory)

COURSE CODE- BARL/BSML/BSNL/BCSL/BECL/BCRL /BBRL-4421

COURSE OUTCOMES

CO1: ‘ਗਲੀਏ ਚਿਕੜੁ ਦੂਰਿ ਘਰੁ’ (ਸਵੈ ਜੀਵਨੀ) ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਸਵੈਜੀਵਨੀ ਸਾਹਿਤ ਰੂਪ ਪ੍ਰਤੀ ਦਿਲਚਸਪੀ, ਸੂਝ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ।

CO2: ‘ਫ਼ਾਸਲੇ’ (ਨਾਟਕ) ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਨਾਟਕ ਨੂੰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਨਾਟਕ ਜਗਤ ਨਾਲ ਜੋੜਣਾ ਹੈ।

CO3: ਸ਼ਬਦ ਜੋੜਾਂ ਦੇ ਨਿਯਮ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰਨ ਦਾ ਮਕਸਦ ਵਿਦਿਆਰਥੀਆਂ ਦੁਆਰਾ ਲਿਖ਼ਤ ਵਿਚ ਕੀਤੀਆਂ ਜਾਣ ਵਾਲੀਆਂ ਗਲਤੀਆਂ ਨੂੰ ਸੁਧਾਰਨਾ ਹੈ। ਅਖ਼ਬਾਰ ਵਿਚ ਇਸ਼ਤਿਹਾਰ ਲਿਖਣਾ ਸਿਖਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਇਸ ਕਲਾ ਵਿਚ ਨਿਪੁੰਨ ਕਰਨਾ ਹੈ।

CO4: ਪੰਜਾਬੀ ਬਬਦ ਸ਼੍ਰੇਣੀਆਂ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ -ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

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Semester IV

Punjabi (Compulsory)

COURSE CODE- BARL/BSML/BSNL/BCSL/BECL/BCRL /BBRL-4421

ਸਮਾਂ : 3 ਘੰਟੇ	**Maximum Marks: 100**
L-T-P	**Theory : 70**
4-0-0	**CA :30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. **ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ।ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।**

2. **ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।**

3. **ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।**

4. **ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।**

ਪਾਠਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

ਯੂਨਿਟ-I

ਗਲੀਏ ਚਿਕੜੁ ਦੂਰਿ ਘਰੁ (ਸਵੈਜੀਵਨੀ): ਸ.ਸ.ਵਣਜਾਰਾ ਬੇਦੀ, ਕਸਤੂਰੀ ਲਾਲ ਐਂਡ ਸੰਨਜ਼, ਅੰਮ੍ਰਿਤਸਰ

(ਨਾਇਕ ਬਿੰਬ/ਸਵੈ ਜੀਵਨੀ ਦੇ ਤੌਰ ਤੇ ਪਰਖੋ/ਵਾਰਤਕ ਸ਼ੈਲੀ)

ਯੂਨਿਟ-II

ਫ਼ਾਸਲੇ (ਨਾਟਕ) :ਜਤਿੰਦਰ ਬਰਾੜ,

(ਵਿਸ਼ਾ ਵਸਤੂ/ਸਾਰ/ਨਾਟਕ ਕਲਾ**)**

ਯੂਨਿਟ-III

(ੳ) ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਜੋੜਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ

(ਅ) ਅਖ਼ਬਾਰ ਨੂੰ ਇਸ਼ਤਿਹਾਰ (ਨਿੱਜੀ, ਦਫ਼ਤਰੀ)

ਯੂਨਿਟ-IV

(ੳ) ਪੰਜਾਬੀ ਬਬਦ ਸ਼੍ਰੇਣੀਆਂ

(ੳ) ਵਿਸ਼ੇਸ਼ਣ : ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਵਰਗੀਕਰਨ

(ਅ) ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ : ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਵਰਗੀਕਰਨ

(ਏ) ਯੋਜਕ : ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਵਰਗੀਕਰਨ

(ਸ) ਵਿਸਮਕ : ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਵਰਗੀਕਰਨ

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SEMESTER–IV

Basic Punjabi

(In lieu of Punjabi Compulsory)

COURSE CODE- BARL/BSML/BSNL/BCSL /BECL/BCRL /BBRL-4031

Course outcomes

CO1:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਦੇ ਵਿਦਿਆਰਥੀ 'ਆਤਮ ਅਨਾਤਮ' (ਕਵਿਤਾ ਭਾਗ) ਦੇ ਨਾਮਵਰ ਕਵੀਆਂ ਮੋਹਨ ਸਿੰਘ,ਜਗਤਾਰ,ਸੁਰਜੀਤ ਪਾਤਰ,ਪਾਸ਼ ਦੀਆਂ ਰਚਨਾਵਾਂ ਦੀ ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ।

CO2:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਦੇ ਵਿਦਿਆਰਥੀ 'ਆਤਮ ਅਨਾਤਮ' (ਕਵਿਤਾ ਭਾਗ) ਦੇ ਵੱਖੋ ਵੱਖਰੀਆਂ ਧਾਰਾਵਾਂ ਨਾਲ ਸਬੰਧਤ ਮੋਹਨ ਸਿੰਘ,ਜਗਤਾਰ,ਸੁਰਜੀਤ ਪਾਤਰ,ਪਾਸ਼ ਦੀਆਂ ਰਚਨਾਵਾਂ ਦੇ ਸਾਰ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ।

CO3: ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਦੇ ਵਿਦਿਆਰਥੀ 'ਆਤਮ ਅਨਾਤਮ' (ਕਵਿਤਾ ਭਾਗ) ਦੇ ਵੱਖੋ ਵੱਖਰੀਆਂ ਧਾਰਾਵਾਂ ਨਾਲ ਸਬੰਧਤ ਮੋਹਨ ਸਿੰਘ,ਜਗਤਾਰ,ਸੁਰਜੀਤ ਪਾਤਰ,ਪਾਸ਼ ਕਵੀਆਂ ਦੇ ਜੀਵਨ ਅਤੇ ਰਚਨਾ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ।

CO4: ਲੇਖ ਰਚਨਾ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।ਸ਼ਬਦ ਜੋੜਾਂ ਦੇ ਨਿਯਮ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰਨ ਦਾ ਮਕਸਦ ਵਿਦਿਆਰਥੀਆਂ ਦੁਆਰਾ ਲਿਖ਼ਤ ਵਿਚ ਕੀਤੀਆਂ ਜਾਣ ਵਾਲੀਆਂ ਗਲਤੀਆਂ ਨੂੰ ਸੁਧਾਰਨਾ ਹੈ।

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SEMESTER–IV

Basic Punjabi

(In lieu of Punjabi Compulsory)

COURSE CODE- BARL/BSML/BSNL/BCSL /BECL/BCRL /BBRL-4031

ਸਮਾਂ : 3 ਘੰਟੇ **Maximum Marks: 100**

L-T-P **Theory :70**
4-0-0 **CA :30**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ (A-D) ਸੈਕਸ਼ਨ ਹੋਣਗੇ।ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਕ੍ਰਮਵਾਰ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਯੂਨਿਟ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ।ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀਹੈ।ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।

3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 14 ਅੰਕ ਹਨ।

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠਕ੍ਰਮ

ਯੂਨਿਟ-I

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ)(ਸੰਪਾਦਕ ਡਾ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਡਾ.ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)

ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ

ਯੂਨਿਟ-II

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ)(ਸੰਪਾਦਕ ਡਾ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਡਾ.ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)

ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਸਾਰ/ਵਿਸ਼ਾ ਵਸਤੂ)

ਯੂਨਿਟ-III

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ)(ਸੰਪਾਦਕ ਡਾ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਡਾ.ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ)

ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਕਵੀਆਂ ਦੇ ਜੀਵਨ ਅਤੇ ਰਚਨਾ ਬਾਰੇ ਮੁੱਢਲੀ ਜਾਣਕਾਰੀ)

ਯੂਨਿਟ-IV

ਲੇਖ ਰਚਨਾ

ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਜੋੜਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਕੇ ਲਿਖਣਾ

SEMESTER IV
Session: 2026-27

Bachelor of Arts / Bachelor of Science (Medical) (Honours) / Bachelor of Science (Non-Medical) (Honours) / Bachelor of Science (Computer Science) (Honours) / Bachelor of Science (Economics) (Honours) / Bachelor of Commerce (Honours) / Bachelor of Business Administration (Honours)

COURSE CODE: BARL-4431/BSML-4431/BSNL-4431/BCSL-4431/BECL-4431/BCRL-4431/BBRL-4431

COURSE TITLE: PUNJAB HISTORY AND CULTURE (From 1605 to 1849 A.D.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

After completing the paper, the students will have a thorough insight into the origin of Sikh faith and its major institutions in Punjab

Course Outcomes:

CO 1: understand the adoption of new policy by Guru Hargobind and martyrdom of Guru Tegh Bahadur

CO 2: To understand the factors leading to the establishment of Khalsa Panth and its impact

CO 3: Have deep insight into the conflict with Mughals and the rise of Banda Singh Bahadur and aftermath.

CO 4: Understand the administration under Maharaja Ranjit Singh, also the fairs, festivals and folk music of Punjab.

SEMESTER IV
Session: 2026-27

Bachelor of Arts / Bachelor of Science (Medical) (Honours) / Bachelor of Science (Non-Medical) (Honours) / Bachelor of Science (Computer Science) (Honours) / Bachelor of Science (Economics) (Honours) / Bachelor of Commerce (Honours) / Bachelor of Business Administration (Honours)

COURSE CODE: BARL-4431/BSML-4431/BSNL-4431/BCSL-4431/BECL-4431/BCRL-4431/BBRL-4431

COURSE TITLE: PUNJAB HISTORY AND CULTURE (From 1605 to 1849 A.D.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Examination Time: 3 Hours — Max. Marks: 100
Credits L-T-P: 4-0-0 — Theory: 70
Contact Hours: 4 Hrs/ Week — CA: 30

Instructions for the Paper Setters

Eight questions of equal marks (marks) are to be set, two in each of the Four Sections (A-D). Questions of Sections A-D should be set from Unit I-IV of the syllabus respectively. Candidates are required to attempt five questions in 800 words selecting at least one question from each section. The fifth question may be attempted from any sections Each question will carry 14 Marks

UNIT I

1. Transformation of Sikhism under Guru Hargobind.

2. Martyrdom of Guru Teg Bahadur

UNIT II

3. Creation of Khalsa

4. Khalsa and its impact on the Punjab

UNIT III

5. Banda Bahadur and his achievements

6. Rise of Misls.

UNIT IV

7. Maharaja Ranjit Singh: - Civil, Military and Land Revenue Administration.

8. Fair, Festivals and Folk Music in the Punjab during the medieval period (Jarag, Baisakhi and Diwali)

Suggested Readings:

- Chopra P.N., Puri, B.N., & Das, M.N. (1974), A Social, Cultural & Economic History of India. Vol. II, Macmillan India Limited, New Delhi.
- Grewal, J.S. (1994). The Sikhs of the Punjab, Cambridge University Press, New Delhi.
- Singh, Fauja (1972). A History of the Sikhs, Vol. III, Patiala: Punjabi University.
- Singh, Khushwant (2011). A History of the Sikhs- Vol. I (1469-1839). New Delhi:
- Singh,Kirpal (1990). History and Culture of the Punjab-Part II (Medieval Period).

Bachelor of Arts / Bachelor of Science (Medical) / Bachelor of Science (Non-Medical) / Bachelor of Science (Computer Science) / Bachelor of Science (Economics)/ Bachelor of Commerce/ Bachelor of Business Administration (Three Year Degree Programme)

&

Bachelor of Arts (Honours) / Bachelor of Science (Medical) (Honours) / Bachelor of Science (Non-Medical) (Honours) / Bachelor of Science (Computer Science) (Honours) / Bachelor of Science (Economics) (Honours)/ Bachelor of Commerce (Honours) / Bachelor of Business Administration (Honours) (Four Year Degree Programme)

(Semester IV)

Session 2026-27

APPRECIATING ENGLISH LITERATURE-II

Course Code: BARL/BSML/BSNL/BCSL/BECL/BCRL/BBRL -4212

(NEP-2020)

COURSE OUTCOMES

After passing this course, the students will be able to:

CO 1: change the narration and voice of sentences after understanding fundamental grammatical rules governing them through the study of "English Grammar in Use" by Raymond Murphy

CO 2: develop an understanding of the poems taught, relate to the socio-cultural background of England through the study of the poems in the prescribes text "Moments in Time"

CO 3: understand the tone, style and central idea through the study of the poems in the prescribes text "Moments in Time"

CO 4: to enhance the writing skills through Business letters writing and E mail writing

Bachelor of Arts / Bachelor of Science (Medical) / Bachelor of Science (Non-Medical) / Bachelor of Science (Computer Science) / Bachelor of Science (Economics)/ Bachelor of Commerce/ Bachelor of Business Administration (Three Year Degree Programme)

&

Bachelor of Arts (Honours) / Bachelor of Science (Medical) (Honours) / Bachelor of Science (Non-Medical) (Honours) / Bachelor of Science (Computer Science) (Honours) / Bachelor of Science (Economics) (Honours)/ Bachelor of Commerce (Honours) / Bachelor of Business Administration (Honours) (Four Year Degree Programme)

(Semester IV)

Session 2026-27

APPRECIATING ENGLISH LITERATURE-II

Course Code: BARL/BSML/BSNL/BCSL/BECL/BCRL/BBRL -4212

Max. Marks: 100

Examination Time: 3 Hrs. **Theory: 70**

L-T-P (Credits): 4-0-0 **CA: 30**

Instructions for the Paper Setters:-

Eight questions are to be set, two from each of the four Units (I-IV). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question will carry 14 marks. (14x5=70)

UNIT-I

English Grammar in Use, 5th Edition by Raymond Murphy, CUP (Revision of Units: 26-37, 42-48, 92-97,113-120)

UNIT-II

Moments in Time: Poems at Sr. No. 1-6

UNIT-III

Moments in Time: Poems at Sr. No. 7-12

UNIT-IV

Paragraph writing, Business Letters, Writing Emails

Texts Prescribed:

1.English Grammar in Use (Fourth Edition) by Raymond Murphy, CUP

2.*Moments in Time*

Bachelor of Science (Honours)

Semester–IV
Session: 2026-27
Course Title: Mathematics (Analysis)
Course Code: BSNL/ BCSL -4333

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate an understanding of limits and how they are used in sequences.

CO 2: Understanding how limits are used in series and apply various test on series.

CO 3: To understand the concepts of Riemann sum, partitions, upper and lower sums, Riemann Inerrability of continuous functions and of monotone functions. Distinguish between the absolute convergence and conditional convergence.

CO 4: To know Conditions for existence of improper integrals, Tests for the convergence of the improper integrals of different kinds, Absolute convergence.

Bachelor of Science (Honours)

Semester–IV
Session: 2026-27
Course Title: Mathematics (Analysis)
Course Code: BSNL/ BCSL -4333

Examination Time: 3 Hours | Max. Marks: 100

L T P | Theory: 70

4 0 0 | CA: 30

Instructions for the Paper Setter: Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Sequence, Subsequence, Limit point of a sequence, Theorems on limits of sequences, Convergence and divergence of a sequence, Bounded and monotonic sequences and their behavior, Squeeze Theorem on sequences, Bolzano-Weierstrass theorem (statement only), Definition of Cauchy sequence, Cauchy's convergence Criterion, Cauchy's first theorem on limits with its applications, Cauchy's second theorem on limits with its applications.

Unit II

Series of non-negative terms, Convergence and divergence of infinite series, Cauchy convergence criterion for series, Comparison tests for convergence. Cauchy's condensation test, Cauchy's integral test, Cauchy's root test, D'Alembert's ratio test, Comparison between Cauchy's root test and D'Alembert's ratio test, Logarithmic test, Gauss test, Alternating series, Leibnitz's test.

Unit III

Partition of an interval, Riemann upper and lower sums, Riemann upper and lower integrals, Riemann integrability, Necessary and sufficient conditions for a bounded function to be Riemann integrable, Riemann integrability of continuous functions, monotone functions, and composition of functions, Darboux theorem, Fundamental Theorem of calculus.

Unit IV

Improper integrals, Conditions for existence of improper integrals, Tests for the convergence of theimproper integrals of different kinds, Absolute convergence.

Text Book:-

S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd. (1991).

Reference Book:

Tom M. Apostol, Calculus: An Indian Adaptation, Wiley India, 2022.

Bachelor of Science (Honours)
Semester–IV
Session: 2026-27
Course Title: Analysis Laboratory
Course Code: BSNP/ BCSP -4333

Course Outcomes

After passing this course, the students will be able to:

CO1. Generate and analyze various types of sequences, including bounded and monotonic sequences, using computational tools.

CO2. Visualize mathematical concepts through plotting techniques to understand the behavior and properties of sequences and series.

CO3. Investigate convergence of sequences and series using analytical and numerical methods such as the Cauchy Root Test and D'Alembert Ratio Test.

CO4. Approximate and interpret the radius of convergence of power series for practical and theoretical applications.

Bachelor of Science (Honours)
Semester–IV
Session: 2026-27
Course Title: Analysis Laboratory
Course Code: BSNP/ BCSP -4333

Examination Time: 3 Hours | Max. Marks: 50
Practical: 35
L T P | CA: 15
0 0 1

List of Practicals (using any package)

1. Generate bounded sequences.
2. Visualize bounded sequences using plots.
3. Study the convergence of sequences through plotting.
4. Visualize monotonic sequences using plots.
5. Investigate convergence of series.
6. Visualization of convergence tests: Cauchy Root test and D' Alembert Ratio test.
7. Approximating radius of convergence of a power series.

Text Books:-

1. S.S. Sastry, Engineering Mathematics - Volume I (4th Edition), PHI, 2008.
2. S.S. Sastry, Engineering Mathematics - Volume II (4th Edition), PHI, 2008.

Bachelor of Science (Honours)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2026-27)
(Semester IV)
COURSE CODE: BSNL/BSML-4084
COURSE TITLE: Chemistry (Inorganic Chemistry-II)

Course outcomes:

Students will be able to

CO1 : Explain the periodic trends, chemical properties, and structures of p-block elements and their compounds, including sulphur and halogen oxoacids, interhalogens, and industrial processes like the Contact Process for sulphuric acid.

CO2 : Compare and contrast the electronic structure, oxidation states, and magnetic properties of d- and f-block elements, including the effects of lanthanide and actinide contraction and their analytical applications.

CO3 : Analyze the structure, bonding, stability, and stereochemistry of coordination compounds using Werner's theory, valence bond theory, and ligand field considerations.

CO4: Interpret electronic spectra of transition metal complexes using Orgel diagrams and selection rules, and describe the structure, bonding, and reactivity of organometallic compounds including their role in catalysis

Bachelor of Science (Honours)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2026-27)
(Semester IV)
COURSE CODE: BSNL/BSML-4084
COURSE TITLE: Chemistry (Inorganic Chemistry-II)

Exam Time: 3Hrs. **Max. Marks: 100**
Credit (L-T-P): 4-0-0 **(Theory: 70, CA: 30)**

Instructions for the Paper Setters: Eight questions of equal marks (fourteen marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdividedinto parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT -I (15 Hrs.)

p–Block Elements: Group 16: General characteristics: atomic radii, Ionisation energies, Melting and boiling point, Electron affinity, Oxidation state, Catenation, Elemental state, Allotropy, Hydrides of group 16, Chemical properties of SO_2, structure of SO_2 & SO_3, Oxoacid of sulphur: structure and basicity. Preparation of sulphuric acid by contacts process and its chemical properties

Group 17: General characteristics: atomic radii, Ionisation energies, melting and boiling point, Electron affinity, Electronegativity, Non-metallic character, colour, Oxidation state and reactivity**,** Hydrides of group 17, Relative acidic strength of hydro acids and Oxoacids of group 17, structure of interhalogen compounds and polyhalides.

Important compounds of p-block: Carbides, fluorocarbons, Silicones and phosphazenes, triphosphazenes.

UNIT -II (15 Hrs.)

Chemistry of Transition Elements: General characteristics of Transition Elements. Properties of the elements of the first transition series, Relative stability of their oxidation state. Coordination number and geometry. General characteristics of elements of Second and Third Transition Series. Difference in the properties of first transition elements with second and third transition series elements in respect of ionic radii, oxidation states, magnetic behaviour.

***f*-block elements**: Lanthanoids: Electronic configurations, oxidation states, ionic radii, lanthanide contraction, colour, spectral and magnetic properties, lanthanum compounds. Actinoids: electronic configurations, oxidation states, ionic radii, actinide contraction, colour, spectral and magnetic properties. Comparison of lanthanoids and actinoids and their analytical applications.

UNIT-III (15 Hrs.)

Coordination Compounds: Nomenclature of coordination compounds, Werner's coordination theory, effective atomic number, polydentate, chelating ligands and chelation, factors affecting stability of chelates, structural and stereoisomerism in coordination compounds with co-ordination number 4 and 6, resolution of racemic mixture, Valence bond theory of transition metal complexes, hybridization and geometry of complexes of Cr, Fe, Co, Cu and its ions, Magnetic properties and colour of coordination compounds.

Transition Metal complexes: an elementary idea of crystal field theory, Jahn-Teller effects. methods of determining magnetic susceptibility by Gouy's and Faraday method. L-S coupling, correlation of μs and μeff values, Nucleophilic Substitution reactions in square planar complexes

UNIT-IV (15 Hrs.)

Electronic Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules and relaxations, splitting of Russel-Saunder states in octahedral and tetrahedral, spectrochemical series, Orgel diagram of one electron-one hole system and two electron-two hole system in octahedral and tetrahedral complexes. Limitation of Orgel diagram.

Organometallic Compounds: Definition, nomenclature and classification of organometallic compounds. σ and π complexes, types of organoligands, EAN rule, bonding in organometals, Preparation, properties, bonding and applications of alkyl lithium and organoaluminium compounds (AlR_3). Metal olefin complexes, bonding in metal-ethylenic complexes, Mechanism of homogeneous hydrogenation reactions of alkene. Metal carbonyls: examples and bonding.

Books suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.
3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.
4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.
5. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.
6. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science (Honours)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2026-27)
(Semester IV)
COURSE CODE: BSNP/BSMP-4084
COURSE TITLE : Chemistry (Inorganic Chemistry-II Lab)

Course outcomes:

Students will be able to analyze the given organic compound through

CO1: Perform volumetric titrations for the quantitative analysis of substances such as acetic acid, antacids, and water hardness using appropriate indicators and standard solutions.

CO2: Apply redox titration techniques (e.g., permanganometry, dichromate method, iodometry) to estimate metal ions like calcium, iron, and copper with accuracy and precision.

CO3: Execute gravimetric analysis procedures for the estimation of metal ions like copper, nickel, and silver through selective precipitation and weighing of pure compounds.

CO4: Synthesize and characterize simple inorganic compounds such as Prussian Blue, potash alum, and copper acetylacetonate, demonstrating understanding of coordination chemistry and crystallization techniques

Bachelor of Science (Honours)
Credit Based Continuous Evaluation Grading System (CBCEGS)
(Under NEP 2020)
(Session: 2026-27)
(Semester IV)
COURSE CODE: BSNP/BSMP-4084
COURSE TITLE : Chemistry (Inorganic Chemistry-II Lab)

Time: 3 Hrs **Marks: 50**
Credits: 0-0-2 **(Practical: 35, CA: 15)**

Volumetric Analysis

1. Determination of acetic acid in commercial vinegar using NaOH.
2. Determination of alkali content-antacid tablet using HCI.
3. Estimation of calcium content in chalk as calcium oxalate by permanganometry.
4. Standardisation of EDTA with $Pb(NO3)2$ / $ZnSO4.7H2O$ and Estimation of hardness of water by EDTA.
5. Estimation of ferrous and ferric by dichromate method.
6. Estimation of copper using sodium thiosulphate.

Gravimetric Analysis

Analysis of Cu as CuSCN; Ni as Ni (dimethylgloxime) and Determination of silver (I) as its chloride

Inorganic Preparations

Synthesis of Iron(III) Hexacyanoferrate(II) $Fe4[Fe(CN)6]3$ (Prussian Blue).

Preparation of Potassium Aluminum Sulfate $KAl(SO_4)\cdot 12\ H_2O$ (Potash Alum)

Preparation of bis Acetylacetonate Copper(II) $Cu(O_2C_5H_7)_2$.

Books Suggested

1. Vogel's Textbook of Quantitative Inorganic Analysis (revised), J. Bassett, R.C. Denney, G.H. Jeffery and J. Mandham, ELBS.
2. Standard Methods of Chemical. Analysis, W.W. Scott: The Technical Press.
3. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
4. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
5. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
6. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
7. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
8. Marr, G. and Rockett, B.W. Practical Inorganic Chemistry, 1972.

Bachelor of Arts (Honours) / Bachelor of Science (Computer Science) (Honours)/ Bachelor of Science (Economics) (Honours) Semester- IV

(Session 2026-27)

Course Code: BARM-4134

BCSM-4134

BECM-4134

COMPUTER SCIENCE

(DATA STRUCTURES USING C++)

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend various concepts of Object Oriented Programming.

CO2: Analyze complexity of algorithms to determine their efficiency and comprehend array and Linked List as base data structures..

CO3: Comprehend various hashing method, sorting and searching algorithms as well as operations of queue and stack data structures.

CO4: Comprehend advanced data structures such as tree and graph.

Bachelor of Arts (Honours) / Bachelor of Science (Computer Science) (Honours)/ Bachelor of Science (Economics) (Honours) Semester- IV

(Session 2026-27)

Course Code: BARM-4134

BCSM-4134

BECM-4134

COMPUTER SCIENCE

(DATA STRUCTURES USING C++)

(THEORY)

Examination Time: 3 +3 Hrs.	**Max. Marks: 100**
	Theory: 40
L-T-P: 3-0-1	**Practical:30**
Credits: 4	**CA: 30**

Instructions for Paper Setter -

Eight questions of equal marks (8 marks each) are to be set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. The students can use Non–programmable/ scientific & Non–storage type calculator.

UNIT–I

Introduction to OOPs: Object Oriented Programming (OOP) v/s Procedural Programming, Encapsulation, Inheritance, Polymorphism, Abstraction.

Classes and Objects: Constructors and Destructors; Access Specifiers (public, private, protected).

Inheritance: class hierarchies, Public & Private inheritance, Levels of inheritance, Overloading v/s overriding; virtual functions, Friend Functions and Friend Classes.

UNIT–II

Data Structures: Introduction to elementary data organization, Common Operation on Data Structures, Algorithm Complexity, Big O Notation, Time-Space Tradeoff between Algorithms.

Arrays: Array defining, representing arrays in memory, various operations on linear arrays, Multi-Dimensional arrays.

Linked Lists: Types of Linked Lists, representing linked list in memory, advantages of using linked lists over arrays, various operations of linked lists, doubly linked List.

UNIT–III

Stacks: Description of stack structure, Implementation of stack, using arrays and linked lists, application of stack-converting, arithmetic expression from infix notation to polish notation and their subsequent evaluation, quicksort technique.

Queues: Description of queue structure, Implementation of queue using arrays and linked lists, description or priorities of queues, dequeues.

Sorting and Searching: Sorting Algorithms, bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, searching Algorithms, linear search and binary search, hashing.

UNIT-IV

Trees: Description of Tree Structure and its Terminology, Binary Trees and Binary Search Trees and their representation in Memory, Heapsort.
Graphs: Description of Graph Structure, Implement Graphs in Memory using Adjacency Matrix, Path Matrix, graph traversal techniques - DFS, BFS.
Files: File Organization Techniques (Sequential, Indexed).

References / Textbooks:

1. Seymour Lipschutz, Data Structures with C (Schaum's Outline Series), McGraw Hill Education (2017), 1st Edition
2. Reema Thareja, Data Structures Using C, Oxford Publication (2014), 2nd Edition
3. Sahni Horowitz, Fundamentals of Data Strucetures in C (2008), 2nd Edition
4. Narasimha Karumanchi, Data Structures and Algorithms made easy, Careermonk Publications (2016), 5th Edition
5. S.K. Srivastava and Deepali Srivastava, Data Structures through C, BPB Publications (2004)
6. Yedidyah Langsam, Augestein and Tanenbaum, Data Structures using C and C++, Pearson Education India (2015), 2nd Edition

Bachelor of Arts (Honours) / Bachelor of Science (Computer Science) (Honours)/ Bachelor of Science (Economics) (Honours) Semester- IV

(Session 2026-27)

Course Code: BARM-4134

BCSM-4134

BECM-4134

COMPUTER SCIENCE

(DATA STRUCTURES USING C++)

(PRACTICAL)

Examination Time: 3 +3 Hrs. **Max. Marks: 100**

Theory: 40

L-T-P: 3-0-1 **Practical:30**

Credits: 4 **CA: 30**

Lab Exercises based on Implementation of Data Structures using C++:

- Classes and Objects, constructors and destructors
- Data types
- Control statements
- Arrays & Strings in C++
- Searching (binary search, linear search)
- Sorting: Bubble Sort, selection sort, insertion sort, quick sort, merge sort, heap sort.
- Linked list
- Stacks (Using Arrays)
- Queues (Using Arrays)
- Trees – Traverse the BST
- Graphs-transversal, finding the shortest path
- File handling

Bachelor of Science (Honours)

SEMESTER-IV

PHYSICS (QUANTUM PHYSICS)

(Session-2026-27)

Course code: BSNL-4395 for Bachelor of Science (Non Medical)

BCSL-4395 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand and explain the fundamental principles leading to the development of quantum mechanics, including wave-particle duality, the De Broglie hypothesis, uncertainty principle, and the photoelectric and Compton effects.

CO2: Apply the operator formalism in quantum mechanics to calculate expectation values, understand the Ehrenfest theorem, and work with Hermitian operators, eigenfunctions, and eigenvalues.

CO3: Solve one-dimensional quantum mechanical problems using the Schrödinger equation, such as step potentials, potential barriers, and particle in a box, and explain phenomena like quantum tunneling.

CO4: Analyze three-dimensional quantum systems, including the particle in a 3D box, the 3D harmonic oscillator, and the hydrogen atom, using Cartesian and spherical coordinate solutions of the Schrödinger equation.

Bachelor of Science (Honours)

SEMESTER–IV

(**Session-2026-27)**

PHYSICS (QUANTUM PHYSICS)

Course code: BSNL-4395 for Bachelor of Science (Non Medical)

BCSL-4395 for Bachelor of Science (Computer Science)

Credits: 4-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**

Examination Time: 3 Hours **Pass Mark: 25**

Instructions for the Paper Setters:

Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question carries 14 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Formalism of Wave Mechanics:

Brief introduction to need and development of quantum mechanics, photoelectric effect, Compton effect, Wave particle duality, De broglie hypothesis, Uncertainty principle, Gaussian wave packet, Operator correspondence, Normalization and probability interpretation of wave function, Superposition principle.

UNIT–II

Expectation value, Probability current and conservation of probability, Admissibility conditions of wave function, Ehrenfest theorem, Eigen function and Eigen value, Operator formalism, orthogonal system, expansion in eigen functions, Hermitian operator, simultaneous eigen function, equation of motion.

UNIT–III

Application of Schrodinger wave equation to one dimensional problems: Fundamental postulates of wave mechanics, Schrodinger's wave equation for a free particle and equation of a particle subject to forces. One dimensional step potential for $E>V_0$, one dimensional step potential for $0<E<V_0$, one dimensional potential barrier of finite height and width, Quantum mechanical tunnelling effect, particle in one dimensional box with infinitely hard walls, one dimensional square well of finite depth

UNIT–IV

Application of Schrodinger equation to three dimensional problems:

Free particle in three dimensional rectangular box, Eigen wave function, Eigenvalues of momentum, energy and degeneracy, three dimensional harmonic oscillator (Cartesian coordinates) wave function, energy levels, degeneracy, Schrodinger's wave equation in spherical polar coordinates, Schrodinger wave equation for spherically symmetric potential for hydrogen atom, wave function of H atom, solution of $R(r),\Theta(\theta),\Phi(\varphi)$ equations.

Text Reference Books:

1. A Text book of Quantum Mechanics: P.M. Mathews and K. Venkatesan, (Tata McGraw Hill Pub. Co, Delhi) 2002.
2. Quantum Mechanics: J. L. Powell and B. Craseman (Narosa Pub. House, New Delhi) 1997.
3. Elements of Modern Physics: S.H. Patil, (McGraw Hill), 1998.
4. Introduction to Quantum Mechanics, L. Pauling and E.B. Wilson (Tata McGraw Hill Pub. Co., Delhi), 2002.

Bachelor of Science (Honours)

SEMESTER–IV

(Session-2026-27)

Course Title: THERMAL & MODERN PHYSICS LAB (PRACTICAL)

Course code: BSNP-4395 for Bachelor of Science (Non Medical)

BCSP-4395 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Perform and analyze thermal experiments to determine physical properties such as thermal conductivity, adiabatic expansion, and heating efficiency, using methods like Lee's method and controlled electric heating.

CO2: Investigate thermoelectric and optical phenomena by plotting the calibration curve of a thermocouple, studying the absorption spectra of iodine vapors, and analyzing the inverse square law using a photovoltaic cell.

CO3: Explore the principles of quantum physics by conducting experiments related to the photoelectric effect, determining Planck's constant, and measuring the ionization potential of mercury.

CO4: Demonstrate understanding of polarization and optical activity by using a polarimeter to measure the rotation of the plane of polarization and determine the specific rotation of sugar.

Bachelor of Science (Honours)

SEMESTER–IV

(Session-2026-27)

THERMAL & MODERN PHYSICS LAB (PRACTICAL)

Course code: BSNP-4395 for Bachelor of Science (Non Medical)

BCSP-4395 for Bachelor of Science (Computer Science)

Credits: 0-0-2 **Max Marks: 50 (ESE Marks: 35, CA: 15)**

Examination Time: 3 Hours **Pass Mark: 13**

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

The distribution of marks is as follows :

i) One experiment 15 Marks

ii) Brief Theory 7 Marks

iii) Viva–Voce 7 Marks

iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper will consist of 8 experiments, out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

List of Experiments

1. To study adiabatic expansion of gas and hence to calculate the value of Volume.
2. To find the coefficient of Thermal Conductivity of a bad conductor by Lee's method.
3. To plot a calibration curve of a given thermocouple (copper constantan) using a potentiometer.
4. To study the photoelectric effect and determine the value of Planck's constant.
5. To determine the ionization potential of mercury.
6. Study of variation of light intensity with distance using photovoltaic cell (Inverse Square Law)
7. To determine the heating efficiency of an electric kettle with varying voltage.
8. To study the absorption spectra of iodine vapours.
9. To study the rotation of the plane of polarization by using a polarimeter.
10. To determine the specific rotation of sugar using Laurent's half shade polarimeter
11. To study the characterizations of Photovoltaic cells.

Bachelor of Science (Honours)

SEMESTER-IV

(Session-2026-27)

APPLIED OPTICS

PHYSICS SKILL ENHANCEMENT COURSE (SEC-1)

Course code: BSNM-4390 for Bachelor of Science (Non Medical)

BCSM-4390 for Bachelor of Science (Computer Science)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: Understand and analyze the principles of interference of light, including the formation of interference patterns using Young's double slit, Fresnel biprism, thin films, Newton's rings, and interferometers such as Michelson, Fabry-Perot, and Mach-Zehnder.

CO2: Apply Fresnel and Fraunhofer diffraction theory to analyze diffraction patterns through rectangular and circular apertures, and evaluate the resolving power of optical instruments like telescopes, microscopes, and diffraction gratings.

CO3: Demonstrate understanding of light polarization through various phenomena including reflection, double refraction, and use of Nicol prisms and retardation plates, and analyze the production and analysis of polarized light using optical devices.

CO4: Explain the working principles of lasers by understanding stimulated emission, Einstein coefficients, population inversion, laser types (e.g., Ruby, Nd:YAG, He-Ne, CO_2), and their applications in holography and optical fiber communication.

Bachelor of Science (Honours)

SEMESTER-IV

(**Session-2026-27)**

APPLIED OPTICS

PHYSICS SKILL ENHANCEMENT COURSE (SEC-1)

Course code: BSNM-4390 for Bachelor of Science (Non Medical)

BCSM-4390 for Bachelor of Science (Computer Science)

Credits: 3-0-0 **Max Marks: 100 (ESE Marks: 70, CA: 30)**

Examination Time: 3 Hours **Pass Mark: 25**

Instructions for the Paper Setters:

Eight questions of equal marks (specified in the syllabus) are to be set, two in each of the four sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question carries 14 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

UNIT–I

Interference of Light:

Superposition of light waves and interference, Young's double slit experiment, Conditions for sustained interference pattern, Coherent sources of light, spatial and temporal coherence Interference pattern by division of wave front, Fresnel Biprism, Displacement of fringes, Change of phase on reflection, Interference in thin films due to reflected and transmitted light, Newton's Rings. Michelson Interferometer, Fabry Perot and Mach Zehnder Interferometer.

UNIT–II

Diffraction:

Fresnel theory of diffraction, half-period zones, Zone plate, Distinction between Fresnel and Fraunhoffer diffraction. Fraunhoffer diffraction at rectangular and circular apertures, Resolving power of telescope in diffraction grating, its use as a spectroscopic element and its resolving power, Resolving power of microscope

UNIT–III

Polarization:

Plane Polarized light, Elliptically polarized light, wire grid polarizer, Sheet polarizer, Mauls' Law, Brewester Law, Polarization by reflection and scattering, Double reflection, Nicol prism, Retardation plates, Production and Analysis of polarized light, Quarter and half wave plates.

UNIT–IV

Laser Fundamentals:

Derivation of Einstein relations, Concept of stimulated emission and population inversion, broadening of spectral lines, three level and four level laser schemes, elementary theory of optical cavity, longitudinal and transverse modes, Components of laser devices, condition for laser action, types of lasers, (Ruby and Nd:YAG lasers, He-Ne and CO2 lasers) construction, mode of creating population inversion and output characteristics, application of lasers –a general outline. Holography and its applications, Optical fibres, design, basic principle, numerical aperture, applications of fibres in optical communication.

Text Reference Books:

1.Fundamentals of Optics: F.A. Jenkins and Harvey E White, (Megraw Hill) 4th Edition, 2001.

2. Optics: Ajoy Ghatak, (McMillan India) 2nd Edition, 7th Reprint, 1997

3. Optics: Born and Wolf, (Pergamon Press) 3rd Edition, 1965.

4. Laser Fundamentals: W.T. Silfvast (Foundation Books), New Delhi, 1996.

5. Laser and Nonlinear Optics: B.B. Laud (New Age Pub.) 2002

6. Laser: Svelto, Plenum Press) 3rd Edition, New York.

7. Optical Electronics, K. Thyagrajan and Ajoy K. Ghatak, Cambridge University Press